

**Municipality/Organization:** City of Malden  
**EPA NPDES Permit Number:** MA041046  
**MADEP Transmittal Number:** 041088  
**Annual Report Number  
& Reporting Period:** No. 12: April 1, 2014-March 31, 2015

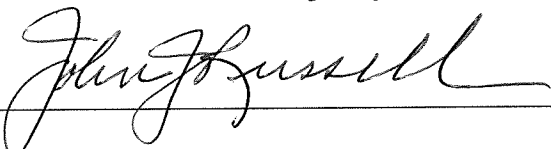
## NPDES PII Small MS4 General Permit Annual Report

### Part I. General Information

**Contact Person:** John J. Russell, P.E. **Title:** City Engineer  
**Telephone #:** 781-397-7040 **Email:** jrussell@cityofmalden.org

#### Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Signature:**   
**Printed Name:** John J. Russell  
**Title:** City Engineer  
**Date:** May 1, 2015

## Part II. Self-Assessment

In support of this compliance program, the City has invested significant resources and funding to support the objectives of the Stormwater Compliance Team (SCT). The systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, and removal of illicit discharges serves to demonstrate the effectiveness of the City's stormwater management program. Through the efforts of City personnel and outside technical support, paper records have been converted into a working GIS resource. This management tool has increased the efficiency and timing of responses, while providing an in depth working knowledge of the infrastructure, major components of which date back to the late 1800s. Of primary note is that working with representatives of the USEPA and IDDE Plan implementation it has been identified that Malden receives substantial dry weather flows from neighboring communities that have been quantitated through flow isolation studies. As a "flow through community" the City has provided this information for public distribution. The City of Malden currently maintains a dedicated team of in-house staff and supporting technical services to meet the challenges of stormwater management within a highly urbanized study area. To support the removal of illicit discharges the City has undertaken flow capacity analyses, GIS mapping of infrastructure components, completion of dry and wet weather sampling, Illicit Discharge Detection and Elimination (IDDE) Plan implementation and flow isolation studies. Building upon the results of dry weather mass balance / flow isolation studies, the City maintains a very aggressive IDDE program that has resulted in readily apparent improvement in the quality of stormwater discharges.

City representatives have been meeting with stewardship organizations such as the Mystic River Watershed Association (MyRWA) and the Friends of the Malden River throughout the last year to develop partnerships and transfer of information. During this reporting period, the City continued to meet with representatives of the Department of Conservation and Recreation (DCR) in an attempt to address long needed repairs to flow conveyance channels at the along Town Line Brook and at Oak Grove. At this time funding constraints have been indicated by DCR and conditions continue to degrade in this major flow conveyance network. As such, outside assistance from political and regulatory representatives is needed to avoid continued degradation of both surface water quality and channel integrity. Through its Capital Improvement Plan (CIP) the City has funded over 450 linear feet of bank repair and stabilization at Fellsmere Pond to improve stormwater runoff characteristics and corresponding surface water quality. In addition, two nearby areas of groundwater breakout were found to be attributable, at least in large part, to compromises to the drainage system that serves the study area which were mitigated through manhole repairs and the installation of new piping. At South Broadway and Callahan Parks, significant improvements in the form of synthetic and grass recreational cover and infrastructure improvements were performed as a continuation of the City's commitment to improved stormwater runoff. The City is also continuing to work with and support the U.S. Army Corps of Engineers (ACOE) National Ecosystem Restoration (NER) Plan that will enhance both habitat and surface water quality along the banks of the Malden River.

As an example of the City's commitment to the MS4 Stormwater program, staffing support has been increased for Malden Department of Public Works (MDPW), who represent the major component of the Compliance Team. The City continues to make significant progress towards meeting the requirements of proposed revisions to the MS4 General Permit, as they pertain to North Coastal Communities. In addition to water quality goals, a notable reduction in local flooding has been achieved through improvements to the drainage system, a once neglected infrastructure

## **Part III. Summary of Best Management Practices (BMPs) and Compliance Team Goals**

### **1. Public Education, Outreach and Community Involvement**

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|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BMP 1-1</b> | <b>Place Educational Information on City's Web Site and Malden Access Television (MATV). Meetings, presentations, distribution of education materials</b> |
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**Responsible Department/Person:**

Engineering Dept, Mayor's Office & MATV

**Measurable Goal(s):**

Continued maintenance of the City informational web site and participation with MATV.

**Progress on Goals- Year 12:**

The City has and continues to expand on community outreach through maintenance of an informational website and work with representatives of MATV to update the community on current stormwater management issues. The City has made a clear commitment, through its Mayor and related support staff to promote community awareness and involvement. This reporting period, the Mystic River Watershed Association (MyRWA) is administering a grant for an Urban Water Project, which consists of staff from Horsley Witten, an engineering firm and MyRWA reviewing City ordinances and generating media information pertaining to stormwater.

In addition, during this permit year a citizens group, referred to as the Friends of the Malden River, has become actively involved in ecosystem restoration and water quality improvement projects. Members of the Stormwater Compliance Team have made presentations, as well as attended meetings held by this advocacy group. Members of the SCT have also met with numerous graduate students from MIT and Tufts Universities to share stormwater and surface water quality information.

**Goal Status:**

Achieved original goals. Community outreach is an integral part of the City's efforts to mitigate stormwater quality concern.

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|----------------|--------------------------------------------------------------------------|
| <b>BMP 1-2</b> | <b>Conduct Recycling Opportunities &amp; Paint Waste Collection Days</b> |
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**Responsible Department/Person:**

DPW & Mayor's Office

**Measurable Goal(s):**

Continuation and possible expansion of recycling collection days, and distribution of related educational information.

**Progress on Goals- Year 12**

MDPW sponsors two (2) paint waste collection and recycling days annually. As summarized in Part V, Section 2.5, these two (2) collection days resulted in the accumulation of a volume that incurred disposal costs of approximately \$10,000. The City also continues to maintain its recycling programs at the MDPW yard.

**Goal Status:**

Annual Program - Activity Ongoing

|                                                           |
|-----------------------------------------------------------|
| <b>BMP 1-3      Enforce Pet Waste Management Programs</b> |
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**Responsible Department/Person:**

Animal Control Dept & City Clerk

**Measurable Goal(s):**

Posting of signage, installation of waste collection containers, park maintenance, ordinance enforcement, Community involvement.

**Progress on Goals- Year 12:**

The Board of Health (BOH) actively monitors public recreation areas to discourage the feeding of waterfowl populations that contribute to the degradation of surface water quality. In addition, pet waste, education and control programs (stations) are in-place. The continued replacement of earthen/grassy playing field surfaces with synthetic cover is also a key factor in the reduction of animal waste contributions to stormwater runoff. Fellsmere Pond is a key surface water body that is monitored by City personnel. In addition, pet waste management is strictly enforced at public open spaces and recreational areas.

**Goal Status:**

Achieved

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|--------------------------------------------------------------------------------------------------------------|
| <b>BMP 1-4      Establish a partnership with local schools to educate Malden's students about stormwater</b> |
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**Responsible Department/Person:**

Stormwater Compliance Team

**Measurable Goal(s):**

Workshops, demonstration projects, student involvement

**Progress on Goals- Year 12:**

The Stormwater Compliance Team spoke to Malden grade school students at the Beebe and Forestdale Schools regarding the City drainage system. Stormwater management goals and ongoing practices are educational tools that are included in community outreach efforts. In addition, the Stormwater Compliance Team provided information to MIT graduate and undergraduate students who are conducting a bacteria assessment consisting of a Storm Water Management Model (SWMM) focusing on tracking bacteria sources in the Malden River. Assistance was also provided to Tufts students who are involved in a Water: Systems, Science and Society (WSSS) educational program to assist in evaluating public access to the Malden and Mystic Rivers.

**Goal Status:**

Through the use of website postings and connection to the classroom, the City hopes to continue the advancement of student involvement in meeting this goal.

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|----------------|------------------------------------------------------------------------------|
| <b>BMP 1-5</b> | <b>Development of student involvement/internship for High School Seniors</b> |
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**Responsible Department/Person:**

Engineering Dept & MDPW

**Measurable Goal(s):**

Number of participants

**Progress on Goals- Year 11:**

See BMP 1-4

**Goal Status:**

Activity Ongoing

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|----------------|------------------------------------------------------------------------|
| <b>BMP 1-6</b> | <b>Expand Cooperative Education programs for college level interns</b> |
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**Responsible Department/Person:**

Engineering Dept

**Measurable Goal(s):**

Number of participants

**Progress on Goals- Year 12:**

During this reporting period the City Engineering Department employed an intern.

**Goal Status:**

The City is currently exploring ways to partner high school and college interns in areas of public outreach and curriculum development. BMPs 1-5 and 1-6 will be coordinated to meet this goal.

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| <b>BMP 1-7</b> | <b>Host or participate in Stormwater Management brainstorming sessions with citizen advisory groups and Mystic River Watershed representatives (MyRWA)</b> |
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**Responsible Department/Person:**

Eng. Dept. & Mayor's Office

**Measurable Goal(s):**

Annual Participation. Dissemination of information to the general public

**Progress on Goals- Year 12:**

The City continues to actively work with interested stakeholders to advance the water quality goals of its stormwater compliance program. The Friends of Malden River is a group of Malden citizens established to promote community awareness and opportunities associated with this resource area. This group meets regularly with MyRWA and has also established lines of communication with the City of Malden, including the Mayor's office, the Engineering office, the Environmental Justice Coordinator. The Friends of Malden River have worked on funding sources, a Public Improvement Plan (PIP) for 378 Commercial Street and a Malden River festival to support community awareness for the Malden River.

This reporting period MyRWA is administering a grant for an Urban Water Project, which consists of staff from Horsley Witten, an engineering firm and MyRWA reviewing City ordinances and generating media information pertaining to stormwater. The City continues to share sampling results with MyRWA and has performed targeted sampling events to investigate discharges to outfalls that have been sampled by MyRWA. One particular area of interest is the Saugus Branch drainage system that discharges to the outfalls referred to as MR-2S and MR-2N.

**Goal Status:**

Ongoing community activity

## 2. Local Planning Processes and Community Involvement

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|----------------|---------------------------------------------------------------------------------------------------------------------|
| <b>BMP 2-1</b> | <b>Development of incentives for redevelopment initiatives that address existing stormwater management concerns</b> |
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**Responsible Department/Person:**

Local Planning Agencies and Compliance Team

**Measurable Goal(s):**

Mitigation of existing stormwater concerns.

**Progress on Goals- Year 12:**

Recently completed and proposed municipal restoration projects for recreational areas have integrated stormwater quality enhancement measures into the design process. The greatest opportunities for the advancement of this goal continues to come from the identified infrastructure and watershed needs that are identified through the ongoing CB inventory, mapping inventory program. Through the integration of the stormwater management program into daily work practices by the Malden DPW, infrastructure deficiencies are more quickly identified and placed into the local permitting process. During site plan review needed upgrades to the existing infrastructure are reviewed and where feasible, incorporated into the review and approval process. Similarly, consideration is given for the implementation of Low Impact Development (LID) measures.

**Goal Status:**

Through the changes in staffing and engineering support, increased planning and incentives to promote improved stormwater management practices will be a priority during the next permit year.

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| <b>BMP 2-2      Development of a “Clean Malden” Program</b> |
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**Responsible Department/Person:**

Stormwater Compliance Team

**Measurable Goal(s):**

Promote neighborhood stewardship programs designed to remove trash from sensitive watershed areas, catch basin inlets and report conditions of concern.

**Progress on Goals- Year 12:**

See BMPs 1-4 thru 1-7

**Goal Status:**

Achieved and ongoing

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|----------------|-------------------------------------------------------------------------------------------|
| <b>BMP 2-3</b> | <b>Inter-departmental review and communication to address stormwater quality concerns</b> |
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**Responsible Department/Person:**

Local Planning and Inspectional Agencies

**Measurable Goal(s):**

Coordination of Planning and Inspectional services to further identify and address stormwater management issues.

**Progress on Goals- Year 12:**

Through the adoption of a City ordinance pertaining to the stormwater management requirements, the objectives of this BMP have been integrated into the formal Department Head meeting agenda. Representatives of the BOH continue to be instrumental in successful enforcement actions when necessary. This program has led to the isolation and mitigation of illicit flow contributions as well as infrastructure deficiencies to be corrected which are discussed in further detail within Appendix B.

**Goal Status:**

Ongoing

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|----------------|---------------------------------------------------------------------|
| <b>BMP 2-4</b> | <b>Development of an electronic database file management system</b> |
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**Responsible Department/Person:**

Engineering Department and Compliance Team

**Measurable Goal(s):**

Compilation of all stormwater infrastructure information, integration of all ongoing inspection, inventory and repair activities.

**Progress on Goals- Year 12:**

Through the assistance of CDM-Smith, the City has completed the conversion of its current mapping system to GIS/electronic format using field GPS receivers. Future goals to advance the operational integration of the electronic file and data management program currently utilized by the City include the use of “tablets” in the field to more readily access information and update existing files. Changes in staffing and more direct daily involvement by engineering personnel will further advance this goal.

**Goal Status:**

Activity Ongoing

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|----------------|-----------------------------------------------------------|
| <b>BMP 2-5</b> | <b>Development and implementation of local ordinances</b> |
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**Responsible Department/Person:**

Local Planning Agencies and Compliance Team

**Measurable Goal(s):**

Adopt and enforce state and federal regulatory guidance. Perform community infrastructure needs analysis and conveyance of information to local permitting processes. Assign BMP guidance and requirements to private land use activities that are connected to the urban stormwater network.

**Progress on Goals- Year 12:**

The City continues to enforce existing stormwater ordinances and is reviewing Green Infrastructure and LID guidance and proposed Permit revisions to provide further enforcement guidance.

**Goal Status:**

Achieved

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| <b>BMP 2-6</b> | <b>Completion of an infrastructure needs analysis</b> |
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**Responsible Department/Person:**

Eng. Dept, DPW, Compliance Team

**Measurable Goal(s):**

Development of a long term plan for infrastructure upgrade

**Progress on Goals- Year 12:**

The reorganization of Engineering and MDPW support staff has advanced the understanding, communication and prioritization of infrastructure needs, as well as more direct daily involvement by City staff.

**Goal Status:**

Annual Ongoing Activity

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|----------------|-----------------------------------------------------------------------------------------------|
| <b>BMP 2-7</b> | <b>Identification of capital improvement projects necessary to improve stormwater quality</b> |
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Conveyance of CIP requirements to Planning Board and local permitting processes. Number of improvement projects completed.

**Progress on Goals- Year 12:**

See BMP 2-6. This BMP is to be combined with the preceding, ongoing activities.

**Goal Status:**

See above.

### 3. Stormwater Monitoring and Inspection Program

**BMP 3-1      Conduct a minimum of one annual inspection of all known outfalls during dry weather sampling events.**

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Documentation of inspection results. Identification of issues of concern and corresponding confirmation resolution/ implementation of mitigation measures.

**Progress on Goals- Year 12:**

During this permit year, two (2) dry weather sampling events were performed by the Stormwater Compliance team. Details pertaining to the dry weather sampling events may be referenced within BMP 3-3 and Appendix B. In addition to the above, no new illicit connections or illicit discharges were identified during this permit year. However, information pertaining to the investigation of one (1) possible illicit connection identified previously is discussed below. The possible illicit connection was identified by the Stormwater Compliance team in a drainage manhole on Sharon Street during a dry weather inspection of this portion of the City. A dry weather flow discharging from a pipe which appeared to be emanating from the rear of the building located at 50 Crystal Street (Viking Seafoods Inc) was identified. The subsequent monitoring of the drainage manhole revealed that the discharge appears to be intermittent, with flows observed to be approximately 10 – 12 gallons per minute, which slowed to a trickle over an approximate 10 minute timeframe. The City Engineering Department has contacted the owners of the Viking Seafoods property to further investigate this condition and the City was informed that this was process water from a cooling tower. The Stormwater Compliance Team conducted several dry weather sampling events at the manhole in question (S14-MH4) and determined that the dry weather flow encountered at manhole S14-MH4 is not an illicit connection and as such no further action is required.

In addition to the above, the owner of the property on South Washington Street where a possible illicit connection was initially identified in 2012 was contacted by the City of Malden Engineering Office. The City was advised that this was a roof drain connection and in response to this, the Engineering Office conducted an onsite inspection and confirmed that the connection was tied to roof drains.

**Goal Status:**

Achieved and Ongoing Activity

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| <b>BMP 3-2</b> | <b>Perform targeted sampling and analyses during dry weather and wet weather sampling events to document seasonal and annual trends.</b> |
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Collection of water quality data

**Progress on Goals- Year 12:**

A summary table with historic dry weather sampling results, together with figures depicting approximate sample locations may be referenced as Appendix A. Following seasonal changes, dry weather sampling will continue during the next permit year and a wet weather sampling event is proposed to be performed during the next qualifying rainfall event.

**Goal Status:**

Achieved and Ongoing Activity

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|----------------|---------------------------------------------------------------------------------------------------------------|
| <b>BMP 3-3</b> | <b>Perform mass balance modeling within primary watersheds to isolate sub basin bacteria loading sources.</b> |
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Identification of source area contributions

**Progress on Goals- Year 12:**

Representatives of NCA and MDPW personnel continue to conduct dry weather inspections of the City's infrastructure. During this permit year the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook respectively, as well as the north central portion of Malden, which discharges to Lower Spot Pond Brook, and then Malden River have been iteratively inspected and monitored. This is an interactive and systematic program that has resulted in the identification and correction of infrastructure deficiencies, with the repair of flow conveyance networks and removal of illicit discharges leading to improvements in the quality of stormwater discharges. Historically, areas selected for inspection were generally based upon the results of the outfall sampling program and/or the identification of dry weather flows by MDPW staff during their routine maintenance and infrastructure locating program. As this program has continued a more uniformed and systematic inspection program has been developed.

NCA conducted a dry weather sampling events at several key outfalls that discharge to the Malden River on 2 July 2014 and 5 November 2014. This included the sampling of baseline water flow from MR-2N and MR-2S, which receive flows from the Saugus Branch. Representatives of MyRWA have met with the City and identified this dry weather flow as a potential issue of concern, based upon the results of their sampling efforts. As shown within Appendix A, during the 5 November sampling event, E. coli levels of 490 MPN/100 ml (MR-2N) and 440 MPN/100 ml (MR-2S) were identified, respectively. These locations were sampled by MyRWA in June of 2013 and elevated bacterial levels were reported. To further investigate the elevated bacteria loadings identified in June 2013, NCA reviewed the MyRWA outfall monitoring data, as well as online U. S.

Geologic Survey (USGS) precipitation data and noted that an antecedent rainfall event approximating the recommended precipitation limit had occurred in the area on 24 June 2013. As noted within Appendix A, the most recent results collected from the Saugus Branch are slightly higher than those collected in July of 2014, however; they are significantly lower than the results obtained by MyRWA in June of 2013.

Over the past several years of the stormwater compliance program, and of a likely consequence from ongoing eco-restoration efforts, a significant increase in waterfowl populations including swans, geese and ducks has been observed. The stagnant nature of surface water flows within the Malden River, together with this increase in waste loadings from waterfowl is currently under review to isolate human versus waterfowl bacteria contributions. This scope of work includes the use of multiple lines of evidence testing of outfall discharges to the River.

The Stormwater Compliance Team has conducted numerous dry weather sampling events to investigate the elevated E. coli levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive. Base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 was completed in February 2012. Given the proximity of the sewer and drain lines to LSP-4, as well as the settlement of the drain line in the area of Buildings 1054 and 1056 Elrich Drive, the focus of assessment activities was directed towards the sewer laterals and nearby drainage line servicing the two apartment buildings. Following dye testing by the Compliance Team, camera surveys performed by representatives of the property owner confirmed that compromises to the laterals servicing two (2) residential building had occurred. Recommendations made by the SCT involved restoring the integrity of the main drainage line to stop the discharges that have been documented at LSP-4.

Working with representatives of the Malden Engineering Department, repairs to the sewer laterals in the area of Building 1054 and 1056 were completed by the property owner in March 2012. Since that time, several dry weather flow samples have been collected from LSP-4, and as shown within Appendix A, E. coli levels although still elevated, decreased significantly relative to concentrations detected in 2012. However, during the 2 July 2014, an E. coli concentration of 110,000 MPN/100 ml was detected at LSP-4. An additional sample was collected on 5 November 2014, with an E. coli concentration of 3,200 MPN/100 ml detected. Field observations noted at that time by NCA included an increased discharge relative to prior sampling events. According to the City Engineering Department, the Eldrich Drive complex is under new ownership and the City has attempted to contact the property owner numerous times to discuss the sampling results, however the owner has been unresponsive. Accordingly, more formal enforcement measures are recommended for the next reporting period.

Flow isolation studies performed to date within Linden Brook Culvert had not revealed any specific source conditions for the results of prior sampling. During this reporting period flow isolation studies were continued on a dry weather flow (Flow 18) in the area of Cherry Street and Sylvan Street which contributes to the western portion of the Linden Brook Culvert. Several dry weather flow samples collected from drainage manhole (C18-MH5) located on Cherry Street contained higher E. coli levels and to further assess this condition, dry weather flow samples were collected on 5 November 2014. E. coli levels encountered at drainage manhole C18-MH5 contained an E. coli level of 1,300 MPN/100 ml. An upstream dry weather flow sample relative to C18-MH5 was also collected from a manhole located on Winship Street (W47-MH1), with a level of 1,700 MPN/100 ml of E. coli identified. This concentration is in the range of the E. coli level quantified at C18-MH5 (1,300 MPN/100 ml) this reporting period. As this flow (Flow 18) originates along Sylvan Street, proximate to the Forestdale School, a dry weather flow sample was collected from

drainage manhole S45-MH4 along Sylvan Street, with a level of 8.5 MPN/100 ml of E. coli identified. The continued targeted sampling of dry weather flow in this area will be performed next reporting period.

A follow-up inspection of dry weather flows encountered along Goldcliff Street was conducted this reporting period. The drainage network in this area of Malden contributes to the western portion of Linden Brook Culvert. The 2 July and 5 November 2014 inspections of drainage manhole G26-MH2 on Goldcliff Street revealed no dry weather flow and as this flow has been assessed several times with no dry weather flows noted, no further action is required.

In addition to the above, a follow-up inspection of dry weather flows initially identified last reporting period was conducted within the eastern portion of Malden in the area of Grant Street, which also contributes to the eastern portion of Linden Brook Culvert. Dry weather flows were encountered previously (Flows 23, 24 & 25) on Grant Street, Wheeler Street and Revere Street, respectively. The 2 July and 5 November 2014 inspection of drainage manholes on Wheeler Street revealed no dry weather flow, while on 2 July, Revere Street drainage contained only a trickle flow and on 5 November there was no dry weather flow. Dry weather flows on Wheeler Street (Flow 24) and Revere Street (Flow 25) have been assessed several times with no dry weather flows noted. Dry weather flow was again encountered on Grant Street during the 5 November 2104 sampling event in drainage manhole G36-MH2. A dry weather flow sample was collected from the manhole and an E. coli concentration of 290 MPN/100 ml was encountered, significantly lower than the 1,700 MPN/100 ml detected in July of 2014. Dry weather flow along Springdale Street (Flow 22) was also evaluated this reporting period through the collection of a dry weather flow sample from manhole S27-MH2 and an E. coli concentration of 17 MPN/100 ml was encountered, well below the applicable Action Level. Additional dry weather flow samples will be collected from Grant Street (G36-MH2) and Springdale Street (S27-MH2) during the next reporting period. Additional details pertaining to dry weather inspections may be referenced from the Illicit Discharge Detection and Elimination Program (IDDE) Semi-Annual Status Reports, which have been filed with USEPA and may be referenced as Appendix B.

**Goal Status:**

Initial city wide objectives for this goal have been met. IDDE program and dry weather flow isolation studies are ongoing.

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| <b>BMP 3-4</b> | <b>Target the evaluation of stormwater discharges from “green space” parklands, cemeteries and open space to assist in the segregation of human, animal and waterfowl bacteria contributions.</b> |
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Separation of non-human bacterial loading and implementation of mitigation measures.

**Progress on Goals- Year 12:**

The City has implemented several measures to reduce discharge of non-human bacterial loading at park lands, cemeteries and open space. These have included the use of dogs, postings to prevent the feeding of waterfowl, pet waste stations and enforcement of posted signage. During this permit year the City converted South Broadway Park from grass playing fields to a synthetic surface. This improvement is located within the Town Line Brook watershed and will have a direct impact upon waterfowl waste contributions, as well as overall runoff quality.

**Goal Status:**

Ongoing Activity

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| <b>BMP 3-5</b> | <b>Development of mitigation strategy based upon sampling and inspection progress for consideration in annual capital planning.</b> |
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Preparation of annual report.

**Progress on Goals- Year 12:**

Dry weather sampling continues to focus upon primary surface water bodies that received base-flow as surface water as well as “flow through” bacterial loading from adjacent communities. The surface water bodies principally include the Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. Beyond the removal of illicit discharges, flow conveyance capacity requirements and necessary infrastructure repairs have been identified. Included amongst long term planning efforts is Phase 3 of a comprehensive Infiltration and In-flow (I&I) study for the municipal sewer system that was performed by CDM Smith, on behalf of the City. This report includes a summary of findings and proposed recommendations to mitigate infiltration and inflow into the City's sewer system and was presented for approval to Massachusetts Water Resources Authority (MWRA) during this permit year. Approval has been received, together with necessary funding.

The City has converted and updated a majority of its current storm drain system mapping to GIS format using field GPS receivers. This includes the scanning of existing record plans as well as the conversion of field data, specifically drainage infrastructure components are located and inventoried as a part of ongoing system wide maintenance, service and inspection program being implemented by the MDPW. In addition to this data collection process, MDPW personnel are also inspecting drainage system components for indications of dry weather flow, as well as illicit discharges or connections. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering and outside technical staff to further investigate. The results obtained from the outfall sampling program, together with the development of an electronic file management system, continue to assist in the prioritization of infrastructure needs.

**Goal Status:**

Both in-house and contracted services are in place to oversee mitigation maintenance and planning efforts.

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| <b>BMP 3-6</b> | <b>Development and Implementation of an Illicit Discharge Detection and Elimination (IDDE) Plan</b> |
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**Responsible Department/Person:**

Eng Dept & Compliance Team

**Measurable Goal(s):**

Development and implementation of an IDDE Plan.

**Progress on Goals- Year 12:**

The City continues to implement its approved IDDE program through its daily CB inspection and maintenance program through the use of a dedicated MDPW Stormwater Team and outside services. The drainage infrastructure is inspected by DPW during the catch basin cleaning program. Upon the identification of previously unknown dry weather flows, the Engineering Department and NCA are immediately notified by MDPW personnel and targeted mass balance sampling efforts are performed. During dry weather inspections completed under the IDDE program, various dry weather flows have been identified. The Semi-Annual Status Reports pertaining to this effort, which have been filed with USEPA, may be referenced as Appendix B.

**Goal Status:**

Achieved

#### 4. Pre- and Post-Construction Stormwater Runoff Control Measures

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|----------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>BMP 4-1</b> | <b>Development of inspection protocol/checklist local permitting agencies to monitor ongoing construction activities</b> |
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Development of checklist

**Progress on Goals- Year 12:**

The City's permitting process now incorporates the criteria contained within adopted stormwater ordinances to guide its review process. These ordinances provided the mechanism for enforcement and work is ongoing to integrate the results from daily inspection and monitoring into these processes.

**Goal Status:**

Achieved and Ongoing

|                |                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BMP 4-2</b> | <b>Integration of Applicant Certification requirement for the monitoring and inspection of development activities into local planning processes.</b> |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Applicant Certification and submission of inspection and monitoring reports (See BMP 4-1).

**Progress on Goals- Year 12:**

No progress has been made to these certification requirements, beyond conditions of approval and City oversight.

**Goal Status:**

Ongoing

|                |                                                                                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>BMP 4-3</b> | <b>Promote the use of new and innovative products/designs in new development initiatives. Condition of approval, monitoring</b> |
|----------------|---------------------------------------------------------------------------------------------------------------------------------|

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Conditions of Approval, monitoring of construction activities.

**Progress on Goals- Year 12:**

Municipal projects within the City have primarily involved the conversion of urban fill areas into capped recreational improvements, including the ongoing conversion of South Broadway Park to synthetic playing field surfaces. During 2014 – 2015 permit year, surface cover and drainage improvements were completed at Callahan Park. Additional improvements performed during this permit year have included turf management and drain line cleaning at Linden Park.

**Goal Status:**

Ongoing

|                |                                                            |
|----------------|------------------------------------------------------------|
| <b>BMP 4-4</b> | <b>Enforcement of existing state and federal guidance.</b> |
|----------------|------------------------------------------------------------|

**Responsible Department/Person:**

Planning Board and Inspectional Services, Eng. Dept.

**Measurable Goal(s):**

Documentation of violations, implementation of corrective actions.

**Progress on Goals- Year 12:**

See BMP 3-6 and 5-8. Following the adoption of local control measures in April 2009, the City has enforced the removal of illicit discharges and required that investigations be undertaken to mitigate improper stormwater discharges. This has involved the upgrade of private sewer connections to the municipal system, removal of illicit discharge connections and the cleanup/maintenance of private properties exhibiting the potential to adversely contribute to wet weather runoff.

**Goal Status:**

Ongoing

|                                                                                         |
|-----------------------------------------------------------------------------------------|
| <b>BMP 4-5      Develop partnerships in planning with local Conservation Commission</b> |
|-----------------------------------------------------------------------------------------|

**Responsible Department/Person:**

Planning Board and Inspectional Services, Eng. Dept.

**Measurable Goal(s):**

Stormwater quality management practices as conditions of approval.

**Progress on Goals- Year 12:**

The goals of this general permit and the corresponding IDDE program are directly communicated to the local Conservation Commission. In addition, infrastructure needs and deficiencies are communicated to the Commission for review and consideration during the local permitting process.

**Goal Status:**

Achieved and ongoing

|                                                                        |
|------------------------------------------------------------------------|
| <b>BMP 4-6      Site design measures to improve stormwater quality</b> |
|------------------------------------------------------------------------|

**Responsible Department/Person:**

Planning Board

**Measurable Goal(s):**

Improved design features for new development.

**Progress on Goals- Year 12:**

The adoption of local ordinances (See BMP 4-3) have provided planning review processes with guidance for appropriate design practices, in addition to BMP 2-5. Further, compliance with stormwater guidance for new development (310 CMR 10.00) is maintained.

**Goal Status:**

Ongoing

## 5.0 Pollution Prevention and Stormwater Management Strategies.

|                                                                     |
|---------------------------------------------------------------------|
| <b>BMP 5-1      Develop a Formal Training Program for DPW Staff</b> |
|---------------------------------------------------------------------|

**Responsible Department/Person:**

DPW, Human Resources Dept.

**Measurable Goal(s):**

Staff Training

**Progress on Goals- Year 12:**

In addition to increased engineering involvement in daily work practices, the City has increased its DPW staff, and during the previous permit year a dedicated vehicle was equipped with the necessary items for IDDE Plan implementation and overall program needs. A trained crew has been assigned to work with NCA and the Malden Engineering Department in meeting the objectives of the IDDE Plan and General Permit Program compliance. This team has been responsible for the identification of numerous water main leaks, resolution of illicit connections and repair of infrastructure components, all of which is directed towards the improvement in the quality of the City's stormwater discharges. Beyond the identification of illicit discharges, the committed focus upon surface water quality and the contributing drainage infrastructure has led to more timely repairs and improved system maintenance.

**Goal Status:**

Achieved and ongoing

|                                               |
|-----------------------------------------------|
| <b>BMP 5-2      Maintain Lawn Care Policy</b> |
|-----------------------------------------------|

**Responsible Department/Person:**

DPW, School Dept., Cemetery Dept

**Measurable Goal(s):**

Proper utilization of pesticides, herbicides, fertilizers and appropriate disposal of lawn trimmings, yard waste

**Progress on Goals- Year 12:**

The application of pesticides, herbicides and fertilizers is provided by a licensed outside contractor, supervised by the MDPW. All other lawn care for recreational areas is maintained by the MDPW.

**Goal Status:**

Ongoing activity

|                |                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------|
| <b>BMP 5-3</b> | <b>Development of a maintenance and monitoring plan for open channel component of Town Line Brook</b> |
|----------------|-------------------------------------------------------------------------------------------------------|

**Responsible Department/Person:**

Eng. Dept., DCR & Compliance Team

**Measurable Goal(s):**

Removal of excess sediment deposits, restoration of flow capacity, structural repair.

**Progress on Goals- Year 12:**

Several meetings and two (2) site walks were held with DCR this reporting period concerning Town Line Brook. However, due to funding constraints, there are no plans for future work. The extent of damage to the concrete wall of this trapezoidal channel remains a significant concern, and has been reviewed with representatives of USEPA. The extent of sediment deposition with the channel, together with compromises in its structural integrity represents long term and ongoing sources for degradation of surface water quality.

**Goal Status:**

Ongoing

|                |                                                                                                                  |
|----------------|------------------------------------------------------------------------------------------------------------------|
| <b>BMP 5-4</b> | <b>Implementation of recommended maintenance and monitoring plan developed for Spot Pond Brook at Oak Grove.</b> |
|----------------|------------------------------------------------------------------------------------------------------------------|

**Responsible Department/Person:**

Eng. Dept., DPW & DCR

**Measurable Goal(s):**

Implementation of those recommendations contained within engineering study completed by Meridian Associates, Inc.

**Progress on Goals- Year 12:**

As referenced in BMP5-3, several meetings and two (2) site walks were held with DCR this reporting period concerning Spot Pond Brook. However, due to funding constraints, there are no plans for future work. No planned maintenance activities occurred during this reporting period.

**Goal Status:**

Funding for necessary improvements and attention by DCR remains the goal of this BMP.

|                |                                                                                |
|----------------|--------------------------------------------------------------------------------|
| <b>BMP 5-5</b> | <b>Expansion of programs such as the Fellsmere Pond restoration initiative</b> |
|----------------|--------------------------------------------------------------------------------|

**Responsible Department/Person:**

Mayor's Office, Compliance Team DPW

**Measurable Goal(s):**

Water quality improvement

**Progress on Goals- Year 12:**

The current Administration has made significant commitment to public outreach and community involvement. At the core of this effort is education and input from concerned residents, as well as the business community. With the development of the Friends of the Malden River Organization, a focus of community involvement includes bank clean up, potential public opportunities and enhancement alternatives for the Malden River Corridor. During last reporting period, a comprehensive mitigation program for Fellsmere Pond was developed and was initiated. This scope of work includes bank stabilization measures, control of invasive species and enforcement of control to restrict/reduce public feeding of waterfowl population. During this reporting period the above referenced bank stabilization measures were completed and significant compromises to the drainage infrastructure that conveys both groundwater outbreak and drainage flow in the area of Fellsmere Pond were identified and addressed.

**Goal Status:**

Achieved and ongoing

|                |                                                                             |
|----------------|-----------------------------------------------------------------------------|
| <b>BMP 5-6</b> | <b>Comprehensive catch basin inspection, inventory, maintenance program</b> |
|----------------|-----------------------------------------------------------------------------|

**Responsible Department/Person:**

Eng. Dept., DPW & Compliance Team

**Measurable Goal(s):**

Electronic logging of CB locations, documentation of CB construction and functional characteristics, recommendations for improved performance standard compliance at individual locations or tributary segments of the drainage system.

**Progress on Goals- Year 12:**

During the 2014-2015 permit year, the Engineering Department and the MDPW continued to document catch basin locations and functional characteristics in conjunction with catch basin cleanings. The information obtained from the CB inventory and clean program is integral to the isolation of illicit flows, implementation of timely repairs and continued development of the GIS drainage layer. Specifically, an ongoing maintenance program also includes repairs to catch basins and laterals, which reduces the potential for sediment entrainment and reduces flooding issues. In addition, drainage systems repairs during this reporting period were made under a Citywide Drainage Improvements and Repairs contract with Tufts Incorporated.

**Goal Status:**

Achieved and Ongoing

|                |                                                                |
|----------------|----------------------------------------------------------------|
| <b>BMP 5-7</b> | <b>Continue sewer re-lining and connection upgrade program</b> |
|----------------|----------------------------------------------------------------|

**Responsible Department/Person:**

Eng. Dept. & DPW

**Measurable Goal(s):**

Reduction in I/I, identification of potential illicit connections, assist in infrastructure needs analysis

**Progress on Goals- Year 12:**

During this reporting period, a \$3 million dollar contract (2014 S-1) was signed by the City for extensive sewer relining/cleaning services. It is anticipated that work was initiated in the spring-summer of 2014 and finished in December 2014.

**Goal Status:**

Ongoing activity

|                |                                                                                   |
|----------------|-----------------------------------------------------------------------------------|
| <b>BMP 5-8</b> | <b>Development and implementation of communication/notification plan for SSOs</b> |
|----------------|-----------------------------------------------------------------------------------|

**Responsible Department/Person:**

Eng. Dept. & DPW

**Measurable Goal(s):**

Notification of U.S. EPA and MDEP within 24 hours of event occurrence

**Progress on Goals- Year 12:**

No SSOs were identified during Year 12. The continued assessment of possible grease blockages within a sewer siphon located at the intersection of Salem and Lynn Streets that passes beneath Linden Brook was conducted this reporting period. A dry weather sampling event was conducted this reporting period with low bacteria concentrations encountered. Additional details may be referenced from the Illicit Discharge Detection and Elimination Program (IDDE) Semi-Annual Status Reports, which have been filed with USEPA and may be referenced as Appendix B.

**Goal Status:**

Achieved and Ongoing

## 6. Pollution Prevention and Good Housekeeping in Municipal Operations

|                |                                                                                  |
|----------------|----------------------------------------------------------------------------------|
| <b>BMP 6-1</b> | <b>Regular meetings of Compliance Team to review plan implementation results</b> |
|----------------|----------------------------------------------------------------------------------|

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Data evaluation and review, implementation of corrective actions, and prioritization of mitigation measures.

**Progress on Goals- Year 12:**

Stormwater management requirements, compliance enforcement and ongoing work practices have been integrated into daily work procedures, with an emphasis placed upon improved communication.

**Goal Status:**

Achieved and Ongoing

|                |                                 |
|----------------|---------------------------------|
| <b>BMP 6-2</b> | <b>Annual Compliance review</b> |
|----------------|---------------------------------|

**Responsible Department/Person:**

Compliance Team & Mayor's Office

**Measurable Goal(s):**

Identification of capital plan improvements, modification of plan and objectives, documentation of plan activity for Annual Report.

**Progress on Goals- Year 12:**

This document, together with the development of a working GIS system represents major milestones that serve to demonstrate the extent of efforts that have been undertaken by the City of Malden to achieve the goals and objectives of the MS4 program. This is also evidenced by both the timing and extent of infrastructure repairs and the overall improved understanding of the municipal drainage and sewer systems. The ongoing IDDE program, including outfall sampling and mass balance isolation studies are key components of ongoing planning efforts designed to prioritize and timely implement necessary infrastructure improvements.

**Goal Status:**

Ongoing

## **Part IV. Summary of Information Collected and Analyzed**

See Appendix B

## **Part V. Program Outputs & Accomplishments (Optional)**

### **1. Programmatic (See BMPs 1-4 and 5-1)**

|     |                                                |                             |
|-----|------------------------------------------------|-----------------------------|
| 1.1 | Stormwater management position created/staffed | Compliance Team Established |
| 1.2 | Annual program budget/expenditures             | \$ 600,000 – 750,000        |

### **2. Education Community Involvement and Training (See BMPs 1-1, 1.2, 1-4, and 1-5)**

|     |                                                                         |          |
|-----|-------------------------------------------------------------------------|----------|
| 2.1 | Estimated number of residents reached by education program(s)           | 55%      |
| 2.2 | Stormwater management committee established                             | Yes      |
| 2.3 | Stream teams established or supported                                   | Yes      |
| 2.4 | Shoreline clean-up participation or quantity of shoreline miles cleaned | None     |
| 2.5 | Household Paint Waste Collection Days                                   |          |
|     | Days sponsored                                                          | 2 Days   |
|     | Community participation                                                 | 20%      |
|     | Material collected                                                      | \$10,000 |
| 2.6 | School curricula implemented                                            | Yes      |

### **3. Legal/Regulatory (See BMPs 2-5 and 3-6)**

|     |                                           |         |
|-----|-------------------------------------------|---------|
| 3.1 | Regulatory Mechanism Status               |         |
|     | Illicit Discharge Detection & Elimination | Adopted |
|     | Erosion & Sediment Control                | Adopted |
|     | Post-Development Stormwater Management    | Adopted |

### **4. Mapping and Illicit Discharges (See BMPs 2-4)**

|     |                                        |                |
|-----|----------------------------------------|----------------|
| 4.1 | Outfall mapping complete               | All Known-100% |
| 4.2 | Estimated or actual number of outfalls | 65             |
| 4.3 | System-Wide mapping complete           |                |
|     | Sewer-Paper/Mylar                      | 100%           |
|     | Sewer-GIS                              | 100%           |
|     | Drain-Paper/Mylar                      | 100%           |
|     | Drain-GIS                              | 90%            |
| 4.4 | Outfalls inspected/screened            | 100%           |
| 4.5 | Illicit discharges identified          | 8              |
| 4.6 | Illicit connections removed            | 260 GPD (est.) |
| 4.7 | % of population on sewer               | 99.6%          |
| 4.8 | % of population on septic systems      | 0.4%           |

## 5. Construction

|     |                                                                                                   |      |
|-----|---------------------------------------------------------------------------------------------------|------|
| 5.1 | Number of construction starts (>1-acre)                                                           | 1    |
| 5.2 | Estimated percentage of construction starts adequately regulated for erosion and sediment control | 1    |
| 5.3 | Site inspections completed                                                                        | 2    |
| 5.4 | Tickets/Stop work orders issued                                                                   | None |
| 5.5 | Fines collected                                                                                   | None |
| 5.6 | Complaints/concerns received from public                                                          | None |

## 6. Post-Development Stormwater Management

|     |                                                                                                                          |      |
|-----|--------------------------------------------------------------------------------------------------------------------------|------|
| 6.1 | Estimated percentage of development/redevelopment projects adequately regulated for post-construction stormwater control | 100% |
| 6.2 | Site inspections completed                                                                                               | 4    |
| 6.3 | Estimated volume of stormwater recharged                                                                                 | None |

## 7. Operations and Maintenance – current reporting period (See BMPs 5-1)

|      |                                                                                                                                                                                                                             |                      |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 7.1  | Average frequency of catch basin cleaning (seasonal) (non-commercial/non-arterial streets)                                                                                                                                  | 3 days a week        |
| 7.2  | Average frequency of catch basin cleaning (commercial/arterial or other critical streets)                                                                                                                                   | 3 days a week        |
| 7.3  | Total number of structures cleaned                                                                                                                                                                                          | 345                  |
| 7.4  | Storm drain cleaned                                                                                                                                                                                                         | 620 LF               |
| 7.5  | Qty. of screening/debris removed from storm sewer infrastructure                                                                                                                                                            | 100 tons             |
| 7.6  | Disposal or use of debris (landfill, POTW, compost, recycle for sand, beneficial use, etc.)                                                                                                                                 | NA                   |
| 7.7  | Cost of screening disposal                                                                                                                                                                                                  | NA                   |
| 7.8  | Average frequency of street sweeping (non-commercial/non-arterial streets)                                                                                                                                                  | 6 days a week        |
| 7.9  | Average frequency of street sweeping (commercial/arterial or other critical streets)                                                                                                                                        | 6 days a week        |
| 7.10 | Qty. of sand/debris collected by sweeping                                                                                                                                                                                   | 1,200 tons           |
| 7.11 | Disposal or use of sweepings (landfill, POTW, compost, recycle for sand, beneficial use, etc.)                                                                                                                              | Glenview LF          |
| 7.12 | Cost of sweeping disposal                                                                                                                                                                                                   | \$49,668             |
| 7.13 | Street sweepers purchased/leased                                                                                                                                                                                            | 0                    |
| 7.14 | Street sweepers specified in contracts                                                                                                                                                                                      | 0                    |
| 7.15 | Reduction in application on public land of:<br>("N/A" = never used; "100%" = elimination)<br>Fertilizers (State regulations require applicators<br>(license which City does not currently have)<br>Herbicides<br>Pesticides | 100%<br>None<br>None |

|      |                                                          |                        |
|------|----------------------------------------------------------|------------------------|
| 7.16 | Anti/De-Icing precuts and rations                        | Salt 100%              |
|      | 5000 gallon tank                                         | CaCl2 100 gals/30 tons |
|      |                                                          | CaCl2-100%             |
| 7.17 | Pre-wetting techniques utilized                          | Yes                    |
| 7.18 | Manual control spreaders used                            | No                     |
| 7.19 | Automatic or Zero-velocity spreaders used                | Yes                    |
| 7.20 | Estimated net reduction in typical year salt application | 15%                    |
| 7.21 | Salt pile covered                                        | Yes                    |

# APPENDIX A

**Environmental Engineering and Land Use Planning**

Table 1.0 Dry Weather Conditions - E. Coli Concentrations  
Site Location, Outfalls/Manholes Malden, MA

| Sample Designation            | E. Coli (MF)<br>(MPN/100ml) |           |            |           |           |           |                        |           |           |          |           |           |          |           |
|-------------------------------|-----------------------------|-----------|------------|-----------|-----------|-----------|------------------------|-----------|-----------|----------|-----------|-----------|----------|-----------|
|                               | 30, 9223B                   |           |            |           |           |           |                        |           |           |          |           |           |          |           |
|                               | ACTION LEVEL- 235 col/100ml |           |            |           |           |           |                        |           |           |          |           |           |          |           |
|                               | 8/4/2011                    | 11/8/2011 | 12/13/2011 | 1/11/2012 | 4/13/2012 | 6/15/2012 | 9/11/2012 <sup>1</sup> | 9/27/2012 | 2/22/2013 | 4/5/2013 | 9/12/2013 | 9/24/2013 | 7/2/2014 | 11/5/2014 |
| Malden River                  |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| MR-0                          | -                           | -         | 9,200      | -         | -         | -         | 3,090                  | -         | -         | 490      | 980       | -         | -        | -         |
| MR-1                          | -                           | -         | 390        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-4                          | -                           | -         | 220        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-5                          | -                           | -         | 9.7        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-6                          | -                           | -         | 4.1        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-8                          | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | 292       | -         | -        | -         |
| MR-11                         | -                           | -         | ND (1.0)   | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-12                         | -                           | -         | 59         | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Saint Mary St. <sup>1</sup>   | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-0-Channel <sup>2</sup>    | -                           | -         | -          | 1,700     | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-3                         | -                           | -         | -          | 1,600     | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-4                         | 17,000                      | -         | -          | >242,000  | -         | 100,000   | -                      | -         | -         | -        | -         | 2,000     | 110,000  | 3,200     |
| LSP-5.1-Channel <sup>2</sup>  | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-9                         | -                           | 34        | -          | 84        | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-10-Channel <sup>2</sup>   | -                           | -         | -          | 10,000    | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| C39-MH0.1                     | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| C46-MH19                      | -                           | -         | -          | -         | -         | -         | 850                    | -         | -         | -        | -         | -         | -        | -         |
| E2-MH2                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E2-MH1                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E13-MH2 (Elrich)              | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E13-MH4 (Elrich)              | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 2,000     | -        | -         |
| E28-MH8                       | -                           | -         | -          | -         | ND (1.0)  | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E28-SP1                       | -                           | -         | -          | -         | 6,100     | -         | 740                    | -         | -         | -        | -         | -         | -        | -         |
| E28-SP2                       | -                           | -         | -          | -         | 5,200     | -         | 310                    | -         | -         | -        | -         | -         | -        | -         |
| E28-MH4A                      | -                           | -         | -          | -         | 1.0       | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| H16-MH13                      | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| H16-MH17                      | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| H25-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| M8-MH3                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| M26-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| NG-C1                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| P36-MH5                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| R18-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| S29-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | 160      | -         | -         | -        | -         |
| S29-MH3                       | -                           | -         | -          | -         | -         | -         | 13,330                 | -         | -         | 190      | -         | -         | -        | -         |
| W25-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Little Creek                  |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| LC-0                          | 2,400                       | -         | 65         | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Town Line Brook               |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| TL-0 <sup>3</sup>             | -                           | 96        | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-1                          | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-3                          | -                           | 8.5       | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-5                          | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-9                          | -                           | 130       | -          | -         | -         | -         | 410                    | -         | -         | -        | -         | -         | -        | -         |
| TL-13                         | -                           | ND (1.0)  | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-24                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-BL-EV                      | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| B53-MH7                       | -                           | -         | -          | -         | -         | -         | 410                    | -         | -         | -        | -         | -         | -        | -         |
| BP-MH3                        | -                           | -         | -          | -         | -         | -         | 200                    | -         | -         | -        | -         | -         | -        | -         |
| L23-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| S3-MH12 <sup>3</sup>          | -                           | -         | -          | -         | -         | -         | 2,880                  | -         | -         | -        | -         | -         | -        | -         |
| S14-MH4                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | ND (1.0) | 4.1       |
| Saugus Branch                 |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| MR-2                          | -                           | -         | 1,200      | -         | -         | -         | -                      | -         | -         | -        | 550       | -         | -        | -         |
| MR-2N                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 150      | 490       |
| MR-2S                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 130      | 440       |
| Broadway/Eastern <sup>4</sup> | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Linden Brook                  |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| B46-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | <1        | -        | -         |
| C18-MH5                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 23,000    | 11,000   | 1,300     |
| C36-MH1                       | -                           | -         | -          | 6.3       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| D17-MH1                       | -                           | -         | -          | 460       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| F1-MH4                        | -                           | -         | -          | -         | -         | -         | 310                    | -         | -         | 12       | -         | -         | -        | -         |
| F23-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 13        | -        | -         |
| G36-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 1,700    | 290       |
| H43-MH1                       | -                           | -         | -          | 28,000    | -         | -         | 5,470                  | -         | -         | 580      | -         | 12        | -        | 1,000     |
| K6-MH1                        | -                           | -         | -          | -         | -         | -         | -                      | 49        | -         | -        | -         | -         | -        | -         |
| L5-MH1                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | 580      | -         | -         | -        | -         |
| LBR-1                         | -                           | -         | -          | -         | -         | -         | >241,920               | -         | <10       | 1        | -         | -         | 520      | 88        |
| M31-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 12        | -        | -         |
| O10-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | 4,300     | -         | 650      | -         | -         | -        | -         |
| P24-MH1                       | -                           | -         | -          | 9.7       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| S27-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | 17        |
| S45-MH4                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | 8.5       |
| V1-MH1                        | -                           | -         | -          | 5.2       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| W26-MH1                       | -                           | -         | -          | 390       | -         | -         | -                      | -         | -         | 320      | -         | -         | -        | -         |
| W47-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 3,500    | 1,700     |

File No. 465.09  
<sup>1</sup>Samples collected by USEPA  
Laboratory certificates contained within attachments



Figure 1 - Malden River Outfalls



Figure 2 - Lower Spot Pond Brook Outfalls



Figure 3 - Town Line Brook Outfalls

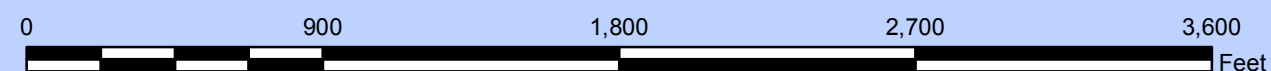


**Figure 4 - Dry Weather Sampling Program**  
MALDEN, MASSACHUSETTS

0 400 800 1,200 1,600 Feet



**Figure 5 - Dry Weather Sampling Program-Linden Brook**  
MALDEN, MASSACHUSETTS



# APPENDIX B

**Environmental Engineering and Land Use Planning**

# **CITY OF MALDEN**

## **Illicit Discharge Detection and Elimination Program Semi-Annual Status Report**

July 1, 2014 – December 31, 2014

Prepared by:

**Nangle Consulting Associates, Inc.**

960 Turnpike St  
Canton, MA 02021

and

**City of Malden Engineering Department**

200 Pleasant Street  
Malden, Massachusetts

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## 1.0 INTRODUCTION

This status report pertains to the period of 1 July through 31 December 2014 for the City of Malden's Illicit Discharge Detection and Elimination (IDDE) Program. The City of Malden's IDDE plan was developed to facilitate the implementation of a systematic and iterative procedure for the evaluation of dry weather flows, identification of potential illicit discharges and timely repairs to the storm drainage infrastructure, with the overall goal of improving surface water quality discharge within the City of Malden. This semi-annual status report has been prepared through the cooperative efforts of the City of Malden Engineering Department, the City of Malden Department of Public Works (MDPW) and Nangle Consulting Associates, Inc. (NCA) to document key program tasks completed during this reporting period.

Since its inception, the City's IDDE program has identified and removed several illicit discharges/connections to the municipal drainage system, reduced significant potable water losses due to the detection of leakages, enforced Best Management Practices (BMPs)/stormwater ordinances and completed repairs to components of the drainage infrastructure. A key component of this effort has been the development and implementation of a comprehensive GIS mapping and catch basin cleaning/repair program, which is maintained by the MDPW and Engineering Department. The goals and objectives of this IDDE plan are directed towards the reduction in the historic bacteria levels that have been detected at selected outfalls within the City. In addition, as a "flow through" community, bacteria loadings entering into the City of Malden's infrastructure from upstream neighboring communities have also been quantified.

In general, the results of dry weather inspections, together with both dry and wet weather sampling, support the opinion that wet weather loadings are tied to the age and condition of the municipal infrastructure, major portions of which were installed during the late 1800's and early 1900's. To address the constraints associated with an aging infrastructure, the City Engineering and Public Works Departments, supplemented by outside technical assistance, have developed a program that integrates the implementation of the IDDE Plan into the routine daily work practices. This has led to the identification of infrastructure deficiencies and enabled the timely repair of potential flow and water quality concerns. These direct response mitigation/repair measures have led not only to the removal of illicit connections/discharges, but improved flow conveyance to eliminate historic flooding concerns.

This report has been prepared to document and summarize IDDE activities that have been undertaken by the City during the July 2014 through December 2014 reporting period and identify key goals and objectives to be considered during future phases of plan implementation. The targeted monitoring of isolated dry weather flows containing discrete bacteria loadings and outfall monitoring has been performed. Utilizing the data and information obtained during this reporting period, an updated work plan of prioritized tasks for the next 6 month period has also been prepared and is included within Section 5.0 of this report.

## **2.0 DOCUMENTED ILLICIT DISCHARGES AND CONNECTIONS**

During this reporting period, no new illicit connections or illicit discharges were identified. However, information pertaining to the investigation of one (1) possible illicit connection identified previously is discussed below. To assist in the review of the information contained within this report, a summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0. The possible illicit connection was identified by the stormwater compliance team in a drainage manhole on Sharon Street during a dry weather inspection of this portion of the City. A dry weather flow discharging from a pipe which appeared to be emanating from the rear of the building located at 50 Crystal Street (Viking Seafoods Inc) was identified. The subsequent monitoring of the drainage manhole revealed that the discharge appears to be intermittent, with flows observed to be approximately 10 – 12 gallons per minute, which slowed to a trickle over an approximate 10 minute timeframe. The City Engineering Department has contacted the owners of the Viking Seafoods property to further investigate this condition and the City was informed that this was process water from a cooling tower. The Stormwater Compliance Team conducted several dry weather sampling events at the manhole in question (S14-MH4) and determined that the dry weather flow encountered at manhole S14-MH4 is not an illicit connection and as such no further action is required. Details pertaining to this dry weather flow may be referenced from Section 3.1.2.

As described in further detail in Section 3.1.1, the City continues to share sampling results with the Mystic River Watershed Association (MyRWA) and has performed targeted sampling events to investigate discharges to outfalls that have been sampled by MyRWA. One particular area of interest is the Saugus Branch drainage system that discharges to the outfalls referred to as MR-2S and MR-2N. The continued assessment of possible grease blockages within a sewer siphon located at the intersection of Salem and Lynn Streets that passes beneath Linden Brook has also been conducted this reporting period. This structure is located at the City line between Malden and Revere and additional details pertaining to the ongoing investigation and inspection program may be referenced from Section 3.1.3.

## **3.0 OVERVIEW OF IDDE ACTIVITIES (JULY 2014 – DECEMBER 2014)**

In addition to outfall sampling, the City of Malden's IDDE Program incorporates the use of three (3) primary measures to identify and mitigate illicit discharges to its municipal drainage system, which may be described as follows:

- (1) Targeted dry weather inspections and sampling by representatives of the Stormwater Compliance Team.
- (2) Detailed inspection of the municipal infrastructure during the daily implementation of the catch basin clean-out and drainage system mapping program.
- (3) Response to public, private or governmental agencies reports of possible sudden and/or identified discharge to the municipal storm system.

Given the winter months, recent activities have focused mainly upon the sampling of key target areas. Targeted dry weather inspections are driven in large part by the results of dry and wet weather sampling at outfalls which discharge to surface water conveyances, principally the

Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. To provide a basis for the iterative dry weather inspection program and the observations recorded during this reporting period, the following excerpt from the City's IDDE work plan describes the methods and prioritization procedure maintained for this ongoing mitigation measure;

- Based upon the initial outfall monitoring data obtained, the City is currently implementing a Rapid-Assessment Prioritization approach through the targeted assessment of dry-weather flows in several areas within the City. Specifically the major tributaries to the most significant volume dry weather discharges to the Town Line Brook and the Malden River have been identified and sampled at key junction locations to initially determine the dry weather contributions from adjacent communities through major flood control infrastructure that is routed through the City of Malden.

As described in prior status reports, a comprehensive dry weather sampling effort using multiple lines of evidence testing was performed by representatives of USEPA and NCA in the fall of 2012. The focus of this extensive USEPA analytical program was directed towards the isolation of potential human based contributions to dry weather flows, using an approach that greatly exceeds the limitations of simple bacteria sampling. Specifically, this approach was intended to resolve traditional limitations involving reliance upon bacteria analysis associated with animal waste contributions. NCA is continuing to work with Alpha Analytical to develop representable and low cost analytical methods to quantify caffeine levels in collected water samples. If successful, additional targeted sampling of priority areas utilizing this approach, as well as additional lines of evidence will be performed.

By design, observations recorded during the dry weather inspections, together with the results of infrastructure sampling, serve as the basis for future work plan tasks and modifications to the original IDDE plan. Accordingly, the IDDE program maintained by the City is regarded as an ongoing and iterative effort that has successfully demonstrated the capability to quickly respond to water quality issues as needs and concerns are identified. The City of Malden has invested significant time and capital funding to develop a Stormwater Compliance Team (SCT) comprised of members of the Department of Public Works, Engineering and outside technical support. Key tasks performed by this group include the performance of dry weather inspections targeted sampling efforts together with the systematic cleaning of catch basins, and related infrastructure components. In addition, their efforts have led to the identification of infrastructure needs, rapid response to illicit discharges, posting of outfall signage, general system maintenance and mitigation of environmental conditions of concern as they are being identified.

Through department head meetings, public outreach, postings of signage and daily work practices, a general awareness of the need for response to illicit discharges has been developed as the third component of the City's IDDE program. Increased involvement by engineering technical staff in the daily work practices of MDPW stormwater personnel is also intended to further this goal. Contact information is readily available through a variety of media, including mailings and web site postings to ensure implementation of appropriate response measures by members of the Stormwater Compliance Team. The current municipal leadership has made a significant effort to increase public awareness and participation through increased integration of digital and electronic media into daily practices. Public outreach has also included active participation by the Compliance Team through community workshops, educational presentations and regional watershed meetings.

### 3.1 Targeted Dry Weather Inspection/Sampling Program (NCA)

Representatives of NCA have conducted dry weather sampling events and evaluations of the City's infrastructure in the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook, respectively and central portions of Malden, which discharge to Lower Spot Pond Brook and ultimately the Malden River. Historically, areas selected for inspection were generally based upon the results of the outfall sampling program and/or the identification of dry weather flows by MDPW staff during their routine maintenance and infrastructure locating program. As described in the following section, this approach has been implemented to investigate sampling results distributed by MyRWA, as well as the Stormwater Compliance team.

A map depicting the approximate locations where targeted dry weather inspections have been conducted by NCA to date is presented as Figure 2. In addition, the drainage infrastructure is also inspected by DPW during the catch basin cleaning program. Upon the identification of previously unknown dry weather flows, the Engineering Department and NCA are immediately notified by MDPW personnel and targeted mass balance sampling efforts are performed. During dry weather inspections completed under the IDDE program, various dry weather flows have been identified. A summary of these flows within the municipal system that have been identified to date are shown on Table 2.0 and Figure 3. As stated above, during this reporting period, dry weather investigations were performed within three (3) key areas that warranted further flow isolation efforts based upon prior dry weather sampling data. These areas include the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook, respectively. In addition, the central portion of Malden was also targeted, which discharges to Lower Spot Pond Brook, and ultimately the Malden River.

#### 3.1.1 Malden River Watershed

The City of Malden's stormwater compliance team initially targeted potential illicit discharges to the Malden River as its highest priority. Utilizing the outfall monitoring data and information obtained during dry weather sampling events, the City has identified significant base flow as surface waters, to the Malden River. Consistent with the original design of the MDC/DCR conveyance network; this occurs primarily thorough culverted channels/brooks located in northwestern portions of the City. This flow includes contributions that originate from the Fells Reservation and Lower Spot Pond Brook. As shown on Figure 4, a total of 26 outfalls to the Malden River have been identified, nine (9) of which have been identified as flowing during dry weather conditions. Periodic dry weather sampling has been performed by NCA, MyRWA and the USEPA.

NCA conducted a dry weather sampling event at several key outfalls that discharge to the Malden River on 5 November 2014. This included the sampling of baseline water flow from MR-2N and MR-2S, which receive flows from the Saugus Branch. Representatives of MyRWA have met with the City and identified this dry weather flow as a potential issue of concern, based upon the results of their sampling efforts. As shown on Table 3.0, E. coli levels of 490 MPN/100 ml (MR-2N) and 440 MPN/100 ml (MR-2S) were identified, respectively. These locations were sampled by MyRWA in June of 2013 and elevated bacterial levels were reported. To further investigate the elevated bacteria loadings identified in June 2013, NCA reviewed the MyRWA outfall monitoring data, as well as online U. S. Geologic Survey (USGS) precipitation data and

noted that an antecedent rainfall event approximating the recommended precipitation limit had occurred in the area on 24 June 2013. As noted on Table 3.0, the most recent results collected from the Saugus Branch are slightly higher than those collected in July of 2014, however; they are significantly lower than the results obtained by MyRWA in June of 2013.

The Stormwater Compliance Team has conducted numerous dry weather sampling events to investigate the elevated *E. coli* levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive (Figure 5). Base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 was completed in February 2012. Given the proximity of the sewer and drain lines to LSP-4, as well as the settlement of the drain line in the area of Buildings 1054 and 1056 Elrich Drive, the focus of assessment activities was directed towards the sewer laterals and nearby drainage line servicing the two apartment buildings. Following dye testing by the Compliance Team, camera surveys performed by representatives of the property owner confirmed that compromises to the laterals servicing two (2) residential building had occurred. Recommendations made by the SCT involved restoring the integrity of the main drainage line to stop the discharges that have been documented at LSP-4.

Working with representatives of the Malden Engineering Department, repairs to the sewer laterals in the area of Building 1054 and 1056 were completed by the property owner in March 2012. Since that time, several dry weather flow samples have been collected from LSP-4, and as shown on Table 3.0, *E. coli* levels although still elevated, decreased significantly relative to concentrations detected in 2012. However, during the 2 July 2014, an *E. coli* concentration of 110,000 MPN/100 ml was detected at LSP-4. An additional sample was collected on 5 November 2014, with an *E. coli* concentration of 3,200 MPN/100 ml detected. Field observations noted at that time by NCA included an increased discharge relative to prior sampling events. According to the City Engineering Department, the Eldrich Drive complex is under new ownership and the City has attempted to contact the property owner numerous times to discuss the sampling results, however the owner has been unresponsive. Accordingly, more formal enforcement measures are recommended for the next reporting period.

### 3.1.2 Town Line Brook Watershed

Town Line Brook in Malden begins at the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Significant tidal influences exist in the form of an approximate 2-3 foot change in surface water elevation between Broadway and the remaining length of the culvert to the Revere City line. As shown on Figure 6, a total of 29 outfalls to Town Line Brook in Malden have been identified. The historic monitoring data of Town Line Brook has revealed relatively uniform bacteria levels during dry weather sampling events. Several outfall locations have consistently exhibited bacteria loadings during dry weather sampling events, including S3-MH12, TL-0, TL-9 and Trifone Brook (TL-24). Manhole sample point S3-MH12 is the upstream sampling point for this section of the Brook as it enters the Malden system from Everett, while TL-0 is located at Broadway, where Town Line Brook daylights. TL-9 is located proximate to the terminus of Hadley Street in Malden and receives dry weather flows from the City of Everett, with Trifone Brook (TL-24), also flowing from Everett prior to discharging into Town Line Brook. Based upon the historic monitoring of these outfalls, it is apparent that contributions continue to enter the Malden system from upstream areas.

As referenced within Section 2.0, a possible illicit connection was identified by the stormwater compliance team in a drainage manhole on Sharon Street (S14-MH4) during a dry weather inspection of the area (Figure 7). A dry weather flow discharging from a pipe which appeared to be emanating from the rear of the building located at 50 Crystal Street (Viking Seafoods Inc) was identified. The subsequent monitoring of the drainage manhole revealed that the discharge appears to be intermittent, with flows observed to be approximately 10 – 12 gallons per minute. This discharge slowed to a trickle over an approximate 10 minute timeframe. The City Engineering Department contacted the owners of the Viking Seafoods property to further investigate this condition. Representatives of Viking Seafoods informed the City that this was process water from a cooling tower. To confirm, the Stormwater Compliance Team conducted a dry weather sampling event at manhole S14-MH4 on 2 July 2014. As shown on Table 3.0, no detectable levels of *E. coli* were encountered within the sample collected from manhole S14-MH4. During this reporting period, a second dry weather flow sample was collected from manhole S14-MH4 and as shown on Table 3.0 an *E. coli* level of 4.1 MPN/100 ml was encountered, well below the applicable Action Level.

### 3.1.3 Linden Brook Watershed

Linden Brook Culvert is the major stormwater conveyance network located in northeasterly portions of the City. Dry weather inspections have revealed base flow throughout the culvert at all times, with *E. coli* levels detected historically within the mid-portion of the culvert, at manholes D17-MH1 and H43-MH1 (Figure 8). Flow isolation studies performed to date within this portion of the City had not revealed any specific source conditions for the results of prior sampling. During this reporting period flow isolation studies were continued on a dry weather flow (Flow 18) in the area of Cherry Street and Sylvan Street which contributes to the western portion of the Linden Brook Culvert (Figure 8). Several dry weather flow samples collected from drainage manhole (C18-MH5) located on Cherry Street contained higher *E. coli* levels and to further assess this condition, dry weather flow samples were collected on 5 November 2014 from the approximate manhole locations shown on Figure 8. Reference to Table 3.0, indicates that the *E. coli* levels encountered at drainage manhole C18-MH5 contained an *E. coli* level of 1,300 MPN/100 ml. An upstream dry weather flow sample relative to C18-MH5 was also collected from a manhole located on Winship Street (W47-MH1), with a level of 1,700 MPN/100 ml of *E. coli* identified. This concentration is in the range of the *E. coli* level quantified at C18-MH5 (1,300 MPN/100 ml) this reporting period. As this flow (Flow 18) originates along Sylvan Street, proximate to the Forestdale School, a dry weather flow sample was collected from drainage manhole S45-MH4 along Sylvan Street, with a level of 8.5 MPN/100 ml of *E. coli* identified. The continued targeted sampling of dry weather flow in this area will be performed next reporting period.

A follow-up inspection of dry weather flows encountered along Goldcliff Street was conducted this reporting period. The drainage network in this area of Malden contributes to the western portion of Linden Brook Culvert. The 2 July and 5 November 2014 inspections of drainage manhole G26-MH2 on Goldcliff Street (Figure 8) revealed no dry weather flow and as this flow has been assessed several times with no dry weather flows noted, no further action is required.

In addition to the above, a follow-up inspection of dry weather flows initially identified last reporting period was conducted within the eastern portion of Malden in the area of Grant Street, which also contributes to the eastern portion of Linden Brook Culvert. As shown on Figure 3 and Table 2.0, dry weather flows were encountered previously (Flows 23, 24 & 25) on Grant Street, Wheeler Street and Revere Street, respectively. The 2 July and 5 November 2014 inspection of drainage manholes on Wheeler Street revealed no dry weather flow, while on 2 July, Revere Street drainage contained only a trickle flow and on 5 November there was no dry weather flow. Dry weather flows on Wheeler Street (Flow 24) and Revere Street (Flow 25) have been assessed several times with no dry weather flows noted. Dry weather flow was again encountered on Grant Street during the 5 November 2104 sampling event in drainage manhole G36-MH2. A dry weather flow sample was collected from the manhole and as shown on Table 3.0, an *E. coli* concentration of 290 MPN/100 ml was encountered, significantly lower than the 1,700 MPN/100 ml detected in July of 2014. Dry weather flow along Springdale Street (Flow 22) was also evaluated this reporting period through the collection of a dry weather flow sample from manhole S27-MH2 and as shown on Table 3.0, an *E. coli* concentration of 17 MPN/100 ml was encountered, well below the applicable Action Level. Additional dry weather flow samples will be collected from Grant Street (G36-MH2) and Springdale Street (S27-MH2) during the next reporting period.

During the September 2012 sampling event, conducted with representatives of the USEPA, a water sample was collected from outfall LBR-1 (Figure 8), located in Revere, at which time distinct indications of sewage odors were noted. Consistent with identification of strong sewage odors and immediately apparent from a review of Table 3.0 is the significantly elevated level of *E. coli* (>241,920 MPN/100 ml) detected in sample LBR-1. To assess this condition and as described in prior status reports, the City of Malden contracted with National Water Main Cleaning Company, under the supervision of CDM Smith. As summarized in the following excerpt from an email to the City of Malden from CDM Smith, it is believed that line blockage due to grease build up may have been a crucial factor for the conditions identified at LBR-1, in addition to a “minor” defect in the form of a leaky joint. Although maintenance was routinely performed on this siphon, the extent of grease build up indicates that a higher frequency of cleaning and maintaining is necessary to further understand the condition.

As you know, National Water Main Cleaning Company along with CDM Smith staff were out on site on Tuesday November 6, 2012 to investigate the potential illicit connection into the Linden Brook Culvert at Salem Street near the Route 1 underpass. The following is a summary of the day’s events. The following figure graphically represents the results of the work.

National Water Main was onsite to clean and CCTV the siphon under the Old Linden Brook culvert. Upon arrival the condition of the sewers had not changed from the previous visit held 2 weeks prior: The downstream manhole (MH 3 in the attached figure) and a manhole upstream of the siphon (MH 1 in the figure) were completely plugged with heavy grease. A limited amount of liquid was passing through MH 3. Heavy cleaning of MH 3 and the sewer under the culvert took longer than expected. From MH 3 upstream to MH 1 an enormous amount of grease and sediment was removed. The pipe was 100% clogged with slugs of grease in several spots.

The sewer between MH 1 and MH 2 was successfully CCTV’d with the aid of the jetter (upstream of the siphon). This pipe was found to be in good condition. The most notable defect was a leaking joint (runner) at 9pm 54-ft from MH 1 (while traveling downstream). This was a rather minor defect. Active I/I was observed, however, it is possible that when the siphon builds some head, a small amount of sewage could exfiltrate from this same joint.

We discovered what appears to be an external drop connection just downstream of MH 2. This prevented us from CCTV'ing any further as the camera could not pass the vertical 90 degree bend. CCTV from the upstream direction would require two jettors or bypass pumping, (one to keep MH 3 drained and one to intercept flow from upstream in MH 2). This vertical drop was heavily blocked with grease. Approximately 80% of the grease in this pipe was removed with a root cutter and the pipe is in much better condition.

Last we lowered the camera into the 12-in connection to the culvert that once housed a gate valve (in MH 3). It no longer houses any gate, instead there is a masonry plug that seems to be in good condition. As the intent of finding the definitive source of sewage into the culvert was inconclusive, we recommend that we resample the outfall and test for parameters consistent with sewage. If the results are consistent with the previous results we should develop a new approach to finding the source.

Based upon the “inconclusive finding” cited by CDM Smith, higher frequency inspections of the siphon and related service connections have been performed. During the inspections, which are conducted on a weekly basis, grease cutter and enzymes are added on an as needed basis. In addition to the higher frequency inspections, a sampling event was performed at LBR-1 during this reporting period. As shown on Table 3.0, the dry weather sample collected at LBR-1 on 5 November 2014 indicated concentrations of 88 MPN/100ml. The higher frequency inspections, as well as dry weather sampling of LBR-1 will be continued during the next reporting period.

### **3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)**

The City has converted its paper storm drain system mapping to a working GIS format through the compilation of digitized plans, field GPS data collection and planimetric mapping information obtained from recent aerials. In addition, drainage infrastructure information including components pipe sizes, type, connections and flow parameters are also inventoried as a part of the ongoing system wide maintenance, service and inspection program. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering and outside technical staff to further investigate.

### **3.3 Inflow Infiltration Sewer System Evaluation & Capacity Analysis**

The City of Malden now maintains a strategic GIS Implementation plan that was developed with the assistance of CDM Smith. The City of Malden has also completed a comprehensive Infiltration and In-flow (I&I) study for its municipal sewer system. CDM Smith, on behalf of the City, has prepared a Phase 3 SSES report that includes a summary of findings and proposed recommendations to mitigate excessive infiltration and inflow into the City's sewer system. This report was presented for approval to MWRA during this permit year. Approval was received together with necessary funding. Currently, contract drawings and specifications are being prepared to address the recommendations of the Phase III Study.

## **4.0 SANITARY SEWER OVERFLOWS (SSO'S)**

No SSOs were identified during this reporting period.

## **5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES**

The City of Malden has implemented a comprehensive illicit discharge elimination program that has resulted in the isolation and mitigation of numerous improper discharges/connections and reduced significant potable water losses due to the detection of leakages. In addition to this, the dry weather sampling program has identified several target areas of intermittent bacteria loadings. These target areas will remain as a primary focus of activities to be performed during this biannual reporting period. The delineation of discrete drainage watersheds and continued implementation of the catch basin cleaning, inspection and inventory program remains a priority of work practices that are being performed by the SCT.

One issue that continues to cloud the understanding of dry weather discharges to the Malden River involves the distinction between human and waterfowl contributions of bacteria. Over the past several years ecosystem restoration efforts along the Malden River, including the River's Edge project and capping of the former General Electric site, have significantly increased animal and waterfowl populations. For example, swan habitats, once not present in the area, have increased substantially within the oxbow for the Malden River. This issue is recommended for quantitative evaluation through the use of multiple lines of evidence and will be investigated in greater detail during the next reporting period. The City is working to integrate inspections and upgrade programs into community development practices, particularly involving tie-ins to the mains which have and are being addressed by CDM Smith, to bring more focus to this condition that is arising from over a century old infrastructure.

In addition to the above, the GIS drainage map is nearing completion and a large percentage of historic information has been linked to the network, thus enabling improved understanding of the overall municipal system and corresponding program capabilities. This represents a key program goal for the next reporting period, as the conversion to a fully digital data entry process continues.

During the next reporting period, the following areas of dry weather flow, and where applicable, continued enforcement of applicable zoning guidance will be performed.

- Outfall LSP-4
- Outfalls MR-2S & MR-2N
- Dry weather flows identified within the Linden Brook watershed.

# TABLES

**Environmental Engineering and Land Use Planning**

**Table 1.0 Summary of Illicit Connections/Discharges identified as of 12/31/2014**

**Illicit Connections**

| Illicit Connection Identification | Date Identified | Discharge Type       | Estimated Volume | Date Removed | Location                |
|-----------------------------------|-----------------|----------------------|------------------|--------------|-------------------------|
| ID-1                              | 1/15/2009       | Sewage               | 40 gpd           | 2/16/2009    | 33 Lodgen Ct., Unit 1F  |
| ID-2                              | 1/15/2009       | Grey Water           | 100 gpd          | 3/2/2009     | 34 Hanover Street       |
| ID-4                              | 8/28/2009       | Sewage               | 60 gpd           | 9/4/2009     | 2-4 Hancock Street      |
| ID-9                              | 5/18/2010       | Sewage               | 60 gpd           | 5/19/2010    | 36 Charles Street       |
| ID-12                             | Apr-12          | Confirmed Roof Drain | NA               | NA           | 100-110 Pleasant Street |
| ID-13                             | Sep-12          | Sewage               | Unknown          | January-13   | Exchange Street         |
| ID-15                             | Oct-13          | Process Water        | Unknown          | N/A          | Sharon Street           |

**Total Illicit Flow Removed to Date:** **260 gpd (94,900 gal/yr)**

**Illicit Discharges**

| Illicit Discharge Identification | Date Identified | Discharge Type          | Estimated Volume | Date Removed | Location                |
|----------------------------------|-----------------|-------------------------|------------------|--------------|-------------------------|
| ID-3                             | 8/11/2009       | Oil Sheen               | Unknown          | n/a          | Near 1081 Fellsway      |
| ID-5                             | 9/10/2009       | #2 oil spill            | <5 gallons       | 9/10/2009    | 269 Pearl Street        |
| ID-6                             | 9/21/2009       | Poss. Washwater         | Unknown          | 9/21/2009    | 120 Main Street         |
| ID-7                             | 12/9/2009       | Trans. Dielectric fluid | <27 Gallons      | 12/10/2009   | Near 6 Grove Street     |
| ID-8                             | 4/29/2010       | Hydraulic Fluid         | <10 Gallons      | 4/29/2010    | 496 Main Street         |
| ID-10                            | 2/10/2012       | Sewage                  | Note 1           | Pending      | 1056 Erlich Drive       |
| ID-11*                           | 9/11/2012       | Sewage                  | Unknown          | 11/6/2012    | Linden Brook @ Lynn St. |
| ID-14                            | 8/15/2013       | Grey Water              | Unknown          | 13-Dec       | Forestdale School       |

1 - approximately 1 gallon per minute observed discharging at LSP-4 during dry weather

\* Possible discharge due to grease blockage-Syphon still under investigation

**Table 2.0 Summary of Dry Weather Flows Identified as of 12/31/2014**

| Flow Identification | Location                           | Flow Type                                  | Status             |
|---------------------|------------------------------------|--------------------------------------------|--------------------|
| Flow 1              | Medford City Line                  | Water Line Leak                            | Removed            |
| Flow 2              | Saint Mary's Street                | Groundwater                                | No Further Action  |
| Flow 3              | Fellsmere Reservation              | Groundwater                                | No Further Action  |
| Flow 4              | Malden River                       | Surcharge-Submerged Invert                 | Evaluation Ongoing |
| Flow 5              | DCR Spot Pond Brook                | Base Flow                                  | Evaluation Ongoing |
| Flow 6              | Forestdale-Pine Banks Park         | Base Flow                                  | No Further Action  |
| Flow 7              | Wigglesworth Street                | Groundwater-Illicit Discharge              | Removed            |
| Flow 8              | Main Street                        | Water Line Leak                            | Removed            |
| Flow 9              | Pierce Street                      | Groundwater Breakout                       | No Further Action  |
| Flow 10             | Linden Brook                       | Base Flow                                  | Evaluation Ongoing |
| Flow 11             | LSP-4                              | Dry Weather Flow                           | Evaluation Ongoing |
| Flow 12             | Kennedy Dr-Granada Highlands Apts. | Base Flow                                  | No Further Action  |
| Flow 13             | Orchard Street                     | Dry Weather Flow                           | Evaluation Ongoing |
| Flow 14             | Exchange Street                    | Intermittent Dry Weather Flow              | Evaluation Ongoing |
| Flow 15             | Lower Commercial Street            | Dry Weather Flow                           | Evaluation Ongoing |
| Flow 16             | Huntley Street                     | Dry Weather Flow                           | No Further Action  |
| Flow 17             | Goldcliff Road                     | Dry Weather Flow: No flow on 7/2 & 11/5/14 | No Further Action  |
| Flow 18             | Cherry & Gilbert Streets           | Dry Weather Flow                           | Evaluation Ongoing |
| Flow 19             | Sylvan Street                      | Dry Weather Flow                           | Evaluation Ongoing |
| Flow 20             | First Street & Elwell Ave          | Base Flow                                  | No Further Action  |
| Flow 21             | Bowman Street                      | Base Flow                                  | No Further Action  |
| Flow 22             | Springdale Street                  | Dry Weather Flow                           | No Further Action  |
| Flow 23             | Grant Street                       | Dry Weather Flow                           | Evaluation Ongoing |
| Flow 24             | Wheeler Street                     | Dry Weather Flow: No flow on 7/2 & 11/5/14 | No Further Action  |
| Flow 25             | Revere Street                      | Dry Weather Flow: No flow on 7/2 & 11/5/14 | No Further Action  |
| Flow 26             | Kennedy Dr & Fairfield Avenue      | Base Flow                                  | No Further Action  |
| Flow 27             | Sharon Street                      | Process Water                              | No Further Action  |

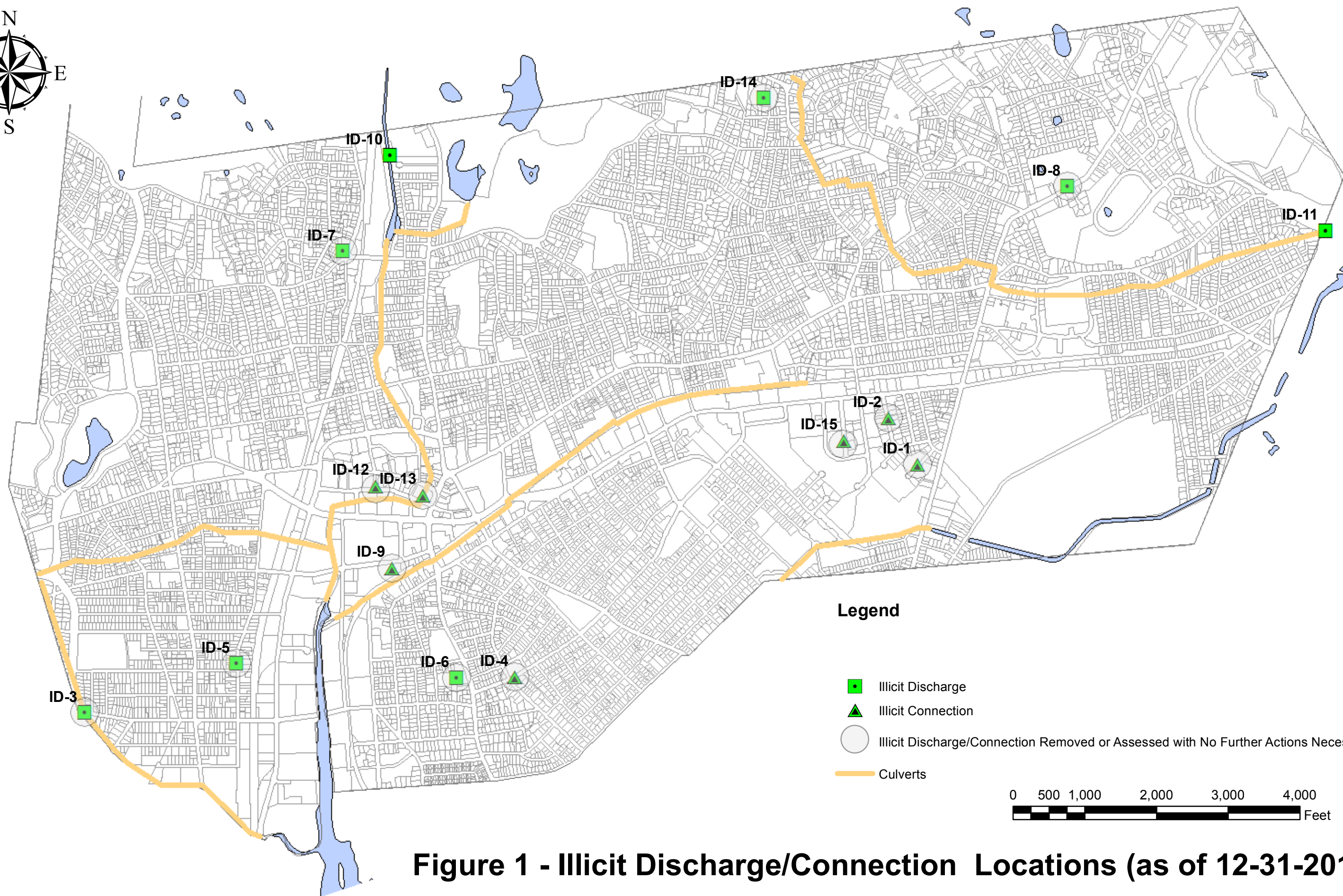
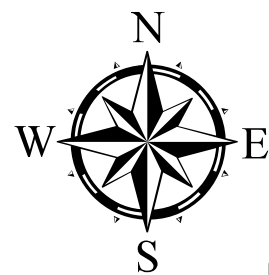
Table 3.0 Dry Weather Conditions - E. Coli Concentrations  
Site Location, Outfalls/Manholes Malden, MA

| Sample Designation            | E. Coli (MF)<br>(MPN/100ml) |           |            |           |           |           |                        |           |           |          |           |           |          |           |
|-------------------------------|-----------------------------|-----------|------------|-----------|-----------|-----------|------------------------|-----------|-----------|----------|-----------|-----------|----------|-----------|
|                               | 30, 9223B                   |           |            |           |           |           |                        |           |           |          |           |           |          |           |
|                               | ACTION LEVEL- 235 col/100ml |           |            |           |           |           |                        |           |           |          |           |           |          |           |
|                               | 8/4/2011                    | 11/8/2011 | 12/13/2011 | 1/11/2012 | 4/13/2012 | 6/15/2012 | 9/11/2012 <sup>1</sup> | 9/27/2012 | 2/22/2013 | 4/5/2013 | 9/12/2013 | 9/24/2013 | 7/2/2014 | 11/5/2014 |
| Malden River                  |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| MR-0                          | -                           | -         | 9,200      | -         | -         | -         | 3,090                  | -         | -         | 490      | 980       | -         | -        | -         |
| MR-1                          | -                           | -         | 390        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-4                          | -                           | -         | 220        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-5                          | -                           | -         | 9.7        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-6                          | -                           | -         | 4.1        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-8                          | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | 292       | -         | -        | -         |
| MR-11                         | -                           | -         | ND (1.0)   | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| MR-12                         | -                           | -         | 59         | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Saint Mary St. <sup>1</sup>   | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-0-Channel <sup>2</sup>    | -                           | -         | -          | 1,700     | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-3                         | -                           | -         | -          | 1,600     | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-4                         | 17,000                      | -         | -          | >242,000  | -         | 100,000   | -                      | -         | -         | -        | -         | 2,000     | 110,000  | 3,200     |
| LSP-5.1-Channel <sup>2</sup>  | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-9                         | -                           | 34        | -          | 84        | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| LSP-10-Channel <sup>2</sup>   | -                           | -         | -          | 10,000    | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| C39-MH0.1                     | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| C46-MH19                      | -                           | -         | -          | -         | -         | -         | 850                    | -         | -         | -        | -         | -         | -        | -         |
| E2-MH2                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E2-MH1                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E13-MH2 (Elrich)              | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E13-MH4 (Elrich)              | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 2,000     | -        | -         |
| E28-MH8                       | -                           | -         | -          | -         | ND (1.0)  | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| E28-SP1                       | -                           | -         | -          | -         | 6,100     | -         | 740                    | -         | -         | -        | -         | -         | -        | -         |
| E28-SP2                       | -                           | -         | -          | -         | 5,200     | -         | 310                    | -         | -         | -        | -         | -         | -        | -         |
| E28-MH4A                      | -                           | -         | -          | -         | 1.0       | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| H16-MH13                      | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| H16-MH17                      | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| H25-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| M8-MH3                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| M26-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| NG-C1                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| P36-MH5                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| R18-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| S29-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | 160      | -         | -         | -        | -         |
| S29-MH3                       | -                           | -         | -          | -         | -         | -         | 13,330                 | -         | -         | 190      | -         | -         | -        | -         |
| W25-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Little Creek                  |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| LC-0                          | 2,400                       | -         | 65         | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Town Line Brook               |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| TL-0 <sup>3</sup>             | -                           | 96        | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-1                          | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-3                          | -                           | 8.5       | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-5                          | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-9                          | -                           | 130       | -          | -         | -         | -         | 410                    | -         | -         | -        | -         | -         | -        | -         |
| TL-13                         | -                           | ND (1.0)  | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-24                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| TL-BL-EV                      | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| B53-MH7                       | -                           | -         | -          | -         | -         | -         | 410                    | -         | -         | -        | -         | -         | -        | -         |
| BP-MH3                        | -                           | -         | -          | -         | -         | -         | 200                    | -         | -         | -        | -         | -         | -        | -         |
| L23-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| S3-MH12 <sup>3</sup>          | -                           | -         | -          | -         | -         | -         | 2,880                  | -         | -         | -        | -         | -         | -        | -         |
| S14-MH4                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | ND (1.0) | 4.1       |
| Saugus Branch                 |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| MR-2                          | -                           | -         | 1,200      | -         | -         | -         | -                      | -         | -         | -        | 550       | -         | -        | -         |
| MR-2N                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 150      | 490       |
| MR-2S                         | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 130      | 440       |
| Broadway/Eastern <sup>4</sup> | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| Linden Brook                  |                             |           |            |           |           |           |                        |           |           |          |           |           |          |           |
| B46-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | <1        | -        | -         |
| C18-MH5                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 23,000    | 11,000   | 1,300     |
| C36-MH1                       | -                           | -         | -          | 6.3       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| D17-MH1                       | -                           | -         | -          | 460       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| F1-MH4                        | -                           | -         | -          | -         | -         | -         | 310                    | -         | -         | 12       | -         | -         | -        | -         |
| F23-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 13        | -        | -         |
| G36-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 1,700    | 290       |
| H43-MH1                       | -                           | -         | -          | 28,000    | -         | -         | 5,470                  | -         | -         | 580      | -         | 12        | -        | 1,000     |
| K6-MH1                        | -                           | -         | -          | -         | -         | -         | -                      | 49        | -         | -        | -         | -         | -        | -         |
| L5-MH1                        | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | 580      | -         | -         | -        | -         |
| LBR-1                         | -                           | -         | -          | -         | -         | -         | >241,920               | -         | <10       | 1        | -         | -         | 520      | 88        |
| M31-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 12        | -        | -         |
| O10-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | 4,300     | -         | 650      | -         | -         | -        | -         |
| P24-MH1                       | -                           | -         | -          | 9.7       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| S27-MH2                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | 17        |
| S45-MH4                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        | 8.5       |
| V1-MH1                        | -                           | -         | -          | 5.2       | -         | -         | -                      | -         | -         | -        | -         | -         | -        | -         |
| W26-MH1                       | -                           | -         | -          | 390       | -         | -         | -                      | -         | -         | 320      | -         | -         | -        | -         |
| W47-MH1                       | -                           | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 3,500    | 1,700     |

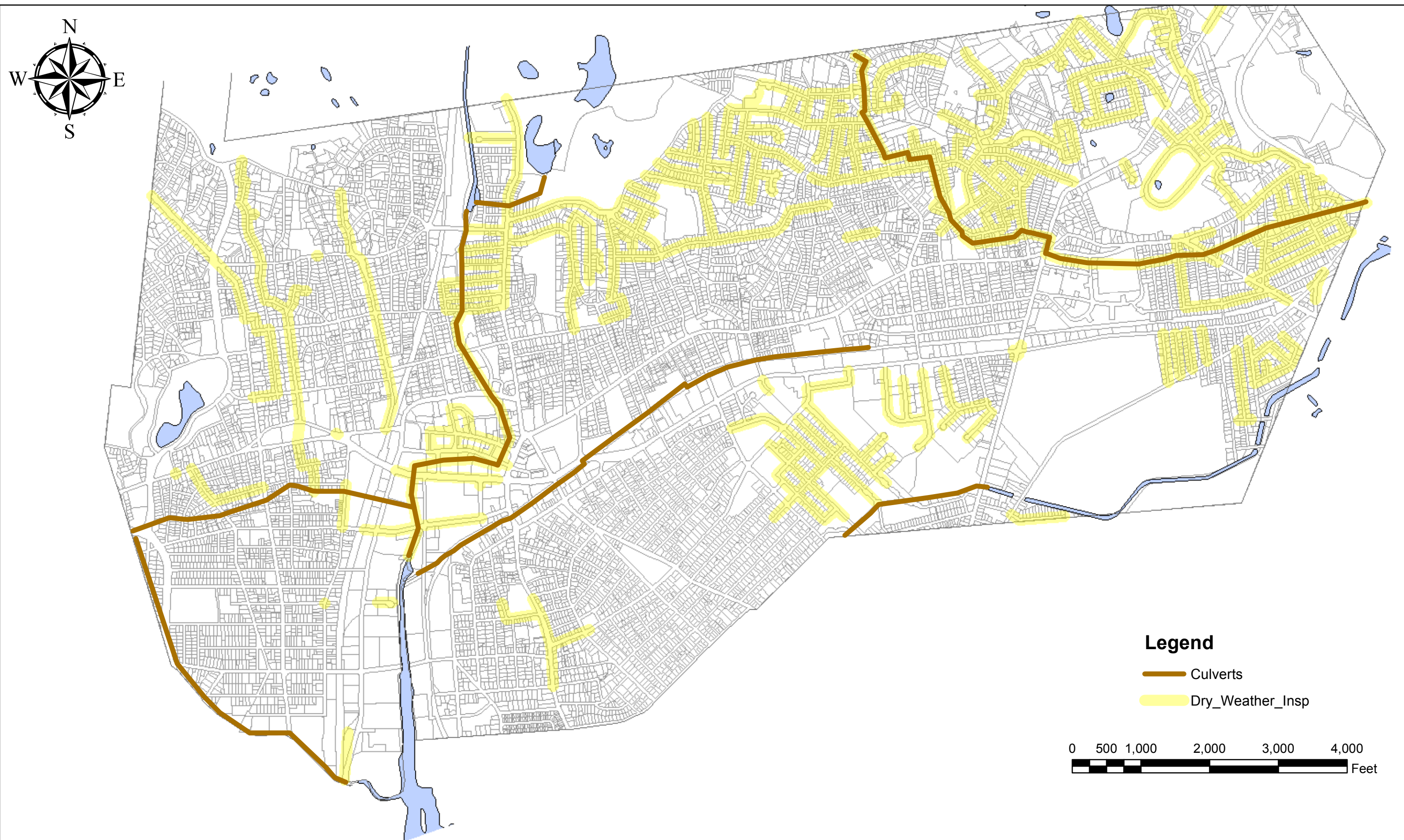
File No. 465.09  
<sup>1</sup>Samples collected by USEPA  
Laboratory certificates contained within attachments

# FIGURES

**Environmental Engineering and Land Use Planning**



**Figure 1 - Illicit Discharge/Connection Locations (as of 12-31-2014)**



**Figure 2 - Dry Weather Inspection Areas (as of 12-31-14)**

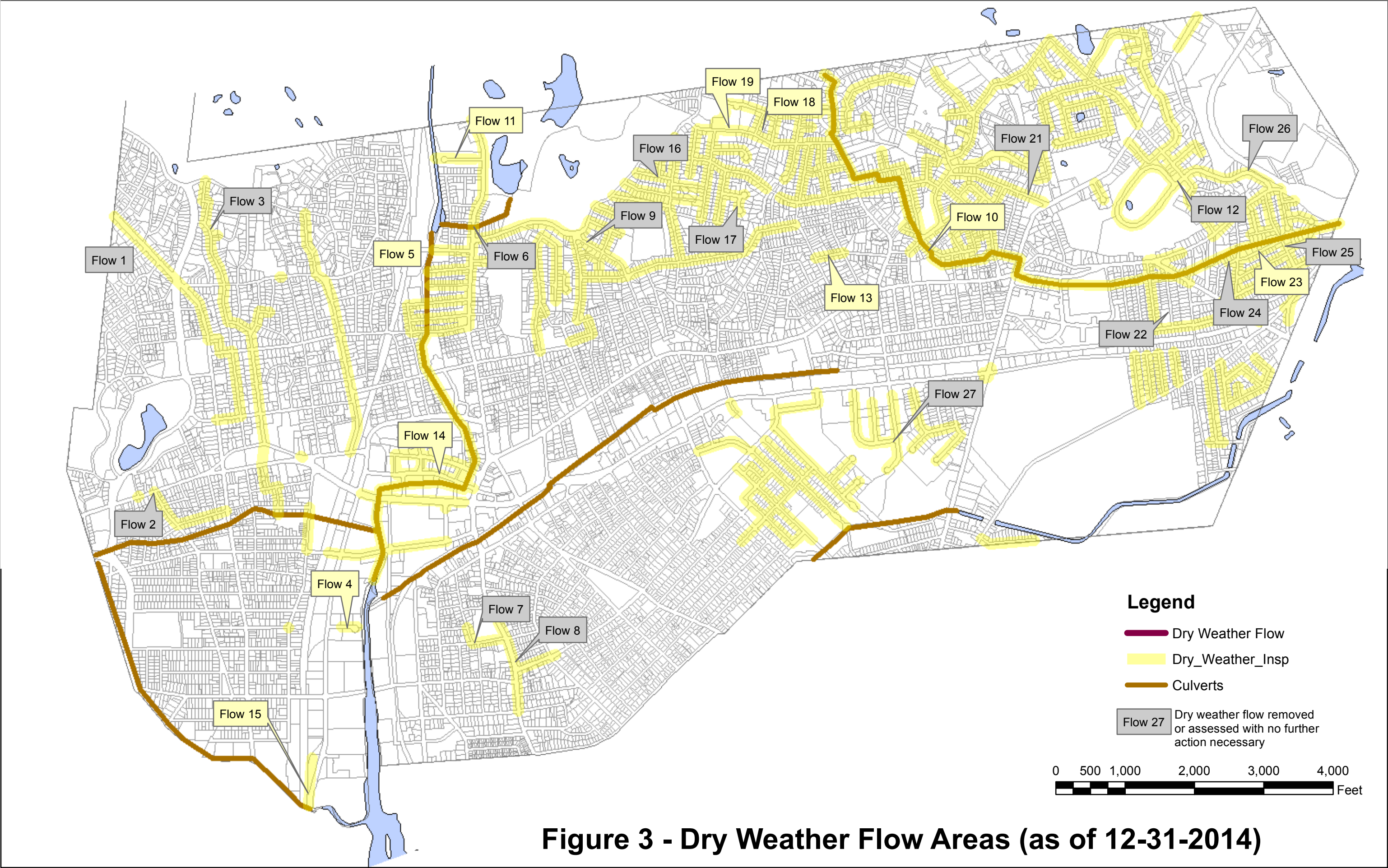


Figure 3 - Dry Weather Flow Areas (as of 12-31-2014)



Figure 4 - Malden River Outfalls



Figure 5 - Lower Spot Pond Brook Outfalls



**Figure 6 - Town Line Brook Outfalls**

# ATTACHMENT A

**Environmental Engineering and Land Use Planning**



## ANALYTICAL REPORT

|                 |                                                                                        |
|-----------------|----------------------------------------------------------------------------------------|
| Lab Number:     | L1426518                                                                               |
| Client:         | Nangle Consulting Associates<br>960 Turnpike Street<br>Building 1D<br>Canton, MA 02021 |
| ATTN:           | Chuck Altobello                                                                        |
| Phone:          | (781) 821-0521                                                                         |
| Project Name:   | CITY OF MALDEN                                                                         |
| Project Number: | 465.09                                                                                 |
| Report Date:    | 11/11/14                                                                               |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

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Eight Walkup Drive, Westborough, MA 01581-1019  
508-898-9220 (Fax) 508-898-9193 800-624-9220 - [www.alphalab.com](http://www.alphalab.com)



**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1426518  
**Report Date:** 11/11/14

| <b>Alpha<br/>Sample ID</b> | <b>Client ID</b> | <b>Matrix</b> | <b>Sample<br/>Location</b> | <b>Collection<br/>Date/Time</b> | <b>Receive Date</b> |
|----------------------------|------------------|---------------|----------------------------|---------------------------------|---------------------|
| L1426518-01                | LSP-4            | WATER         | MALDEN, MA                 | 11/05/14 13:30                  | 11/05/14            |
| L1426518-02                | LBR-1            | WATER         | MALDEN, MA                 | 11/05/14 09:15                  | 11/05/14            |
| L1426518-03                | W47-MH1          | WATER         | MALDEN, MA                 | 11/05/14 11:30                  | 11/05/14            |
| L1426518-04                | C18-MH5          | WATER         | MALDEN, MA                 | 11/05/14 12:00                  | 11/05/14            |
| L1426518-05                | S45-MH4          | WATER         | MALDEN, MA                 | 11/05/14 11:45                  | 11/05/14            |
| L1426518-06                | S14-MH4          | WATER         | MALDEN, MA                 | 11/05/14 08:45                  | 11/05/14            |
| L1426518-07                | MR-2S            | WATER         | MALDEN, MA                 | 11/05/14 07:30                  | 11/05/14            |
| L1426518-08                | MR-2N            | WATER         | MALDEN, MA                 | 11/05/14 07:35                  | 11/05/14            |
| L1426518-09                | S27-MH2          | WATER         | MALDEN, MA                 | 11/05/14 09:40                  | 11/05/14            |
| L1426518-10                | G36-MH2          | WATER         | MALDEN, MA                 | 11/05/14 10:30                  | 11/05/14            |
| L1426518-11                | H43-MH1          | WATER         | MALDEN, MA                 | 11/05/14 12:30                  | 11/05/14            |

**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1426518  
**Report Date:** 11/11/14

### Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

#### HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

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**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1426518  
**Report Date:** 11/11/14

### Case Narrative (continued)

#### Sample Receipt

The samples were received at the laboratory above the required temperature range. The samples were transported to the laboratory in a cooler with ice and delivered directly from the sampling site.

L1426518-07 and -08: The analysis of E. Coli was received with the method required holding time exceeded and was performed at the client's request.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:



Cristin Walker

Title: Technical Director/Representative

Date: 11/11/14

# **INORGANICS & MISCELLANEOUS**

**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1426518**Report Date:** 11/11/14**SAMPLE RESULTS****Lab ID:** L1426518-01**Client ID:** LSP-4**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 11/05/14 13:30**Date Received:** 11/05/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 3200   |           | MPN/100ml | 200 | NA  | 200                | -                | 11/05/14 16:45   | 30,9223B             | SE      |



Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1426518

Report Date: 11/11/14

## SAMPLE RESULTS

Lab ID: L1426518-02

Client ID: LBR-1

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 11/05/14 09:15

Date Received: 11/05/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 88     |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1426518**Report Date:** 11/11/14**SAMPLE RESULTS****Lab ID:** L1426518-03**Client ID:** W47-MH1**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 11/05/14 11:30**Date Received:** 11/05/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 1700   |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1426518  
**Report Date:** 11/11/14

**SAMPLE RESULTS**

**Lab ID:** L1426518-04  
**Client ID:** C18-MH5  
**Sample Location:** MALDEN, MA  
**Matrix:** Water

**Date Collected:** 11/05/14 12:00  
**Date Received:** 11/05/14  
**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 1300   |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1426518**Report Date:** 11/11/14**SAMPLE RESULTS****Lab ID:** L1426518-05**Client ID:** S45-MH4**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 11/05/14 11:45**Date Received:** 11/05/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 8.5    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1426518**Report Date:** 11/11/14**SAMPLE RESULTS****Lab ID:** L1426518-06**Client ID:** S14-MH4**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 11/05/14 08:45**Date Received:** 11/05/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 4.1    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1426518**Report Date:** 11/11/14**SAMPLE RESULTS****Lab ID:** L1426518-07**Client ID:** MR-2S**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 11/05/14 07:30**Date Received:** 11/05/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 440    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1426518

Report Date: 11/11/14

## SAMPLE RESULTS

Lab ID: L1426518-08

Client ID: MR-2N

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 11/05/14 07:35

Date Received: 11/05/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 490    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1426518**Report Date:** 11/11/14**SAMPLE RESULTS****Lab ID:** L1426518-09**Client ID:** S27-MH2**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 11/05/14 09:40**Date Received:** 11/05/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 17     |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1426518

Report Date: 11/11/14

## SAMPLE RESULTS

Lab ID: L1426518-10

Client ID: G36-MH2

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 11/05/14 10:30

Date Received: 11/05/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 290    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1426518**Report Date:** 11/11/14**SAMPLE RESULTS****Lab ID:** L1426518-11**Client ID:** H43-MH1**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 11/05/14 12:30**Date Received:** 11/05/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 1000   |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 11/05/14 17:30   | 30,9223B             | SE      |



Project Name: CITY OF MALDEN

Lab Number: L1426518

Project Number: 465.09

Report Date: 11/11/14

### Method Blank Analysis Batch Quality Control

| Parameter                                                                         | Result | Qualifier | Units     | RL | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-----------------------------------------------------------------------------------|--------|-----------|-----------|----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab for sample(s): 01-10 Batch: WG737880-1 |        |           |           |    |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                                                                     | <1     |           | MPN/100ml | 1  | NA  | 1                  | -                | 11/05/14 16:45   | 30,9223B             | SE      |
| Microbiological Analysis - Westborough Lab for sample(s): 11 Batch: WG737881-1    |        |           |           |    |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                                                                     | <1     |           | MPN/100ml | 1  | NA  | 1                  | -                | 11/05/14 17:30   | 30,9223B             | SE      |

Project Name: CITY OF MALDEN

Lab Number: L1426518

Project Number: 465.09

Report Date: 11/11/14

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

## Cooler Information Custody Seal

Cooler

A Absent

## Container Information

| Container ID | Container Type                 | Cooler | pH  | Temp<br>deg C | Pres | Seal   | Analysis(*)    |
|--------------|--------------------------------|--------|-----|---------------|------|--------|----------------|
| L1426518-01A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-01B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-02A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-02B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-03A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-03B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-04A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-04B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-05A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-05B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-06A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-06B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-07A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-07B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-08A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-08B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-09A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-09B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-10A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-10B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-11A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |
| L1426518-11B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 15.6          | Y    | Absent | E-COLI-QT(.25) |

\*Values in parentheses indicate holding time in days



**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1426518  
**Report Date:** 11/11/14

## GLOSSARY

### Acronyms

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EDL  | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).                        |
| EPA  | - Environmental Protection Agency.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| LCS  | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.                                                                                                                                                                                                                                                         |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS.                                                                                                                                                                                                                                                                                                                                                                                                      |
| LFB  | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.                                                                                                                                                                                                                                                        |
| MDL  | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.                                                                                                                         |
| MS   | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.                                                                                                                                                                                                                                                  |
| MSD  | - Matrix Spike Sample Duplicate: Refer to MS.                                                                                                                                                                                                                                                                                                                                                                                                             |
| NA   | - Not Applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| NC   | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.                                                                                                                                                                                                                                                                                                          |
| NI   | - Not Ignitable.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RL   | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.                                                                                                                                                                                                                                  |
| RPD  | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM  | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.                                                                                                                                                                                                                                                                                                    |

### Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

### Terms

**Total:** With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

**Analytical Method:** Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

### Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**Report Format:** Data Usability Report



**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1426518  
**Report Date:** 11/11/14

#### **Data Qualifiers**

- G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1426518  
**Report Date:** 11/11/14

## REFERENCES

- 30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



## Certification Information

Last revised April 15, 2014

**The following analytes are not included in our NELAP Scope of Accreditation:**

### **Westborough Facility**

**EPA 524.2:** Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.

**EPA 8260C:** 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.

**EPA 8330A/B:** PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT.

**EPA 8270D:** 1-Methylnaphthalene, Dimethylnaphthalene, 1,4-Diphenylhydrazine.

**EPA 625:** 4-Chloroaniline, 4-Methylphenol.

**SM4500:** Soil: Total Phosphorus, TKN, NO<sub>2</sub>, NO<sub>3</sub>.

**EPA 9071:** Total Petroleum Hydrocarbons, Oil & Grease.

### **Mansfield Facility**

**EPA 8270D:** Biphenyl.

**EPA 2540D:** TSS

**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

**The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:**

### **Drinking Water**

**EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Tl; **EPA 200.7:** Ba, Be, Ca, Cd, Cr, Cu, Na; **EPA 245.1:** Mercury;

**EPA 300.0:** Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B**

**EPA 332:** Perchlorate.

**Microbiology:** SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.

### **Non-Potable Water**

**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn;

**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, Ti, Tl, V, Zn;

**EPA 245.1, SM4500H-B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC,**

**SM426C, SM4500NH3-BH, EPA 350.1:** Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO3-F,**

**EPA 353.2:** Nitrate-N, **SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4,**

**SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**

**EPA 624:** Volatile Halocarbons & Aromatics,

**EPA 608:** Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

**EPA 625:** SVOC (Acid/Base/Neutral Extractables); **EPA 600/4-81-045:** PCB-Oil.

**Microbiology:** SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



WESTBORO, MA  
TEL: 508-898-9220  
FAX: 508-898-9193

MANSFIELD, MA  
TEL: 508-822-9300  
FAX: 508-822-3288

# CHAIN OF CUSTODY

PAGE 1 OF 2

## Project Information

Project Name: City of Malden

Project Location: Malden Ma

Project #: 465,09

Project Manager:

ALPHA Quote #:

## Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: 12/12/14 Time:

Date Rec'd in Lab: 11/5/14

## Report Information - Data Deliverables

☐ FAX☐ EMAIL☐ ADEx☐ Add'l Deliverables

## Billing Information

☐ Same as Client info

PO #:

## Regulatory Requirements/Report Limits

State /Fed Program

Criteria

## MA MCP PRESUMPTIVE CERTAINTY --- CT REASONABLE CONFIDENCE PROTO

☐ Yes ☒ No

Are MCP Analytical Methods Required?

☐ Yes ☒ No

Is Matrix Spike (MS) Required on this SDG? (If yes see note in Comments)

☐ Yes ☒ No

Are CT RCP (Reasonable Confidence Protocols) Required?

## Client Information

Client: NCA

Address: 960 Turnpike St  
Canton Ma 02021

Phone: 781-821-0521

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

## Other Project Specific Requirements/Comments/Detection Limits:

If MS is required, indicate in Sample Specific Comments which samples and what tests MS to be performed.  
(Note: All CAM methods for inorganic analyses require MS every 20 soil samples)

X1 - drainage

| ALPHA Lab ID<br>(Lab Use Only) | Sample ID | Collection |       | Sample Matrix | Sampler's Initials | ANALYSIS<br>E. Coli - Enumeration |  |  |  |  |  |  |  |  |  | TOTAL # BOTTLES |   |
|--------------------------------|-----------|------------|-------|---------------|--------------------|-----------------------------------|--|--|--|--|--|--|--|--|--|-----------------|---|
|                                |           | Date       | Time  |               |                    |                                   |  |  |  |  |  |  |  |  |  |                 |   |
| 26578 01                       | LSP-4     | 11/5/14    | 13:30 | X1            | CA                 | X                                 |  |  |  |  |  |  |  |  |  |                 | 2 |
| 02                             | LBR-1     |            | 9:15  |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 03                             | W47-MH1   |            | 11:30 |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 04                             | C18-MH5   |            | 12:00 |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 05                             | S45-MH4   |            | 11:45 |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 06                             | S14-MH4   |            | 8:45  |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 07                             | MR-2S     |            | 7:30  |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 08                             | MR-2N     |            | 7:35  |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 09                             | S27-MH2   |            | 9:40  |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |
| 10                             | G36-MH2   |            | 10:30 |               |                    | X                                 |  |  |  |  |  |  |  |  |  |                 |   |

## SAMPLE HANDLING

Filtration \_\_\_\_\_

☐ Done☐ Not needed☐ Lab to do☐ Preservation☐ Lab to do

(Please specify below)

Sample Specific Comments

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT  
MA MCP or CT RCP?

FORM NO: 01-01 (rev. 18-Jan-2010)

Container Type P

Preservative H

Relinquished By: [Signature]

Date/Time 11/5/14 14:11

Received By: [Signature]

Date/Time 11/5/14 14:11

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.



# **CITY OF MALDEN**

## **Illicit Discharge Detection and Elimination Program Semi-Annual Status Report**

January 1, 2014 – June 30, 2014

Prepared by:

**Nangle Consulting Associates, Inc.**

960 Turnpike St  
Canton, MA 02021

and

**City of Malden Engineering Department**

200 Pleasant Street  
Malden, Massachusetts

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## **ATTACHMENTS**

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|--------------|-------------------------|

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## 1.0 INTRODUCTION

This status report pertains to the period of 1 January through 30 June 2014 for the City of Malden's Illicit Discharge Detection and Elimination (IDDE) Program. The City of Malden's IDDE plan was developed to facilitate the implementation of a systematic and iterative procedure for the evaluation of dry weather flows, identification of potential illicit discharges and timely repairs to the storm drainage infrastructure, with the overall goal of improving surface water quality discharge within the City of Malden. This semi-annual status report has been prepared through the cooperative efforts of the City of Malden Engineering Department, the City of Malden Department of Public Works (MDPW) and Nangle Consulting Associates, Inc. (NCA) to document key program tasks completed during this reporting period.

Since its inception, the City's IDDE program has identified and removed several illicit discharges/connections to the municipal drainage system, reduced significant potable water losses due to the detection of leakages, enforced Best Management Practices (BMPs)/stormwater ordinances and completed repairs to components of the drainage infrastructure. A key component of this effort has been the development and implementation of a comprehensive GIS mapping and catch basin cleaning/repair program, which is maintained by the MDPW and Engineering Department. The goals and objectives of this IDDE plan are directed towards the reduction in the historic bacteria levels that have been detected at selected outfalls within the City. In addition, as a "flow through" community, bacteria loadings entering into the City of Malden's infrastructure from upstream neighboring communities have also been quantified. As noted in prior submittals, the results of dry weather inspections, together with both dry and wet weather sampling, support the opinion that wet weather loadings are tied to the age and condition of the municipal infrastructure, major portions of which were installed during the late 1800's and early 1900's.

The City Engineering and Public Works Departments, supplemented by outside technical assistance, have developed a program that integrates the implementation of the IDDE Plan into the routine daily work practices. The incorporation of the IDDE program by City personnel has led to the identification of infrastructure deficiencies and enabled the timely repair of potential flow and water quality concerns. These direct response mitigation/repair measures have led not only to the removal of illicit connections/discharges, but improved flow conveyance to eliminate historic flooding concerns. An additional component of IDDE Plan implementation is the enforcement of applicable zoning ordinances to ensure that appropriate actions are taken for private parties responsible for illicit tie-ins and discharges.

This report has been prepared to document and summarize IDDE activities that have been undertaken by the City during the January 2014 through June 2014 reporting period and identify key goals and objectives to be considered during future phases of plan implementation. During this reporting period, the comprehensive GIS mapping program initially developed by NCA has continues to be expanded for use by municipal departments under the direction of CDM Smith. In addition, the targeted monitoring of isolated dry weather flows containing discrete bacteria loadings and outfall monitoring has been performed. Utilizing the data and information obtained during this reporting period, an updated work plan of prioritized tasks for the next 6 month period has also been prepared and is included within Section 5.0 of this report.

## **2.0 DOCUMENTED ILLICIT DISCHARGES AND CONNECTIONS**

During this reporting period, no new illicit connections or illicit discharges were identified. However, information pertaining to the investigation of one (1) possible illicit connection and one (1) illicit discharge identified previously is discussed below. To assist in the review of the information contained within this report, a summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0. The possible illicit connection was identified by the stormwater compliance team in a drainage manhole on Sharon Street during a dry weather inspection of this portion of the City. A dry weather flow discharging from a pipe which appeared to be emanating from the rear of the building located at 50 Crystal Street (Viking Seafoods Inc) was identified. The subsequent monitoring of the drainage manhole revealed that the discharge appears to be intermittent, with flows observed to be approximately 10 – 12 gallons per minute, which slowed to a trickle over an approximate 10 minute timeframe. The City Engineering Department has contacted the owners of the Viking Seafoods property to further investigate this condition and the City was informed that this was process water from a cooling tower. The Stormwater Compliance Team conducted a dry weather sampling event at the manhole in question (S14-MH4) in July of 2014 and details pertaining to this sampling event may be referenced from Section 3.1.2.

In addition to the above, the owner of the property on South Washington Street where a possible illicit connection was initially identified in 2012 was contacted by the City of Malden Engineering Office. The City was advised that this was a roof drain connection and in response to this, the Engineering Office conducted an onsite inspection and confirmed that the connection was tied to roof drains.

As described in further detail in Section 3.1.1, the City continues to share sampling results with the Mystic River Watershed Association (MyRWA) and has performed targeted sampling events to investigate discharges to outfalls that have been sampled by MyRWA. One particular area of interest is the Saugus Branch drainage system that discharges to the outfalls referred to as MR-2S and MR-2N. The continued assessment of possible grease blockages within a sewer siphon located at the intersection of Salem and Lynn Streets that passes beneath Linden Brook has also been conducted this reporting period. This structure is located at the City line between Malden and Revere and additional details pertaining to the ongoing investigation and inspection program may be referenced from Section 3.1.3.

## **3.0 OVERVIEW OF IDDE ACTIVITIES (JANUARY 2014 – JUNE 2014)**

In addition to outfall sampling, the City of Malden's IDDE Program incorporates the use of three (3) primary measures to identify and mitigate illicit discharges to its municipal drainage system, which may be described as follows:

- (1) Targeted dry weather inspections and sampling by representatives of the Stormwater Compliance Team.
- (2) Detailed inspection of the municipal infrastructure during the daily implementation of the catch basin clean-out and drainage system mapping program.

- (3) Response to public, private or governmental agencies reports of possible sudden and/or identified discharge to the municipal storm system.

As described in the City's 2009 IDDE work plan, targeted dry weather inspections are driven in large part by the results of dry and wet weather sampling at outfalls which discharge to surface water conveyances, principally the Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. To provide a basis for the iterative dry weather inspection program and the observations recorded during this reporting period, the following excerpt from the City's IDDE work plan describes the methods and prioritization procedure maintained for this ongoing mitigation measure;

- Based upon the initial outfall monitoring data obtained, the City is currently implementing a Rapid-Assessment Prioritization approach through the targeted assessment of dry-weather flows in several areas within the City. Specifically the major tributaries to the most significant volume dry weather discharges to the Town Line Brook and the Malden River have been identified and sampled at key junction locations to initially determine the dry weather contributions from adjacent communities through major flood control infrastructure that is routed through the City of Malden.

As described in prior status reports, a comprehensive dry weather sampling effort using multiple lines of evidence testing was performed by representatives of USEPA and NCA in the fall of 2012. The focus of this extensive USEPA analytical program was directed towards the isolation of potential human based contributions to dry weather flows, using an approach that greatly exceeds the limitations of simple bacteria sampling. Specifically, this approach was intended to resolve traditional limitations involving reliance upon bacteria analysis associated with animal waste contributions. It is anticipated that additional targeted sampling of priority areas utilizing this approach will be performed, as NCA is currently working with Alpha Analytical to develop a method for this analysis of key parameters , such as caffeine.

By design, observations recorded during the dry weather inspections, together with the results of infrastructure sampling, serve as the basis for future work plan tasks and modifications to the original IDDE plan. Accordingly, the IDDE program maintained by the City is regarded as an ongoing and iterative effort that has successfully demonstrated the capability to quickly respond to water quality issues as needs and concerns are identified. The City of Malden has invested significant time and capital funding to develop a Stormwater Compliance Team (SCT) comprised of members of the Department of Public Works, Engineering and outside technical support. Key tasks performed by this group include the performance of dry weather inspections targeted sampling efforts together with the systematic cleaning of catch basins, and related infrastructure components. In addition, their efforts have led to the identification of infrastructure needs, rapid response to illicit discharges, posting of outfall signage, general system maintenance and mitigation of environmental conditions of concern as they are being identified.

Through department head meetings, public outreach, postings of signage and daily work practices, a general awareness of the need for response to illicit discharges has been developed as the third component of the City's IDDE program. Increased involvement by engineering technical staff in the daily work practices of MDPW stormwater personnel is also intended to further this goal. Contact information is readily available through a variety of media, including mailings and web site postings to ensure implementation of appropriate response measures by members of the Stormwater Compliance Team. The current municipal leadership has made a significant effort to increase public awareness and participation through increased integration of

digital and electronic media into daily practices. Public outreach has also included active participation by the Compliance Team through community workshops, educational presentations and regional watershed meetings.

### **3.1 Targeted Dry Weather Inspection/Sampling Program (NCA)**

Representatives of NCA and MDPW personnel continue to conduct dry weather inspections of the City's infrastructure and during this reporting period the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook, respectively and central portions of Malden, which discharge to Lower Spot Pond Brook and ultimately the Malden River have been iteratively inspected and monitored. Historically, areas selected for inspection were generally based upon the results of the outfall sampling program and/or the identification of dry weather flows by MDPW staff during their routine maintenance and infrastructure locating program. As described in the following section, this approach has been implemented to investigate sampling results distributed by MyRWA, as well as the Stormwater Compliance team.

A map depicting the approximate locations where targeted dry weather inspections have been conducted by NCA to date is presented as Figure 2. In addition, the drainage infrastructure is also inspected by DPW during the catch basin cleaning program. Upon the identification of previously unknown dry weather flows, the Engineering Department and NCA are immediately notified by MDPW personnel and targeted mass balance sampling efforts are performed. During dry weather inspections completed under the IDDE program, various dry weather flows have been identified. A summary of these flows within the municipal system that have been identified to date are shown on Table 2.0 and Figure 3. As stated above, during this reporting period, dry weather investigations were performed within three (3) key areas that warranted further flow isolation efforts based upon prior dry weather sampling data. These areas include the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook, respectively. In addition, the central portion of Malden was also targeted, which discharges to Lower Spot Pond Brook, and ultimately the Malden River.

#### **3.1.1 Malden River Watershed**

The City of Malden's stormwater compliance team initially targeted potential illicit discharges to the Malden River as its highest priority. Utilizing the outfall monitoring data and information obtained during dry weather sampling events, the City has identified significant base flow as surface waters, to the Malden River. Consistent with the original design of the MDC/DCR conveyance network; this occurs primarily thorough culverted channels/brooks located in northwestern portions of the City. This flow includes contributions that originate from the Fells Reservation and Lower Spot Pond Brook. As shown on Figure 4, a total of 23 outfalls to the Malden River have been identified, nine (9) of which have been identified as flowing during dry weather conditions. Periodic dry weather sampling has been performed by NCA, MyRWA and the USEPA.

NCA conducted a dry weather sampling event at several key outfalls that discharge to the Malden River on 2 July 2014. This included the sampling of baseline water flow from MR-2N and MR-2S, which receive flows from the Saugus Branch. Representatives of MyRWA have met with the City and identified this dry weather flow as a potential issue of concern, based upon

the results of their sampling efforts. As shown on Table 3.0, E. coli levels of 150 MPN/100 ml (MR-2N) and 130 MPN/100 ml (MR-2S) were identified, respectively. These locations were sampled by MyRWA in June of 2013 and elevated bacterial levels were reported. To further investigate the elevated bacteria loadings identified in June 2013, NCA reviewed the MyRWA outfall monitoring data, as well as online U. S. Geologic Survey (USGS) precipitation data and noted that an antecedent rainfall event approximating the recommended precipitation limit had occurred in the area on 24 June 2013. As noted on Table 3.0, the most recent results collected from the Saugus Branch are below the applicable Action Level for the Malden River and are significantly lower than the results obtained by MyRWA in June of 2013.

The Stormwater Compliance Team has conducted numerous dry weather sampling events to investigate the elevated E. coli levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive (Figure 5). Base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 was completed in February 2012. Given the proximity of the sewer and drain lines to LSP-4, as well as the settlement of the drain line in the area of Buildings 1054 and 1056 Elrich Drive, the focus of assessment activities was directed towards the sewer laterals and nearby drainage line servicing the two apartment buildings. Following dye testing by the Compliance Team, camera surveys performed by representatives of the property owner confirmed that compromises to the laterals servicing two (2) residential building had occurred. Recommendations made by the SCT involved restoring the integrity of the main drainage line to stop the discharges that have been documented at LSP-4.

Working with representatives of the Malden Engineering Department, repairs to the sewer laterals in the area of Building 1054 and 1056 were completed by the property owner in March 2012. Since that time, several dry weather flow samples have been collected from LSP-4, and as shown on Table 3.0, E. coli levels although still elevated, decreased significantly relative to concentrations detected in 2012. However, during the most recent sampling event, conducted on 2 July 2014, an E. coli concentration of 110,000 MPN/100 ml was detected at LSP-4. According to the City Engineering Department, the Eldrich Drive complex is under new ownership and the City has attempted to contact the property owner numerous times to discuss the sampling results, however the owner has been unresponsive. Accordingly, more formal enforcement measures are recommended for the next reporting period.

### 3.1.2 Town Line Brook Watershed

Town Line Brook in Malden begins at the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Significant tidal influences exist in the form of an approximate 2-3 foot change in surface water elevation between Broadway and the remaining length of the culvert to the Revere City line. As shown on Figure 6, a total of 29 outfalls to Town Line Brook in Malden have been identified. The historic monitoring data of Town Line Brook has revealed relatively uniform bacteria levels during dry weather sampling events. Several outfall locations have consistently exhibited bacteria loadings during dry weather sampling events, including S3-MH12, TL-0, TL-9 and Trifone Brook (TL-24). Manhole sample point S3-MH12 is the upstream sampling point for this section of the Brook as it enters the Malden system from Everett, while TL-0 is located at Broadway, where Town Line Brook daylights. TL-9 is located proximate to the terminus of

Hadley Street in Malden and receives dry weather flows from the City of Everett, with Trifone Brook (TL-24), also flowing from Everett prior to discharging into Town Line Brook. No dry weather flows from the Town Line Brook watershed were sampled during this reporting period, however, dry weather inspections of the watershed area revealed one (1) dry weather flow located on Sharon Street.

As referenced within Section 2.0, a possible illicit connection was identified by the stormwater compliance team in a drainage manhole on Sharon Street (S14-MH4) during a dry weather inspection of the area (Figure 7). A dry weather flow discharging from a pipe which appeared to be emanating from the rear of the building located at 50 Crystal Street (Viking Seafoods Inc) was identified. The subsequent monitoring of the drainage manhole revealed that the discharge appears to be intermittent, with flows observed to be approximately 10 – 12 gallons per minute. This discharge slowed to a trickle over an approximate 10 minute timeframe. The City Engineering Department contacted the owners of the Viking Seafoods property to further investigate this condition. Representatives of Viking Seafoods informed the City that this was process water from a cooling tower. To confirm, the Stormwater Compliance Team conducted a dry weather sampling event at manhole S14-MH4 on 2 July 2014. As shown on Table 3.0, no detectable levels of E. coli were encountered within the sample collected from manhole S14-MH4.

### *3.1.3 Linden Brook Watershed*

Linden Brook Culvert is the major stormwater conveyance network located in northeasterly portions of the City. Dry weather inspections have revealed base flow throughout the culvert at all times, with E. coli levels detected historically within the mid-portion of the culvert, at manholes D17-MH1 and H43-MH1 (Figure 7). Flow isolation studies performed to date within this portion of the City had not revealed any specific source conditions for the results of prior sampling. During this reporting period flow isolation studies were conducted on a dry weather flow (Flow 18) in the area of Cherry Street and Sylvan Street which contributes to the western portion of the Linden Brook Culvert. As outlined within the last IDDE Status Report, a dry weather flow sample collected from drainage manhole (C18-MH5) located on Cherry Street contained an E. coli level of 23,000 MPN/100 ml. To further assess this condition, several dry weather flow samples were collected on 2 July 2014 from the approximate manhole locations shown on Figure 7. Reference to Table 3.0, indicates that the E. coli levels encountered at drainage manhole C18-MH5 contained an E. coli level of 11,000 MPN/100 ml. An upstream dry weather flow sample relative to C18-MH5 was also collected from a manhole located on Winship Street (W47-MH1). Although lower than those encountered at C18-MH5, higher bacteria loadings were also identified at this manhole, with an E. coli concentration of 3,500 MPN/100 ml identified. As this flow (Flow 18) originates along Sylvan Street, proximate to the Forestdale School, targeted sampling of dry weather flow in this area will be performed next reporting period.

In addition to the above, a follow-up inspection of dry weather flows initially encountered last reporting period was conducted within the eastern portion of Malden in the area of Grant Street, which contributes to the eastern portion of Linden Brook Culvert. As shown on Figure 7 and Table 2.0, dry weather flows were encountered last reporting period (Flows 23, 24 & 25) on Grant Street, Wheeler Street and Revere Street, respectively. The 2 July 2014 inspection of drainage manholes on Wheeler Street revealed no dry weather flow, while Revere

Street drainage contained only a trickle flow. Dry weather flow was again encountered on Grant Street during the 2 July 2104 sampling event in drainage manhole G36-MH2. A dry weather flow sample was collected from the manhole and as shown on Table 3.0, an E. coli concentration of 1,700 MPN/100 ml was encountered. Additional dry weather flow samples will be collected from this area during the next reporting period.

During the September 2012 sampling event, representatives of the USEPA collected a water sample from outfall LBR-1 (Figure 7), located in Revere, where distinct indications of sewage odors were noted. Consistent with identification of strong sewage odors and immediately apparent from a review of Table 3.0 is the significantly elevated level of E. coli (>241,920 MPN/100 ml) detected in sample LBR-1. To assess this condition and as described in prior status reports, the City of Malden contracted with National Water Main Cleaning Company, under the supervision of CDM Smith. As summarized in the following excerpt from an email to the City of Malden from CDM Smith, it is believed that line blockage due to grease build up may have been a crucial factor for the conditions identified at LBR-1, in addition to a “minor” defect in the form of a leaky joint. Although maintenance was routinely performed on this siphon, the extent of grease build up indicates that a higher frequency of cleaning and maintaining is necessary to further understand the condition.

As you know, National Water Main Cleaning Company along with CDM Smith staff were out on site on Tuesday November 6, 2012 to investigate the potential illicit connection into the Linden Brook Culvert at Salem Street near the Route 1 underpass. The following is a summary of the day’s events. The following figure graphically represents the results of the work.

National Water Main was onsite to clean and CCTV the siphon under the Old Linden Brook culvert. Upon arrival the condition of the sewers had not changed from the previous visit held 2 weeks prior: The downstream manhole (MH 3 in the attached figure) and a manhole upstream of the siphon (MH 1 in the figure) were completely plugged with heavy grease. A limited amount of liquid was passing through MH 3. Heavy cleaning of MH 3 and the sewer under the culvert took longer than expected. From MH 3 upstream to MH 1 an enormous amount of grease and sediment was removed. The pipe was 100% clogged with slugs of grease in several spots.

The sewer between MH 1 and MH 2 was successfully CCTV’d with the aid of the jetter (upstream of the siphon). This pipe was found to be in good condition. The most notable defect was a leaking joint (runner) at 9pm 54-ft from MH 1 (while traveling downstream). This was a rather minor defect. Active I/I was observed, however, it is possible that when the siphon builds some head, a small amount of sewage could exfiltrate from this same joint.

We discovered what appears to be an external drop connection just downstream of MH 2. This prevented us from CCTV’ing any further as the camera could not pass the vertical 90 degree bend. CCTV from the upstream direction would require two jetters or bypass pumping, (one to keep MH 3 drained and one to intercept flow from upstream in MH 2). This vertical drop was heavily blocked with grease. Approximately 80% of the grease in this pipe was removed with a root cutter and the pipe is in much better condition.

Last we lowered the camera into the 12-in connection to the culvert that once housed a gate valve (in MH 3). It no longer houses any gate, instead there is a masonry plug that seems to be in good condition. As the intent of finding the definitive source of sewage into the culvert was inconclusive, we recommend that we resample the outfall and test for parameters consistent with sewage. If the results are consistent with the previous results we should develop a new approach to finding the source.

Based upon the “inconclusive finding” cited by CDM Smith, higher frequency inspections of the siphon and related service connections have been performed. During the inspections, which are conducted on a weekly basis, grease cutter and enzymes are added on an

as needed basis. In addition to the higher frequency inspections, a sampling event was performed at LBR-1 during this reporting period. As shown on Table 3.0, the dry weather sample collected at LBR-1 on 2 July 2014 indicated concentrations of 520 MPN/100ml. The level encountered during the most recent sampling event is slightly higher than the two (2) most recent sampling events and as such, higher frequency inspections, as well as dry weather sampling of LBR-1 will be continued during the next reporting period.

### **3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)**

The City has converted its paper storm drain system mapping to a working GIS format through the compilation of digitized plans, field GPS data collection and planimetric mapping information obtained from recent aerials. In addition, drainage infrastructure information including components pipe sizes, type, connections and flow parameters are also inventoried as a part of the ongoing system wide maintenance, service and inspection program. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering and outside technical staff to further investigate.

### **3.3 Inflow Infiltration Sewer System Evaluation & Capacity Analysis**

The City of Malden now maintains a strategic GIS Implementation plan that was developed with the assistance of CDM Smith. The City of Malden has also completed a comprehensive Infiltration and In-flow (I&I) study for its municipal sewer system. CDM Smith, on behalf of the City, has prepared a Phase 3 SSES report that includes a summary of findings and proposed recommendations to mitigate excessive infiltration and inflow into the City's sewer system. This report was presented for approval to MWRA during this permit year. Approval was received together with necessary funding. Currently, contract drawings and specifications are being prepared to address the recommendations of the Phase III Study.

## **4.0 SANITARY SEWER OVERFLOWS (SSO'S)**

No SSOs were identified during this reporting period.

## **5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES**

The City of Malden has implemented a comprehensive illicit discharge elimination program that has resulted in the isolation and mitigation of numerous improper discharges/connections and reduced significant potable water losses due to the detection of leakages. In addition to this, the dry weather sampling program has identified several target areas of intermittent bacteria loadings. These target areas will remain as a primary focus of activities to be performed during this biannual reporting period. The delineation of discrete drainage watersheds and continued implementation of the catch basin cleaning, inspection and inventory program remains a priority of work practices that are being performed by the SCT.

In addition to the above, the GIS drainage map is nearing completion and a large percentage of historic information has been linked to the network, thus enabling improved understanding of the overall municipal system and corresponding program capabilities. During the development of the GIS drainage map, the manual recording of system components, such as

pipe diameter, dry weather flow characteristics, and structural conditions has been performed and is being entered into the digital database. This represents a key program goal for the next reporting period, as the conversion to a fully digital data entry process continues.

During the next reporting period, the following areas of dry weather flow, and where applicable, continued enforcement of applicable zoning guidance will be performed.

- Outfall LSP-4
- Outfalls MR-2S & MR-2N
- Process water at Sharon Street
- Dry weather flows identified within the Linden Brook watershed.

# TABLES

**Environmental Engineering and Land Use Planning**

**Table 1.0 Summary of Illicit Connections/Discharges identified as of 6/30/2014**

**Illicit Connections**

| Illicit Connection Identification | Date Identified | Discharge Type       | Estimated Volume | Date Removed | Location                |
|-----------------------------------|-----------------|----------------------|------------------|--------------|-------------------------|
| ID-1                              | 1/15/2009       | Sewage               | 40 gpd           | 2/16/2009    | 33 Lodgen Ct., Unit 1F  |
| ID-2                              | 1/15/2009       | Grey Water           | 100 gpd          | 3/2/2009     | 34 Hanover Street       |
| ID-4                              | 8/28/2009       | Sewage               | 60 gpd           | 9/4/2009     | 2-4 Hancock Street      |
| ID-9                              | 5/18/2010       | Sewage               | 60 gpd           | 5/19/2010    | 36 Charles Street       |
| ID-12                             | Apr-12          | Confirmed Roof Drain | NA               | NA           | 100-110 Pleasant Street |
| ID-13                             | Sep-12          | Sewage               | Unknown          | January-13   | Exchange Street         |
| ID-15                             | Oct-13          | Process Water        | Unknown          | N/A          | Sharon Street           |

**Total Illicit Flow Removed to Date:** **260 gpd (94,900 gal/yr)**

**Illicit Discharges**

| Illicit Discharge Identification | Date Identified | Discharge Type          | Estimated Volume | Date Removed | Location                |
|----------------------------------|-----------------|-------------------------|------------------|--------------|-------------------------|
| ID-3                             | 8/11/2009       | Oil Sheen               | Unknown          | n/a          | Near 1081 Fellsway      |
| ID-5                             | 9/10/2009       | #2 oil spill            | <5 gallons       | 9/10/2009    | 269 Pearl Street        |
| ID-6                             | 9/21/2009       | Poss. Washwater         | Unknown          | 9/21/2009    | 120 Main Street         |
| ID-7                             | 12/9/2009       | Trans. Dielectric fluid | <27 Gallons      | 12/10/2009   | Near 6 Grove Street     |
| ID-8                             | 4/29/2010       | Hydraulic Fluid         | <10 Gallons      | 4/29/2010    | 496 Main Street         |
| ID-10                            | 2/10/2012       | Sewage                  | Note 1           | Pending      | 1056 Erlich Drive       |
| ID-11*                           | 9/11/2012       | Sewage                  | Unknown          | 11/6/2012    | Linden Brook @ Lynn St. |
| ID-14                            | 8/15/2013       | Grey Water              | Unknown          | 13-Dec       | Forestdale School       |

1 - approximately 1 gallon per minute observed discharging at LSP-4 during dry weather

\* Possible discharge due to grease blockage-Syphon still under investigation

**Table 2.0 Summary of Dry Weather Flows Identified as of 6/30/2014**

| Flow Identification | Location                           | Flow Type                           | Status             |
|---------------------|------------------------------------|-------------------------------------|--------------------|
| Flow 1              | Medford City Line                  | Water Line Leak                     | Removed            |
| Flow 2              | Saint Mary's Street                | Groundwater                         | No Further Action  |
| Flow 3              | Fellsmere Reservation              | Groundwater                         | No Further Action  |
| Flow 4              | Malden River                       | Surcharge-Submerged Invert          | Evaluation Ongoing |
| Flow 5              | DCR Spot Pond Brook                | Base Flow                           | Evaluation Ongoing |
| Flow 6              | Forestdale-Pine Banks Park         | Base Flow                           | No Further Action  |
| Flow 7              | Wigglesworth Street                | Groundwater-Illicit Discharge       | Removed            |
| Flow 8              | Main Street                        | Water Line Leak                     | Removed            |
| Flow 9              | Pierce Street                      | Groundwater Breakout                | No Further Action  |
| Flow 10             | Linden Brook                       | Base Flow                           | Evaluation Ongoing |
| Flow 11             | LSP-4                              | Dry Weather Flow                    | Evaluation Ongoing |
| Flow 12             | Kennedy Dr-Granada Highlands Apts. | Base Flow                           | No Further Action  |
| Flow 13             | Orchard Street                     | Dry Weather Flow                    | Evaluation Ongoing |
| Flow 14             | Exchange Street                    | Intermittent Dry Weather Flow       | Evaluation Ongoing |
| Flow 15             | Lower Commercial Street            | Dry Weather Flow                    | Evaluation Ongoing |
| Flow 16             | Huntley Street                     | Dry Weather Flow                    | No Further Action  |
| Flow 17             | Goldcliff Road                     | Dry Weather Flow: No flow on 7/2/14 | Evaluation Ongoing |
| Flow 18             | Cherry & Gilbert Streets           | Dry Weather Flow                    | Evaluation Ongoing |
| Flow 19             | Sylvan Street                      | Dry Weather Flow                    | Evaluation Ongoing |
| Flow 20             | First Street & Elwell Ave          | Base Flow                           | No Further Action  |
| Flow 21             | Bowman Street                      | Base Flow                           | No Further Action  |
| Flow 22             | Springdale Street                  | Dry Weather Flow                    | Evaluation Ongoing |
| Flow 23             | Grant Street                       | Dry Weather Flow                    | Evaluation Ongoing |
| Flow 24             | Wheeler Street                     | Dry Weather Flow: No flow on 7/2/14 | Evaluation Ongoing |
| Flow 25             | Revere Street                      | Dry Weather Flow: No flow on 7/2/14 | Evaluation Ongoing |
| Flow 26             | Kennedy Dr & Fairfield Avenue      | Base Flow                           | No Further Action  |
| Flow 27             | Sharon Street                      | Process Water                       | No Further Action  |

Table 3.0 **Dry Weather Conditions - E. Coli Concentrations**

Site Location, Outfalls/Manholes Malden, MA

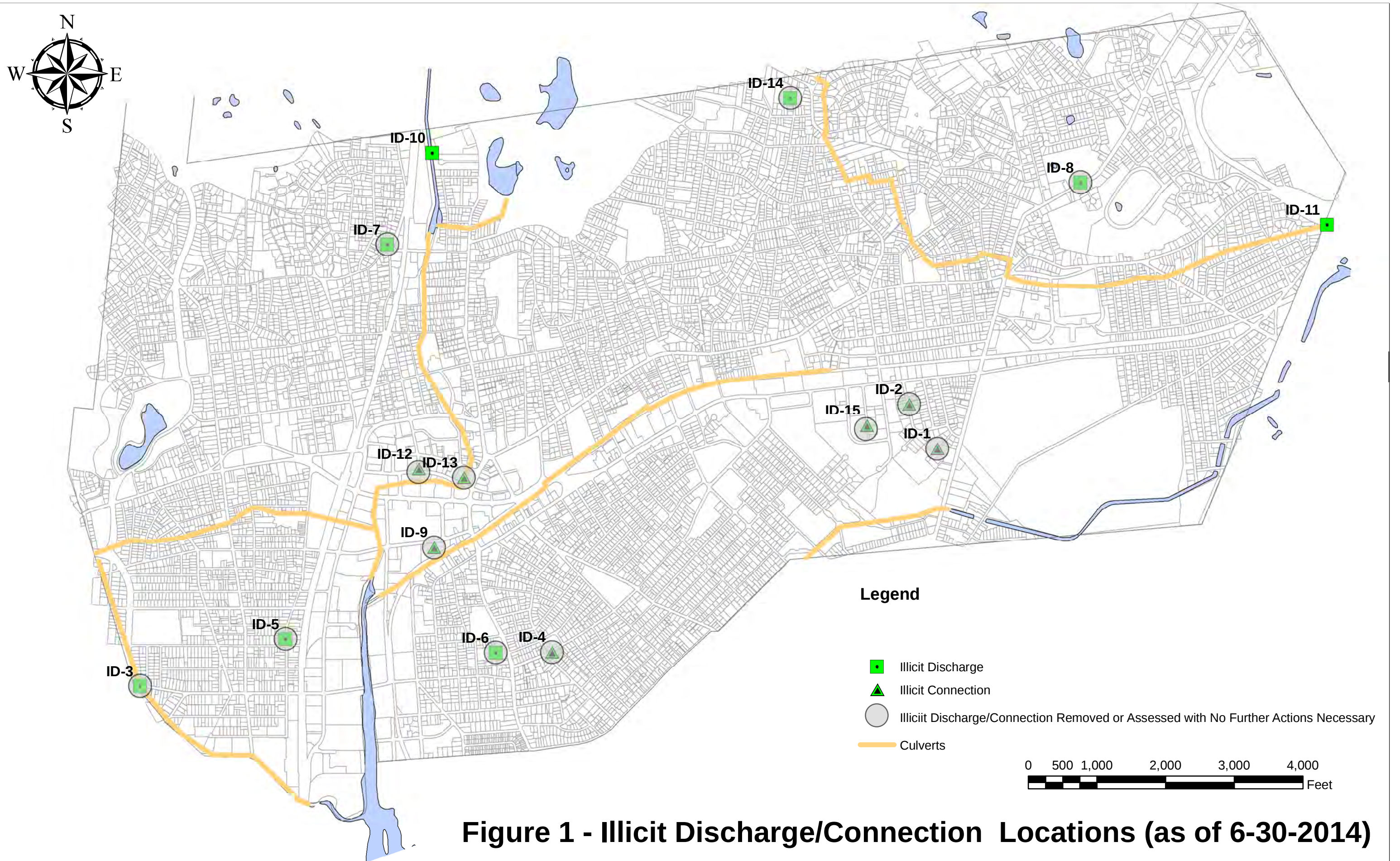
Sample Description: Water

| Sample Designation            | E. Coli (MF)<br>(MPN/100ml) |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
|-------------------------------|-----------------------------|----------|-----------|-----------|-----------|----------|-----------|----------|-----------|-----------|----------|-----------|------------|-----------|-----------|-----------|------------------------|-----------|-----------|----------|-----------|-----------|----------|
|                               | 30, 9223B                   |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
|                               | ACTION LEVEL- 235 col/100ml |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
|                               | 09/12/06                    | 09/11/07 | 9/24/2008 | 4/17/2009 | 6/25/2009 | 8/6/2009 | 7/29/2010 | 8/4/2010 | 8/10/2010 | 8/31/2010 | 8/4/2011 | 11/8/2011 | 12/13/2011 | 1/11/2012 | 4/13/2012 | 6/15/2012 | 9/11/2012 <sup>2</sup> | 9/27/2012 | 2/22/2013 | 4/5/2013 | 9/12/2013 | 9/24/2013 | 7/2/2014 |
| Malden River                  |                             |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
| MR-0                          | 150                         | 1,100    | -         | 68        | -         | -        | 110       | -        | -         | -         | -        | -         | 9,200      | -         | -         | -         | 3,090                  | -         | -         | 490      | 980       | -         | -        |
| MR-1                          | -                           | 160      | -         | -         | -         | -        | 130       | -        | -         | -         | -        | -         | 390        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| MR-4                          | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | 220        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| MR-5                          | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | 9.7        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| MR-6                          | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | 4.1        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| MR-8                          | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | 292      | -         | -         | -        |
| MR-11                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | ND (1.0)   | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| MR-12                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | 59         | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| Saint Mary St. <sup>1</sup>   | -                           | 110      | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| LSP-0-Channel <sup>2</sup>    | -                           | 460      | -         | -         | -         | -        | -         | 10,000   | -         | 2,000     | -        | -         | -          | 1,700     | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| LSP-3                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | 1,600     | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| LSP-4                         | -                           | -        | -         | -         | -         | -        | -         | 14,000   | -         | 2,000     | 17,000   | -         | -          | >242,000  | -         | 100,000   | -                      | -         | -         | -        | 2,000     | 110,000   | -        |
| LSP-5.1-Channel <sup>2</sup>  | -                           | 630      | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| LSP-9                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | 34       | -         | 84         | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| LSP-10-Channel <sup>2</sup>   | -                           | 350      | -         | -         | -         | -        | -         | 4,900    | -         | -         | -        | -         | -          | 10,000    | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| C39-MH0.1                     | -                           | -        | -         | -         | -         | ND (2.0) | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| C46-MH19                      | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | 850       | -                      | -         | -         | -        | -         | -         | -        |
| E2-MH2                        | -                           | -        | -         | ND (2.0)  | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| E2-MH1                        | -                           | -        | -         | ND (2.0)  | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| E13-MH2 (Elrich)              | -                           | -        | -         | -         | -         | -        | -         | -        | -         | 98        | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| E13-MH4 (Elrich)              | -                           | -        | -         | -         | -         | -        | -         | -        | -         | 2,400     | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | 2,000     | -         | -        |
| E28-MH8                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | ND (1.0)  | -         | -                      | -         | -         | -        | -         | -         | -        |
| E28-SP1                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | 6,100     | -         | 740       | -                      | -         | -         | -        | -         | -         | -        |
| E28-SP2                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | 5,200     | -         | 310       | -                      | -         | -         | -        | -         | -         | -        |
| E28-MH4A                      | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | 1.0       | -         | -                      | -         | -         | -        | -         | -         | -        |
| H16-MH13                      | -                           | -        | -         | -         | -         | 25       | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| H16-MH17                      | -                           | -        | -         | -         | ND (2.0)  | ND (2.0) | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| H25-MH2                       | -                           | -        | -         | -         | 16        | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| M8-MH3                        | -                           | -        | -         | 5,100     | -         | ND (2.0) | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| M26-MH1                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| NG-C1                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| P36-MH5                       | -                           | -        | 3,500     | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| R18-MH1                       | -                           | -        | -         | -         | -         | 290      | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| S29-MH1                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | 160      | -         | -         | -        |
| S29-MH3                       | -                           | -        | 96        | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | 13,330                 | -         | -         | 190      | -         | -         | -        |
| W25-MH1                       | -                           | -        | -         | -         | -         | 2.0      | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| Little Creek                  |                             |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
| LC-0                          | 7                           | 140      | -         | ND (2.0)  | -         | -        | 190       | -        | -         | -         | 2,400    | -         | 65         | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| Town Line Brook               |                             |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
| TL-0 <sup>3</sup>             | 1,500                       | 280      | -         | 62        | -         | -        | 730       | -        | -         | -         | -        | 96        | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| TL-1                          | ND (2.0)                    | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| TL-3                          | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | 8.5       | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| TL-5                          | -                           | -        | -         | -         | -         | -        | -         | 2,400    | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| TL-9                          | 640                         | -        | -         | -         | -         | -        | -         | 8,200    | -         | -         | -        | 130       | -          | -         | -         | 410       | -                      | -         | -         | -        | -         | -         | -        |
| TL-13                         | 30                          | 70       | -         | -         | -         | -        | -         | -        | -         | -         | -        | ND (1.0)  | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| TL-24                         | 520                         | 1,500    | -         | -         | -         | -        | -         | 24,000   | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| TL-BL-EV                      | 440                         | 740      | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| B53-MH7                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | 410       | -                      | -         | -         | -        | -         | -         | -        |
| BP-MH3                        | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | 200       | -                      | -         | -         | -        | -         | -         | -        |
| L23-MH1                       | -                           | -        | -         | 3         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| S3-MH12 <sup>3</sup>          | -                           | 2,200    | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | 2,880     | -                      | -         | -         | -        | -         | -         | -        |
| S14-MH4                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | ND (1.0) |
| Saugus Branch                 |                             |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
| MR-2                          | -                           | ND (2.0) | -         | -         | -         | -        | 220       | -        | -         | 1,100     | -        | -         | 1,200      | -         | -         | -         | -                      | -         | -         | 550      | -         | -         | -        |
| MR-2S                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 130       | -        |
| MR-2N                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | 150      |
| Broadway/Eastern <sup>4</sup> | -                           | 140      | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| Linden Brook                  |                             |          |           |           |           |          |           |          |           |           |          |           |            |           |           |           |                        |           |           |          |           |           |          |
| B46-MH2                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | <1        | -         | -        |
| C18-MH5                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | 23,000    | 11,000    | -        |
| C36-MH1                       | -                           | -        | -         | -         | -         | -        | 160       | -        | -         | -         | -        | -         | 6.3        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| D17-MH1                       | -                           | -        | -         | -         | -         | -        | 1,200     | -        | 360       | -         | -        | -         | 460        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| F1-MH4                        | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | 310       | -                      | -         | 12        | -        | -         | -         | -        |
| F23-MH2                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | 13        | -         | -        |
| G36-MH2                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 1,700     | -        |
| H43-MH1                       | -                           | -        | -         | -         | -         | -        | 1,600     | -        | 2,400     | -         | -        | -         | 28,000     | -         | -         | 5,470     | -                      | -         | 580       | -        | 12        | -         | -        |
| K6-MH1                        | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | 49                     | -         | -         | -        | -         | -         | -        |
| L5-MH1                        | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | 580       | -         | -        | -         | -         | -        |
| LBR-1                         | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | >241,920  | -                      | <10       | 1         | -        | -         | 520       | -        |
| M31-MH1                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | 12       | -         | -         | -        |
| O10-MH1                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | 9.7        | -         | -         | -         | 4,300                  | -         | 650       | -        | -         | -         | -        |
| P24-MH1                       | -                           | -        | -         | -         | -         | 96       | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| V1-MH1                        | -                           | -        | -         | -         | -         | -        | -         | -        | 15        | -         | -        | -         | 5.2        | -         | -         | -         | -                      | -         | -         | -        | -         | -         | -        |
| W26-MH1                       | -                           | -        | -         | -         | -         | 180      | -         | -        | -         | -         | -        | -         | 390        | -         | -         | -         | -                      | -         | 320       | -        | -         | -         | -        |
| W47-MH1                       | -                           | -        | -         | -         | -         | -        | -         | -        | -         | -         | -        | -         | -          | -         | -         | -         | -                      | -         | -         | -        | -         | 3,500     | -        |

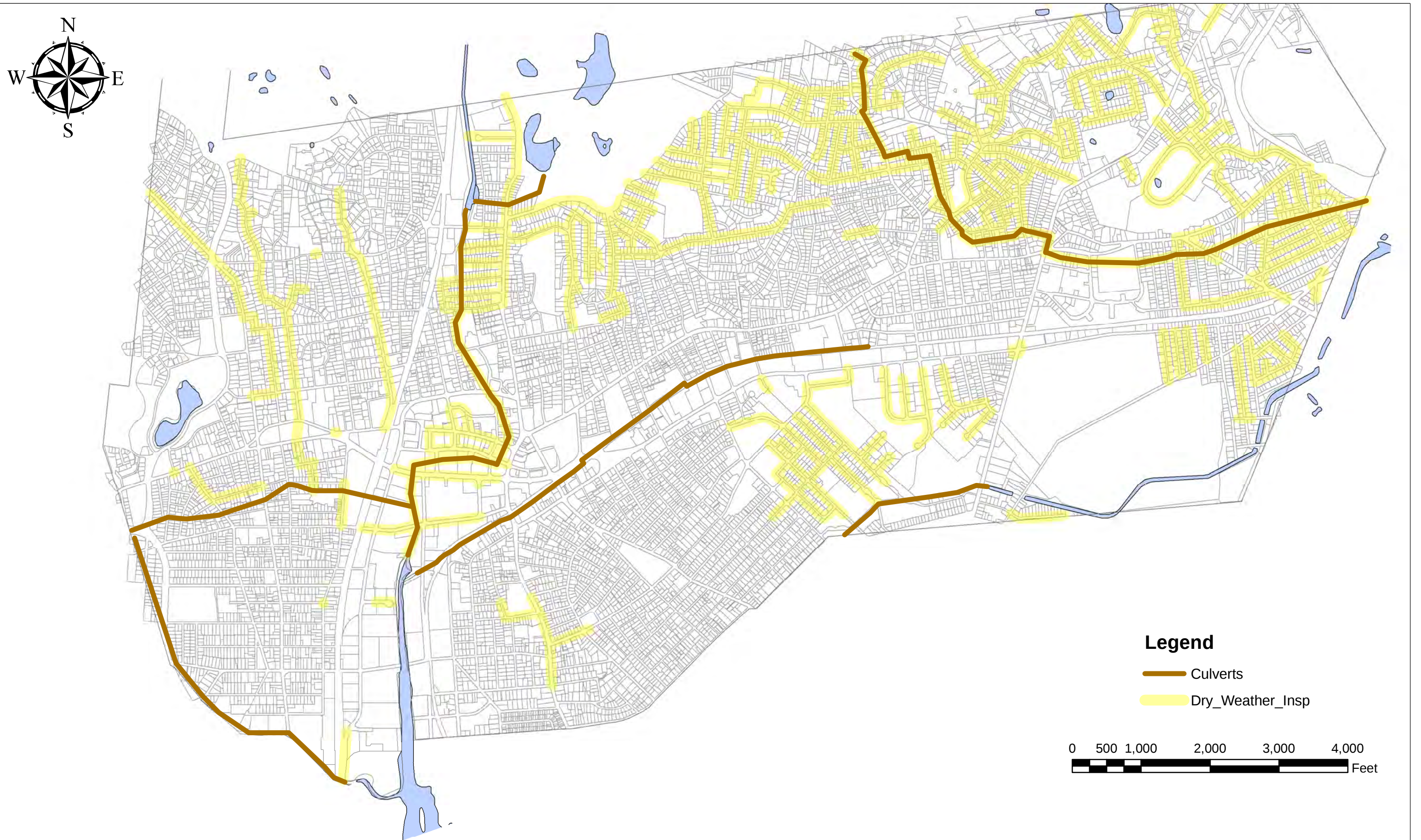
File No. 465.09  
<sup>1</sup>Samples collected by USEPA  
Laboratory certificates contained within attachments.

# FIGURES

**Environmental Engineering and Land Use Planning**



**Figure 1 - Illicit Discharge/Connection Locations (as of 6-30-2014)**



**Figure 2 - Dry Weather Inspection Areas (as of 6-30-14)**

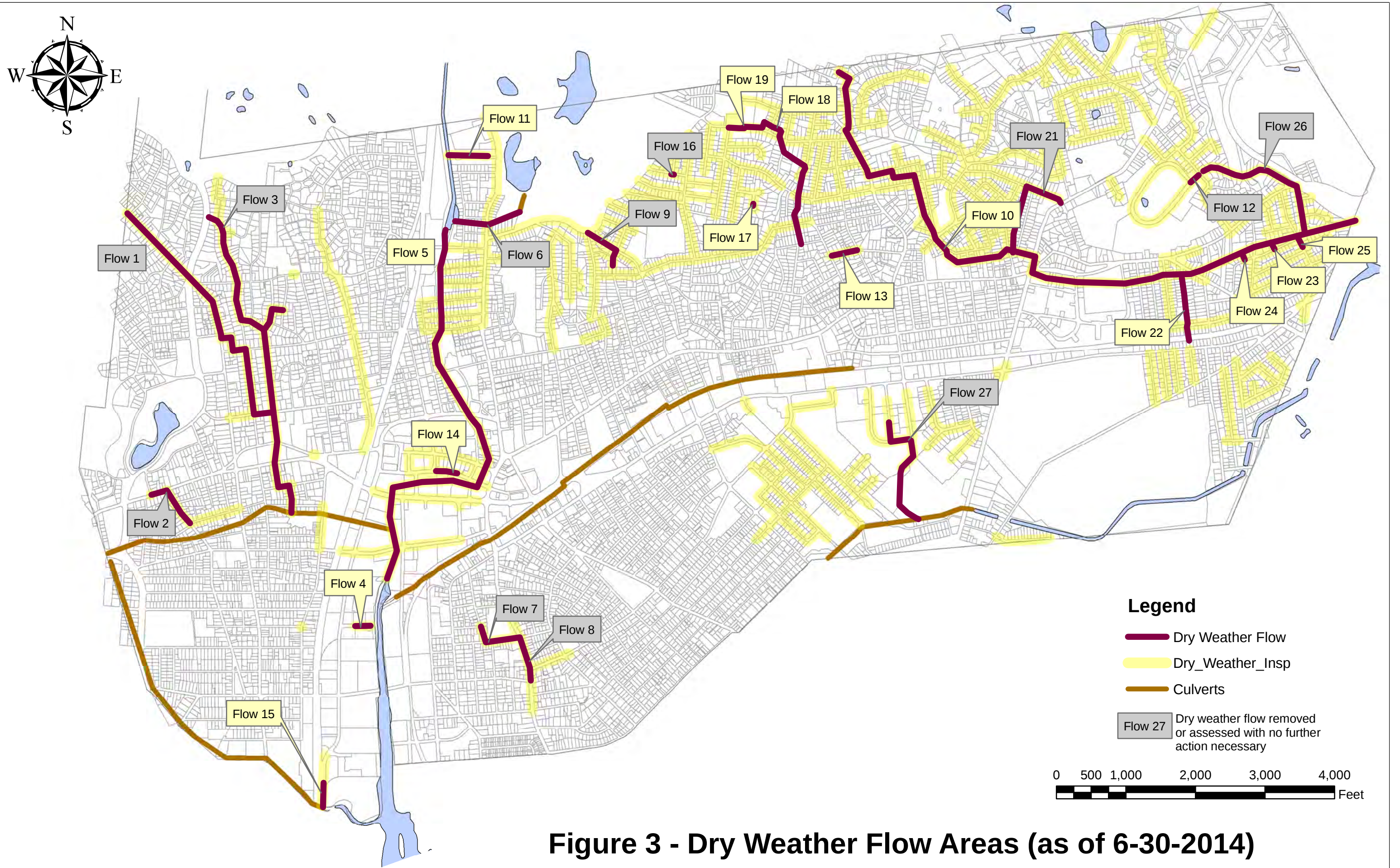




Figure 4 - Malden River Outfalls



Figure 5 - Lower Spot Pond Brook Outfalls



**Figure 6 - Town Line Brook Outfalls**

# ATTACHMENT A

**Environmental Engineering and Land Use Planning**



## ANALYTICAL REPORT

|                 |                                                                                        |
|-----------------|----------------------------------------------------------------------------------------|
| Lab Number:     | L1414669                                                                               |
| Client:         | Nangle Consulting Associates<br>960 Turnpike Street<br>Building 1D<br>Canton, MA 02021 |
| ATTN:           | Chuck Altobello                                                                        |
| Phone:          | (781) 821-0521                                                                         |
| Project Name:   | CITY OF MALDEN                                                                         |
| Project Number: | 465.09                                                                                 |
| Report Date:    | 07/10/14                                                                               |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

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Eight Walkup Drive, Westborough, MA 01581-1019  
508-898-9220 (Fax) 508-898-9193 800-624-9220 - [www.alphalab.com](http://www.alphalab.com)



**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1414669  
**Report Date:** 07/10/14

| <b>Alpha<br/>Sample ID</b> | <b>Client ID</b> | <b>Matrix</b> | <b>Sample<br/>Location</b> | <b>Collection<br/>Date/Time</b> | <b>Receive Date</b> |
|----------------------------|------------------|---------------|----------------------------|---------------------------------|---------------------|
| L1414669-01                | S14-MH4          | WATER         | MALDEN, MA                 | 07/02/14 08:00                  | 07/02/14            |
| L1414669-02                | LBR-1            | WATER         | MALDEN, MA                 | 07/02/14 08:30                  | 07/02/14            |
| L1414669-03                | G36-MH2          | WATER         | MALDEN, MA                 | 07/02/14 09:00                  | 07/02/14            |
| L1414669-04                | C18-MH5          | WATER         | MALDEN, MA                 | 07/02/14 10:00                  | 07/02/14            |
| L1414669-05                | W47-MH1          | WATER         | MALDEN, MA                 | 07/02/14 10:30                  | 07/02/14            |
| L1414669-06                | MR2-S            | WATER         | MALDEN, MA                 | 07/02/14 11:00                  | 07/02/14            |
| L1414669-07                | MR2-N            | WATER         | MALDEN, MA                 | 07/02/14 11:05                  | 07/02/14            |
| L1414669-08                | LSP-4            | WATER         | MALDEN, MA                 | 07/02/14 12:00                  | 07/02/14            |

**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1414669  
**Report Date:** 07/10/14

### Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

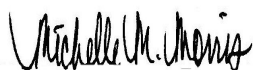
#### HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:



Michelle M. Morris

Title: Technical Director/Representative

Date: 07/10/14

# **INORGANICS & MISCELLANEOUS**

Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1414669

Report Date: 07/10/14

## SAMPLE RESULTS

Lab ID: L1414669-01

Client ID: S14-MH4

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 07/02/14 08:00

Date Received: 07/02/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |    |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | <1     |           | MPN/100ml | 1  | NA  | 1                  | -                | 07/02/14 15:40   | 30,9223B             | DE      |



Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1414669

Report Date: 07/10/14

## SAMPLE RESULTS

Lab ID: L1414669-02

Client ID: LBR-1

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 07/02/14 08:30

Date Received: 07/02/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 520    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 07/02/14 15:40   | 30,9223B             | DE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1414669**Report Date:** 07/10/14**SAMPLE RESULTS****Lab ID:** L1414669-03**Client ID:** G36-MH2**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 07/02/14 09:00**Date Received:** 07/02/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 1700   |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 07/02/14 15:40   | 30,9223B             | DE      |



**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1414669  
**Report Date:** 07/10/14

**SAMPLE RESULTS**

**Lab ID:** L1414669-04  
**Client ID:** C18-MH5  
**Sample Location:** MALDEN, MA  
**Matrix:** Water

**Date Collected:** 07/02/14 10:00  
**Date Received:** 07/02/14  
**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 11000  |           | MPN/100ml | 200 | NA  | 200                | -                | 07/02/14 15:40   | 30,9223B             | DE      |



Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1414669

Report Date: 07/10/14

## SAMPLE RESULTS

Lab ID: L1414669-05

Client ID: W47-MH1

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 07/02/14 10:30

Date Received: 07/02/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 3500   |           | MPN/100ml | 200 | NA  | 200                | -                | 07/02/14 15:40   | 30,9223B             | DE      |



Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1414669

Report Date: 07/10/14

## SAMPLE RESULTS

Lab ID: L1414669-06

Client ID: MR2-S

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 07/02/14 11:00

Date Received: 07/02/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 130    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 07/02/14 15:40   | 30,9223B             | DE      |



Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1414669

Report Date: 07/10/14

## SAMPLE RESULTS

Lab ID: L1414669-07

Client ID: MR2-N

Sample Location: MALDEN, MA

Matrix: Water

Date Collected: 07/02/14 11:05

Date Received: 07/02/14

Field Prep: Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 150    |           | MPN/100ml | 1.0 | NA  | 1                  | -                | 07/02/14 15:40   | 30,9223B             | DE      |



**Project Name:** CITY OF MALDEN**Project Number:** 465.09**Lab Number:** L1414669**Report Date:** 07/10/14**SAMPLE RESULTS****Lab ID:** L1414669-08**Client ID:** LSP-4**Sample Location:** MALDEN, MA**Matrix:** Water**Date Collected:** 07/02/14 12:00**Date Received:** 07/02/14**Field Prep:** Not Specified

| Parameter                                  | Result | Qualifier | Units     | RL  | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--------------------------------------------|--------|-----------|-----------|-----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab |        |           |           |     |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                              | 110000 |           | MPN/100ml | 200 | NA  | 200                | -                | 07/02/14 15:40   | 30,9223B             | DE      |



Project Name: CITY OF MALDEN

Lab Number: L1414669

Project Number: 465.09

Report Date: 07/10/14

### Method Blank Analysis

#### Batch Quality Control

| Parameter                                                                         | Result | Qualifier | Units     | RL | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-----------------------------------------------------------------------------------|--------|-----------|-----------|----|-----|--------------------|------------------|------------------|----------------------|---------|
| Microbiological Analysis - Westborough Lab for sample(s): 01-08 Batch: WG702986-1 |        |           |           |    |     |                    |                  |                  |                      |         |
| E. Coli (MPN)                                                                     | <1     |           | MPN/100ml | 1  | NA  | 1                  | -                | 07/02/14 15:40   | 30,9223B             | DE      |

Project Name: CITY OF MALDEN

Project Number: 465.09

Lab Number: L1414669

Report Date: 07/10/14

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

## Cooler Information Custody Seal

## Cooler

A Absent

## Container Information

| Container ID | Container Type                 | Cooler | pH  | Temp<br>deg C | Pres | Seal   | Analysis(*)    |
|--------------|--------------------------------|--------|-----|---------------|------|--------|----------------|
| L1414669-01A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-01B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-02A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-02B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-03A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-03B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-04A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-04B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-05A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-05B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-06A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-06B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-07A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-07B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-08A | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |
| L1414669-08B | Bacteria Cup Na2S2O3 preserved | A      | N/A | 5.4           | Y    | Absent | E-COLI-QT(.25) |

\*Values in parentheses indicate holding time in days

**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1414669  
**Report Date:** 07/10/14

## GLOSSARY

### Acronyms

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EDL  | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).                        |
| EPA  | - Environmental Protection Agency.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| LCS  | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.                                                                                                                                                                                                                                                         |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS.                                                                                                                                                                                                                                                                                                                                                                                                      |
| LFB  | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.                                                                                                                                                                                                                                                        |
| MDL  | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.                                                                                                                         |
| MS   | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.                                                                                                                                                                                                                                                  |
| MSD  | - Matrix Spike Sample Duplicate: Refer to MS.                                                                                                                                                                                                                                                                                                                                                                                                             |
| NA   | - Not Applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| NC   | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.                                                                                                                                                                                                                                                                                                          |
| NI   | - Not Ignitable.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RL   | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.                                                                                                                                                                                                                                  |
| RPD  | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM  | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.                                                                                                                                                                                                                                                                                                    |

### Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

### Terms

**Total:** With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

**Analytical Method:** Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

### Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.

**Report Format:** Data Usability Report



**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1414669  
**Report Date:** 07/10/14

**Data Qualifiers**

- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

**Project Name:** CITY OF MALDEN  
**Project Number:** 465.09

**Lab Number:** L1414669  
**Report Date:** 07/10/14

## REFERENCES

- 30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



## Certification Information

Last revised April 15, 2014

**The following analytes are not included in our NELAP Scope of Accreditation:**

### **Westborough Facility**

**EPA 524.2:** Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.

**EPA 8260C:** 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.

**EPA 8330A/B:** PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT.

**EPA 8270D:** 1-Methylnaphthalene, Dimethylnaphthalene, 1,4-Diphenylhydrazine.

**EPA 625:** 4-Chloroaniline, 4-Methylphenol.

**SM4500:** Soil: Total Phosphorus, TKN, NO<sub>2</sub>, NO<sub>3</sub>.

**EPA 9071:** Total Petroleum Hydrocarbons, Oil & Grease.

### **Mansfield Facility**

**EPA 8270D:** Biphenyl.

**EPA 2540D:** TSS

**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

**The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:**

### **Drinking Water**

**EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Tl; **EPA 200.7:** Ba, Be, Ca, Cd, Cr, Cu, Na; **EPA 245.1:** Mercury;

**EPA 300.0:** Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO<sub>3</sub>-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B**

**EPA 332:** Perchlorate.

**Microbiology:** SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.

### **Non-Potable Water**

**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn;

**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, Ti, Tl, V, Zn;

**EPA 245.1, SM4500H-B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC,**

**SM426C, SM4500NH<sub>3</sub>-BH, EPA 350.1:** Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO<sub>3</sub>-F,**

**EPA 353.2:** Nitrate-N, **SM4500NH<sub>3</sub>-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4,**

**SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**

**EPA 624:** Volatile Halocarbons & Aromatics,

**EPA 608:** Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

**EPA 625:** SVOC (Acid/Base/Neutral Extractables); **EPA 600/4-81-045:** PCB-Oil.

**Microbiology:** SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

