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Via Electronc Mail

August 29, 2025

Mr. Richard Fisher
Project Manger
U.S. Environmental Protection Agency, New England Region
Five Post Office Square
Suite 100
Boston, MA 02109

Re: GE-Pittsfield/Housatonic River Site
GE Pittsfield Facility (GECD100)
Surface Water Discharge Work Plan

Dear Mr. Fisher:

In accordance with the Thirteenth Modification of the Consent Decree for the GE-Pittsfield/Housatonic River Site, I am enclosing for EPA's review and approval GE's *Surface Water Discharge Monitoring Plan for General Electric Pittsfield Facility*. Upon approval, this work plan will replace the substantive requirements of GE's former NPDES permit.

We would be glad to discuss this work plan with EPA. Please let me know if you have any questions about it.

Very truly yours,

Matthew Calacone / MJW

Matthew Calacone
Senior Project Manager
GE Aerospace

Enclosure

Cc: (via electronic mail):
Joshua Fontaine, EPA
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GE Internal Repository

August 2025
General Electric Company – Pittsfield, Massachusetts

Surface Water Discharge Work Plan for General Electric Pittsfield Facility

August 2025
General Electric Company – Pittsfield, Massachusetts

Surface Water Discharge Work Plan for General Electric Pittsfield Facility

Prepared for
General Electric Company
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Prepared by
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ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
BMP	best management practice
CD	Consent Decree
CEPP	Contingency and Emergency Procedures Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
City	City of Pittsfield
CMR	Code of Massachusetts Regulations
DMR	discharge monitoring report
ECS	existing conditions survey
EPA	U.S. Environmental Protection Agency
Facility	Facility owned by the General Electric Company in Pittsfield, Massachusetts
FSP/QAPP	Field Sampling Plan/Quality Assurance Project Plan
GE	General Electric Company
gpm	gallons per minute
GPS	global positioning system
GWTF	Groundwater Treatment Facility
I/I	Infiltration/inflow
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MDL	method detection limit
mg/L	milligram per liter
MGD	million gallons per day
MSGP	Multi-Sector General Permit
µg/L	microgram per liter
ND	non-detect
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
O&G	oil and grease
OPCA	On-Plant Consolidation Area
OSC	On-Scene Coordinator
OWS	oil//water separator
PCB	polychlorinated biphenyl
PCSWMM	Personal Computer Storm Water Management Model
POP	Project Operations Plan

Site Stormwater Plan	*Sampling and Analysis Plan for Supplemental Site Stormwater Characterization at the GE-Pittsfield Site*
SOW	Statement of Work for Removal Actions Outside the River
SU	standard unit
SVOC	semi-volatile organic compound
SWMM	Storm Water Management Model
SWPPP	Stormwater Pollution Prevention Plan
TCE	trichloroethene
TSS	total suspended solids
VOC	volatile organic compound
Work Plan	*Surface Water Discharge Work Plan for General Electric Pittsfield Facility*
WTP	Water Treatment Plant

1 Introduction

1.1 Background

The facility owned by the General Electric Company (GE) in Pittsfield, Massachusetts (the Facility), comprises an approximately 225-acre parcel of land adjacent to the Housatonic River and Unkamet Brook. Although the Facility historically housed multiple manufacturing operations that produced many products, including transformers, ordnance, and plastics, the last of those operations ceased in 2003, and GE has eliminated all manufacturing-related discharges. The current activities conducted by GE at the Facility consist of environmental remediation activities, which are subject to a comprehensive Consent Decree (CD) executed by GE, the United States, the Commonwealth of Massachusetts, and other parties in 1999 and approved by a federal court in 2000, to address environmental conditions at the Facility and the adjacent Housatonic River and environs (EPA and GE 2000).

Historically, discharges from the Facility were covered by an individual National Pollutant Discharge Elimination System (NPDES) permit issued by the U.S. Environmental Protection Agency (EPA) under the federal Clean Water Act, which was originally sought and obtained when the Facility included numerous process outfalls from active manufacturing operations. The first individual permit became effective on February 7, 1992, was modified on May 21, 1992, and expired on February 7, 1997, but was administratively extended by virtue of a timely renewal application submitted on August 9, 1996. In addition, in April 2001, GE sought and obtained coverage under EPA’s Multi-Sector General Permit (MSGP) for discharge of stormwater associated with industrial activity. On December 22, 2004, EPA and the Massachusetts Department of Environmental Protection (MassDEP) jointly released for public comment a draft NPDES Permit No. MA0003891 for the Facility. GE submitted detailed comments on the draft permit on March 25, 2005. On September 30, 2008, EPA and MassDEP jointly issued a final NPDES permit for the Facility. That permit integrated stormwater discharges from certain outfalls previously covered under the MSGP, as well as those outfalls identified under GE’s individual NPDES permit.

In November 2008, GE filed petitions for review of that permit with the EPA Environmental Appeals Board and MassDEP, and GE invoked dispute resolution under the CD regarding the permit. Following these filings, GE, EPA, and MassDEP engaged in settlement negotiations that ultimately led to EPA’s withdrawal of the disputed provisions in April 2009 and GE’s withdrawal of its challenges. Thereafter, on June 3, 2009, EPA and MassDEP released for public comment a draft modification of the permit, and on October 1, 2009, they jointly issued a final modified permit for a five-year period under the federal and state Clean Water Acts. That modified permit replaced the prior numerical effluent limitations and prohibitions in the 2008 permit with narrative effluent limitations (except for the discharge from GE’s groundwater water treatment facility in Building 64G) and was based largely on the required implementation of best management practices (BMPs), which were specified in an attachment to the permit. GE subsequently implemented the activities required under the 2009 modified permit, including new studies related to dry-weather and wet-weather discharges, as well as short-term and long-term BMPs.

On June 27, 2013, GE submitted a timely and complete application to EPA and MassDEP for reissuance of NPDES Permit No. MA0003891. On March 14, 2014, GE received a letter from EPA stating that the application was administratively complete. A similar letter was received from MassDEP on July 26, 2013. As a result, under EPA's and MassDEP's regulations the conditions of the expired 2009 modified permit continued in effect.

In September 2023, EPA and MassDEP issued draft revised permits for public comment, including extensive new requirements. GE submitted detailed comments on those draft revised permits on December 20, 2023. Subsequently, GE and EPA engaged in extensive discussions about the draft revised permits. Ultimately, EPA and GE agreed that, because GE's activities at the Facility no longer involve any manufacturing or other industrial operations or discharges but only remediation activities subject to the CD, its remaining discharges from its groundwater treatment plant and its stormwater discharges would likewise be better regulated under the CD as well, rather than under a revised NPDES permit. This would allow for consistent oversight by EPA personnel familiar with the Facility infrastructure and the remediation operations and is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), under which the CD was executed. In particular, CERCLA and the CD exempt cleanups from the need to obtain permits, such as an NPDES permit (see CERCLA Section 121(e)(1) and CD ¶ 9.a), and EPA's regulations under the Clean Water Act provide that discharges in compliance with the instructions of an EPA On-Scene Coordinator (OSC) pursuant to EPA's CERCLA regulations do not require NPDES permits (40 *Code of Federal Regulations* [CFR] 122.3(d)).

Accordingly, the United States prepared and filed with the federal court on May 1, 2025, a Non-Material Modification of the CD, which modified the Statement of Work for Removal Actions Outside the River (SOW; Appendix E to the CD), effective on that date, to provide that regulatory authority over point source discharges from the Facility to adjacent surface waters (the Housatonic River and Unkamet Brook) was transferred from the former NPDES permit to EPA under CERCLA and the CD. Specifically, this SOW modification provided that: (1) upon its effective date, GE would be required to comply with the substantive provisions of the former NPDES permit (i.e., the 2009 modified permit) under the authority of the CD and CERCLA; and (2) within 120 days, GE must submit for EPA approval a Surface Water Discharge Work Plan to govern the point source discharges from the Facility, which, upon EPA approval, will govern GE's responsibilities for such discharges and supersede any provisions of the former NPDES permit. The SOW modification stated that the Commonwealth of Massachusetts did not object to the SOW modification and agreed that GE's compliance with the Surface Water Discharge Work Plan would satisfy GE's obligations under the Massachusetts Clean Waters Act. The SOW modification also listed the specific elements that must be included in the Surface Water Discharge Work Plan, as specified in Section 1.2.

As required by the SOW modification, GE sent a letter to EPA and MassDEP on May 7, 2025 (clarified in an email on May 30, 2025), withdrawing its June 27, 2013, NPDES permit renewal application in light of the SOW modification. On June 23, 2025, EPA responded to GE accepting its withdrawal of its renewal application, and on June 27, 2025, MassDEP did so as well.

In accordance with the requirements of the May 1, 2025, SOW modification, this *Surface Water Discharge Work Plan* (Work Plan) presents GE's plan for the continued management of the point source discharges from the Facility to the Housatonic River and Unkamet Brook. Upon EPA approval, the provisions of this Work Plan will constitute instructions of EPA's OSC pursuant to 40 CFR 122.3(d). This Work Plan is subject to ongoing future changes proposed by GE and approved by EPA, which will then likewise constitute instructions of EPA's OSC pursuant to 40 CFR 122.3(d).

1.2 Plan Requirements

Section 2.9.2 of the SOW modification specifies that the Surface Water Discharge Work Plan must contain the following elements:

- For each outfall or point source discharge from the Facility that has not been abandoned, numeric and/or non-numeric effluent limitations, monitoring and reporting requirements, and effluent and ambient characteristics, including addressing the following constituents: total suspended solids (TSS), pH, oil and grease (O&G), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs);
- Details regarding sampling and analytical protocols, analytical detection levels, sampling locations, and quality assurance and quality control, including, if warranted, proposed modifications to GE's second revised Field Sampling Plan/Quality Assurance Project Plan (FSP/QAPP; Arcadis 2023);
- Details regarding the development and implementation of a revised Stormwater Pollution Prevention Plan (SWPPP) that documents the selection, design, installation/operation, and maintenance of control measures (including BMPs) to minimize pollutant discharges.
- BMPs, including cleaning and inspecting the existing stormwater system, repair and/or replacement of stormwater system components, optimization and enhancement measures of treatment plants and oil/water separators (OWSs), pavement sweeping, measures that could reduce peak flows, such as increasing areas of vegetated cover, reduction in dry-weather flows, and other control measures to reduce contaminant effluent concentrations;
- Details regarding reporting requirements; and

- An identification of the substantive federal and state applicable or relevant and appropriate requirements (ARARs) pertaining to GE's surface water discharges and a statement of how GE proposes to attain (or seek an EPA-approved waiver) of such ARARs.

1.3 Plan Organization

The remainder of this Work Plan is organized into the following sections:

- Section 2 provides a description of the various stormwater drainage areas and stormwater control measures that are currently in place at the Facility.
- Section 3 presents a discussion of the federal and state ARARs pertaining to surface water discharges from the Facility and how they will be attained.
- Section 4 provides a summary of existing surface water discharge monitoring data collected by GE under the former NPDES permit.
- Section 5 provides numeric and/or non-numeric effluent limitations for each outfall/discharge point from the Facility, sampling and analysis activities, and BMPs to be implemented under this Work Plan.
- Section 6 summarizes how monitoring data and BMP activities will be summarized and reported to EPA.
- Section 7 lists the references cited in this Work Plan.

In addition, this Work Plan includes a number of appendices. Appendix A contains GE's revised SWPPP for the stormwater discharges from the Facility. Appendix B provides Standard Operating Procedures (SOPs) for sampling and analytical activities called for by this Work Plan for which SOPs are not already included in GE's current site-wide FSP/QAPP (Arcadis 2023).[1] Appendix C contains a copy of GE's June 2024 *Sampling and Analysis Plan for Supplemental Site Stormwater Characterization at the GE-Pittsfield Site*.

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[1] It is anticipated that these new SOPs will be added to the next revised version of the FSP/QAPP.

2 Pollutant Sources and Current Stormwater Control Measures

2.1 Stormwater Drainage Area Descriptions

This section provides an overview of each drainage area associated with the outfalls included in the former NPDES permit. The drainage areas at the Facility are shown on Figures 2-1 through 2-8 and are further described below.

2.1.1 Drainage Area 005N

Drainage Area 005 encompasses most of the central and western portions of the area south of East Street and some portions north of East Street (herein referred to as Drainage Areas 005S and 005N, respectively). Drainage Area 005N includes approximately 32 acres of drainage area, of which approximately 25 acres are impervious, including Building 100 (Figure 2-1). Drainage Area 005N is bordered by Tyler Street on the north and Merrill Road on the south. This drainage area includes a small section of Tyler Street and the land north, owned by the City of Pittsfield (City). Specifically, approximately nine acres of Drainage Area 005N are controlled by the City and collect flow from Tyler Street and portions of East Street (Figure 2-2), which then enters the GE system and comingles with GE's stormwater flows. Runoff from Drainage Area 005N is collected and conveyed through a series of manholes, catch basins, and treatment systems prior to discharge through outfalls in other drainage areas to the Housatonic River.

2.1.2 Drainage Area 005S

Drainage Area 005S is bordered on the north by East Street and on the south by the Housatonic River (Figure 2-3). Drainage Area 005S includes approximately 12 acres of drainage area, of which approximately four acres are impervious. Most discharges from Drainage Area 005N are conveyed into this area as is runoff from portions of East Street (City property). Approximately one acre of this drainage area is controlled by the City and/or by the Massachusetts Department of Transportation (MassDOT), which collects flow from a portion of East Street that then enters the GE system and comingles with GE's stormwater flows. This area includes OWSs 64W and 64Z. Flows within this area discharge to the Housatonic River through Outfalls 005, 05A, and 05B.

2.1.3 Drainage Area 006

Drainage Area 006 encompasses most of the eastern portion of the area south of East Street and directly west of Newell Street, includes portions north of East Street, and is bordered on the south by the Housatonic River (Figure 2-4). The drainage area includes the baseball field west of Newell Street, OWS 64X, and the grassed area to the east of the Building 64G Groundwater Treatment Facility (GWTF) located south of East Street. Areas north of East Street include the area south of Merrill Road. In addition, stormwater runoff from portions of the area west of Newell Street, East Street, and

Merrill Road is conveyed to this drainage area. Approximately two acres of Drainage Area 006, controlled by the City and/or MassDOT, collect flow from East Street, Newell Street, and areas north of East Street, which then enters the GE system and comingles with GE's stormwater flows. Drainage Area 006 includes approximately 13 acres of drainage area, of which approximately 2.5 acres are impervious. This area includes OWS 64X. Flows within this area discharge to the Housatonic River through Outfalls 006, 06A, and SRO5.

2.1.4 Drainage Area 009

This drainage area encompasses the areas east of Plastics Avenue, north of Merrill Road, and immediately south of Drainage Area YD12. The area also includes OWS 119W (Figure 2-5). All areas are associated with the Facility. Drainage Area 009 includes approximately 11 acres of drainage area, of which approximately 8.5 acres are impervious. Flows within this drainage area discharge into Unkamet Brook through Outfall 009.

2.1.5 Drainage Area YD10

Drainage Area YD10 is bounded on the north by Dalton Avenue, Unkamet Brook in the northeast, and Drainage Area YD12 on the south (Figure 2-6 and Figure 2-7). This area encompasses the decorative detention pond adjacent to Dalton Avenue and the residential neighborhood bounded by Dalton Avenue, Allendale Road, Maryland Avenue, and Plastics Avenue. Drainage Area YD10 includes approximately 31 acres of drainage area, of which approximately 7.2 acres are impervious. Approximately 19.7 acres of the 31-acre Drainage Area YD10 constitute an adjacent residential area located outside of the Facility. Stormwater runoff from this area is conveyed on to the Facility via overland flow and the City storm sewer system. Runoff from Drainage Area YD10 drains into the decorative pond that acts as a detention basin. The pond discharges to Unkamet Brook through four 18-inch-diameter culverts at Outfall YD10.

2.1.6 Drainage Area YD12

Drainage Area YD12 is bounded on the north by Drainage Area YD10 and on the south by Drainage Area 009. This area encompasses various office buildings and plant roadways (Figure 2-6). Drainage Area YD12 includes approximately 7.5 acres of drainage area, of which approximately 4.7 acres are impervious. Runoff from Drainage Area YD12 drains via a series of manholes and catch basins to Unkamet Brook.

2.1.7 Drainage Area YD13

Drainage Area YD13 encompasses a portion of the capped Building 71 and Hill 78 On-Plant Consolidation Areas (OPCAs). Drainage Area YD13 includes approximately five acres of drainage area, of which 0.3 acre is impervious. It is bounded on the north by Drainage Area YD16 (Figure 2-8). Stormwater runoff from Drainage Area YD13 accumulates in a stormwater collection basin, which then discharges to a manhole on GE property before comingling with stormwater discharges from the Pittsfield Generating Company and General Dynamics. These stormwater flows ultimately discharge into the City stormwater system that leads to the Housatonic River.

2.1.8 Drainage Area YD16

Drainage Area YD16 encompasses another portion of the capped OPCAs as well as a portion of the General Dynamics parking lot. The drainage area includes approximately 8.6 acres, of which approximately 3.1 acres are impervious. The drainage area is bounded on the south by Drainage Area YD13 and on the north by Tyler Street extension (Figure 2-8). Stormwater runoff from Drainage Area YD16 accumulates in a stormwater collection basin, which then discharges to manholes on GE property before comingling with City stormwater. These stormwater flows ultimately discharge to the Housatonic River.

2.2 Groundwater Treatment Facility at Building 64G

In addition to the stormwater conveyance system, GE operates a GWTF at Building 64G. The Building 64G GWTF was constructed in 1991 with an initial design capacity of approximately 0.9 million gallons per day (MGD). The plant is designed to treat PCBs, VOCs, and SVOCs in water. The Building 64G GWTF is used for the treatment and discharge of groundwater, landfill leachate, remediation-derived wastewater, and water from storm sewer cleaning. The majority of influent is produced from a series of 12 individual groundwater pumping wells located throughout the Facility. A portion of the wells pump to a nearby retention tank pump station located outside of the GWTF, from which water is pumped to the influent tank. The remainder of the groundwater wells pump directly to the influent tank. The treatment process consists of pH adjustment, polymer addition, flocculation, inclined plate clarification, continuous backwash sand filtration, and 80,000-pound activated carbon treatment. Solids are concentrated and pressed for subsequent off-site disposal in cubic yard boxes. Treated Building 64G GWTF effluent discharges at internal Outfall 64G, combines with effluent from GE’s separate water treatment plant (WTP) in Building 64T, and is subsequently discharged to the Housatonic River through Outfall 005.

2.3 Current Stormwater Control Measures

This section summarizes the stormwater control measures that GE currently uses to reduce the likelihood for potential pollutants to enter the Facility’s stormwater discharges. Specifically, this section describes the controls that have been selected to meet non-numeric technology-based effluent limitations for pollutants in all drainage areas. This section also describes the management of stormwater runoff using existing stormwater treatment facilities/controls at the Facility.

2.3.1 Non-Numeric Technology-Based Controls

A variety of non-numeric technology-based controls (i.e., BMPs) are currently being implemented by GE at the Facility in all drainage areas. As summarized below, these controls include good housekeeping, employee training, facility security, preventive maintenance, spill prevention and response, management of stormwater runoff, sediment and erosion control, recordkeeping, and incident reporting. These activities will continue under this Work Plan, as noted in Section 5.3.4.3 and described in the revised SWPPP provided in Appendix A.

2.3.1.1 Good Housekeeping

When used in conjunction with routine inspections, good housekeeping can be a very effective method of pollution prevention, including limiting the amount of spilled, settled, and leaked materials that can be washed away with stormwater. The following are examples of good housekeeping practices used at the Facility:

- Scheduling regular pickup and disposal of garbage and waste materials;
- Routinely inspecting for leaks and observing conditions of drums, tanks, and containers;
- Promptly performing cleanup of any spilled materials;
- Ensuring that cleanup procedures are reviewed and understood by employees;
- Keeping an up-to-date inventory of all materials present at the site and clearly labeling containers; and
- Maintaining clean ground surfaces with regular sweeping, vacuuming, etc.

2.3.1.2 Personnel Training

All personnel working at portions of the Facility where materials that could contain pollutants are handled will be given instruction and information regarding the following:

- Environmental laws and regulations;
- Pollution prevention concepts;
- Implementation of the SWPPP;
- Measures and controls to be used in each drainage area to minimize the pollutants in Facility stormwater discharges; and
- Site spill/release emergency response procedures.

Training also covers procedures for cleaning and washing equipment and emphasize the potential human hazards and environmental impacts from the discharge of residual wash water.

2.3.1.3 Site Security

The Facility site security staff are present 24 hours per day, seven days per week. Access to the Facility is restricted by fencing and electronically controlled gates that are monitored from a security station by closed-circuit television. All contractors and persons on extended visits are issued badges for access to the Facility. All contractors and persons on extended visits to the Facility are pre-approved by GE prior to entry. Infrequent visitors must register at the reception desk and are escorted to their on-site destination by GE personnel.

2.3.1.4 Preventive Maintenance

A preventive maintenance program for indoor and outdoor equipment is used in conjunction with routine inspections. The inspections are designed to reveal conditions that could cause breakdowns or failures that may result in the discharge of pollutants. In addition, routine maintenance is conducted on the stormwater or groundwater system controls located at the Facility (e.g., OWSs, Building 64T WTP, and Building 64G GWTF) in accordance with those facilities' Operation and Maintenance Plans.

2.3.1.5 Spill Prevention and Response Procedures

In the event of a spill, trained Facility personnel are required perform specific response procedures as are outlined in the GE Integrated Emergency Response Plan/Health and Safety Program (Exhibit F-1 to GE's Contingency and Emergency Procedures Plan [CEPP] included as Attachment F to GE's May 2025 revised Project Operations Plan [POP; Arcadis 2024]). All personnel designated to engage in emergency spill response are fully trained and properly equipped. GE's treatment plant operators are also available to respond to minor chemical releases and incidents at the Facility in support of GE personnel. In addition, GE maintains relationships with nearby emergency response contractors for assistance with larger spills or incidents.

All spills, releases, inspection results, and maintenance issues related to stormwater are to be immediately brought to the attention of the manager listed in the GE Integrated Emergency Response Plan. Reporting is discussed in Section 2.3.1.6, and a complete list of spill response procedures is presented in the GE Integrated Emergency Response Plan.

To minimize the potential for leaks, spills, and other releases that may be exposed to stormwater, the following preventative measures are carried out where practicable:

- Plainly labeling containers (e.g., "Universal Waste," "Hazardous Waste," etc.) that could be susceptible to spillage and/or leakage to encourage the proper handling of the container and material and to facilitate a rapid response if spills or leaks occur;
- Installing barriers between material storage and traffic areas;
- Providing secondary containment around material storage areas; and

- Reviewing and posting signage related to material storage and handling areas in plain sight.

2.3.1.6 Incident Reporting

In the event of an emergency or other release of hazardous substances or materials, the notifications required by all applicable laws and regulations are to be made, including those under CERCLA, the Emergency Planning and Community Right-to-Know Act, the Clean Water Act, the Toxic Substances Control Act, Massachusetts Chapter 21E, and/or the Massachusetts Contingency Plan. In particular, in cases where a discharge contains a hazardous substance or oil in an amount equal to or in excess of a reportable quantity or standard established under 40 CFR Parts 110, 117, and 302 or 310 Code of Massachusetts Regulations (CMR) 40, the National Response Center must be notified as soon as GE has knowledge of the exceedance, and other applicable reporting procedures must be followed in accordance with GE's CEPP in Attachment F to the May 2025 revised POP. In addition, the CD establishes certain specific notification requirements for emergencies and certain other releases of hazardous substances. Those requirements are set forth in Section 5.1.3 of the CEPP.[2]

2.3.1.7 Recordkeeping and Internal Reporting

Spill and pollution prevention efforts are enhanced by retaining records in an orderly manner at the Facility. Therefore, records regarding stormwater pollution prevention activities are maintained on site.

2.3.1.8 Sedimentation and Erosion Control

On an ongoing basis during demolition activities and remediation-related projects at the Facility, sedimentation and erosion controls are implemented. These controls may include, but are not limited to, silt fence, hay bales, manhole/catch basin inlet protection, and pneumatic/mechanical pipe plugs. A large portion of the Facility consists of paved or other impervious surfaces, thus limiting the potential for erosion. Grass and other landscaped areas are periodically monitored for signs of erosion by on-site personnel.

2.3.2 Stormwater Management Controls

This section describes the existing stormwater treatment facilities, by drainage area, that manage runoff from the Facility. As described below, Facility stormwater is managed using stormwater detention basins, OWSs, and a dedicated stormwater treatment facility. In addition, for drainage areas where specific structural stormwater management controls are not present, the management practices used to minimize the potential for the introduction of pollutants to stormwater runoff are described below.

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[2] In addition to these general notification requirements, exceedances of a numerical effluent limitation are reported separately and will, in the future, be reported as discussed in Section 6 of this Work Plan.

2.3.2.1 Drainage Area 005

Drainage Area 005 contains the Building 64T WTP, which was constructed in 1987 with a treatment capacity of 0.5 MGD. The Building 64T WTP was designed to remove suspended solids from stormwater. Stormwater enters the treatment plant from the 64Z OWS, with flows originating from Drainage Area 005N as further discussed below. The treatment process at Building 64T includes pH adjustment and the addition of polymer to promote flocculation of solids. Following mixing, the water moves through modular treatment units in which additional mixing, inclined plate clarification, and multimedia filtration occur. Periodically, the multimedia filters and inclined plates are backwashed to a sludge holding tank. Solids from the tank are processed through an inclined plate clarifier where the solids are concentrated and pressed at the same solids handling area as used by the Building 64G GWTF. Treated water is discharged from the Building 64T WTP through internal Outfall 64T and ultimately Outfall 005 to the Housatonic River.

During initial stormwater conditions, flows generated from Drainage Area 005N are first conveyed to OWS 64Z and then discharged to the Building 64T WTP for treatment. These flows also include dry-weather flow that has been observed to originate from City-owned areas of East Street and Tyler Street. Under full stormwater conditions, flow generated from Drainage Area 005N is partitioned between two outlet pipes within the East Street Diversion Structure, which is a gate valve-controlled system that splits flow between OWS 64Z and OWS 64X. Excess flow volumes not directed to OWS 64Z are diverted towards Newell Street and enter Drainage Area 006, discussed further below. OWS 64Z was designed to handle and treat stormwater as follows:

- Flows entering OWS 64Z with an influent rate up to 380 gallons per minute (gpm), the maximum treatment capacity of the Building 64T WTP, pass through the separator and are directed to the Building 64T WTP for treatment.
- Flows entering OWS 64Z greater than 380 gpm but less than 2,300 gpm pass through the separator, bypass Building 64T, and discharge to a manhole that leads to OWS 64W.
- Flows greater than 2,300 gpm (the maximum design capacity) bypass OWS 64Z at the 64Z Diversion Structure and are directed to a manhole that leads to OWS 64W.

Once the discharge from OWS 64Z (or the bypass around OWS 64Z) reaches OWS 64W, the flows pass through that separator and discharge to the Housatonic River through Outfall 05A and/or Outfall 05B, depending on storm intensity. Additionally, any flows generated within Drainage Area 005S flow to OWS 64W for discharge through Outfalls 05A/05B. During initial stormwater conditions, flows generated from the south side of East Street are conveyed to OWS 64W for treatment and subsequently discharged through Outfall 05A.

2.3.2.2 Drainage Area 006

Drainage Area 006 contains OWS 64X. During dry-weather conditions and initial storm conditions, flow generated within Drainage Basin 006 is conveyed to OWS 64X and discharged through Outfall 006 to the Housatonic River. Dry-weather flow baseline monitoring performed by GE in 2010 and 2011 indicates that most of the dry-weather flow observed in the Drainage Area 006 conveyance system is attributable to the City and/or MassDOT. A series of manholes and catch basins collect runoff from areas south of East Street and east of the Building 64T WTP. In addition, a portion of Drainage Area 006 collects flow from East Street, Newell Street, and areas north of East Street.

Under full stormwater conditions, flow from north of East Street that is not diverted to OWS 64Z from the East Street Diversion Structure is routed to OWS 64X. If the influent flow rate into OWS 64X is less than approximately 2,100 gpm, the treated water discharges through Outfall 006. If influent flow into OWS 64X is in excess of approximately 2,100 gpm, the excess flow bypasses OWS 64X and discharges through Outfall 06A. At approximately the same time that flows begin discharging through Outfall 06A, bypassing OWS 64X, a second bypass discharge begins flowing through the sewer relief overflow outlet (i.e., Outfall SRO5) located beneath the Newell Street Bridge.

2.3.2.3 Drainage Area 009

Drainage Area 009 contains OWS 119W. Flows generated in Drainage Area 009 are collected within the storm sewer network located within this drainage area. OWS 119W collects flows within this drainage area before discharging through internal Outfall 09B (located at the inlet pipe of Manhole 9B-1A) and subsequently discharging into Unkamet Brook through Outfall 009. In November 2014, a CheckMate Check Valve (check valve) was installed at Outfall 009 to help limit the influence of Unkamet Brook on OWS 119W. The Drainage Area 009 storm sewer system near the 119W OWS is typically inundated with water from Unkamet Brook. Since Outfall 09B is an internal outfall and stormwater flows through this location to Outfall 009, GE has proposed that future sampling be conducted only at Outfall 009, as described in Section 5.1.7 of this Work Plan.

2.3.2.4 Drainage Area YD10

As noted in Section 2.1.5, runoff from Drainage Area YD10 drains into the decorative detention pond located near Plastics and Dalton Avenues, which discharges to Unkamet Brook through four 18-inch-diameter culverts. The discharge of the pond contains an overflow weir inlet structure.

2.3.2.5 Drainage Area YD12

As noted in Section 2.1.6, Drainage Area YD12 consists of roadways and parking areas near office buildings, and stormwater collected from this area discharges through a 24-inch-diameter pipe to Unkamet Brook at Outfall YD12. A portion of the YD12 drainage system is typically inundated with water from Unkamet Brook. Various stormwater controls are in place in Building 121 to reduce the potential for the mixing of pollutants with stormwater; these include grated blind catch basins for collecting spills and an interior floor berm to prevent materials from migrating outside.

2.3.2.6 Drainage Area YD13

As described in Section 2.1.7, Drainage Area YD13 encompasses a portion of the capped Building 71 and Hill 78 OPCAs. Surface runoff from the OPCAs is directed to various swales and catchment areas that direct the water to a stormwater detention basin. The stormwater detention basin promotes sediment settling prior to discharge to a storm drain that ultimately discharges into the Housatonic River.

2.3.2.7 Drainage Area YD16

Similar to Drainage Area YD13, Drainage Area YD16 encompasses portions of the General Dynamics parking lot and a portion of the capped OPCAs. The storm drain from Drainage Area YD13 flows into the Drainage Area YD16 outlet manhole. As described in Section 2.1.8, stormwater runoff from Drainage Area YD16 accumulates in a stormwater collection basin. The stormwater detention basin promotes sediment settling prior to discharge to a storm drain that ultimately discharges into the Housatonic River.

2.3.3 Dry-Weather Flow

GE has conducted monitoring of dry-weather flows at Outfalls 05A, 006, and 009 since 2010 in accordance with the revised *Dry Weather Ambient Monitoring Plan* (Arcadis 2011). GE also has completed numerous dry-weather flow reduction activities. Table 2-1 provides a summary of the dry-weather flow reduction activities completed by GE to date. Those activities have been successful in eliminating dry-weather flows from Outfalls 05A and 009. Specifically, no dry-weather flow has been observed at Outfall 009 since 2012, and no dry-weather flow has been observed at Outfall 05A since 2017. Dry-weather flow inputs do continue to occur within the 005 Drainage Basin, primarily from areas owned by the City over which GE lacks control (i.e., Tyler Street); that flow is treated at the Building 64T WTP and discharged to the Housatonic River via Outfall 005.

Table 2-1
Dry-Weather Flow Reduction Activities

Year Implemented	Drainage Basin	Facility Location	Storm Sewer Structure/Pipe Segment	Description of Dry-Weather Flow Reduction
2010	005	East Street Area 22-South	5SC-2A	Stormwater pipe between 5SC-2 and 5SC-2A was filled with a non-shrink grout to eliminate dry-weather flow infiltration.
	009	Unkamet Brook Area	9B-6A	Catch Basin 9B-6 sump was filled with a non-shrink grout to eliminate dry-weather flow infiltration.
2013	009	Unkamet Brook Area	9B-14	Catch basin repairs were made, including reinstallation of the catch basin's grate frame and several supporting bricks.
	009	Unkamet Brook Area	9B-1A	A permanent pipe plug was installed to replace a previously installed temporary pipe plug.
2015	005	East Street Area 22-North	Building 100A to 5NB-2	Storm sewer pipe segments were abandoned.
			Building 100A to 5NC-2	
			Building 100A to 5NC-2	
	YD11	Unkamet Brook Area	Outfall YD11	Outfall YD11 was abandoned, including storm sewer segments from YD11A-3 to Outfall YD11.
	005	East Street Area 22-North	5NC-6B3A and 5NC-16B1	Catch basin repairs were made, including reinstallation of the catch basin's grate frames and supporting bricks.
2019	005	East Street Area 22-North	5NA-7A and 5NA-8A1	A manhole was abandoned due to its condition and presence of other catch basins in the area.
2023	005	East Street Area 22-North	5NA-11A to 5NA-11	Catch Basin 5NA-11A and storm sewer pipe segment from 5NA-11A to 5NA-11 were filled with flowable concrete fill.

Within Drainage Area 006, dry-weather flow baseline monitoring performed in 2010 and 2011 indicated that most of that flow is attributable to the City and/or MassDOT. This was demonstrated by the fact that dry-weather flows observed at Outfall 006 were attributed almost exclusively to non-GE-owned portions of the storm sewer system located in Newell Street, which is part of the City and MassDOT stormwater system), as noted in the revised *Dry Weather Ambient Monitoring Plan* (Arcadis 2011).

Because dry-weather flows have largely been eliminated at the Facility, except for dry-weather discharges from areas attributed almost exclusively to non-GE-owned portions of the storm sewer system over which GE lacks control, and because future short-term BMPs are focused on eliminating any remaining GE contributions to dry-weather flow, the surface water discharge monitoring activities described in Section 5 for stormwater discharges include monitoring only of wet-weather discharges (although monitoring at Outfall 64G will continue to be conducted routinely regardless of weather).

3 Applicable or Relevant and Appropriate Requirements

As noted in Section 1.2, the SOW modification requires that this Work Plan identify the ARARs for GE's surface water discharges. The ARARs that are pertinent to those discharges are presented in Table 3-1 (attached). That table also specifies the actions to be taken by GE to comply with these ARARs and, in the case of one ARAR, a proposal for waiver by EPA.[3] As specified in the SOW modification, these ARARs will replace the ARARs in Technical Attachment B to the SOW regarding discharges of treated water from GE's GWTF.

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[3] As noted in Table 3-1, the state water quality standards and recommended national water quality criteria for PCBs include a criterion of 0.000064 micrograms per liter (µg/L) based on human consumption of water and organisms. That criterion should be waived under CERCLA, as EPA has done for the Rest of River remedy, on the ground that achievement of that ARAR is technically impracticable to reliably measure or attain in the receiving waters. See CERCLA Section 121(d)(4)(C).

4 Summary of Existing Discharge Monitoring Data

This section provides a summary of discharge monitoring data collected by GE under the former NPDES permit from January 2015. Samples were collected at the various Facility outfalls and yard drains (and the GWTF) described in Section 2.1 during precipitation events (wet weather) and during periods of no precipitation (dry weather). Dry-weather samples were collected on days when less than 0.1 inch of total precipitation fell and no snow melt occurred. Wet-weather samples were collected on days when more than 0.1 inch of total precipitation fell or snow melt occurred and the interval from the preceding measurable storm was at least 24 hours. As stated in Section 2.3.3, dry-weather flows have largely been eliminated at the Facility, except for dry-weather discharges in the Drainage Area 005 and 006 basins that are attributed almost exclusively to publicly owned portions of the storm sewer system. Therefore, this section summarizes only data collected during wet-weather sampling events (with the exception of Section 4.6, which describes dry-weather monitoring of VOCs and SVOCs at Outfall 006).

4.1 Flow

Flows have been measured on a continuous basis since approximately 2010 at Outfalls 005, 05A, 05B, 006, 06A, and 009. Table 4-1 provides a summary of annual flow volume measured at each location since 2015. As expected, annual flow volumes are variable and are highly dependent on precipitation. For example, 2024 has one of the highest annual flow volumes over this period. This is due in large part to a heavy precipitation event that occurred in March 2024, in which 2.3 inches of rainfall over a 24-hour period was recorded at the Pittsfield Airport.

Table 4-1
Summary of Annual Flow Volume by Outfall (2015 to 2024)

Year	Flow Volume (million gallons)					
	005	05A	05B	006	06A	009
2015	62.1	10.0	0.7	6.3	0.3	5.0
2016	38.0	7.8	0.7	4.9	0.3	3.1
2017	42.8	9.7	0.9	4.8	0.3	24.9
2018	44.1	10.8	2.1	5.9	0.2	20.8
2019	60.1	12.5	2.0	4.0	0.4	27.7
2020	55.1	9.4	1.0	4.9	1.3	18.5
2021	67.0	19.0	1.2	7.6	0.3	20.8
2022	75.1	12.9	2.4	3.9	0.1	21.9
2023	74.2	16.5	0.8	9.8	0.2	13.8
2024	89.0	12.1	14.3	10.9	0.5	19.5

4.2 Total PCBs

Figures 4-1 through 4-10 present time-series data on total PCB concentrations observed under wet-weather conditions since 2011 at Outfalls 005, 05A, 05B, 006, 06A, and 009, and Drainage Areas YD10, YD12, YD13 , and YD16. Table 4-2 provides a tabular summary of the PCB data for these outfalls (as well as Outfall 64G) during the period of 2015 to 2025 and during the last two and a half years (2023 to 2025). These figures demonstrate that wet-weather total PCB concentrations over these periods tend to be highly variable at all locations. This is expected due to nature of stormwater sampling influences, such as intensity and duration of storms, seasonal variations, and changes in site activities. Drainage Area 005S tends to have the highest concentrations, particularly at Outfall 05B during bypass events. While total PCBs at all outfalls are highly variable, average concentrations have generally declined over time.

Table 4-2
Summary of Aroclor Total PCBs by Outfall (2015 to 2025 and 2023 to 2025)

Outfall	Total PCBs (2015–2025) (µg/L)			Total PCBs (2023–2025) (µg/L)		
	Min	Average	Max	Min	Average	Max
005	0.0059	0.098	0.37	0.0028	0.045	0.19
05A	0.12	0.88	4.7	0.12	0.59	1.6
05B	0.39	3.0	13	1.3	2.5	4.0
006	0.0084	0.33	2.7	0.014	0.16	0.78
06A	0.22	1.2	7.9	0.13	0.91	1.9
009	ND	0.56	0.88	ND	0.021	0.042
YD10	0.64	0.33	1.3	0.0064	0.63	1.3
YD12	0.082	0.14	0.30	0.097	0.13	0.17
YD13	0.0077	0.041	0.067	0.024	0.038	0.051
YD16	ND	0.033	0.080	0.015	0.015	0.015
64G[a]	ND	0.014	0.034	ND	0.016	0.017

Notes:

a. For Outfall 64G, 88% of the samples collected in the 2015-2025 period and 98% of the samples collected in 2023-2025 showed no detected PCBs

ND: non-detect

Figure 4-11 shows a time series of PCB concentrations for the GWTF Outfall 64G. Sampling conducted at this internal outfall is performed on a routine schedule regardless of wet or dry weather conditions. As shown there and noted in Table 4-2, PCB concentrations in this effluent are nearly all below the detection limit.

4.3 Total Suspended Solids

Figures 4-1 through 4-10 also present time-series data on TSS concentrations observed under wet-weather conditions since 2015 at each location, and Figure 4-11 shows time-series data of TSS concentrations for the GWTF Outfall 64G. Table 4-3 provides a tabular summary of these data during the periods of 2015 to 2025 and 2023 to 2025. Similar to PCBs, these figures demonstrate that wet-weather TSS concentrations over this period tend to be highly variable at all locations. On average, Drainage Area 006 tends to have the highest concentrations, while Drainage Area 009 generally has the lowest concentrations. As with PCBs, TSS concentrations at Outfall 64G are nearly all below detection.

Table 4-3
Summary of Total Suspended Solids by Outfall (2015 to 2025 and 2023 to 2025)

	TSS (2015–2025) (mg/L)			TSS (2023–2025) (mg/L)		
Outfall	**Min**	**Average**	**Max**	**Min**	**Average**	**Max**
005[a]	ND	1.45	6.9	ND	1.5	4.7
05A	ND	37	214	ND	29	120
05B	ND	89	300	4.0	98	220
006	ND	71	275	1.6	73	239
06A	3.1	318	1670	33	555	1670
009	ND	4.6	50	ND	4.2	27
YD10	1.7	19	60	2.6	31	60
YD12	1.6	15	43	6.3	18	35
YD13	2.6	19	78	21	50	78
YD16	ND	13	31	2.3	9.7	14
64G[b]	ND	1.2	5.4	ND	1.1	5.4

Notes:

a. Statistics for Outfall 005 exclude one anomalous value of 59 mg/L recorded in 2025.

b. For Outfall 64G, 97% of the samples collected in the 2015-2025 period and 98% of the samples collected in 2023-2025 showed no detected TSS.

ND: non-detect

4.4 Oil and Grease

Figures 4-1 through 4-10 also present time-series data on O&G concentrations observed under wet-weather conditions since 2015 at each stormwater outfall. A majority of the O&G concentrations measured at all locations have been below detection. At times when O&G was detected, concentrations were generally well below the O&G daily maximum discharge limitation established in the former NPDES permit of 15 milligrams per liter (mg/L) at all locations. Further, after 2021, O&G has been detected only at Outfalls 006 and 06A. Table 4-4 provides a tabular summary of the O&G concentrations at the stormwater outfalls (plus Outfall 64G), including frequency of detection.

Table 4-4
Summary of Oil and Grease Data by Outfall (2015 to 2025)

Outfall	Detection Frequency	O&G (2015–2025)		
		Min	Average	Max
005	3/289 (1.0%)	0.70	1.8	5.0
05A	1/53 (1.9%)	0.70	2.0	5.1
05B	1/43 (2.3%)	1.2	2.3	8.8
006	1/53 (1.9%)	0.70	2.6	15
06A	12/45 (27%)	1.2	4.3	14
009	0/56 (0%)	0.70	1.6	4.1
YD10	0/9 (0%)	1.2	1.3	1.4
YD12	0/8 (0%)	1.1	1.3	1.4
YD13	1/8 (13%)	1.1	3.4	5.0
YD16	0/9 (0%)	1.2	3.6	5.0
64G	2/234 (0.85%)	0.70	3.5	13

It should be noted that the typical method reporting limit for O&G is in the range of approximately 4.5 to 5.0 mg/L. As a result, with the exception of Outfalls 006 and 06A, many of the detections at the stormwater outfalls have estimated concentrations or detections at or slightly above the detection limit, supporting the position that for every other outfall, O&G sampling is no longer necessary.

Figure 4-11 shows a time series of O&G concentrations for the GWTF internal Outfall 64G. O&G concentrations in this effluent are nearly all below the detection limit, with the exception of two detections that occurred after 2021.

4.5 pH

Figures 4-1 through 4-11 also show time-series data on measured pH at all outfall locations where pH is measured (note that pH is not monitored at yard drain locations). The pH results measured across the various Facility outfalls range from approximately 6.51 to 8.81 standard units (SU) (with an average of 7.59 SU). Table 4-5 provides a tabular summary of pH at all locations.

Table 4-5
Summary of pH by Outfall (2015 to 2025)

Outfall	pH (2015–2025)		
	Min	Average	Max
005	6.62	7.68	8.21
006	6.60	7.41	8.81
009	6.54	7.22	8.37
05A	6.59	7.54	8.47

Outfall	pH (2015–2025)		
	Min	Average	Max
05B	6.51	7.51	8.63
06A	6.58	7.61	8.62
64G	7.80	8.16	8.50

4.6 VOCs and SVOCs

Sampling for VOCs and SVOCs is performed by GE at internal Outfall 64G and is also performed at Outfall 006 under dry-weather conditions. Samples collected between 2018 and 2025 show non-detect results for many of those constituents. Tables 4-6a and 4-6b (attached) provide a summary of all VOC and SVOC results at Outfalls 64G and 006, respectively, including number of samples, number and frequency of detection, and maximum detected concentration.

At Outfall 006, for SVOCs, only seven of 41 constituents had detectable concentrations. Similarly, for VOCs, only seven of 34 constituents had detectable concentrations; the most frequently detected VOCs were toluene (11%), trichloroethene (TCE) (11%), and trichlorofluoromethane (6%). Detectable concentrations of each of these constituents were generally low.

Similarly at Outfall 64G, SVOC detections were generally infrequent, with only one or two detectable results during the period from 2018 to 2025. For VOCs, only three of 34 constituents had detectable concentrations; the most frequently detected VOCs were chloroethane (49%) and 1,1-dichloroethane (43%).

5 Surface Water Discharge Plan Activities

As described in Section 4, PCB concentrations observed at the various Facility outfalls since 2011 are highly variable, but average concentrations generally show reductions over time. High variability in stormwater effluent concentrations is expected due to several factors, including variability in site conditions and changeability that can occur because of differing conditions across the diverse stormwater sampling events, such as intensity and duration of wet-weather events. The observed decline in effluent PCB concentrations since 2011 is largely due to the implementation of various BMPs during that time. The objectives of this Work Plan are to identify activities—consistent with those required by the SOW modification—that are expected to continue to improve water quality in discharges from the various Facility outfalls and reduce the quantity (i.e., volume) of those discharges, and present a monitoring plan that is sufficient to evaluate the effectiveness of those activities. This section provides that information.

5.1 Effluent Limitations and Monitoring

As described in Section 2, there are two internal outfalls that discharge from the treatment plants (Building 64G GWTF [Outfall 64G] and Building 64T WTP [Outfall 64T]), one outfall for the combined effluent of 64G and 64T (Outfall 005), six outfalls associated with drainage areas and bypasses (Outfalls 05A, 05B, 006, 06A, SRO5 and 009), and Drainage Areas YD10, YD12, YD13, and YD16. Monitoring and reporting at these locations have been conducted for many years at various intervals under prior NPDES permits. In accordance with Section 2.9.2.a of the SOW modification, this section identifies numeric and/or non-numeric effluent limitations, as well as monitoring and reporting requirements, for each non-abandoned Facility outfall for the constituents required to be addressed by the SOW modification. A numeric effluent limitation is a specific numeric value that limits the amount of a constituent that can be discharged into a receiving water. Non-numeric effluent limitations refer to site-specific controls or BMPs that are designed to minimize discharge of constituents into receiving waters. Both types of limits are permissible under the Clean Water Act, and EPA has determined that numeric limits are neither necessary nor appropriate for most stormwater discharges. The effluent limitations identified for each outfall and constituent in this section represent a combination of numeric and non-numeric limitations. As will be discussed in the following subsections, the identified non-numeric effluent limitations generally consist of BMPs that are described in Section 5.3.

5.1.1 Outfall 64G

Effluent at Outfall 64G consists of treated groundwater and City water (used for facility maintenance), treated water from storm sewer cleaning (a BMP), and treated water generated as part of response actions conducted under the CD. Under the prior NPDES permit, Outfall 64G had a numeric PCB effluent limit of 0.065 micrograms per liter (µg/L) (monthly average), as measured using a modified

Aroclor PCB Method 8082. That permit stated that every effort should be made to achieve the method detection limit (MDL) of 0.014 µg/L for that modified Aroclor PCB method. The permit further stated that PCB detections between 0.014 µg/L and 0.065 µg/L were to be recorded as "zero" on discharge monitoring reports [DMRs]. Under this Work Plan, GE will use a different PCB analytical method (Method 608.3) for analysis of all PCB samples.[4] Prior to implementation, an analytical method study will be conducted to evaluate MDLs associated with that new method and to evaluate comparability of results between the modified Aroclor method and Method 608.3. Accordingly, the prior NPDES permit's numeric effluent limit of 0.065 µg/L will be maintained until that method study has been completed; any proposed change to the effluent limit will be included in a method study summary report to be submitted to EPA for review and approval. A method study plan will be submitted to EPA within 45 days of approval of this Work Plan. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at Outfall 64G is provided in Table 5-1.

Table 5-1
Effluent Monitoring, Reporting, and Numeric Limits at Outfall 64G

Effluent Characteristic	Effluent Limit	Measurement Frequency	Sample Type
Flow	Report in MGD	Continuous	Recorder
PCBs, Total	0.065 µg/L, with effort to achieve MDL of 0.014 µg/L[a]	1/Month	24-hour composite
pH	6.5–9.0 SU	1/Month	Grab
VOCs, Total	Report in µg/L	1/Month	Grab
SVOCs, Total	Report in µg/L	1/Month	Grab

Note:
1. Subject to revision based on results of PCB analytical method study.

In addition to these requirements, discharges at Outfall 64G will be subject to a non-numeric effluent limitation consisting of the routine maintenance that is conducted on the Building 64G GWTF in accordance with that facility's Operation and Maintenance Plan (see Section 2.3.1.4).

5.1.2 Outfall 005

The discharge from Outfall 005 to the Housatonic River consists of a commingled stream of treated effluent from internal Outfall 64G and treated stormwater from internal Outfall 64T. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at Outfall 005 is provided in Table 5-2. Note that recording of total rainfall will be included in the Outfall 005 sampling table, but these data are applicable to the entire site. Rainfall will be recorded using an

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[4] The Modified Method 8082 is a modified version of the standard Method 8082 that was developed specifically for the NPDES monitoring program under the former NPDES permit. GE will change to Method 608.3, which is a standard and higher-resolution PCB analytical method, for PCB samples collected under this Work Plan.

on-site rain gauge. As backup, the City of Pittsfield Municipal Airport weather gauge data can be used as a source of precipitation information if needed.

Table 5-2
Effluent Monitoring, Reporting, and Numeric Limits at Outfall 005

Effluent Characteristic	Effluent Limit	Measurement Frequency	Sample Type
Flow	Report in MGD	Continuous	Recorder
Rainfall	Report in inches	Continuous	Recorder
PCBs, Total	Report in µg/L	1/Month	Flow composite
TSS	Report in mg/L	1/Month	Flow composite
pH	6.5–9.0 SU	1/Month	Grab

In addition to these requirements, discharges of PCBs and TSS at Outfall 005 will be subject to non-numeric effluent limitations consisting of the various short-term and recurring BMPs identified in Sections 5.3.4.1 and 5.3.4.3 to be performed in the Drainage Area 005 basin. The longer-term stormwater infiltration/inflow (I/I) and impervious cover reductions identified in Section 5.3.4.2, if and when implemented, will also constitute non-numeric effluent limitations applicable to discharges from Outfall 005.

5.1.3 Outfall 05A

The discharge from Outfall 05A consists of treated flow from OWS 64W to the Housatonic River. Additional discharge characteristics can include City water used for fire suppression and testing activities, and other site stormwater. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at Outfall 05A is provided in Table 5-3.

Table 5-3
Effluent Monitoring, Reporting, and Numeric Limits at Outfall 05A

Effluent Characteristic	Effluent Limit	Measurement Frequency	Sample Type
Flow	Report in MGD	Continuous	Recorder
PCBs, Total	Report in µg/L	1/Month	Flow composite
TSS	Report in mg/L	1/Month	Flow composite
pH	6.5–9.0 SU	1/Quarter	Grab

In addition, similar to Outfall 005, discharges of PCBs and TSS at Outfall 05A will be subject to non-numeric effluent limitations consisting of the various short-term and recurring BMPs identified in Sections 5.3.4.1 and 5.3.4.3 to be performed in Drainage Area 005, as well as the longer-term stormwater I/I and impervious cover reductions identified in Section 5.3.4.2.

5.1.4 Outfall 05B

The discharge from Outfall 05B consists of stormwater that exceeds the discharge capacity of OWS 64W (and Outfall 05A). Sampling at this outfall is possible only during heavy precipitation events. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at Outfall 05B is provided in Table 5-4.

Table 5-4
Effluent Monitoring, Reporting, and Numeric Limits at Outfall 05B

Effluent Characteristic	Effluent Limit	Measurement Frequency	Sample Type
Flow	Report in MGD	Continuous	Recorder
PCBs, Total	Report in µg/L	1/Quarter	Flow composite
TSS	Report in mg/L	1/Quarter	Flow composite
pH	6.5–9.0 SU	1/Quarter	Grab

In addition, similar to Outfalls 005 and 05A, discharges of PCBs and TSS at Outfall 05B will be subject to non-numeric effluent limitations consisting of the various short-term and recurring BMPs identified in Sections 5.3.4.1 and 5.3.4.3 to be performed in Drainage Area 005, as well as the longer-term stormwater I/I and impervious cover reductions identified in Section 5.3.4.2.

5.1.5 Outfall 006

The discharge from Outfall 006 consists of treated flow from OWS 64X to the Housatonic River. Additional discharge characteristics can include City water used for fire suppression or testing activities. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at Outfall 006 is provided in Table 5-5. As described in Section 4.4, because there were recent detections of O&G at this location and Outfall 06A, the numeric effluent limit of 15 mg/L for O&G that was included in the prior NPDES permit has been maintained.

Table 5-5
Effluent Monitoring, Reporting, and Numeric Limits at Outfall 006

Effluent Characteristic	Effluent Limit	Measurement Frequency	Sample Type
Flow	Report in MGD	Continuous	Recorder
PCBs, Total	Report in µg/L	1/Month	Flow composite
TSS	Report in mg/L	1/Month	Flow composite
O&G	15 mg/L	1/Quarter	Grab
pH	6.5–9.0 SU	1/Quarter	Grab

In addition, discharges of PCBs and TSS at Outfall 006 will be subject to non-numeric effluent limitations consisting of the various short-term and recurring BMPs identified in Sections 5.3.4.1 and 5.3.4.3 to be performed in the Drainage Area 006 basin. The longer-term stormwater I/I and impervious cover reductions identified in Section 5.3.4.2, if and when implemented, will also constitute non-numeric effluent limitations applicable to Outfall 006.

5.1.6 Outfalls 06A and SRO5

When flows from the Outfall 006 drainage basin exceed the capacity of OWS 64X, the excess flow discharges through Outfalls 06A. As stated in Section 2.2.2, as flows begin discharging through Outfall 06A, bypassing OWS 64X, a second bypass discharge begins flowing through the sewer relief overflow outlet (i.e., Outfall SRO5) located beneath the Newell Street Bridge. The prior NPDES permit did not include sampling requirements at Outfall SRO5 due to safety considerations related to the location of the outfall under the Newell Street Bridge with limited access for occupancy or sampling and rapidly changing river stage conditions during bypass events in wet weather. Additionally, a significant portion of flow through SRO5 is attributable to the City, over which GE lacks control. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at Outfall 06A is provided in Table 5-6. As described in Section 4.4, because O&G has recently been detected at Outfall 06A, the numeric effluent limit of 15 mg/L for O&G that was included in the prior NPDES permit has been maintained.

Table 5-6
Effluent Monitoring, Reporting, and Numeric Limits at Outfalls 06A and SRO5

Effluent Characteristic	Outfall	Effluent Limit	Measurement Frequency	Sample Type
Flow	06A	Report in MGD	Continuous	Recorder
	SRO5	Report in MGD	Per Discharge Event	Recorder
PCBs, Total	06A	Report in µg/L	1/Quarter	Flow composite
TSS	06A	Report in mg/L	1/Quarter	Flow composite
O&G	06A	15 mg/L	1/Quarter	Grab
pH	06A	6.5–9.0 SU	1/Quarter	Grab

In addition, similar to Outfall 006, discharges of PCBs and TSS at Outfall 06A will be subject to non-numeric effluent limitations consisting of the various short-term and recurring BMPs identified in Sections 5.3.4.1 and 5.3.4.3 to be performed in Drainage Area 006, as well as the longer-term stormwater I/I and impervious cover reductions identified in Section 5.3.4.2.

5.1.7 Outfall 009

The discharge from Outfall 009 consists of treated flow from OWS 119W to Unkamet Brook. Additional discharge characteristics can include City water used for fire suppression or testing activities. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at Outfall 009 is provided in Table 5-7.

Table 5-7
Effluent Monitoring, Reporting, and Numeric Limits at Outfall 009

Effluent Characteristic	Effluent Limit	Measurement Frequency	Sample Type
Flow	Report in MGD	Continuous	Recorder
PCBs, Total	Report in µg/L	1/Month	Flow composite
TSS	Report in mg/L	1/Month	Flow composite
pH	6.5–9.0 SU	1/Month	Grab

In addition, discharges of PCBs and TSS at Outfall 009 will be subject to non-numeric effluent limitations consisting of the various short-term and recurring BMPs identified in Sections 5.3.4.1 and 5.3.4.3 to be performed in Drainage Area 009, with the exception that the short-term impervious cover reduction activities described in Section 5.3.4.1 will not apply to Outfall 009. The longer-term stormwater I/I and impervious cover reductions identified in Section 5.3.4.2, if and when implemented, will also constitute non-numeric effluent limitations applicable to Outfall 009.

5.1.8 Drainage Areas YD10, YD12, YD13, and YD16

As described in Section 2, the yard drain drainage basins represent drainage from a mix of both GE and non-GE (i.e., City) properties. Drainage from these areas is generally associated with City and internal plant roadways, employee parking areas, and/or the OPCAs. Sampling in these areas under the prior NPDES permit was performed once per year. This same sampling frequency is being retained in this Work Plan. A summary of identified numeric effluent limits, reporting, and monitoring for all constituents at all four yard drains is provided in Table 5-8.

Table 5-8
Effluent Monitoring, Reporting, and Numeric Limits at Yard Drains

Effluent Characteristic	Effluent Limit	Measurement Frequency	Sample Type
Flow	Report in MGD	1/Year	Portable recorder
PCBs, Total	Report in µg/L	1/Year	Flow composite
TSS	Report in mg/L	1/ Year	Flow composite
pH	6.5–9.0 SU	1/ Year	Grab

In addition, discharges of PCBs and TSS at the yard drains will be subject to non-numeric effluent limitations consisting of all but two of the short-term and recurring BMPs identified in Sections 5.3.4.1 and 5.3.4.3; the short-term slip-lining and impervious cover reduction activities described in Section 5.3.4.1 will not apply to the yard drains. On a long-term basis, the evaluation of stormwater I/I reductions described in Section 5.3.4.2 will constitute a non-numeric effluent limitation applicable to the yard drains, but the impervious cover reductions will not.

5.2 Sampling Plan

This section presents GE's plan for the performance of the required sampling events specified in Section 5.3 for the various outfalls and discharge points.

5.2.1 Sampling Event Conditions

5.2.1.1 Normal Operating Conditions at 64G GWTF

Collection of effluent samples at Outfall 64G will be performed during normal operating conditions. Sampling events at this location are not weather dependent. Samples collected for PCB and TSS analyses will be collected as 24-hour flow-weighted composite samples. All other samples at Outfall 64G, including those for pH and VOCs/SVOCs analyses, will be collected as grab samples. An SOP for the collection of the surface water grab samples is provided in Appendix B-1; and an SOP for the collection of the 24-hour flow-weighted composite water samples, including flow-composite forms, is provided in Appendix B-2. SOPs for the laboratory analyses are described in Section 5.2.2.

5.2.1.2 Wet-Weather Sampling Event Criteria

As stated in Section 5.1, all stormwater samples to be collected under this Work Plan will be collected during wet-weather events. A wet-weather event is defined as an event that involves greater than 0.1 inch of rainfall or snow melt and that occurs at least 24 hours from the previously measurable (i.e., greater than 0.1 inch) event as recorded by the on-site rain gauge. The 24-hour criterion will be waived when the preceding measurable storm did not yield a measurable discharge.

5.2.2 Sample Collection and Analysis

As noted above, effluent samples at Outfall 64G will be collected as 24-hour flow-weighted composite samples in accordance with the SOP in Appendix B-2. Stormwater samples at outfalls and yard drains will be collected as flow-weighted composite samples for PCBs and TSS and grab samples for O&G, pH, and VOCs/SVOCs. The composite stormwater samples will be collected as 40-minute composites at Outfalls 05B and 06A and as three-hour composites at all other stormwater outfalls. The SOPs for collection of three-hour composite samples and 40-minute composite samples are provided in Appendices B-3 and B-4, respectively; and as noted above, the SOP for collection of grab samples is provided in Appendix B-1. In addition, GE's on-site contractor will continue to perform field analysis of pH using a calibrated pH meter. This analysis will be conducted in accordance with GE's existing SOP for field measurement of water parameters, which is Appendix A-1 to the current FSP/QAPP. All samples will be handled, packaged, and shipped in accordance with GE's existing SOP for sample handling, packing, and shipping, which is Appendix DD to the current FSP/QAPP.

Water samples that were collected under the prior NPDES permit were submitted to SGS in Wilmington, North Carolina, for analysis of PCB Aroclors using the Modified Method 8082 referenced in Section 5.1.1. GE will continue to submit water samples to SGS for Aroclor PCB analysis using that same method until the Method 608.3 study discussed in Section 5.1.1 has been completed. SGS's SOP for such analysis was provided in Attachment J to the current FSP/QAPP, which will continue to be followed pending the completion of the Method 608.3 study. Water samples have been and will continue to be submitted to ALS in Rochester, New York for analysis of TSS (Method SM2540D), O&G (Method E1664B), and VOCs/SVOCs (Methods E624/E625). These analyses will be conducted in accordance with ALS's analytical SOP provided in Appendix B-5 hereto. MDLs and reporting limits for these analyses are listed in Table 5-9 (attached).

5.3 Best Management Practices

5.3.1 Approach

As discussed in Section 5.1, the non-numeric effluent limitations for PCB and TSS discharges from the Facility will consist of various BMPs. As noted in Section 1.2, the SOW modification states that BMPs need to include cleaning and inspecting the existing stormwater system; repair and/or replacement of stormwater system components; optimization and enhancement measures for treatment plants and OWSs; pavement sweeping; measures that could reduce peak flows, such as increasing areas of vegetated cover; reduction in dry-weather flows; and other control measures to reduce contaminant effluent concentrations. To achieve these ends, GE will use an iterative approach to BMP implementation, cycling through the designing, implementing, testing, and reviewing stages using information and data collected throughout the process. This approach allows for continual improvement by building on the previously completed BMPs. GE anticipates performing significant short-term BMPs over the next 24 months, as well as performing recurring BMPs at a greater frequency than in prior years. GE will also perform an assessment of potential implementation of longer-term BMPs. In general, the short-term and recurring BMPs will be focused on TSS reductions in stormwater. These short-term BMPs will be used not only to improve stormwater quality, but also to provide data and information to better define the feasibility and effectiveness of long-term BMPs. Recurring BMPs are also tailored to maintain the site and prevent conditions that could lead to poor stormwater quality. Longer-term BMPs will be focused more heavily on stormwater volume reductions; volume reductions will translate to reductions in contaminant loadings to the receiving water.

To initiate this process, GE previously determined that additional data/information was needed to determine what might be achievable at the Facility and through what BMPs. Accordingly, GE prepared a *Sampling and Analysis Plan for Supplemental Site Stormwater Characterization at the GE-Pittsfield Site* (Site Stormwater Plan) in June 2024. A copy of that plan is included in Appendix C to this Work Plan. GE began implementing the Site Stormwater Plan in the fall of 2024. A critical component of that plan is continuous flow monitoring at various locations throughout GE's stormwater system. Under the prior NPDES permit, flow monitoring has been performed on a continuous basis at the various outfall (end-of-pipe) locations. In addition, the additional continuous flow monitoring described in the Site Stormwater Plan is being performed at a number of locations further upstream in the system to support several objectives, including development and calibration of a site hydrologic and hydraulic model and to characterize GE and off-site (i.e., City/MassDOT) flow contributions to the system under a variety of flow conditions. Such a model will allow for the development of concepts for site improvements and modifications that will aid in the management and treatment of stormwater. Additional details regarding the models and data collected to date are described below.

5.3.2 Continuous Flow Monitoring

Continuous flow monitoring pursuant to the Site Stormwater Plan was initiated in October 2024 and is ongoing as of August 2025. Pulsar flow meters were installed at 12 temporary locations throughout the Facility stormwater system and are set to collect data at five-minute intervals.[5] Monitoring locations were selected to obtain data at points that were judged to be most useful in characterizing stormwater flows at the Facility, but also considered other factors such as ease of access. Some of the actual locations where flow meters are installed have deviated from the locations anticipated in the Site Stormwater Plan; actual installed locations are shown on Figure 5-1. Since these temporary locations are remote, flow meters are operated using a battery and the units are inspected and data downloaded every two to three weeks. Evaluation of these data is ongoing. Ultimately, these data will be used to support development of the Facility hydraulic model. As such, a summary of these data will be provided in a future deliverable summarizing the development of that model.

5.3.3 Hydrologic/Hydraulic Modeling

A hydrologic and hydraulic model will be developed using the Personal Computer Storm Water Management Model (PCSWMM) framework to support evaluations of stormwater runoff and conveyance onto and through the Facility. PCSWMM utilizes EPA's Storm Water Management Model (SWMM) engine, a hydrologic and hydraulic model used to simulate runoff quantity and quality for drainage systems during single events or long-term periods. PCSWMM is used to support planning, analysis, and design related to stormwater and other drainage systems.

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[5] The Site Stormwater Plan did not specify an exact timeline over which continuous flow monitoring would be performed at these 12 temporary locations. The primary objective of this flow monitoring is to capture a range of flow conditions that are experienced in the system, including larger rainfall events that would likely trigger bypasses. Continuous flow monitoring at these locations will be terminated when GE has determined that sufficient data have been collected to characterize flow conditions at these locations.

The PCSWMM model that will be developed for the Facility will use information from stormwater infrastructure drawings to develop the hydraulic and conveyance elements for an existing conditions model. The hydrology of the existing conditions model will be developed and calibrated using data collected from the continuous flow monitoring program described in Section 5.3.2 combined with rainfall data from local precipitation gauges.

After the existing conditions model has been developed, it can be used to develop BMP concepts and evaluate their effectiveness under a variety of precipitation scenarios. These precipitation scenarios could include historical precipitation events and statistical event storms (for example, the two-year, 24-hour storm event). The model results can also be used to assist in the development of BMP implementation strategies to target and prioritize more effective BMPs for site-specific conditions.

5.3.4 BMPs

GE will pursue an iterative approach to BMP development and implementation, implementing short-term, long-term, and recurring BMPs to improve stormwater management and quality. Those BMPs are described in Sections 5.3.4.1, 5.3.4.2, and 5.3.4.3, respectively. The short-term BMPs are BMPs that GE is committed to implementing within approximately the next 24 months. The longer-term BMPs are those that GE is committed to evaluating (supported in part by the model described above); however, a final decision on whether or not to implement those BMPs is being deferred until after the evaluations have been completed and the results have been shared with EPA. Recurring BMPs are ongoing BMPs at the Facility that are implemented on a regular basis. To address the SOW modification requirement that BMPs include optimization and enhancement measures for the treatment plants and OWSs, the short-term BMPs described in Section 5.3.4.1 include inspection and cleaning of the OWSs to enhance their effectiveness, and additional BMPs for operation and maintenance (e.g., media replacement) will be evaluated for the Building 64T WTP in the future, as noted in Section 5.3.4.2.

5.3.4.1 Short-Term BMPs

The following are the short-term BMPs that GE will implement within 24 months of approval of this Work Plan. Within that time frame, GE will perform the inspection/survey and cleaning-related BMPs first. Following completion of those activities, data collection from the various outfalls (described in Sections 5.1 and 5.2) will be conducted for a period of at least six months to establish a new post-cleaning baseline dataset. Those data and results of the inspections/surveys will be used to inform other short-term BMPs described in this section, such as reduction of groundwater infiltration (if discovered during cleaning and inspections) and possible abandonment of certain storm sewer infrastructure. Finally, GE is also planning to prioritize the installation of a soil/vegetative cover over the Building 12 Complex in fall 2025 in order to reduce stormwater flow in that area.

A. Stormwater System Cleaning and Video Inspection

GE will perform hydraulic pressure washing of the interior surfaces of active stormwater piping and associated manholes and catch basins within GE's property limits to remove accumulated sediment and debris. In addition, GE will perform video inspection following stormwater cleaning activities to assess pipe integrity. GE estimates that approximately 29,500 linear feet of stormwater piping are located within the GE's property limits and that all this piping will be cleaned and video inspected. The stormwater piping located within GE's property limits is shown on Figures 2-1 through 2-8. It is expected that this BMP, which will remove accumulated sediment and pressure wash the interior surfaces of facility infrastructure, will improve the quality of stormwater discharges site-wide.

B. Stormwater System Existing Conditions Survey

GE will conduct an existing conditions survey (ECS) of active stormwater piping and associated manholes and catch basins. GE will utilize a global positioning system (GPS) to create comprehensive surveys of the underground stormwater systems, including pipe invert elevations and confirmation of pipe diameter and material of construction. The ECS will be used to develop future infrastructure design and planning.

C. Evaluation and Slip Lining of Certain Pipe Laterals

To support this BMP, GE has evaluated the segments of the site-wide storm sewer system that may be located within the seasonal high groundwater table. GE used available information of pipe invert elevations and nearby monitoring well groundwater elevation data to perform this assessment. This evaluation identified that the pipe segments listed in Table 5-10 may be located within the seasonal high groundwater level. Based on the cleaning and inspection activities described above, GE will evaluate whether these pipe segments require rehabilitation in the form of slip lining to eliminate the potential for groundwater infiltration. Under the prior NPDES permit, GE performed stormwater infrastructure improvements that eliminated dry-weather flows in these drainage basins. While GE has not observed infiltration attributable to GE within these drainage basins for several years, slip-lining activities will be focused on degraded pipe sections with the potential for groundwater I/I. The locations of potential areas for slip lining are shown on Figures 5-1 and 5-2.

Table 5-10
Summary of Potential Stormwater Pipe Sections to be Slip Lined

Drainage Basin	Affected Outfalls	Stormwater Pipe Section
005N	005/05A/05B/006/06A	5NE-1C to 5N-3, 5NB-1 to 5N-3, and 5N-2 to 5N-3
005S	005/05A/05B	5SC-13 to 5SC-12, 5SC-12 to 5SC-11, 5SC-11 to 5SC-10, 5SC-3A to 5SC-3A1, and 5SC-3A1 to 5SC-3A
009	009	9B-8 to 9B-9

In addition, the entirety of the storm sewer system will be evaluated for infrastructure improvements based on the results of the stormwater pipe cleaning and video inspection described in Section 5.3.4.1.A. Any such additional areas that may be subject to rehabilitation will be addressed under GE's long-term BMP activities described in Section 5.3.4.2.

D. OWS Inspection and Cleaning

GE will perform inspection and cleaning activities at OWSs 64Z, 64X, 64W, and 119W to enhance their operational effectiveness. Cleaning activities will be performed in 2026 following the completion of spring site-wide roadway sweeping activities. The cleaning will include sediment removal and pressure washing of all interior surfaces of the OWSs. In addition, GE will perform quarterly inspections of each OWS, including observations of proper functioning of mechanical equipment and signs of excessive debris accumulation. Future sediment removal and cleaning of the OWSs will be performed annually. The results of the cleaning activities will be used to assess the typical sedimentation observed on an annual basis and identify the need for adjustments in the frequency of cleaning. Additional details regarding the OWS are provided in GE's SWPPP provided in Appendix A.

E. Stormwater Flow Reductions – Impervious Cover Reductions

GE will endeavor to reduce impervious cover surfaces within the Facility in an effort to decrease stormwater flow volumes. These measures may include adding a soil/vegetative cover over impervious areas such as building floor slabs and asphalted areas. To date, GE has evaluated the former Building 12 Complex and determined that the installation of a soil/vegetative cover will result in stormwater flow reductions by removing approximately 4.78 acres of impervious cover. The installation of the soil cover over the former Building 12 Complex is proposed to occur in the fall of 2025, and details showing lateral extent of grass placement, access road configuration, and other site-specific information are shown in the attached Figures 5-3a and 5-3b. GE will further evaluate impervious covers across the Facility for areas where the conversion of surface cover from impervious to permeable would result in appreciable stormwater flow reductions. GE will perform such additional evaluations in Drainage Area 005N (including the former Building 14 Complex), Drainage Area 005S, and Drainage Area 009 as part of the longer-term BMPs, as described in Section 5.3.4.2.B.

G. Abandonment of Existing Stormwater Sewer Piping

GE will review and evaluate the potential to further reduce the size of the existing storm sewer network, taking into consideration the hydraulic model and other site-specific factors. GE may propose abandonment activities for certain pipe segments as part of future rehabilitation efforts.

5.3.4.2 Long-Term BMPs to be Evaluated

The longer-term BMPs described in this section are focused on decreasing stormwater inputs and reducing the potential for further groundwater infiltration into GE's storm sewer system, if observed.[6]

A. Stormwater I/I Reductions

GE will use the results of the video inspection activities to identify severely degraded stormwater piping or infrastructure and potential sources of I/I from segments above the seasonal high-water table. GE will evaluate these segments to determine which segments may be candidates for repair or rehabilitation. GE will also evaluate the condition of manholes and catch basins within the system for structures that are degraded and/or potentially contribute to I/I. GE will provide EPA with a report summarizing these stormwater infrastructure evaluations and a schedule for proposed stormwater repairs (i.e., pipe segments and manholes/catch basins) in the first annual report described in Section 6.

B. Stormwater Flow Reductions – Impervious Cover Reductions

GE will attempt to reduce the impervious cover in Drainage Areas 005N, 005S, and 009, thereby resulting in a decrease of discharge from the stormwater system. To achieve this end, GE will evaluate those drainage basins to determine whether the current impervious cover can be converted to a permeable cover (i.e., soil/vegetation). As described above, GE has already evaluated the former Building 12 Complex and determined that the installation of a soil/vegetative cover will result in stormwater flow reductions and will not impede the continued Facility operations (i.e., at Building 100). GE will perform similar evaluations in Drainage Areas 005N, 005S, and 009, including areas of former building slabs, asphalted/gravel parking areas, access roadways, etc. GE will also evaluate the use of "riparian" corridors in areas where converting entire building slabs, parking lots, etc. from an impervious to a permeable cover is not feasible. GE anticipates initiating these evaluations in 2026 and providing a summary of the areas that could be converted to a permeable cover in the next annual report following completion of the evaluations

C. Flow Evaluations for Future Modifications of the East Street Diversion Structure Bypass/Outfall SRO5

Stormwater from a portion of East Street Area 2-North flows through the East Street Diversion Structure (see Figure 2-4) prior to being conveyed to OWS 64Z for treatment. During high-flow stormwater conditions (i.e., flow greater than approximately 800 gpm), stormwater is bypassed at the East Street Diversion Structure and combines with City stormwater from East Street and Newell Street. These stormwater flows are then either conveyed back onto GE property, treated at OWS 64X and discharged through Outfall 006 or, for stormwater flows greater than approximately 2,100 gpm, bypassed at Manhole 6A-3 (see Figure 2-4) and discharged through Outfall SRO5. Elimination of the bypass would substantially remove GE stormwater from commingling with the City's East Street and

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[6] In addition to these longer-term BMPs to address stormwater, GE will evaluate longer-term BMPs for operation and maintenance of the Building 64T WTP, such as media replacement, to enhance its effectiveness.

Newell Street stormwater. This would allow the City to discharge all City-related stormwater collected in East Street and Newell Street through Outfall SRO5. Evaluations will be conducted using direct measurements of flow and/or the Facility hydraulic model described in Section 5.3.3 to investigate the potential and options to eliminate the East Street Diversion Structure bypass. GE will also need to discuss these efforts with the City of Pittsfield for concurrence. It is anticipated that this evaluation and discussions with the City will begin after substantial completion of prior short-term flow reduction measures. GE will provide updates on these activities in subsequent reports.

5.3.4.3 Recurring Best Management Practices

Recurring BMPs that will be implemented at the Facility will consist of continuation of non-numeric controls described in Section 2.3.1 of this Work Plan and in Section 3 of the revised SWPPP provided in Appendix A. In particular, as described in Section 3.2 of the revised SWPPP, GE will perform the following recurring BMPs on a regular basis:

- All manholes and catch basins located at the Facility (approximately 360 structures) will be inspected and cleaned. This inspection and cleaning will be conducted annually for approximately 90 structures per year, performed rotationally, so that each structure is cleaned, at a minimum, once every four years.
- OWS 64Z, 64X, 64W, and 119W will be cleaned annually, beginning in 2026, which represents an increase in the cleaning frequency compared to prior years. Future sediment cleaning events will be evaluated to determine whether the cleaning frequency can be reduced as other BMPs are being implemented concurrently.
- Roadways will be regularly swept to reduce the amount of material that could be conveyed into the stormwater system. Roadway sweeping will be performed on a semiannual basis (spring and fall) or more frequently as needed.
- Catch basin filter bags will be installed at locations with the potential to collect roadway and impervious cover materials and debris, primarily at locations to be selected in high-traffic areas within Drainage Basins 005, 009, YD10, YD12, and YD16. These filter bags will be inspected monthly for a period of one year to determine their effectiveness at removing solids. The results of the inspections will be used to evaluate and propose changes in locations, usage, or inspection frequency. These locations are shown on Figures 5-4 through 5-8.

Additional details regarding each of these recurring BMPs are provided in Section 3.2 of the revised SWPPP.

5.4 SWPPP Development and Implementation

Section 2.9.2.b of the SOW modification requires that this Work Plan provide details regarding the development and implementation of a revised SWPPP. Instead, GE has developed a revised SWPPP to address water quality improvements at the Facility. As noted above, that revised SWPPP is provided in Appendix A. Similar to the prior version, the revised SWPPP has been organized to discuss the design, installation/operation, and maintenance of control measures (including BMPs) to minimize pollutant discharges. The SWPPP contains information about potential pollutant sources, details non-numeric stormwater control measures (i.e., BMPs), outlines stormwater monitoring and inspections, and discusses SWPPP modifications and corrective actions. This SWPPP will be modified further over time as various BMPs or control measures are implemented or adjusted.

5.5 Operation of Treatment Systems

Operation of the Building 64G GWTF, the Building 64T WTP, and OWSs 64Z, 64W, 64X, and 119W will be conducted in compliance with the applicable substantive requirements of the Massachusetts operation, maintenance, and pretreatment standards for wastewater treatment works (310 CMR 12.00)

In addition, GE will ensure that operation of the Building 64G GWTF, the Building 64T WTP, and the above-listed OWSs is conducted by appropriately trained and qualified wastewater treatment system operators. Specifically, those operators will be required to be appropriately trained and have prior job experience with the systems and components included in the treatment process, be trained on those facilities' Operation and Maintenance Plans, and be familiar with contingency and emergency response actions.

6 Reporting

Summary tables of surface water discharge analytical results received each month will be provided in GE's monthly progress reports under the CD. In the event that there is an exceedance of a numeric effluent limit, GE will investigate the root cause of that exceedance and provide a written summary to EPA within 30 days of receipt of the laboratory results. That summary will include any recommendation(s) for modification of operations or BMPs as needed.

Separately, GE will prepare an annual summary report on the surface water discharge program. That report will include the following:

- Tabular and graphical summaries of flow, precipitation, and laboratory analytical results for all parameters (PCBs, TSS, O&G, pH, VOCs, and SVOCs, as applicable) for each outfall;
- Summaries and status updates on implementation of short-term BMPs and status of long-term BMP evaluations;
- Evaluations of the effectiveness of the numeric and non-numeric effluent limitations, BMPs, and the sampling program, including the identification of any data gaps;
- A proposal for any modifications or additions to the effluent limitations, BMPs, and/or sampling requirements or procedures; and
- If warranted, a proposal for any other modifications to the overall surface water discharge monitoring and control program described in this Work Plan.

The annual report will be provided to EPA by April 1 of the year following the completion of the subject activities. At that time, GE will also provide an updated version of the SWPPP if there are significant changes requiring updates.

7 References

Arcadis, 2011. *Dry Weather Ambient Monitoring Plan*. Prepared for General Electric Company, Pittsfield, Massachusetts. November 2011.

Arcadis, 2023. *Field Sampling Plan/Quality Assurance Project Plan*. GE-Pittsfield/Housatonic River Site Prepared for General Electric Company, Pittsfield, Massachusetts. Revised December 21, 2023.

Arcadis, 20244. *Project Operations Plan*. GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised November 2024.

EPA and GE (U.S. Environmental Protection Service and General Electric Company), 2000. Consent Decree in *United States of America, State of Connecticut, and Commonwealth of Massachusetts v. General Electric Company*. Civil Action Nos. 99-30225, 99-30226, 99-30227-MAP, entered by the United States District Court for the District of Massachusetts. October 27, 2000.

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Tables

Table 3-1
Applicable or Relevant and Appropriate Requirements

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to be Taken to Comply with ARARs[1]
Chemical-Specific ARARs				
Federal ARARs				
None				
State ARARs				
Numeric Massachusetts Water Quality Criteria for PCBs – Massachusetts Surface Water Quality Standards	314 CMR 4.05	Establishes water quality standards for various pollutants in surface water. Those for PCBs are: • Freshwater chronic aquatic life criterion (based on protection of mink): 0.014 µg/L. • Human Health criterion based on human consumption of water and organisms: 0.000064 µg/L.	Relevant and appropriate for setting effluent limitations for point source discharges to surface water	These water quality standards have been considered in setting numeric and non-numeric effluent limitations for the surface water discharge program. See first Clean Water Act entry on next page. The human health criterion of 0.000064 µg/L based on human consumption of water and organisms should be waived by EPA, as EPA has done for the Rest of River remedy, on the ground that achievement of that ARAR is technically impracticable to reliably measure or attain in the receiving waters.
To Be Considered				
Clean Water Act, National Recommended Water Quality Criteria for PCBs	National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047, EPA Office of Water, Office of Science and Technology (Nov. 2002).	Establishes national recommended surface water quality criteria for various pollutants. Those for PCBs are: • Freshwater chronic aquatic life criterion (based on protection of mink): 0.014 µg/L. • Human health criterion based on human consumption of water and organisms: 0.000064 µg/L.	To be considered	See the above entry for the Massachusetts Water Quality Standards.
Location-Specific ARARs				
Federal ARARs				
None				

Table 3-1
Applicable or Relevant and Appropriate Requirements

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to be Taken to Comply with ARARs[1]
State ARARs				
None				
Action-Specific ARARs				
Federal ARARs				
Clean Water Act and National Pollutant Discharge Elimination System (NPDES) Regulations	33 USC 1342 40 CFR 122, including, but not limited to, 122.3(d) and 122.44 40 CFR 125.1-125.3	Each NPDES permit must require point source discharges to meet technology-based effluent limitations, water quality-based effluent limitations/ requirements necessary to meet state water quality standards, certain minimum monitoring requirements, and other specified requirements, except that discharges in compliance with instructions of the EPA On-Scene Coordinator (OSC) are exempt from these requirements (122.3(d)).	Not directly applicable because no NPDES permit is required, but relevant and appropriate for setting effluent limitations and other requirements for point source discharges to surface water.	The surface water discharge program includes numeric and non-numeric effluent limitations, monitoring and reporting requirements, and other requirements, as specified in the Surface Water Discharge Work Plan. Upon EPA approval, those effluent limitations and other requirements will constitute OSC instructions. Point source discharges from the GE Facility will be in compliance with those OSC instructions.
Clean Water Act – NPDES Regulations (stormwater discharges)	40 CFR 122.44(k) See also 40 CFR 122.26(c)(ii) for stormwater discharges associated with small construction activity	Best management practices (BMPs) must be employed to control pollutants in stormwater discharges.	Not directly applicable because no NPDES permit is required, but relevant and appropriate to stormwater discharges to surface water.	The surface water discharge program will include short-term, long-term, and recurring BMPs to address stormwater discharges and thus will comply with these requirements.
Toxic Substances Control Act (TSCA) Regulations on Discharge of PCB-containing Water	40 CFR 761.50(a)(3)	Prohibits discharge of water containing PCBs to navigable waters unless PCB concentration is <3 mg/L or discharge is in accordance with NPDES discharge limits.	Applicable	Discharges to navigable waters from the GE Facility will comply with this provision.

Table 3-1
Applicable or Relevant and Appropriate Requirements

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to be Taken to Comply with ARARs[1]
TSCA Regulations on PCB Storage	40 CFR 761.65(a)&(b)	Establishes requirements for the storage of PCB waste containing ≥50 ppm PCBs.	Applicable to the solids residue generated by the Building 64G Groundwater Treatment Facility (GWTF)	The storage of the PCB-containing solids residue at the Building 64G GWTF meets the substantive requirements of these regulations.
TSCA Regulations on Decontamination	40 CFR 761.79	Establishes decontamination standards and procedures for removing PCBs from water, organic liquids, and various types of surfaces.	Applicable	Any decontamination activities conducted as part of the surface water discharge program will comply with these requirements.
State ARARs				
Massachusetts Operation, Maintenance, and Pretreatment Standards for Wastewater Treatment Works	310 CMR 12.00	Establishes operation, maintenance, and pretreatment requirements for wastewater treatment works	Applicable to Building 64G GWTF, Building 64T WTP. and OWSs 64Z, 64W, 64X, 119W	GE will comply with the applicable substantive requirements of these regulations in the operation and maintenance of Building 64G GWTF, the Building 64T WTP, and OWSs 64Z, 64W, 64X, 119W.
Massachusetts Hazardous Waste Regulations on Identification and Listing of Hazardous Waste	310 CMR 30.100	Establishes criteria and lists for determining whether a waste is a hazardous waste under state law. Note: Waste containing PCBs at a concentration equal to or greater 50 mg/kg constitutes a listed hazardous waste under the Massachusetts regulations, but the Massachusetts hazardous waste regulations do not apply to facilities for such waste that comply with EPA's TSCA regulations (see 310 CMR 30.501(3)(a)).	Applicable to the solids residue generated by the Building 64G GWTF	The solids residue generated by the treatment process at the Building 64G GWTF contains PCBs at concentrations ≥50 ppm. However, that storage complies with the applicable TSCA regulations on storage of PCB waste (in 40 CFR 761.65) and thus is not subject to the location, storage, or management requirements of the Massachusetts hazardous waste regulations. The surface water discharge program does not involve waste that would be considered hazardous on any other basis.

Table 3-1
Applicable or Relevant and Appropriate Requirements

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to be Taken to Comply with ARARs[1]
Massachusetts Hazardous Waste Regulations for Generators	310 CMR 30.305	Requires generators of state-listed hazardous waste to send such waste only to certain authorized facilities. (This requirement is an exception to the above-referenced PCB exemption from the Massachusetts hazardous waste regulations.)	Applicable to the off-site transport of solids residue generated at the Building 64G GWTF	GE complies with these requirements as applicable to the solids residue generated at the Building 64G GWTF.

Notes:

1. Compliance with ARARs refers to compliance with the substantive requirements, criteria, or limitations of each provision, not any administrative or procedural requirements therein.

ARAR: applicable or relevant and appropriate requirement
BMP: best management practice
CFR: Code of Federal Regulations
CMR: Code of Massachusetts Regulations
EPA:. U.S. Environmental Protection Agency
GWTF: Groundwater Treatment Facility
mg/L: milligram per kilogram
µg/L: microgram per liter
NPDES: National Pollutant Discharge Elimination System
OSC: On-Scene Coordinator
OWS: oil/water separator
PCB: polychlorinated biphenyl
ppm: parts per million
TSCA: Toxic Substances Control Act
USC: United States Code
WTP: Water Treatment Plan

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,2,4-Trichlorobenzene	2018	0	24	0	0
	2019	4.82	22	1	5
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,2-Dichlorobenzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,2-Diphenylhydrazine	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,3-Dichlorobenzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,4-Dichlorobenzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0.328	22	1	5
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
2,2'-Oxybis (1-chloropropane)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2,4,6-Trichlorophenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
2,4-Dichlorophenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
2,4-Dimethylphenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2,4-Dinitrophenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
2,4-Dinitrotoluene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2,6-Dinitrotoluene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
2-Chloronaphthalene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
2-Chlorophenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2-Nitrophenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
3,3'-Dichlorobenzidine	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
4-Bromophenyl-phenyl ether	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
4-Chloro-3-methylphenol	2018	0	14	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
4-Chlorophenyl phenyl ether	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
4-Methylphenol (p-Cresol)	2018	0	10	0	0
4-Nitrophenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Benzidine	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Bis(2-chloroethoxy)methane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Bis(2-chloroethyl)ether	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Bis(2-ethylhexyl)phthalate	2018	0	24	0	0
	2019	187	22	2	9
	2020	0	22	0	0
	2021	1.46	24	1	4
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Butylbenzyl phthalate	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Di-n-butyl phthalate	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	22.4	19	2	11
	2023	0	24	0	0
	2024	0	20	0	0
	2025	37	12	1	8

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Di-n-octyl phthalate	2018	1.97	24	1	4
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Diethyl phthalate	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	3.52	24	1	4
	2024	0	20	0	0
	2025	0	12	0	0
Dimethyl phthalate	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	2018	3.19	24	1	4
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Hexachlorobenzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Hexachlorocyclopentadiene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Hexachloroethane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Isophorone	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
n-Nitrosodi-n-propylamine	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
n-Nitrosodimethylamine	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
n-Nitrosodiphenylamine	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Nitrobenzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Pentachlorophenol	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Phenol	2018	0	24	0	0
	2019	5.41	22	1	5
	2020	0	22	0	0
	2021	0	24	0	0
	2022	5.61	19	1	5
	2023	2.78	24	1	4
	2024	0	20	0	0
	2025	0	12	0	0
Total SVOC	2018	5.16	25	1	4
	2019	187	22	4	18
	2020	0	22	0	0
	2021	1.46	24	1	4
	2022	22.4	19	3	16
	2023	2.78	24	1	4
	2024	0	20	0	0
	2025	37	12	1	8

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,1,1-Trichloroethane	2018	0	24	0	
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,1,2,2-Tetrachloroethane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,1,2-Trichloroethane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,1-Dichloroethane	2018	0.521	24	10	42
	2019	0.546	22	9	41
	2020	0.749	22	11	50
	2021	0.577	24	8	33
	2022	0.664	19	10	53
	2023	0.407	24	7	29
	2024	0.563	20	11	55
	2025	0	12	0	0
1,1-Dichloroethene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,2-Dichloroethane	2018	0	13	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,2-Dichloroethene	2018	0	11	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,2-Dichloroethene, trans-	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,2-Dichloropropane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
1,3-Dichloropropene	2018	0	10	0	0
1,3-Dichloropropene, cis-	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,3-Dichloropropene, trans-	2018	0	14	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
2-Chloroethylvinyl ether	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Acrolein	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Acrylonitrile	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Benzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Bromodichloromethane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Bromoform (Tribromomethane)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Bromomethane (Methyl bromide)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Carbon tetrachloride (Tetrachloromethane)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Chlorobenzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Chloroethane	2018	1.39	24	17	71
	2019	1.11	22	12	55
	2020	1.09	22	8	36
	2021	0.612	24	12	50
	2022	0.624	19	13	68
	2023	4.36	24	8	33
	2024	0.605	20	9	45
	2025	0.431	12	4	33
Chloroform	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Chloromethane	2018	0.297	24	1	4
	2019	0	22	0	0
	2020	0.401	22	1	5
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Dibromochloromethane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Dichlorodifluoromethane	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Dichloromethane (Methylene chloride)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Ethylbenzene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Tetrachloroethene (PCE)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Toluene	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Trichloroethene (TCE)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0

Table 4-6a

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Building 64G

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Trichlorofluoromethane (Fluorotrichloromethane)	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Vinyl chloride	2018	0	24	0	0
	2019	0	22	0	0
	2020	0	22	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	24	0	0
	2024	0	20	0	0
	2025	0	12	0	0
Total VOC	2018	1.6	25	14	56
	2019	1.11	22	15	68
	2020	1.84	22	13	59
	2021	1.05	24	14	58
	2022	1.15	19	14	74
	2023	4.36	24	12	50
	2024	1.17	20	13	65
	2025	0.431	12	4	33

Note:

µg/L: microgram per liter

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,2,4-Trichlorobenzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,2-Dichlorobenzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,2-Diphenylhydrazine	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,3-Dichlorobenzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0.238	12	1	8
1,4-Dichlorobenzene	2018	1.2	16	13	81
	2019	0.656	21	14	67
	2020	0.53	19	12	63
	2021	1.07	24	13	54
	2022	0.452	20	14	70
	2023	1.04	24	12	50
	2024	0.664	24	16	67
	2025	1.57	12	10	83
2,2'-Oxybis (1-chloropropane)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2,4,6-Trichlorophenol	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
2,4-Dichlorophenol	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
2,4-Dimethylphenol	2018	0	16	0	0
	2019	1.7	21	1	5
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2,4-Dinitrophenol	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
2,4-Dinitrotoluene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
2,6-Dinitrotoluene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2-Chloronaphthalene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
2-Chlorophenol	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
2-Nitrophenol	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
3,3'-Dichlorobenzidine	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
4-Bromophenyl-phenyl ether	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
4-Chloro-3-methylphenol	2018	0	4	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
4-Chlorophenyl phenyl ether	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
4-Methylphenol (p-Cresol)	2018	0	12	0	0
4-Nitrophenol	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Benzidine	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Bis(2-chloroethoxy)methane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Bis(2-chloroethyl)ether	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Bis(2-ethylhexyl)phthalate	2018	0	16	0	0
	2019	106	21	2	10
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Butylbenzyl phthalate	2018	0	16	0	0
	2019	1.15	21	1	5
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Di-n-butyl phthalate	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	15.9	19	2	11
	2023	2.29	23	1	4
	2024	0	24	0	0
	2025	28.6	12	1	8
Di-n-octyl phthalate	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Diethyl phthalate	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Dimethyl phthalate	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Hexachlorobenzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Hexachlorocyclopentadiene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Hexachloroethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Isophorone	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
n-Nitrosodi-n-propylamine	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
n-Nitrosodimethylamine	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
n-Nitrosodiphenylamine	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Nitrobenzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Pentachlorophenol	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Phenol	2018	3.17	16	1	6
	2019	18.1	21	1	5
	2020	0	18	0	0
	2021	0	24	0	0
	2022	5.16	19	1	5
	2023	12.2	23	1	4
	2024	0	24	0	0
	2025	0	12	0	0
Total SVOC	2018	3.17	29	13	45
	2019	106	21	4	19
	2020	0	18	0	0
	2021	0	24	0	0
	2022	15.9	19	3	16
	2023	12.2	23	1	4
	2024	0	24	0	0
	2025	28.6	12	1	8
1,1,1-Trichloroethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,1,2,2-Tetrachloroethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,1,2-Trichloroethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,1-Dichloroethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,1-Dichloroethene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,2-Dichloroethane	2018	0	4	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,2-Dichloroethene	2018	0	12	0	0
1,2-Dichloroethene, trans-	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
1,2-Dichloropropane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,3-Dichloropropene	2018	0	12	0	0
1,3-Dichloropropene, cis-	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
1,3-Dichloropropene, trans-	2018	0	4	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
2-Chloroethylvinyl ether	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Acrolein	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Acrylonitrile	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Benzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Bromodichloromethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Bromoform (Tribromomethane)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0.322	12	1	8

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Bromomethane (Methyl bromide)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Carbon tetrachloride (Tetrachloromethane)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Chlorobenzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0.283	24	2	8
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Chloroethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Chloroform	2018	0.93	16	2	13
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0.6	24	1	4
	2024	0.58	24	1	4
	2025	0	12	0	0
Chloromethane	2018	0.326	16	2	13
	2019	0	21	0	0
	2020	0.296	19	1	5
	2021	0.323	24	2	8
	2022	0.35	20	1	5
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Dibromochloromethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Dichlorodifluoromethane	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Dichloromethane (Methylene chloride)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Ethylbenzene	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	18	0	0
	2021	0	24	0	0
	2022	0	19	0	0
	2023	0	23	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Tetrachloroethene (PCE)	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Table 4-6b

Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Toluene	2018	0.87	16	4	25
	2019	0.702	21	4	19
	2020	0	19	0	0
	2021	0.554	24	6	25
	2022	0.343	20	1	5
	2023	0.263	24	2	8
	2024	0	24	0	0
	2025	0.416	12	1	8
Total VOC	2018	2.66	29	20	69
	2019	1.29	21	17	81
	2020	1.36	19	14	74
	2021	1.54	24	14	58
	2022	0.686	20	17	85
	2023	1.25	24	15	63
	2024	3.08	24	16	67
	2025	2.31	12	12	100
Trichloroethene (TCE)	2018	0.27	16	1	6
	2019	0.453	21	3	14
	2020	0.662	19	2	11
	2021	0	24	0	0
	2022	0.239	20	1	5
	2023	0.347	24	3	13
	2024	2.8	24	5	21
	2025	1.99	12	2	17

Table 4-6b
Summary of Volatile Organic Compounds and Semi-Volatile Organic Compounds, Drainage Area 006 (Dry Weather Samples)

Analyte	Year	Maximum Concentration (µg/L)	Number of Samples Analyzed	Number of Detects	Frequency of Detection (%)
Trichlorofluoromethane (Fluorotrichloromethane)	2018	0.565	16	4	25
	2019	0.268	21	1	5
	2020	0.696	19	3	16
	2021	0	24	0	0
	2022	0.315	20	1	5
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0
Vinyl chloride	2018	0	16	0	0
	2019	0	21	0	0
	2020	0	19	0	0
	2021	0	24	0	0
	2022	0	20	0	0
	2023	0	24	0	0
	2024	0	24	0	0
	2025	0	12	0	0

Note:

µg/L: microgram per liter

Table 5-9
Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
Standard Methods				
1664B (HEM)	Oil and Grease, Total		1600	5000
SM 2540D-2015	TSS		NA	1000
PCBs				
Modified 8082	Aroclor – 1016		0.014	0.0162
Modified 8083	Aroclor – 1260		0.014	0.0162
Modified 8084	Aroclor – 1242		0.014	0.0162
Modified 8085	Aroclor – 1248		0.014	0.0162
Modified 8086	Aroclor – 1232		0.014	0.0162
Modified 8087	Aroclor – 1254		0.014	0.0162
Modified 8088	Aroclor – 1221		0.014	0.0162
VOCs				
8260D	1,1,1,2-TETRACHLOROETHANE	630-20-6	0.2	1.0
8260D	1,1,1-TRICHLOROETHANE	71-55-6	0.2	1.0
8260D	1,1,2,2-TETRACHLOROETHANE	79-34-5	0.2	1.0
8260D	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON 113)	76-13-1	0.2	1.0
8260D	1,1,2-TRICHLOROETHANE	79-00-5	0.2	1.0
8260D	1,1-DICHLOROETHANE	75-34-3	0.2	1.0
8260D	1,1-DICHLOROETHENE	75-35-4	0.2	1.0
8260D	1,1-DICHLOROPROPENE	563-58-6	0.2	1.0
8260D	1,2,3-TRICHLOROBENZENE	87-61-6	0.25	1.0
8260D	1,2,3-TRICHLOROPROPANE	96-18-4	0.26	1.0
8260D	1,2,4-TRICHLOROBENZENE	120-82-1	0.34	1.0
8260D	1,2,4-TRIMETHYLBENZENE	95-63-6	0.2	1.0
8260D	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	0.22	2.0
8260D	1,2-DIBROMOETHANE	106-93-4	0.2	1.0
8260D	1,2-DICHLORO-1,1,2-TRIFLUOROETHANE (FREON 123A)	354-23-4	0.2	1.0
8260D	1,2-DICHLOROBENZENE	95-50-1	0.2	1.0
8260D	1,2-DICHLOROETHANE	107-06-2	0.2	1.0

Table 5-9
Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8260D	1,2-DICHLOROETHENE, TOTAL	540-59-0	0.35	2.0
8260D	1,2-DICHLOROPROPANE	78-87-5	0.2	1.0
8260D	1,3,5-TRICHLOROBENZENE	108-70-3	0.27	1.0
8260D	1,3,5-TRIMETHYLBENZENE	108-67-8	0.2	1.0
8260D	1,3-DICHLOROBENZENE	541-73-1	0.2	1.0
8260D	1,3-DICHLOROPROPANE	142-28-9	0.2	1.0
8260D	1,4-DICHLOROBENZENE	106-46-7	0.2	1.0
8260D	1,4-DIOXANE	123-91-1	6.4	100
8260D	1-BUTANOL (N-BUTANOL)	71-36-3	55	100
8260D	1-CHLORO-4-(TRIFLUOROMETHYL) BENZENE(=4-CHLOROBENZOFLUORIDE)	98-56-6	0.22	1.0
8260D	2,2-DICHLORO-1,1,1-TRIFLUOROETHANE (FREON 123)	306-83-2	0.2	1.0
8260D	2,2-DICHLOROPROPANE	594-20-7	0.24	1.0
8260D	2,3,6-TRICHLOROTOLUENE	2077-46-5	0.9	5.0
8260D	2,4,5-TRICHLOROTOLUENE	6639-30-1	1.11	5.0
8260D	2,4-, 2,5-, and 2,6-DICHLOROTOLUENE COELUTION	CASID39497	0.59	1.5
8260D	2,4-DICHLOROBENZOTRIFLUORIDE	320-60-5	0.49	1.0
8260D	2,5-DICHLOROBENZOTRIFLUORIDE	320-50-3	0.3	1.0
8260D	2-BUTANONE (MEK)	78-93-3	0.78	5.0
8260D	2-CHLORO-1,3-BUTADIENE (CHLOROPRENE)	126-99-8	0.2	1.0
8260D	2-CHLOROBENZOTRIFLUORIDE	88-16-4	0.2	1.0
8260D	2-CHLOROETHYLVINYL ETHER	110-75-8	0.53	1.0
8260D	2-CHLOROTOLUENE	95-49-8	0.2	1.0
8260D	2-HEXANONE	591-78-6	0.2	5.0
8260D	2-METHYL-1-PROPANOL (ISOBUTLYL ALC)	78-83-1	5.8	40
8260D	2-METHYL-2-PROPANOL (TERTBUTYL ALC)	75-65-0	6	40
8260D	2-PROPANOL	67-63-0	22	40
8260D	3,4- and 2,3-DICHLOROTOLUENE COELUTION	CASID39496	0.62	1.0
8260D	3,4-DICHLOROBENZOTRIFLUORIDE	328-84-7	0.33	1.0
8260D	3-CHLOROBENZOTRIFLUORIDE	98-15-7	0.2	1.0

Table 5-9
Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8260D	3-CHLOROTOLUENE	108-41-8	0.2	1.0
8260D	4-CHLOROTOLUENE	106-43-4	0.2	1.0
8260D	4-ISOPROPYLTOLUENE	99-87-6	0.2	1.0
8260D	4-METHYL-2-PENTANONE (MIBK)	108-10-1	0.2	5.0
8260D	ACETONE	67-64-1	5	5.0
8260D	ACETONITRILE-ALLYL CHLORIDE COELUTION	5-05-8/107-0	5.2	10
8260D	ACROLEIN	107-02-8	3.1	10
8260D	ACRYLONITRILE	107-13-1	0.9	10
8260D	BENZENE	71-43-2	0.2	1.0
8260D	BROMOBENZENE	108-86-1	0.2	1.0
8260D	BROMOCHLOROMETHANE	74-97-5	0.2	1.0
8260D	BROMODICHLOROMETHANE	75-27-4	0.2	1.0
8260D	BROMOFORM	75-25-2	0.25	1.0
8260D	BROMOMETHANE	74-83-9	0.7	1.0
8260D	CARBON DISULFIDE	75-15-0	0.42	1.0
8260D	CARBON TETRACHLORIDE	56-23-5	0.34	1.0
8260D	CHLOROBENZENE	108-90-7	0.2	1.0
8260D	CHLOROETHANE	75-00-3	0.23	1.0
8260D	CHLOROFORM	67-66-3	0.51	1.0
8260D	CHLOROMETHANE	74-87-3	0.4	1.0
8260D	CIS-1,2-DICHLOROETHENE	156-59-2	0.23	1.0
8260D	CIS-1,3-DICHLOROPROPENE	10061-01-5	0.2	1.0
8260D	CYCLOHEXANE	110-82-7	0.3	1.0
8260D	CYCLOHEXANONE	108-94-1	4.6	20
8260D	DIBROMOCHLOROMETHANE	124-48-1	0.2	1.0
8260D	DIBROMOMETHANE	74-95-3	0.2	1.0
8260D	DICHLORODIFLUOROMETHANE (FREON 12)	75-71-8	0.21	1.0
8260D	DICHLOROFLUOROMETHANE (FREON 21)	75-43-4	0.2	1.0
8260D	DICHLOROMETHANE	75-09-2	0.65	1.0

Table 5-9
Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8260D	DIETHYL ETHER	60-29-7	0.2	1.0
8260D	DIISOPROPYL ETHER (DIPE)	108-20-3	0.2	1.0
8260D	ETHYL ACETATE	141-78-6		2.0
8260D	ETHYL METHACRYLATE	97-63-2	0.2	2.0
8260D	ETBE	637-92-3	0.2	1.0
8260D	ETHYLBENZENE	100-41-4	0.2	1.0
8260D	HEXACHLOROBUTADIENE	87-68-3	0.33	2.0
8260D	IODOMETHANE	74-88-4	4.3	5.0
8260D	ISOPROPYLBENZENE	98-82-8	0.2	1.0
8260D	M+P-XYLENE	179601-23-1	0.25	2.0
8260D	METHACRYLONITRILE	126-98-7	0.26	2.0
8260D	METHYL ACETATE	79-20-9	0.37	2.0
8260D	METHYL METHACRYLATE	80-62-6	0.2	2.0
8260D	METHYLCYCLOHEXANE	108-87-2	0.2	1.0
8260D	METHYL-TERT-BUTYL ETHER (MTBE)	1634-04-4	0.2	1.0
8260D	NAPTHALENE	91-20-3	0.55	1.0
8260D	N-BUTYLACETATE	123-86-4	0.2	1.0
8260D	N-BUTYLBENZENE	104-51-8	0.2	1.0
8260D	N-HEPTANE	142-82-5	0.26	1.0
8260D	N-PROPYLBENZENE	103-65-1	0.2	1.0
8260D	O-XYLENE	95-47-6	0.2	1.0
8260D	PROPIONITRILE	107-12-0	1.3	5.0
8260D	SEC-BUTYLBENZENE	135-98-8	0.2	1.0
8260D	STYRENE	100-42-5	0.2	1.0
8260D	TAME	994-05-8	0.2	1.0
8260D	TERT-BUTYLBENZENE	98-06-6	0.2	1.0
8260D	TETRACHLOROETHENE	127-18-4	0.21	1.0
8260D	TETRAHYDROFURAN	109-99-9	0.77	2.0
8260D	TOLUENE	108-88-3	0.2	1.0

Table 5-9
Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8260D	TRANS-1,2-DICHLOROETHENE	156-60-5	0.2	1.0
8260D	TRANS-1,3-DICHLOROPROPENE	10061-02-6	0.23	1.0
8260D	TRANS-1,4-DICHLORO-2-BUTENE	110-57-6	0.78	1.0
8260D	TRICHLOROETHENE	79-01-6	0.2	1.0
8260D	TRICHLOROFLUOROMETHANE (FREON 11)	75-69-4	0.24	1.0
8260D	VINYL ACETATE	108-05-4	1.1	2.0
8260D	VINYL CHLORIDE	75-01-4	0.2	1.0
8260D	XYLENES, TOTAL	1330-20-7	0.23	3.0
8260D-SURR	1,2-DICHLOROETHANE-D4-SURR	17060-07-0	NA	NA
8260D-SURR	4-BROMOFLUOROBENZENE-SURR	460-00-4	NA	NA
8260D-SURR	DIBROMOFLUOROMETHANE-SURR	1868-53-7	NA	NA
8260D-SURR	TOLUENE-D8-SURR	2037-26-5	NA	NA
SVOCs				
8270E	1,2,3,4-TETRACHLOROBENZENE	634-66-2	1.5	5.0
8270E	1,2,4,5-TETRACHLOROBENZENE	95-94-3	1.2	10.0
8270E	1,2,4-TRICHLOROBENZENE	120-82-1	1.2	10.0
8270E	1,2-DICHLOROBENZENE	95-50-1	1.2	10.0
8270E	1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	122-66-7	1.4	10.0
8270E	1,3,5-TRINITROBENZENE	99-35-4	4.4	10.0
8270E	1,3-DICHLOROBENZENE	541-73-1	1.1	10.0
8270E	1,3-DINITROBENZENE	99-65-0	1.8	10.0
8270E	1,4-DICHLOROBENZENE	106-46-7	1.2	10.0
8270E	1,4-NAPHTHOQUINONE	130-15-4	3.6	50.0
8270E	1-METHYL-2-PYRROLIDINONE	872-50-4	1	10.0
8270E	1-METHYLNAPHTHALENE	90-12-0	1.5	10.0
8270E	1-NAPHTHYLAMINE	134-32-7	2	10.0
8270E	2,3,4,6-TETRACHLOROPHENOL	58-90-2	2.7	10.0
8270E	2,3,4-TRICHLOROPHENOL	15950-66-0	1.1	5.0
8270E	2,3,5-TRICHLOROPHENOL	933-78-8	1.4	5.0

Table 5-9

Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8270E	2,3,6-TRICHLOROPHENOL	933-75-5	1	5.0
8270E	2,4,5-TRICHLOROPHENOL	95-95-4	1.1	10.0
8270E	2,4,6-TRICHLOROPHENOL	88-06-2	1.4	10.0
8270E	2,4-DICHLOROPHENOL	120-83-2	1.3	10.0
8270E	2,4-DIMETHYLPHENOL	105-67-9	4.3	10.0
8270E	2,4-DINITROPHENOL	51-28-5	20	50.0
8270E	2,4-DINITROTOLUENE	121-14-2	2.4	10.0
8270E	2,5-DICHLOROPHENOL	538-78-8	1	5.0
8270E	2,6-DICHLOROPHENOL	87-65-0	1.2	10.0
8270E	2,6-DINITROTOLUENE	606-20-2	1.4	10.0
8270E	2-ACETYLAMINOFLUORENE	53-96-3	4.1	10.0
8270E	2-CHLORONAPHTHALENE	91-58-7	1.4	10.0
8270E	2-CHLOROPHENOL	95-57-8	1.1	10.0
8270E	2-METHYL-5-NITROANILINE (5-NITRO-O-TOLUIDINE)	99-55-8	1.9	10.0
8270E	2-METHYLNAPHTHALENE	91-57-6	1.3	10.0
8270E	2-METHYLPHENOL	95-48-7	1	10.0
8270E	2-NAPHTHYLAMINE	91-59-8	1.6	10.0
8270E	2-NITROANILINE	88-74-4	1.4	10.0
8270E	2-NITROPHENOL	88-75-5	1	10.0
8270E	2-PICOLINE	109-06-8	13	50.0
8270E	3,4-DICHLOROPHENOL	95-77-2	1.1	5.0
8270E	3,3'-DICHLOROBENZIDINE	91-94-1	2.7	10.0
8270E	3,3'-DIMETHYLBENZIDINE	119-93-7	18	50.0
8270E	3+4-CHLOROPHENOL		8.1	10.0
8270E	3+4-METHYLPHENOL	06-44-5 + 10	1.2	10.0
8270E	3,5-DICHLOROPHENOL	591-35-5	1.6	5.0
8270E	3-METHYLCHOLANTHRENE	56-49-5	1.5	10.0
8270E	3-NITROANILINE	99-09-2	2.8	10.0
8270E	4,6-DINITRO-2-METHYLPHENOL	534-52-1	8.7	50.0

Table 5-9

Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8270E	4-AMINOBIPHENYL	92-67-1	2.7	10.0
8270E	4-BROMOPHENYL-PHENYLETHER	101-55-3	1.7	10.0
8270E	4-CHLORO-3-METHYLPHENOL	59-50-7	1.1	10.0
8270E	4-CHLOROANILINE	106-47-8	2.6	10.0
8270E	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	1.5	10.0
8270E	4-NITROANILINE	100-01-6	1.4	10.0
8270E	4-NITROPHENOL	100-02-7	6.4	50.0
8270E	4-NITROQUINOLINE-1-OXIDE	56-57-5	17	50.0
8270E	7,12-DIMETHYLBENZ(a)ANTHRACENE	57-97-6	2.7	50.0
8270E	aa-DIMETHYLPHENETHYLAMINE	122-09-8		50.0
8270E	ACENAPHTHENE	83-32-9	1.4	10.0
8270E	ACENAPHTHYLENE	208-96-8	1.4	10.0
8270E	ACETOPHENONE	98-86-2	1.3	10.0
8270E	alpha-TERPINEOL	98-55-5	2.4	10.0
8270E	ANILINE	62-53-3	1.5	10.0
8270E	ANTHRACENE	120-12-7	1.3	10.0
8270E	ARAMITE	140-57-8	5.2	10.0
8270E	ATRAZINE	1912-24-9	2.1	10.0
8270E	BENZALDEHYDE	100-52-7	1	10.0
8270E	BENZIDINE	92-87-5	100	100.0
8270E	BENZO(A)ANTHRACENE	56-55-3	1.6	10.0
8270E	BENZO(A)PYRENE	50-32-8	1.2	10.0
8270E	BENZO(B)FLUORANTHENE	205-99-2	1.2	10.0
8270E	BENZO(G,H,I)PERYLENE	191-24-2	2.1	10.0
8270E	BENZO(K)FLUORANTHENE	207-08-9	1.3	10.0
8270E	BENZOIC ACID	65-85-0	36	50.0
8270E	BENZYL ALCOHOL	100-51-6	1.6	10.0
8270E	BIPHENYL	92-52-4	1.4	10.0
8270E	BIS(1-CHLOROISOPROPYL)ETHER	108-60-1	1.4	10.0

Table 5-9

Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8270E	BIS(-2-CHLOROETHOXY)METHANE	111-91-1	1.9	10.0
8270E	BIS(2-CHLOROETHYL)ETHER	111-44-4	1.3	10.0
8270E	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	4.3	10.0
8270E	BUTYL BENZYL PHTHALATE	85-68-7	2.9	10.0
8270E	CAPROLACTAM	105-60-2	1.5	10.0
8270E	CARBAZOLE	86-74-8	1.6	10.0
8270E	CHLOROBENZILATE	510-15-6	3.4	10.0
8270E	CHRYSENE	218-01-9	1.2	10.0
8270E	DIALLATE	2303-16-4	2	10.0
8270E	DIBENZO(A,H)ANTHRACENE	53-70-3	1.1	10.0
8270E	DIBENZOFURAN	132-64-9	1.4	10.0
8270E	DIETHYLPHTHALATE	84-66-2	1.1	10.0
8270E	DIMETHOATE	60-51-5	1.8	10.0
8270E	DIMETHYL PHTHALATE	131-11-3	1.3	10.0
8270E	DI-N-BUTYL PHTHALATE	84-74-2	1.7	10.0
8270E	DI-N-OCTYL PHTHALATE	117-84-0	3.3	10.0
8270E	DINOSEB	88-85-7	8.7	50.0
8270E	DIPHENYLAMINE	122-39-4	2.7	10.0
8270E	DISULFOTON	298-04-4	3	10.0
8270E	ETHYL METHANESULFONATE	62-50-0	1.1	10.0
8270E	FAMPHUR	52-85-7	5.4	10.0
8270E	FLUORANTHENE	206-44-0	1.5	10.0
8270E	FLUORENE	86-73-7	1.3	10.0
8270E	HEXACHLOROBENZENE	118-74-1	1.6	10.0
8270E	HEXACHLOROBUTADIENE	87-68-3	2.2	10.0
8270E	HEXACHLOROCYCLOPENTADIENE	77-47-4	2.1	10.0
8270E	HEXACHLOROETHANE	67-72-1	1.1	10.0
8270E	HEXACHLOROPROPENE	1888-71-7	1	10.0
8270E	INDENO(1,2,3-CD)PYRENE	193-39-5	1.8	10.0

Table 5-9

Typical Reporting Limits and Method Detection Limits for VOCs, SVOCs, and Miscellaneous Analyses of Stormwater Samples

Method	Analyte	CAS No.	MDL (µg/L [ppb])	MRL (µg/L [ppb])
8270E	ISODRIN	465-73-6	1.5	10.0
8270E	ISOPHORONE	78-59-1	1.4	10.0
8270E	ISOSAFROLE	120-58-1	1.7	10.0
8270E	KEPONE	143-50-0	31	50.0
8270E	METHAPYRILENE	91-80-5	44	50.0
8270E	METHYL METHANESULFONATE	66-27-3	2.4	10.0
8270E	METHYL PARATHION	298-00-0	3.5	10.0
8270E	NAPHTHALENE	91-20-3	1.2	10.0
8270E	NITROBENZENE	98-95-3	1.5	10.0
8270E	N-NITROSODIETHYLAMINE	55-18-5	1.4	10.0
8270E	N-NITROSODIMETHYLAMINE	62-75-9	1	10.0
8270E	N-NITROSODI-N-BUTYLAMINE	924-16-3	2.1	10.0
8270E	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	1.2	10.0
8270E	N-NITROSODIPHENYLAMINE	86-30-6	6.3	10.0
8270E	N-NITROSOMETHYLETHYLAMINE	10595-95-6	2.6	10.0
8270E	N-NITROSOMORPHOLINE	59-89-2	1.4	10.0
8270E	N-NITROSOPIPERIDINE	100-75-4	1.4	10.0
8270E	N-NITROSOPYRROLIDINE	930-55-2	2.5	10.0
8270E	OCTACHLOROCYCLOPENTENE	706-78-5	3.2	5.0

Notes:

MDL: method detection limit

NA: not applicable

ppb: parts per billion

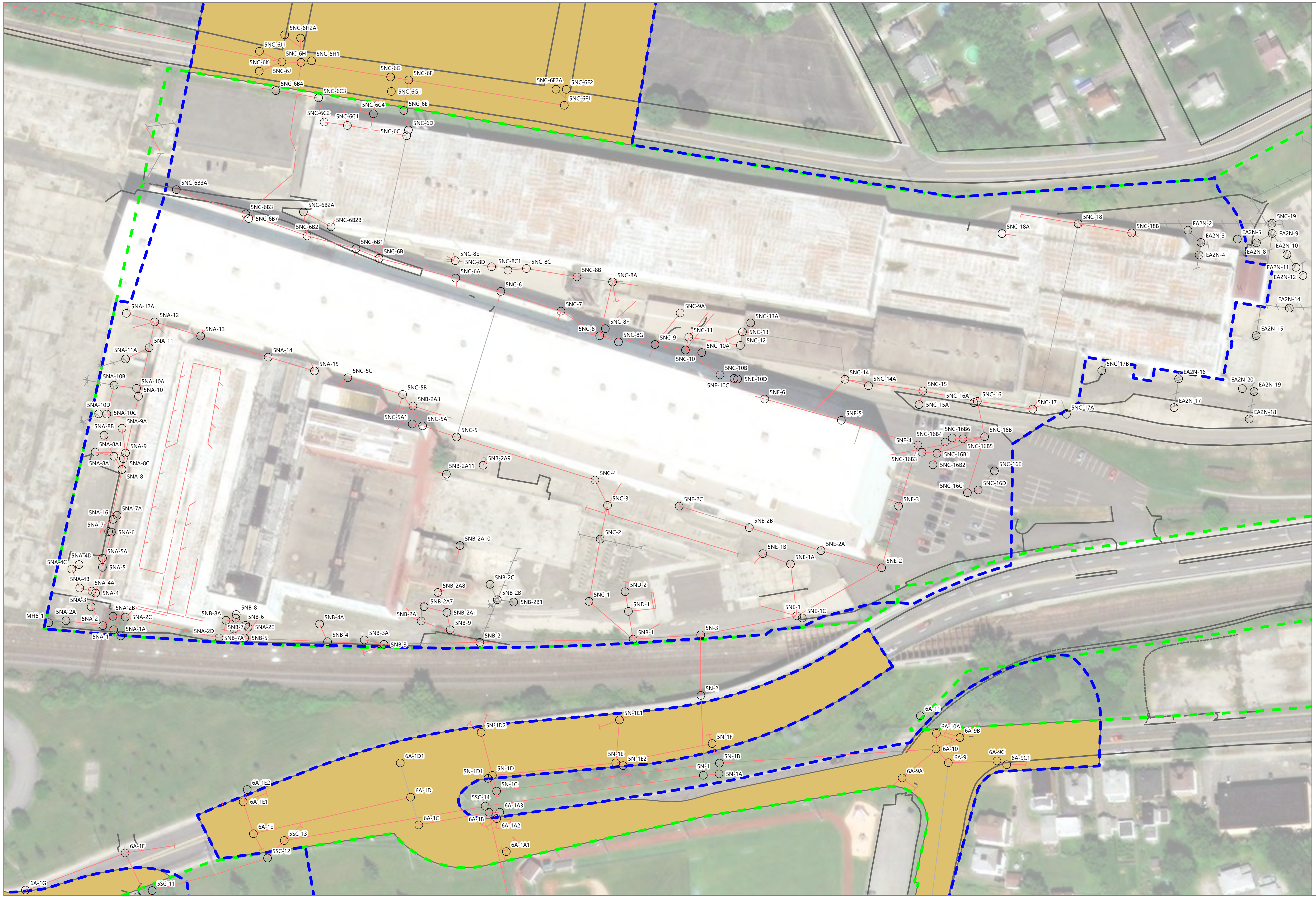
RL: reporting limit

TSS: total suspended solids

SVOC: semi-volatile organic compound

VOC: volatile organic compound

Figures



LEGEND:

○ Manhole/Catch Basin

— Storm Sewer Piping

— Historical Storm Sewer

— Storm Sewer Abandoned

▬ Drainage Basin Limits

▬ General Electric Company Facility Boundary

— Road

▨ Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

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Feet

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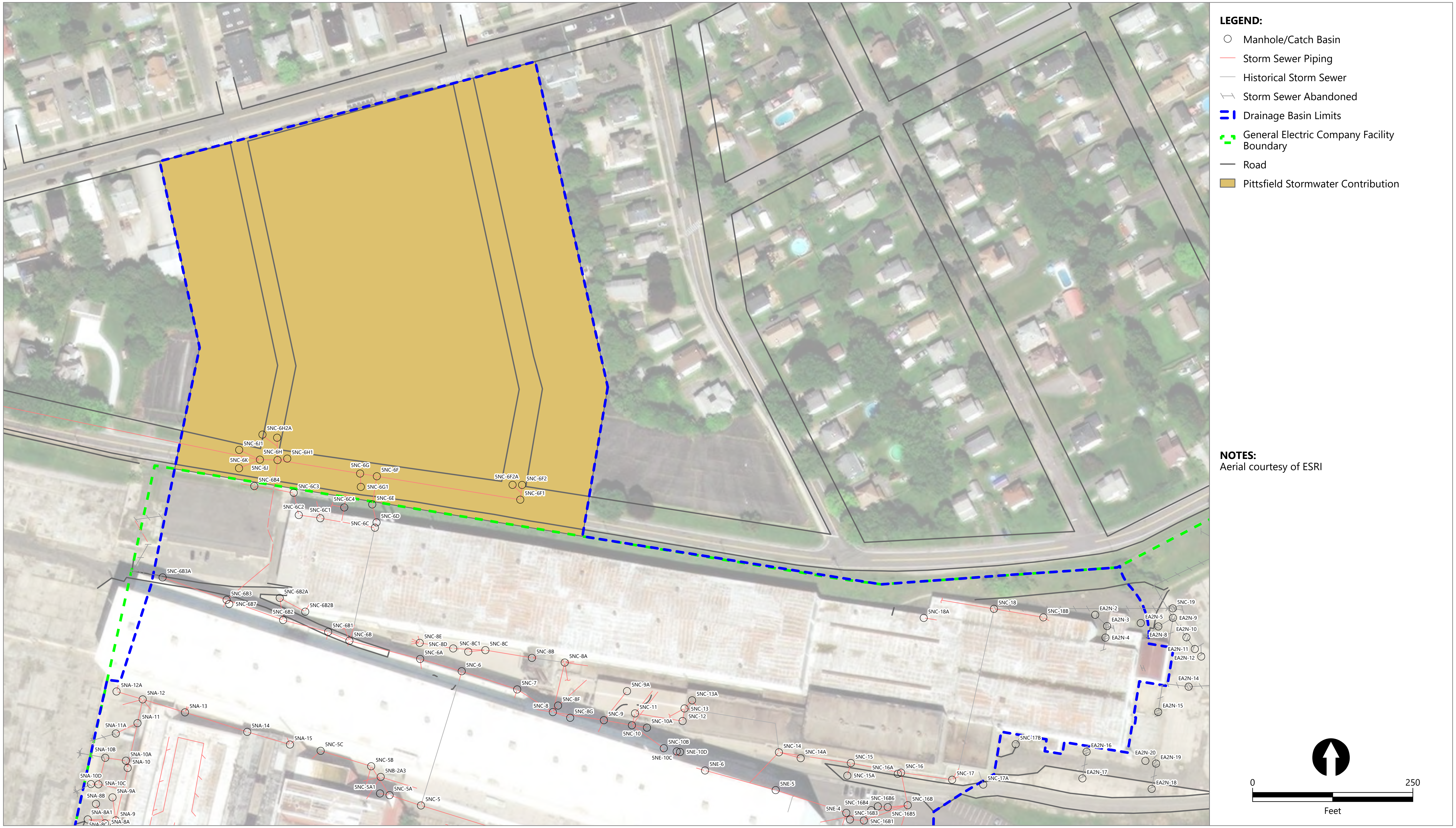
ANCHOR QEA

Figure 2-1
Drainage Basin Design - 005 North Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- ○ Manhole/Catch Basin
- — Storm Sewer Piping
- — Historical Storm Sewer
- ⊢ Storm Sewer Abandoned
- ▬ Drainage Basin Limits
- ▬ General Electric Company Facility Boundary
- — Road
- ▨ Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

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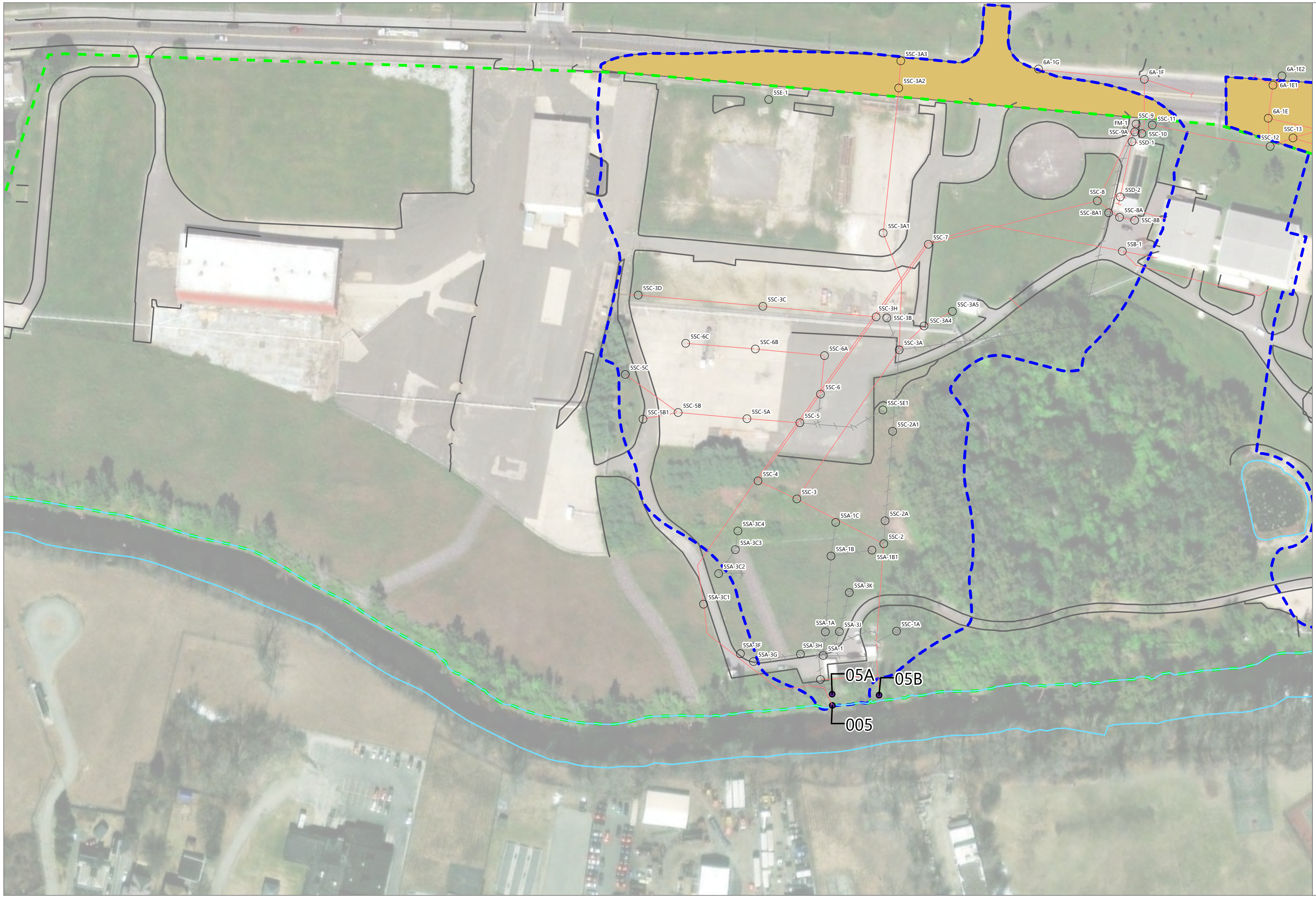
Figure 2-2
Drainage Basin Design - 005 North Drainage Basin - Residential Area
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- ○ Manhole/Catch Basin
- Storm Sewer Piping
- Historical Storm Sewer
- Storm Sewer Abandoned
- ● Outfall
- Water Boundary
- Drainage Basin Limits
- General Electric Company Facility Boundary
- Road
- ▨ Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

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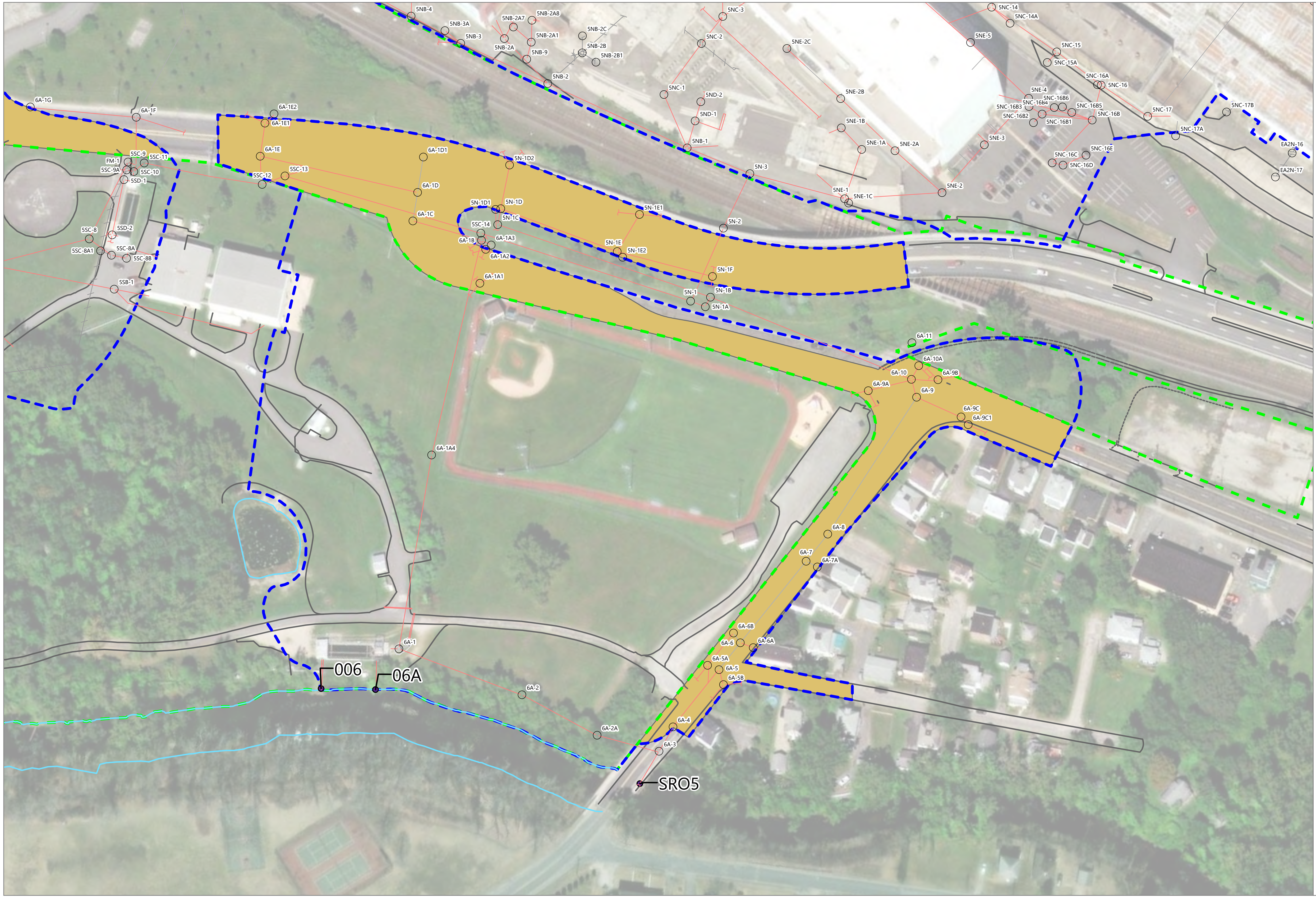
Figure 2-3
Drainage Basin Design - 005 South Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- ○ Manhole/Catch Basin
- — Storm Sewer Piping
- — Historical Storm Sewer
- ⟝ Storm Sewer Abandoned
- ● Outfall
- — Water Boundary
- ▬ Drainage Basin Limits
- ▬ General Electric Company Facility Boundary
- ▨ Riprap
- — Road
- ■ Pittsfield Stormwater Contribution

NOTES:
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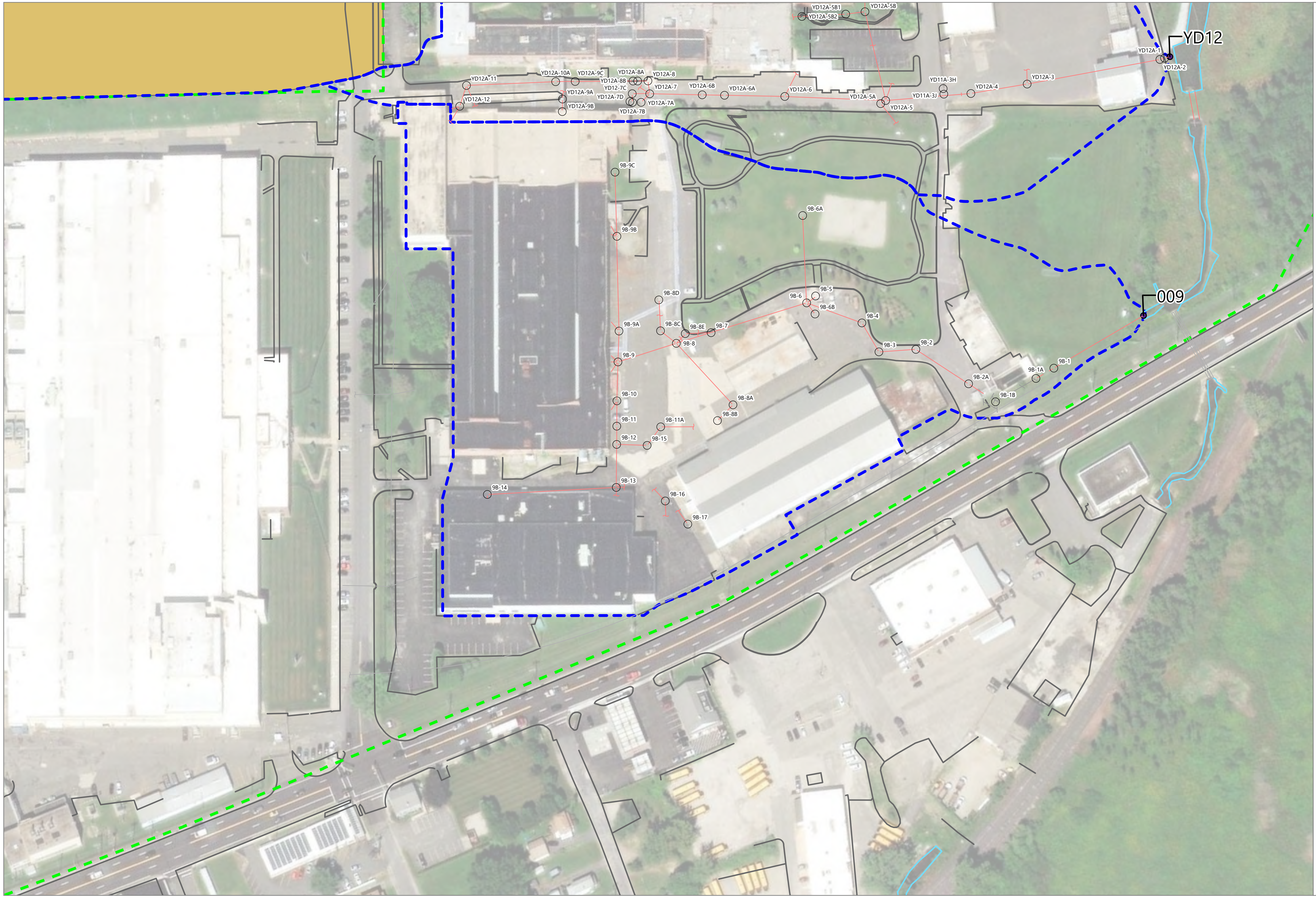
Figure 2-4
Drainage Basin Design - 006 Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

○	Manhole/Catch Basin
—	Storm Sewer Piping
—	Historical Storm Sewer
⊢⊣	Storm Sewer Abandoned
●	Outfall
—	Water Boundary
▬ ▬	Drainage Basin Limits
▬ ▬	General Electric Company Facility Boundary
—	Road
▨	Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

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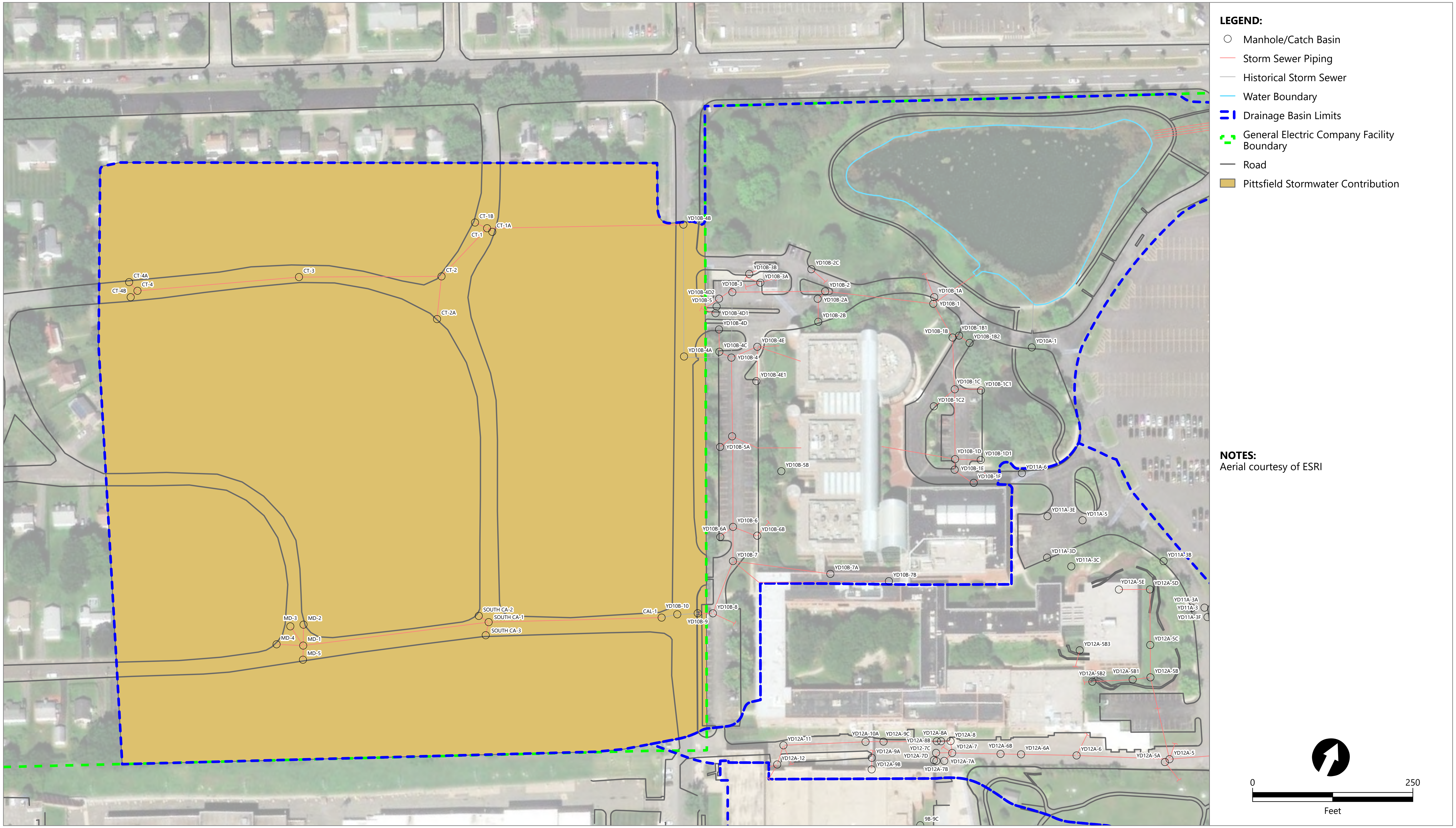
Figure 2-5
Drainage Basin Design - 009 Drainage Area
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- ○ Manhole/Catch Basin
- Storm Sewer Piping
- Historical Storm Sewer
- Water Boundary
- Drainage Basin Limits
- General Electric Company Facility Boundary
- Road
- Pittsfield Stormwater Contribution

NOTES:
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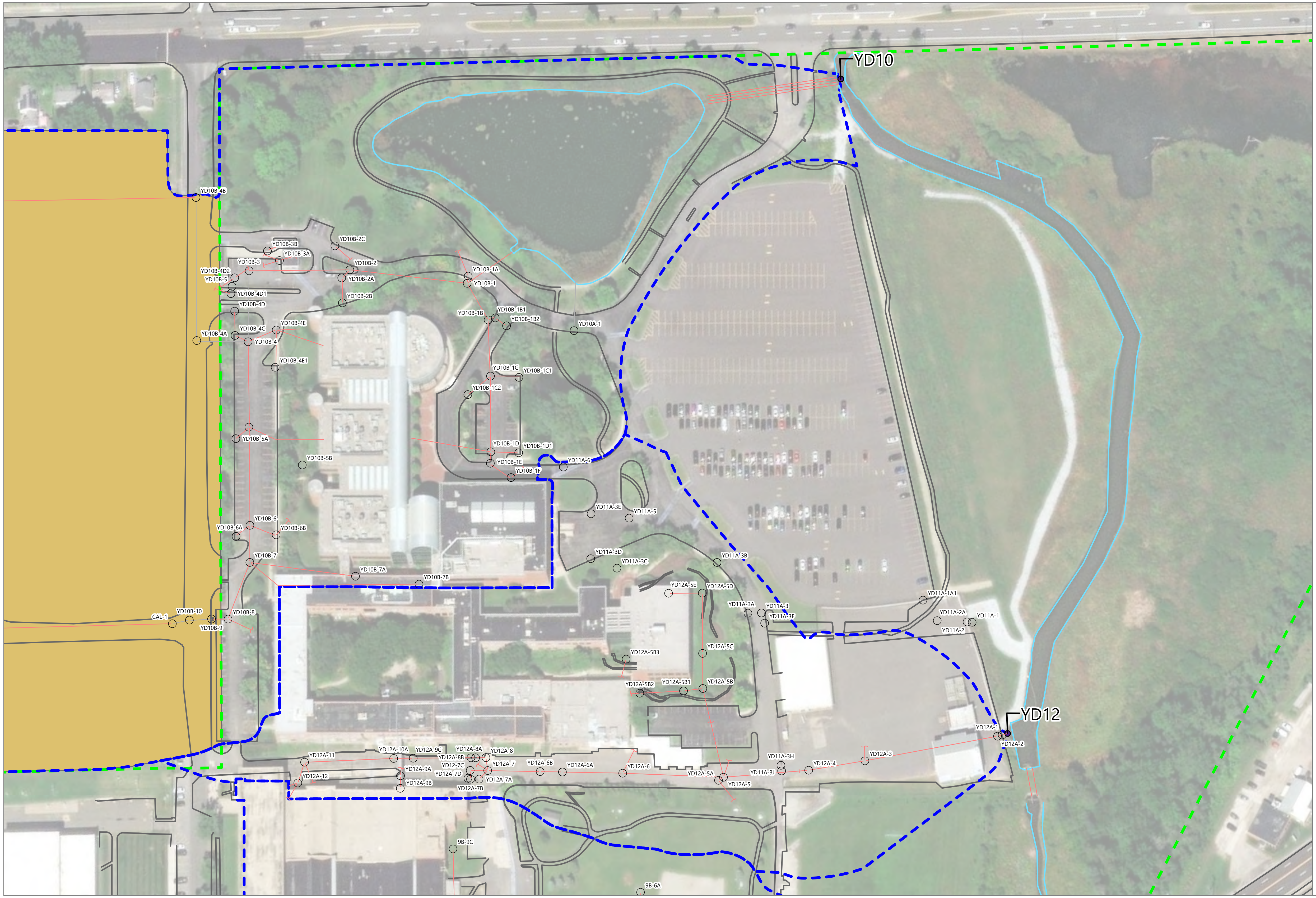
Figure 2-6
Drainage Basin Design - YD10 Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

○ Manhole/Catch Basin

— Storm Sewer Piping

— Historical Storm Sewer

● Outfall

— Water Boundary

▬ ▬ Drainage Basin Limits

▬ ▬ General Electric Company Facility Boundary

— Road

▨ Pittsfield Stormwater Contribution

NOTES:
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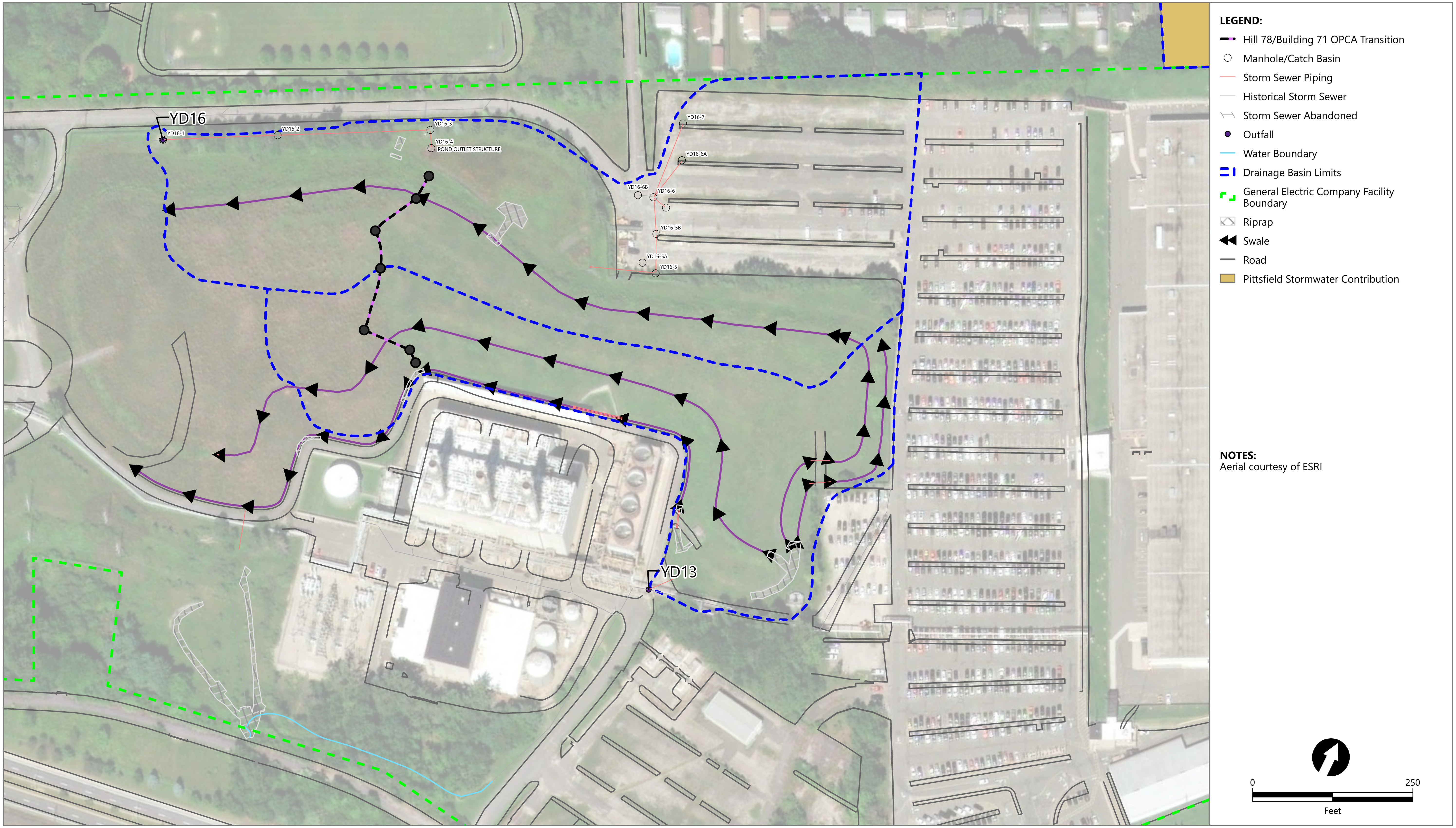
ANCHOR QEA

Figure 2-7
Drainage Basin Design - YD10 and YD12 Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



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ANCHOR
QEA

Figure 2-8
Drainage Basin Design - YD13 and YD16 Drainage Basins
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts

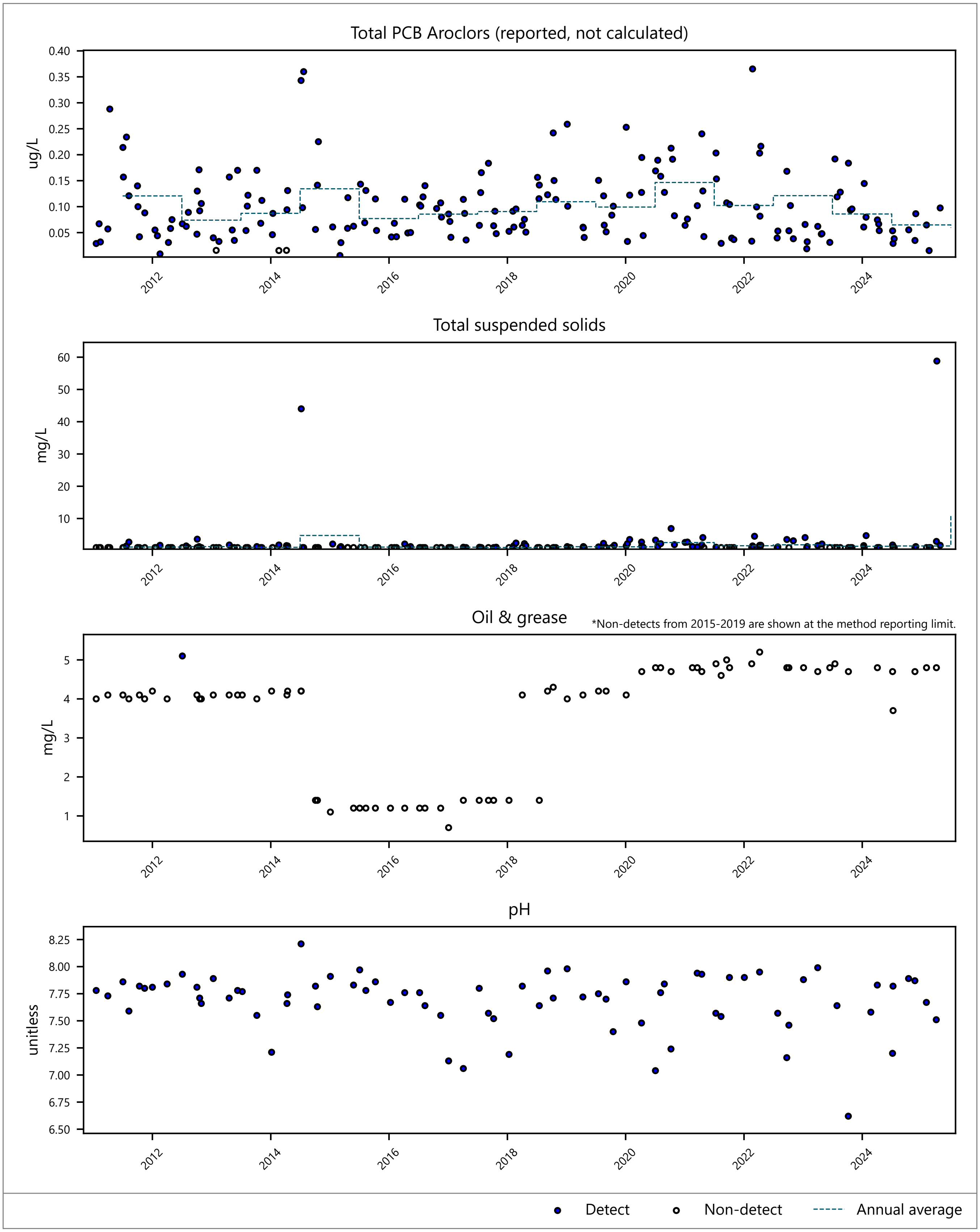

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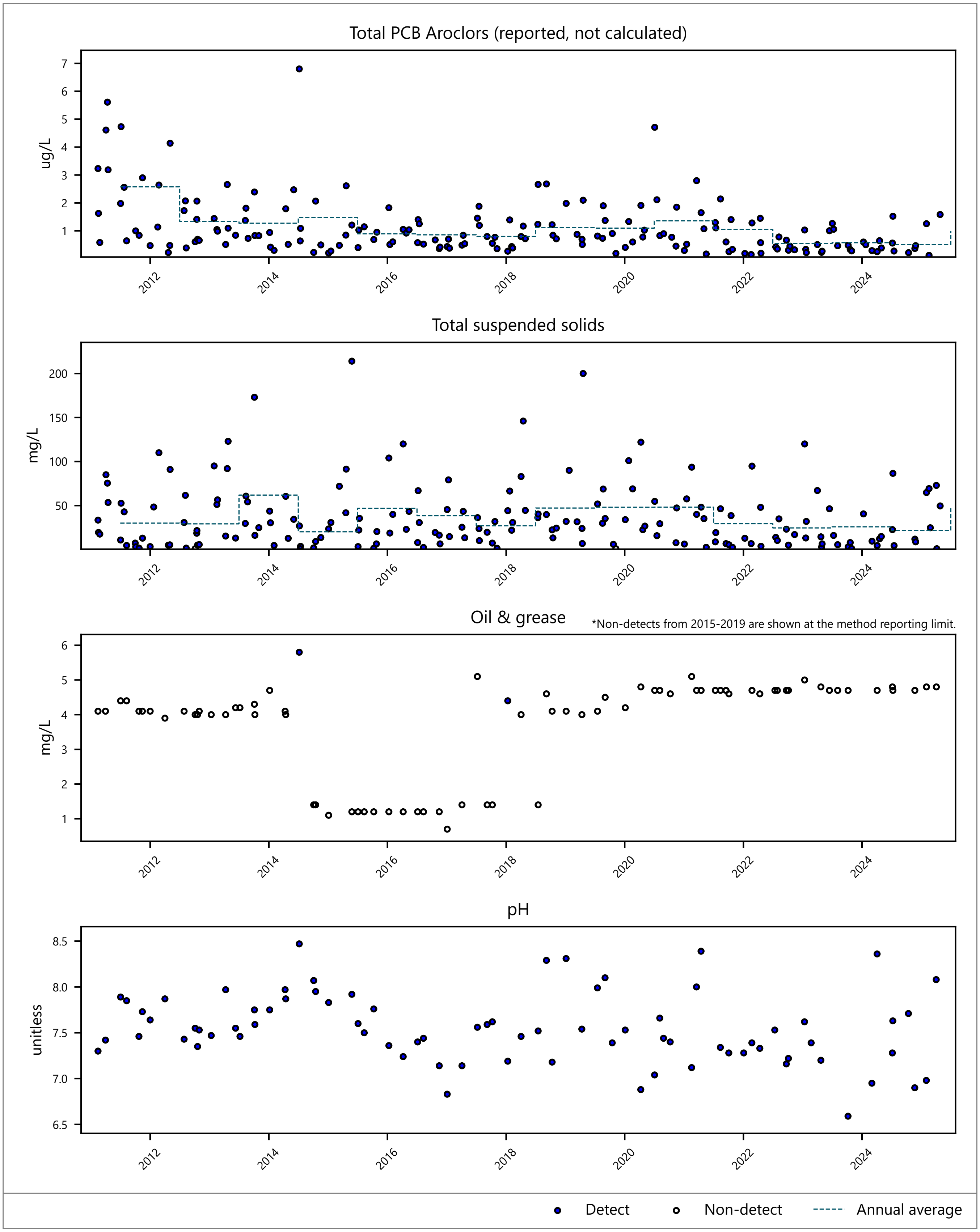
Figure 4-1
Time Series of PCB, TSS, Oil & Grease, and pH at 005

Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts


Total PCB Aroclors (reported, not calculated)

Total suspended solids

Oil & grease

*Non-detects from 2015-2019 are shown at the method reporting limit.

pH

ANCHOR QEA

Figure 4-2
Time Series of PCB, TSS, Oil & Grease, and pH at 05A
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts

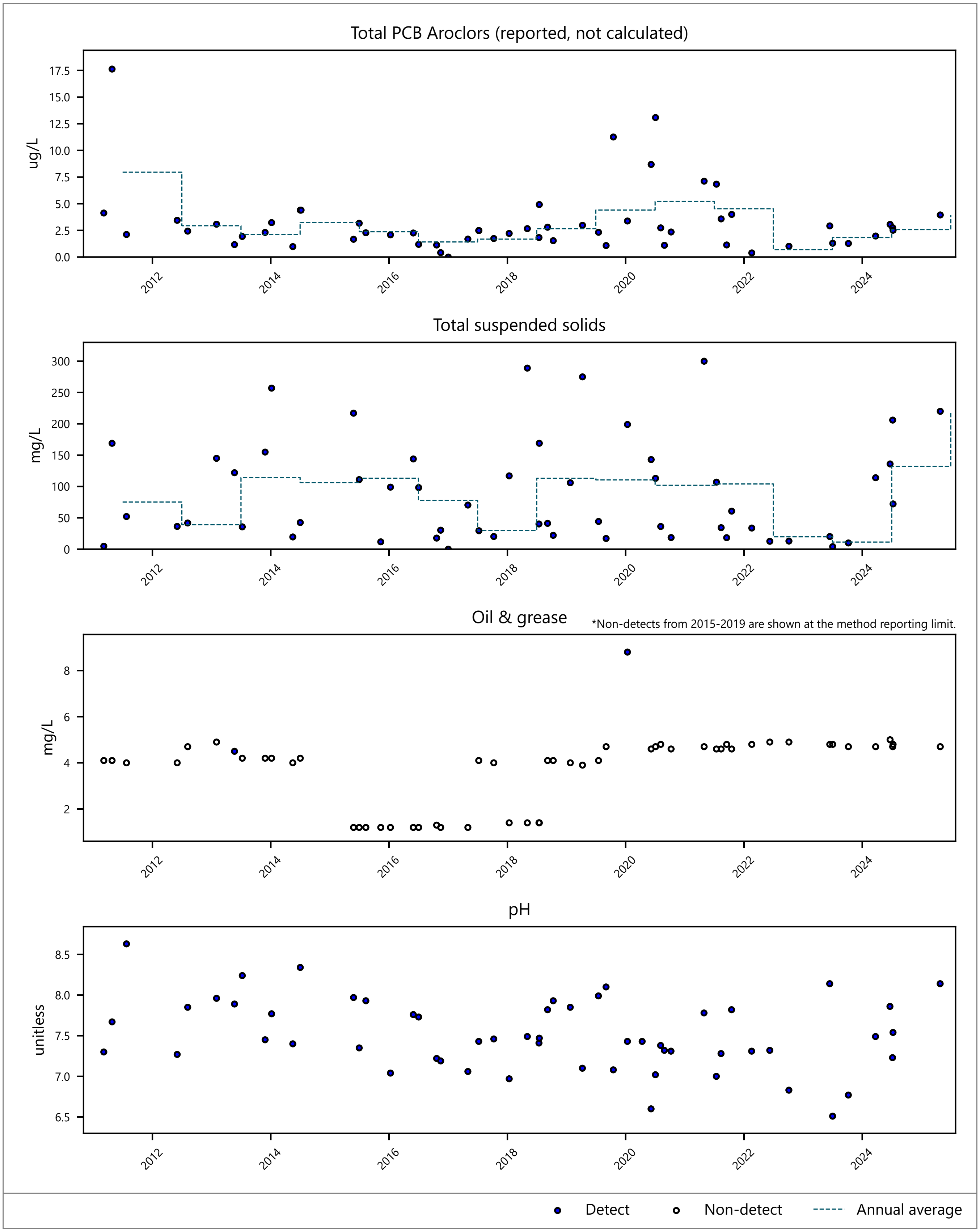


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Figure 4-3
Time Series of PCB, TSS, Oil & Grease, and pH at 05B

Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts

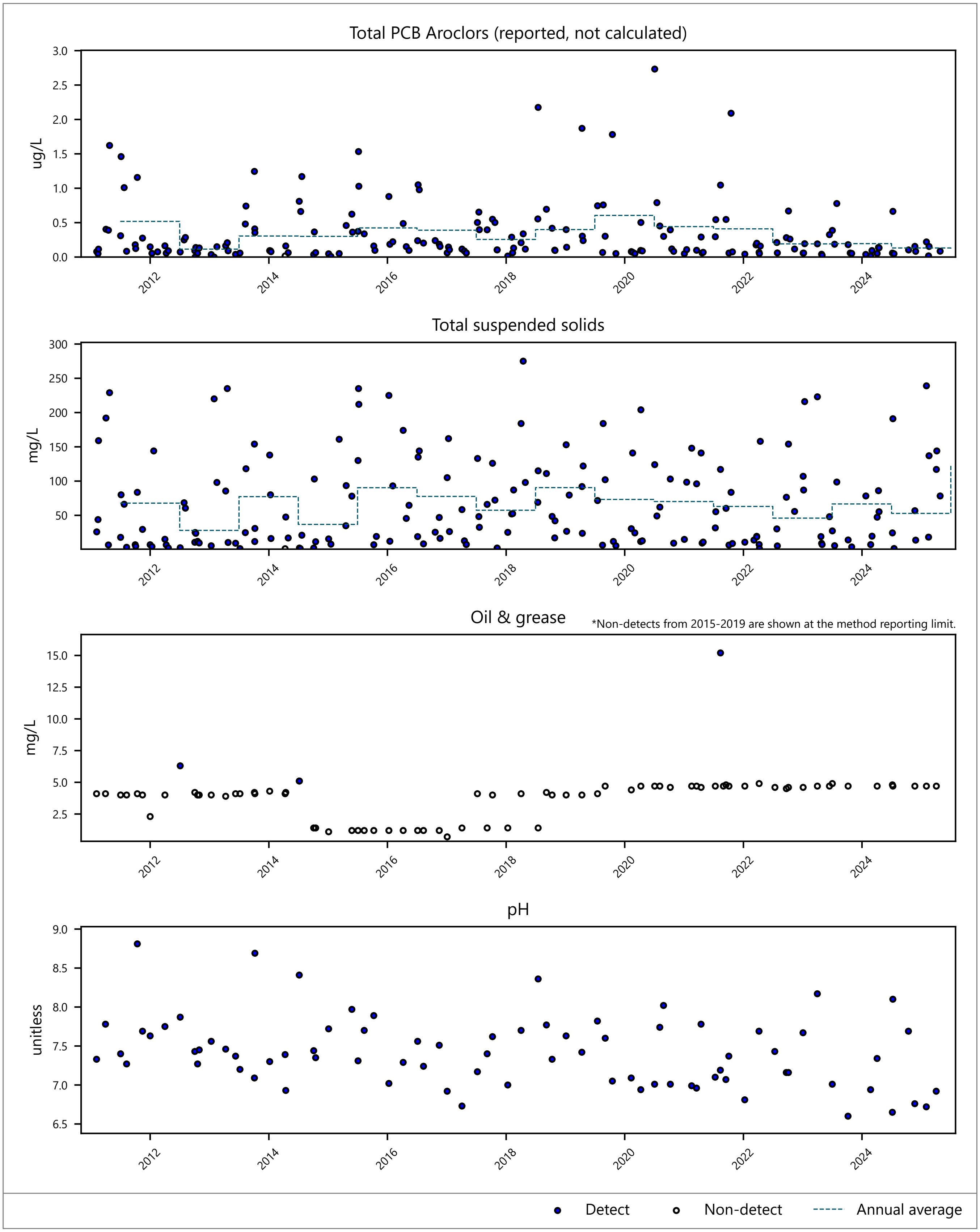

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Figure 4-4
Time Series of PCB, TSS, Oil & Grease, and pH at 006

Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts

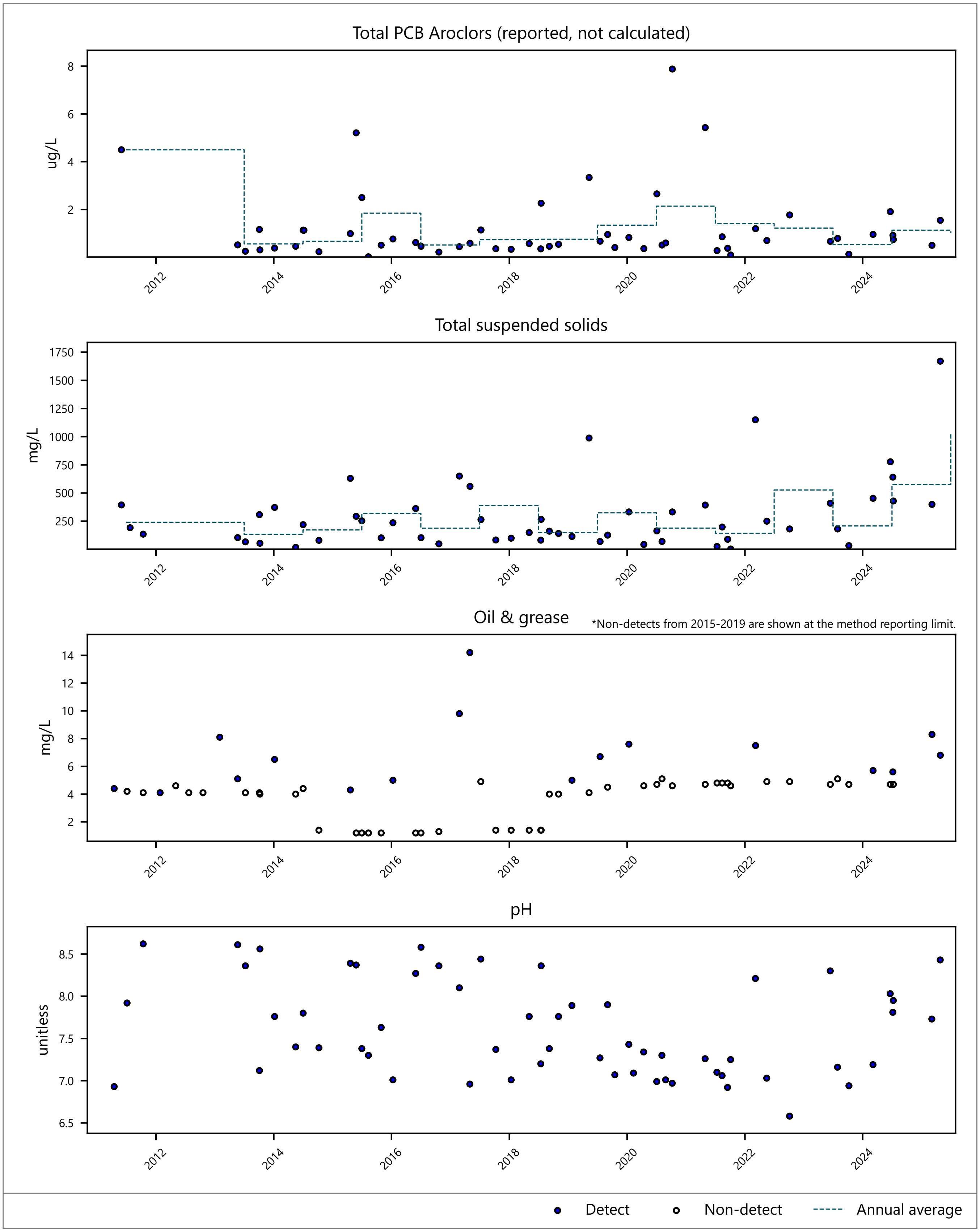

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Figure 4-5
Time Series of PCB, TSS, Oil & Grease, and pH at 06A
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts

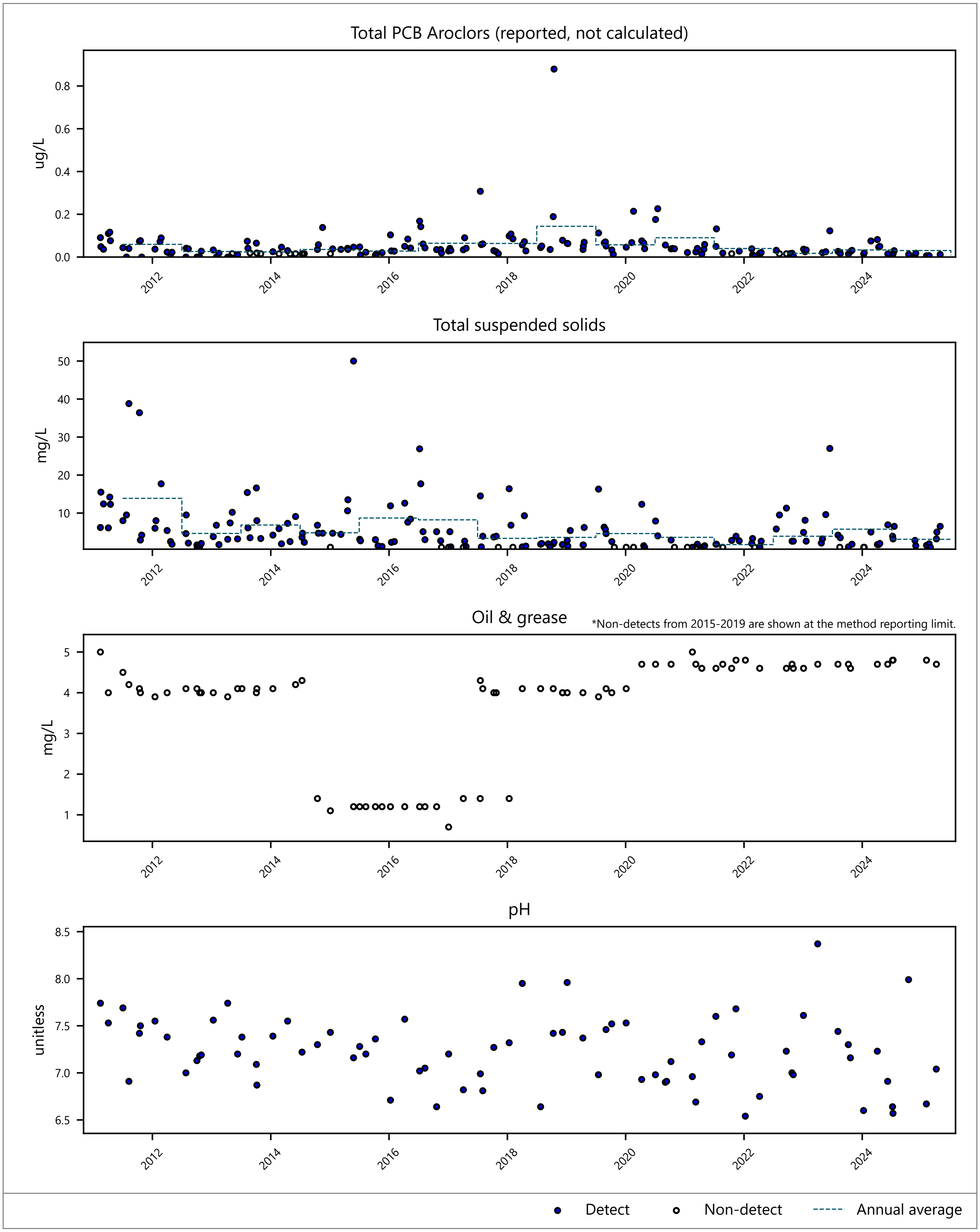

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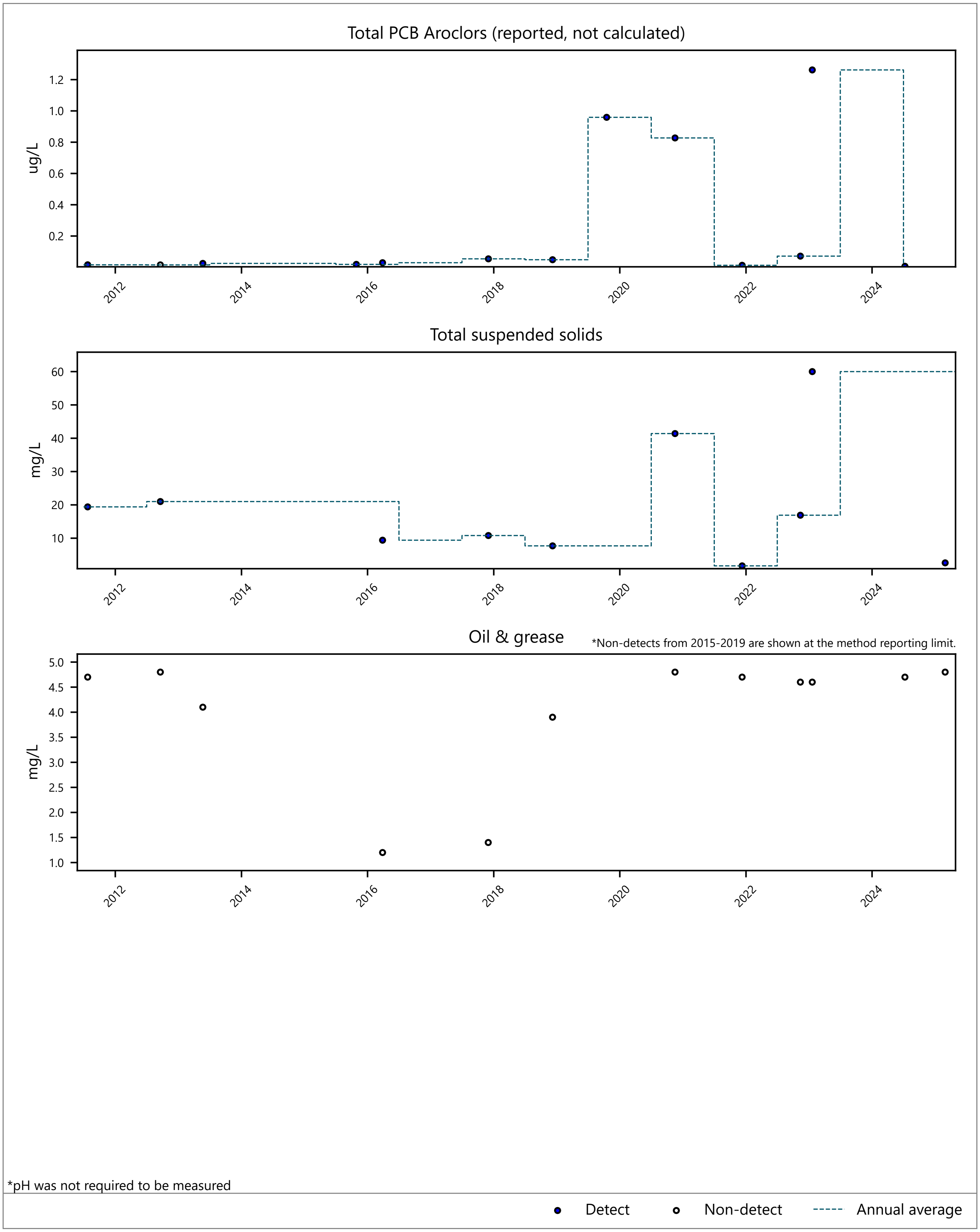
Figure 4-6
Time Series of PCB, TSS, Oil & Grease, and pH at 009

Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



*Non-detects from 2015-2019 are shown at the method reporting limit.

*pH was not required to be measured

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Figure 4-7
Time Series of PCB, TSS, Oil & Grease, and pH at YD10

Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts

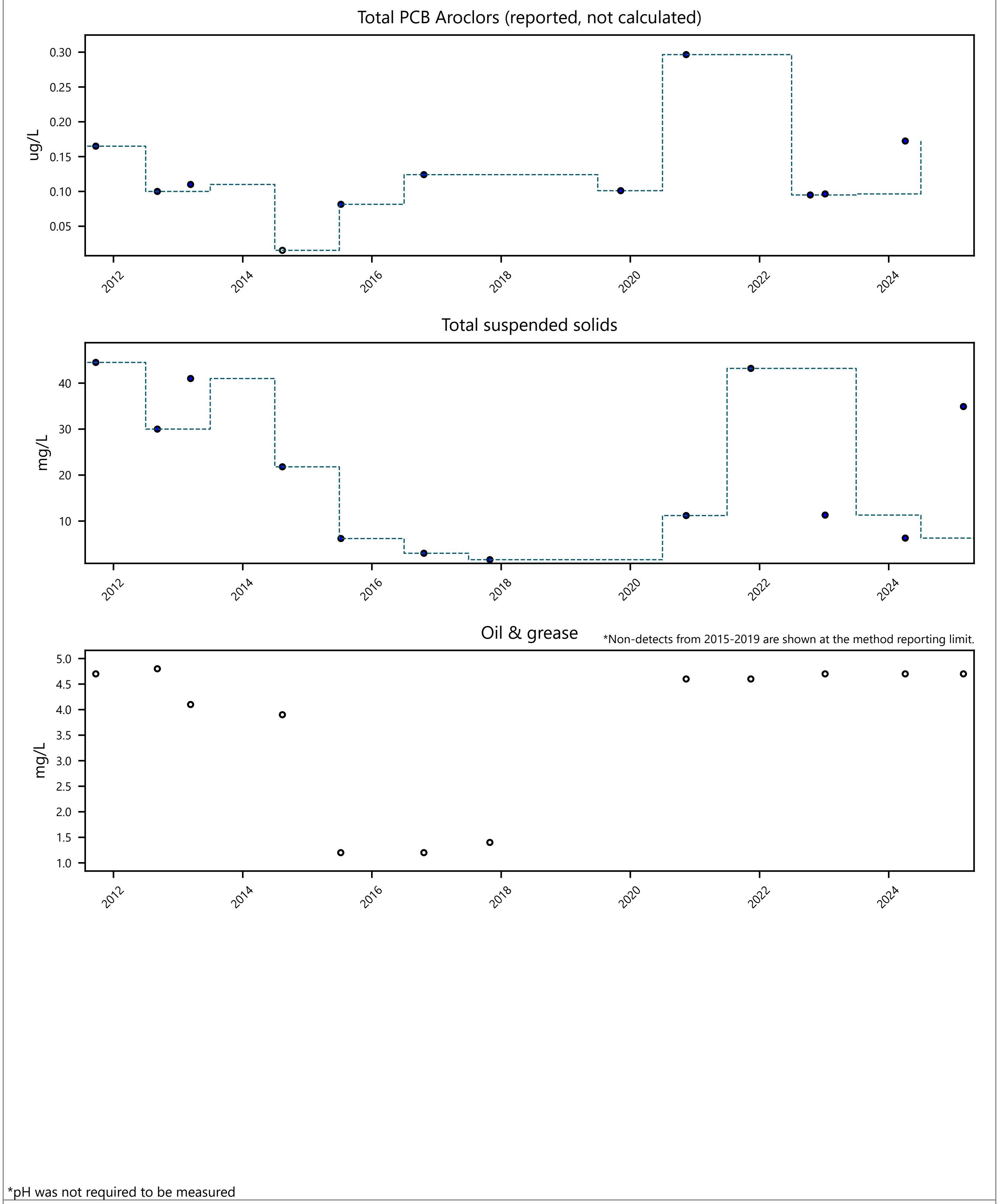

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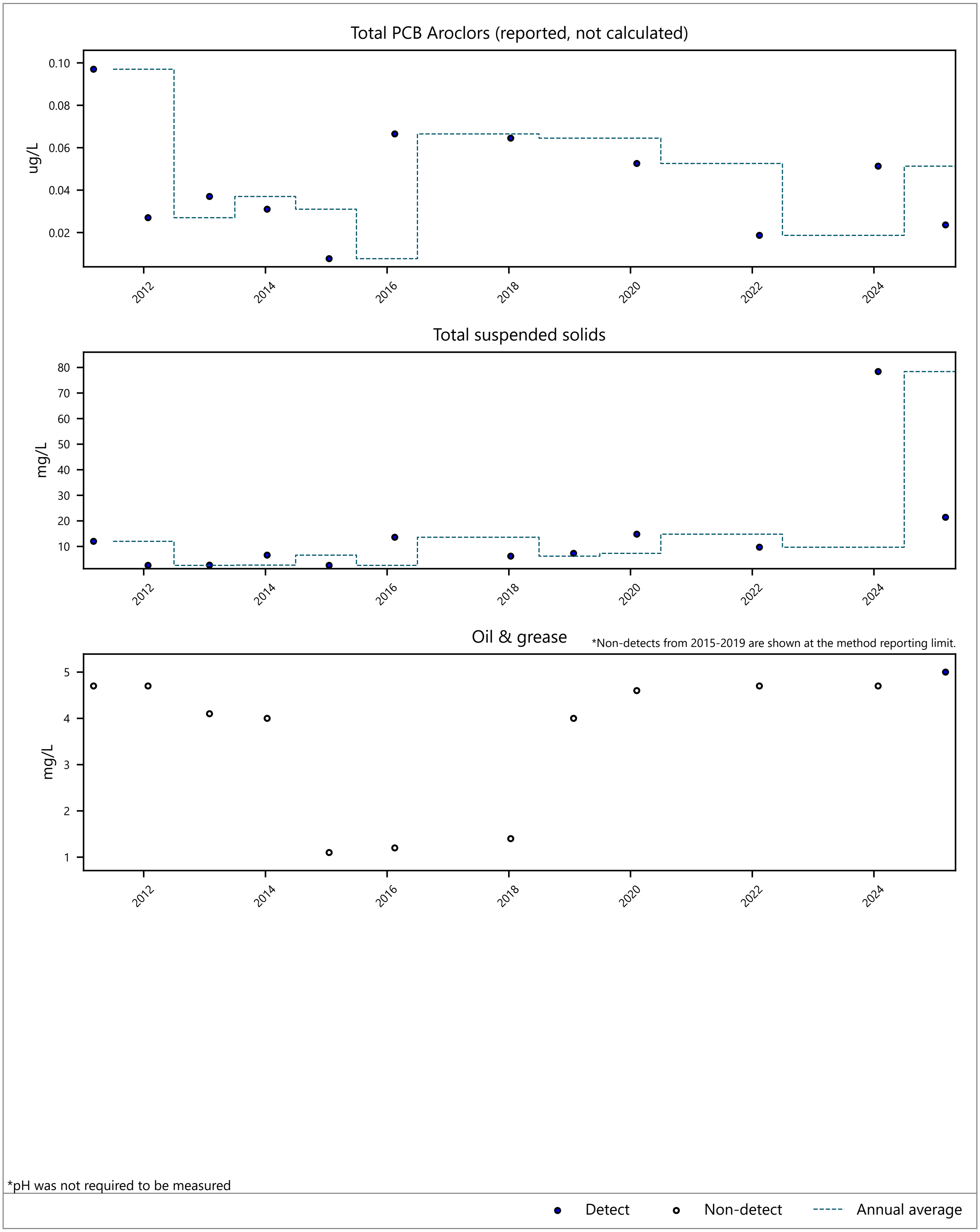
Figure 4-8
Time Series of PCB, TSS, Oil & Grease, and pH at YD12
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



*Non-detects from 2015-2019 are shown at the method reporting limit.

*pH was not required to be measured

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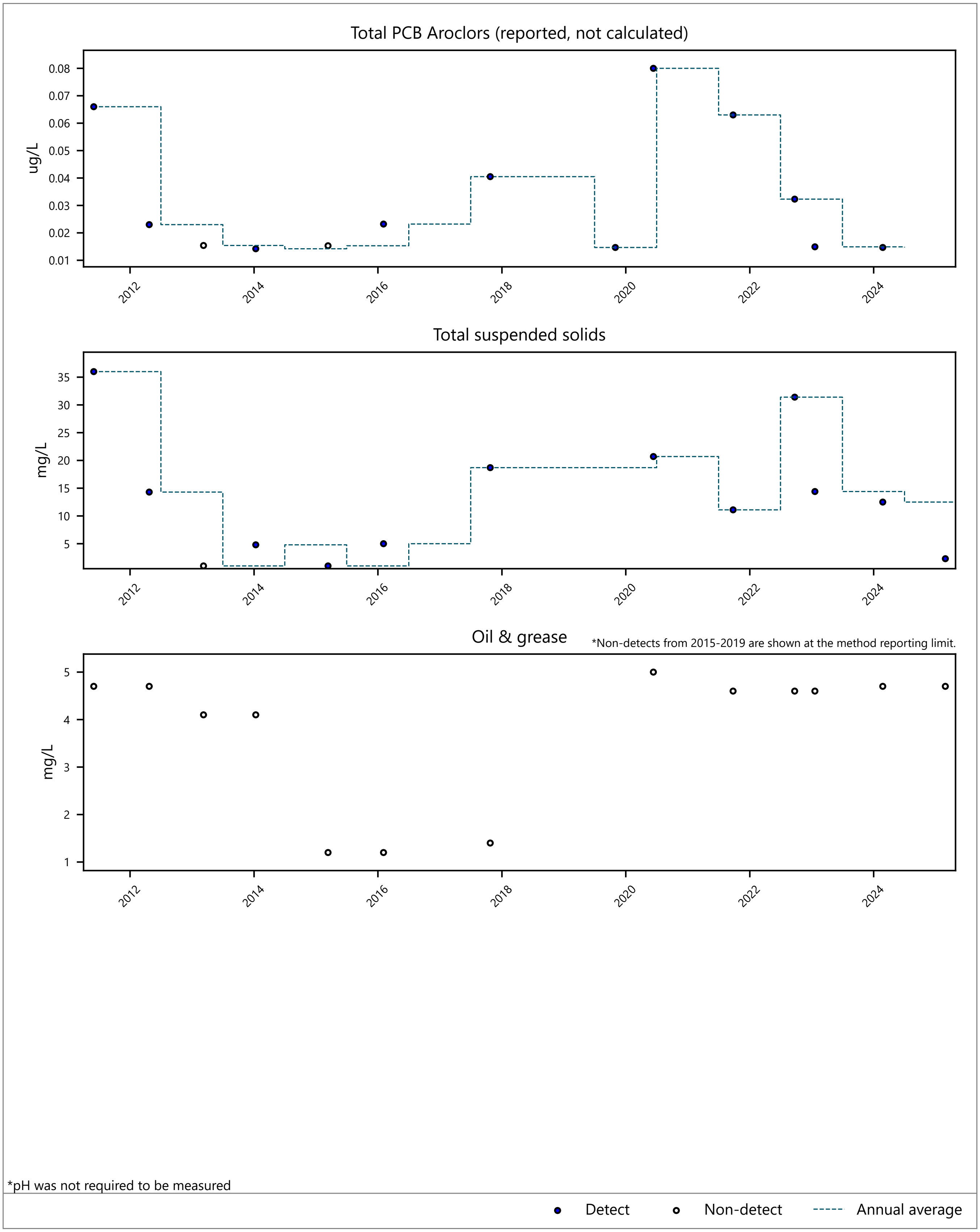
ANCHOR QEA

Figure 4-9
Time Series of PCB, TSS, Oil & Grease, and pH at YD13
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



*pH was not required to be measured

Figure 4-10

Time Series of PCB, TSS, Oil & Grease, and pH at YD16

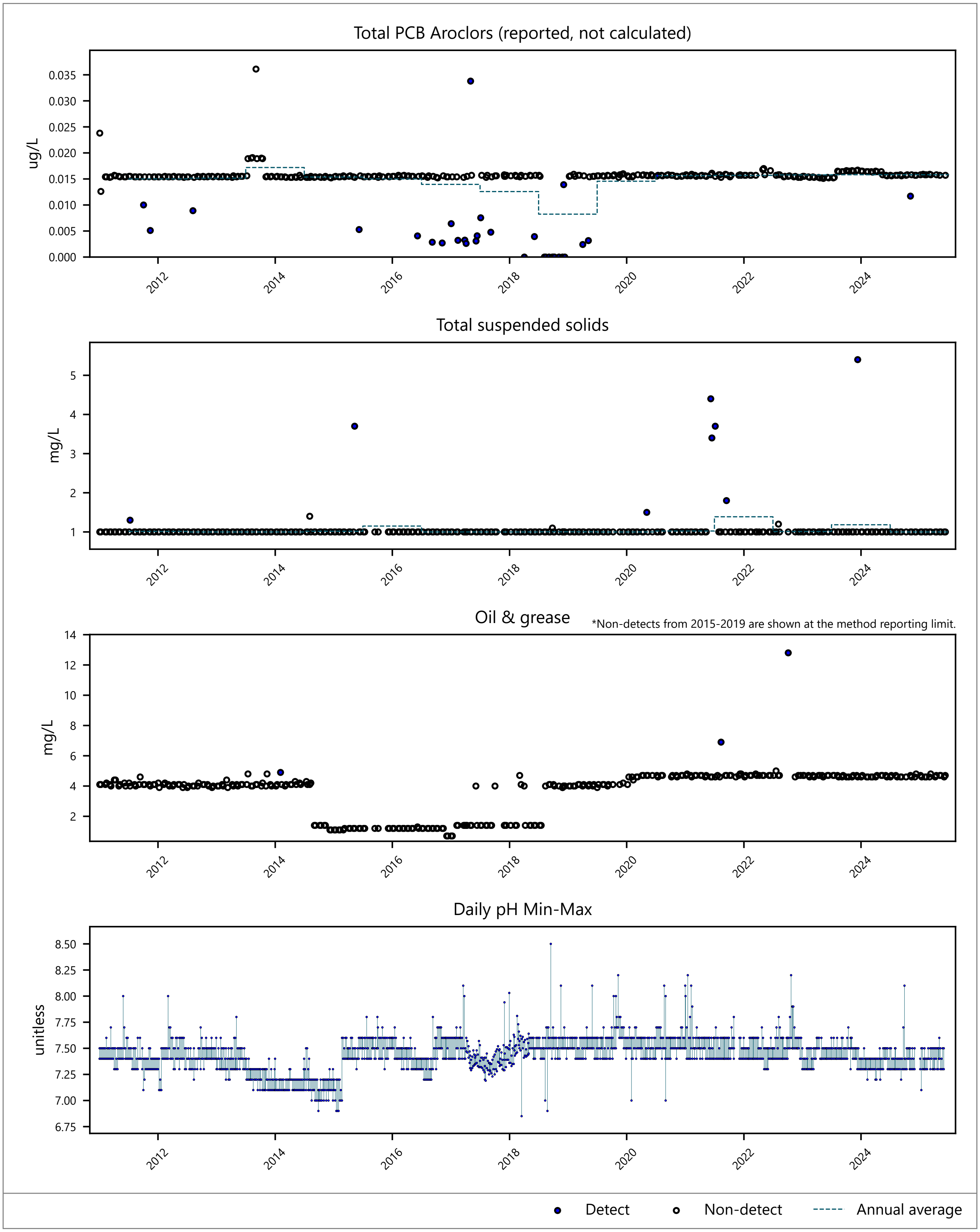


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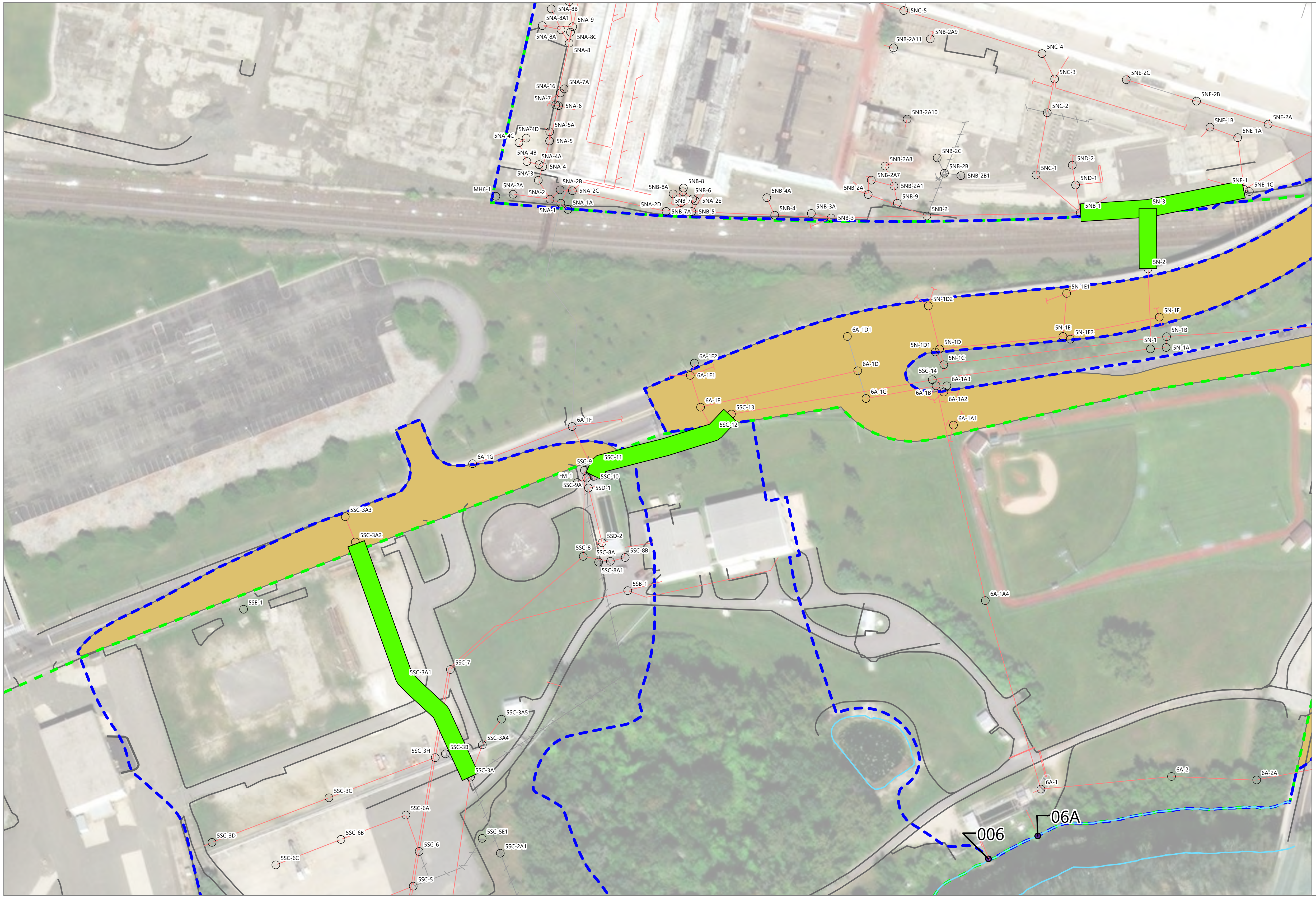
Figure 4-11
Time Series of PCB, TSS, Oil & Grease, and pH at 64G
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- 🟩 Potential Slip Lined Areas
- ○ Manhole/Catch Basin
- Storm Sewer Piping
- Historical Storm Sewer
- Storm Sewer Abandoned
- ● Outfall
- Water Boundary
- Drainage Basin Limits
- General Electric Company Facility Boundary
- Riprap
- Road
- Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

Publish Date: 2025/08/29, 11:11 AM | User: dmiller
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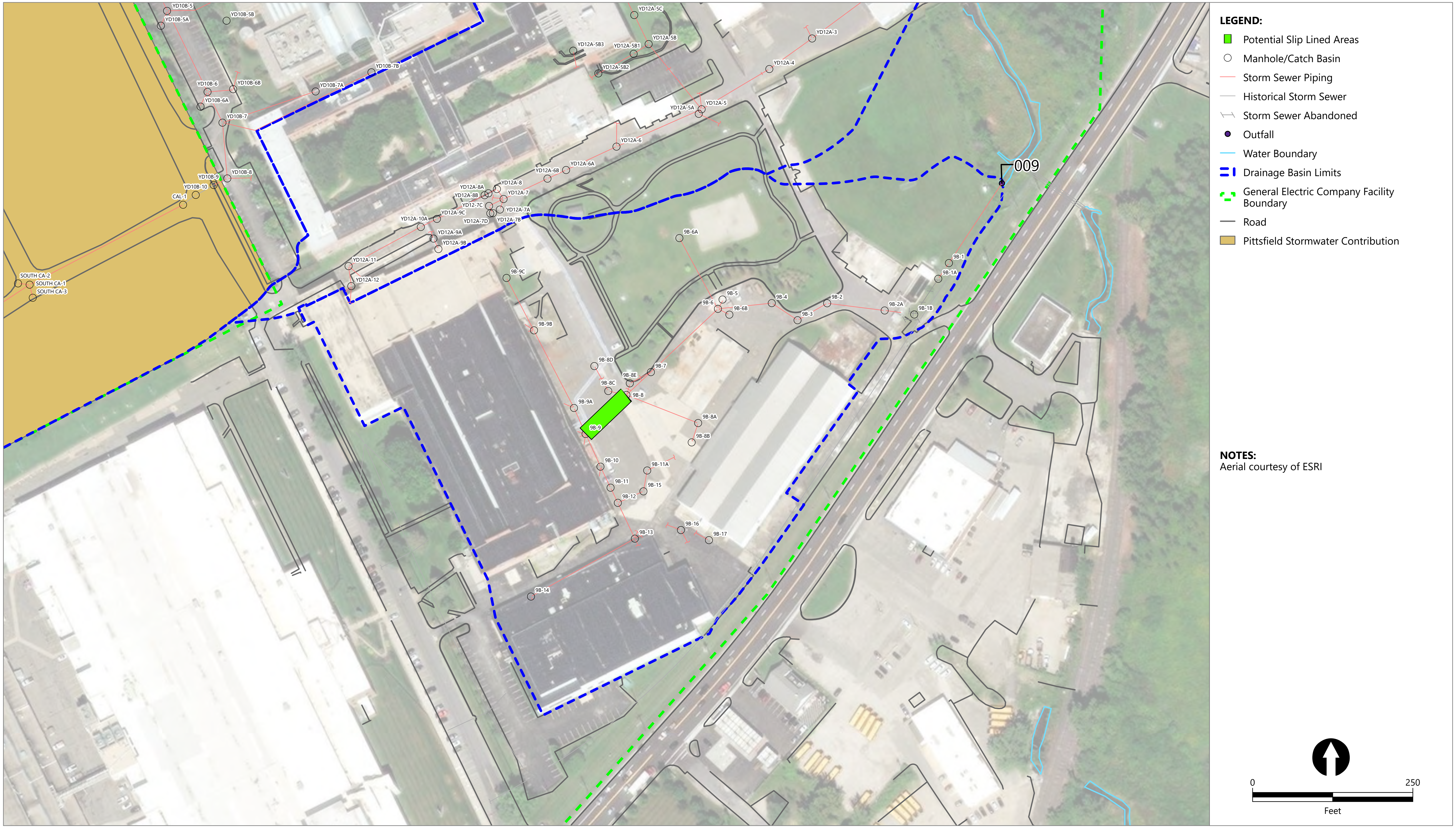
ANCHOR QEA

Figure 5-1
Drainage Basin Design – Potential Slip Lining Locations
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



NOTES:
Aerial courtesy of ESRI

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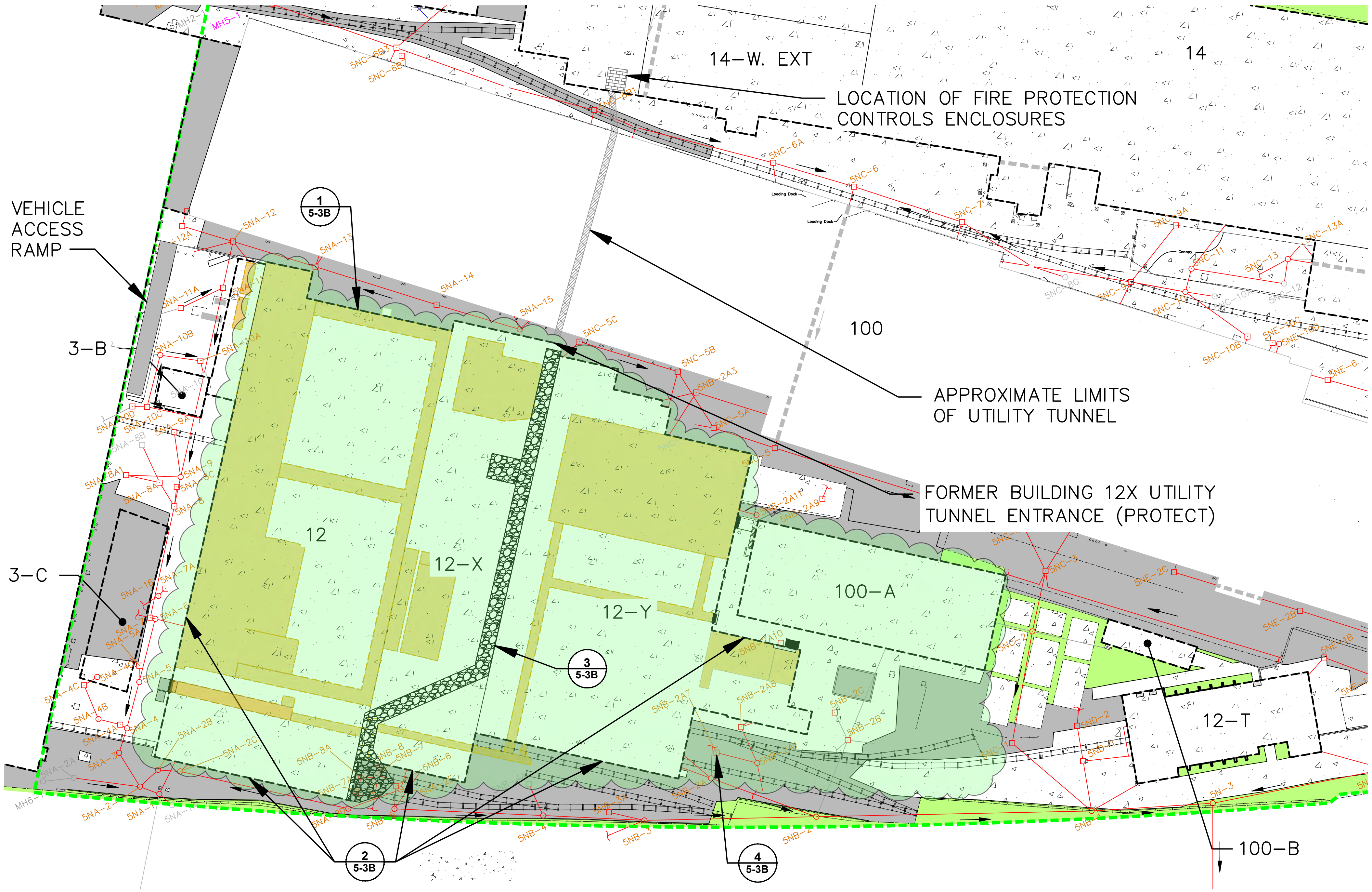
ANCHOR QEA

Figure 5-2
Drainage Basin Design – Potential Slip Lining Locations
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

—○—	6–FOOT–TALL CHAIN–LINK FENCE
–△–△–△–	GUARDRAIL
■	EXISTING BUILDING
▭	FORMER BUILDING/STRUCTURE LOCATION
12	BUILDING ID
■	ASPHALT
▨	CONCRETE
🟩	UNPAVED AREA (GRASS/DIRT/GRAVEL)
☁	APPROXIMATE LIMITS OF POTENTIAL GRASS–COVERED AREAS (SEE 1/2 VEGETATIVE COVER)
▨	ACCESS DRIVE TO UTILITY TUNNEL
– – –	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
—○— YD10B–4B	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND OR ABANDONED
—○— YD10A–1	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
⊢—	PIPE DESTINATION UNKNOWN
○	MANHOLE
□	CATCH BASIN
▬	TUNNEL/VAULT BACKFILLED WITH DEMOLITION DEBRIS

NOTES:

1. BASE MAPPING FROM TOPOGRAPHIC SURVEY (DRAWING S2059W01) BY FORESIGHT LAND SURVEYORS DATED 2/9/05. BASE MAPPING WAS REVISED 9/28/10 BASED ON A HILL DRAWING TITLED "OVERALL SITE PLAN", DATED 7/12/2010, AT A SCALE OF 1" = 40'.
2. NOT ALL PHYSICAL FEATURES SHOWN.
3. THE LIMITS OF GRASS COVERED AREAS ARE APPROXIMATE AND GENERALLY CONFORM TO FOOTPRINTS OF FORMER BUILDINGS WHERE THERE IS A DIFFERENCE IN ELEVATION WITH THE SURROUNDING GROUND SURFACE.
4. REFER TO DETAILS 1 AND 2 FOR VEGETATIVE COVER SECTIONS AND TRANSITIONS.
5. TRANSITION AT FORMER BUILDING 12X UTILITY TUNNEL ENTRANCE SHALL ACCOMMODATE DOOR SWING INTO THE FORMER BUILDING 12X FOOTPRINT.
6. ACCESS DRIVE SHALL ONLY CROSS TUNNEL OR VAULT AREAS THAT ARE COMPLETELY BACKFILLED WITH CONCRETE.
7. ACCESS DRIVE SHALL BE SAME DEPTH AS AND TRANSITION TO SURROUNDING GROUND AS TOPSOIL DETAILS 1 AND 2.
8. ACCESS DRIVE SHALL BE CONSTRUCTED WITH DENSE GRADED CRUSHED STONE, MASSDOT M2.01.7.
9. STORMWATER INFRASTRUCTURE (I.E., MANHOLES AND CATCH BASINS) WITHIN THE LIMITS OF OR ADJACENT TO THE PROPOSED VEGETATIVE COVER SHALL BE MODIFIED AND/OR ABANDONED, AS NECESSARY, TO PROMOTE PROPER DRAINAGE.

0 50' 100'
GRAPHIC SCALE

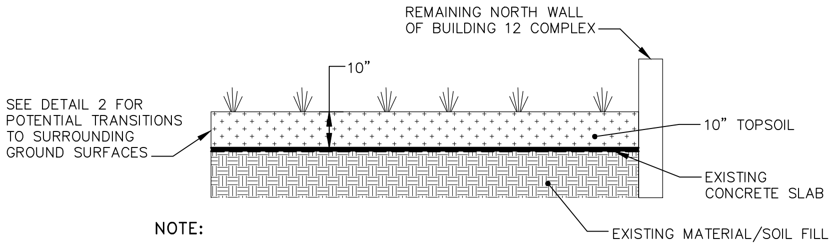
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
SURFACE WATER DISCHARGE WORK PLAN

BUILDINGS 12 COMPLEX POTENTIAL GRASS-COVERED AREAS

ARCADIS

FIGURE
5-3A

C:\Users\LPOSENAUER\DC\ACCDocs\Arcadis ACC US\AUS-99999999-GE_PITTSFIELD_MA\Project Files\10_WIP\10T_ARC_ENV\2025\01-DWG\SWDWP-F-5-3AB-B12 VEGETATIVE COVER.dwg LAYOUT: 5-3A SAVED: 8/27/2025 2:53 PM ACADVER: 24.3S (LMS TECH) PAGESETUP: ----
PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/28/2025 10:33 AM BY: POSENAUER, LISA
XREFS:
X-BASEMAP-DEMO
SWPPPX11

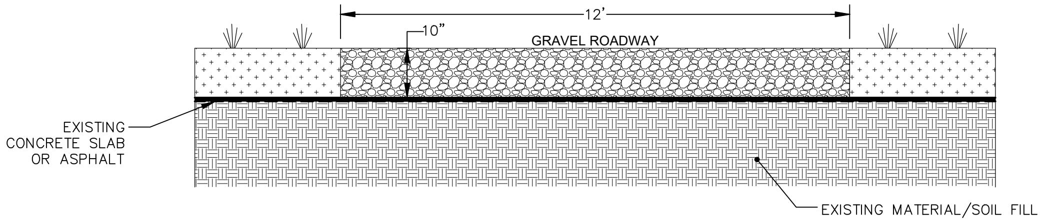


NOTE:

1. THE TOTAL THICKNESS OF THE VEGETATIVE COVER SHALL BE 10 INCHES. THIS THICKNESS SHALL BE VERIFIED (THROUGH SURVEY) BY THE CONTRACTOR IN ACCORDANCE WITH RESTORATION REQUIREMENTS.

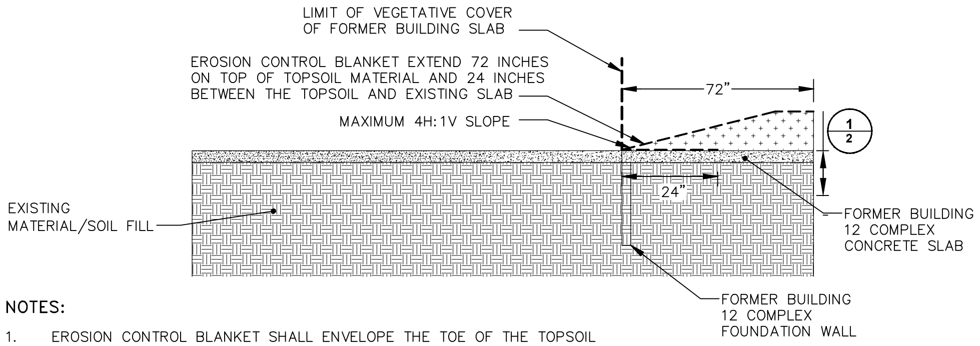
VEGETATIVE COVER ①

NOT TO SCALE



TYPICAL NEW ACCESS ROAD ③

NOT TO SCALE



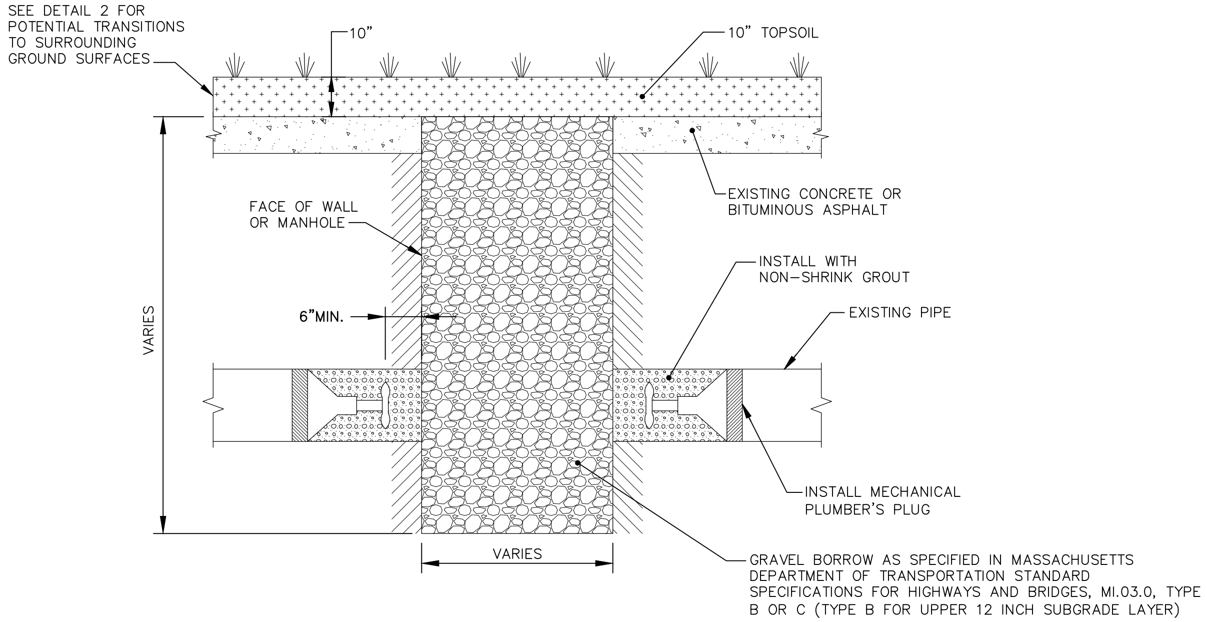
NOTES:

1. EROSION CONTROL BLANKET SHALL ENVELOPE THE TOE OF THE TOPSOIL MATERIAL TO THE LIMITS SHOWN. LIMITS BASED ON A ROLL WIDTH OF 8 FEET.

2. INSTALL ANCHORS THROUGH THE BLANKET INTO THE TOPSOIL MATERIAL IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

TRANSITION FROM BUILDING EDGE TO SURROUNDING GROUND SURFACES ②

NOT TO SCALE



NOTES:

1. THE ABOVE IS INTENDED ONLY TO SHOW A TYPICAL/CONCEPTUAL MANHOLE ABANDONMENT PROCEDURE, AS EXISTING MANHOLE SIZES AND CONFIGURATIONS VARY. PROCEDURES MAY BE MODIFIED IN THE FIELD, AS NECESSARY, BASED ON CONDITIONS ENCOUNTERED. FIELD MODIFICATIONS MUST BE REVIEWED BY GE AND/OR GE'S REPRESENTATIVE.

2. TO THE EXTENT PRACTICAL (AS DETERMINED BY GE AND/OR GE'S REPRESENTATIVE), GRAVEL BORROW SHALL BE PLACED IN MAXIMUM 1–FOOT–THICK LIFTS AND COMPACTED.

TYPICAL MANHOLE/SUBSURFACE VOID ABANDONMENT DETAIL ④

NOT TO SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
SURFACE WATER DISCHARGE WORK PLAN

DETAILS

ARCADIS

FIGURE
5-3B

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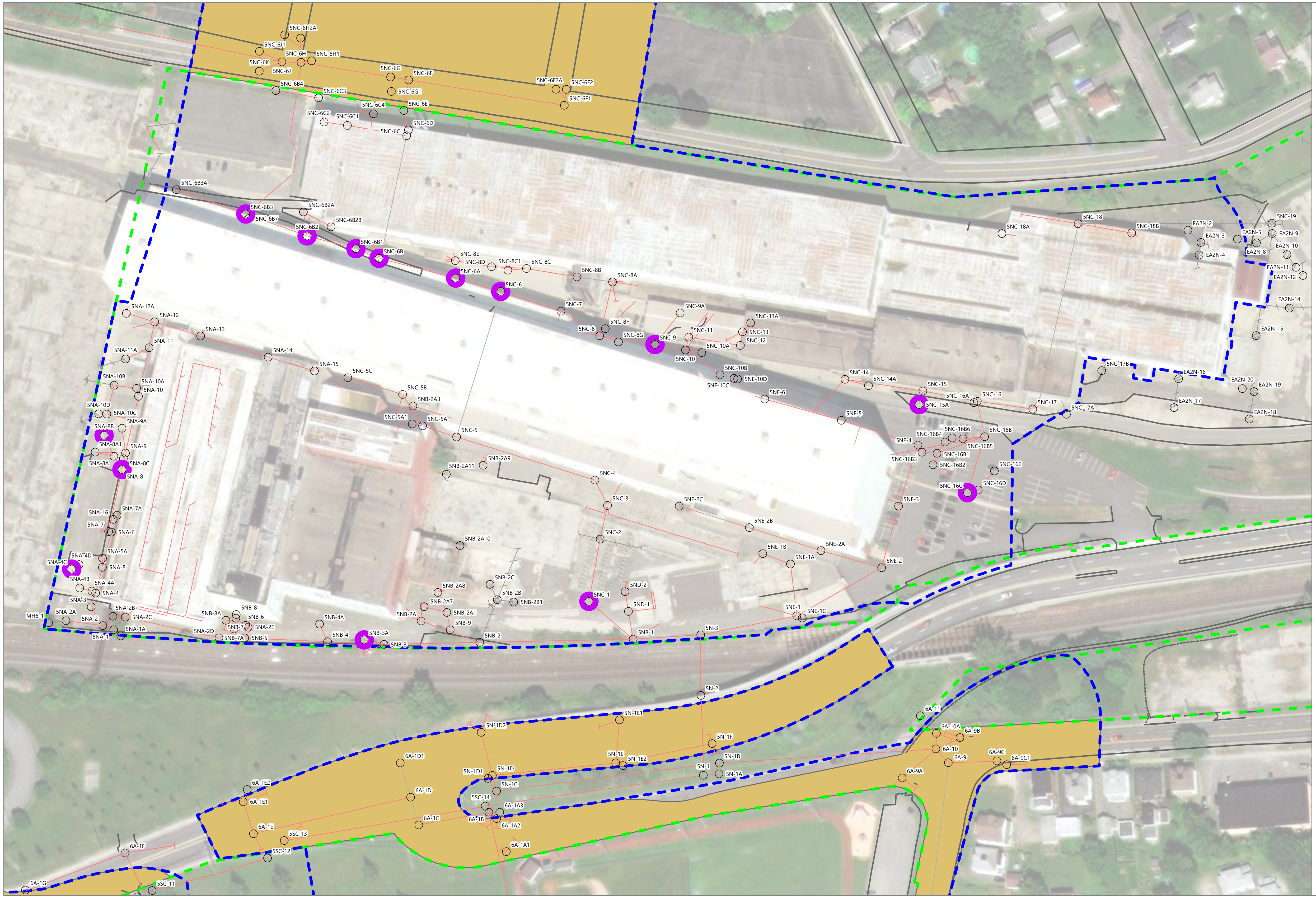
PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/28/2025 10:33 AM BY: POSENAUER, LISA

XREFS:
X-BASEMAP-DEMO
SWPPX11



LEGEND:

● Catch Basin Filter Bag Location

○ Manhole/Catch Basin

— Storm Sewer Piping

— Historical Storm Sewer

⊢ Storm Sewer Abandoned

▬ ▬ Drainage Basin Limits

▬ ▬ General Electric Company Facility Boundary

— Road

▨ Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

0 250
Feet

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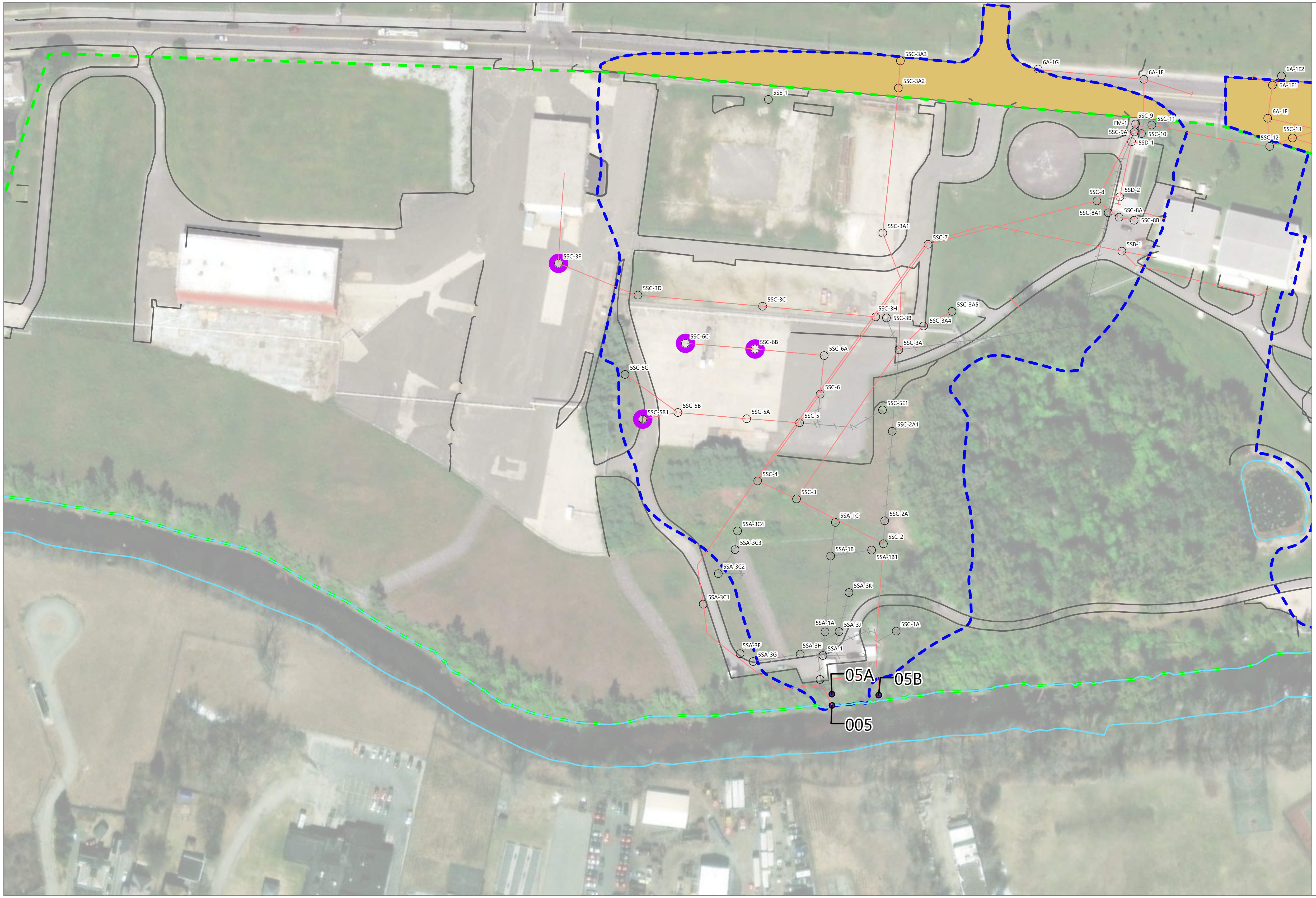
ANCHOR QEA

Figure 5-4
Catch Basin Filter Bags to be Installed and Inspected - 005 North Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- ○ Catch Basin Filter Bag Location
- ○ Manhole/Catch Basin
- Storm Sewer Piping
- Historical Storm Sewer
- Storm Sewer Abandoned
- ● Outfall
- Water Boundary
- Drainage Basin Limits
- General Electric Company Facility Boundary
- Road
- ▨ Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

0 250
Feet

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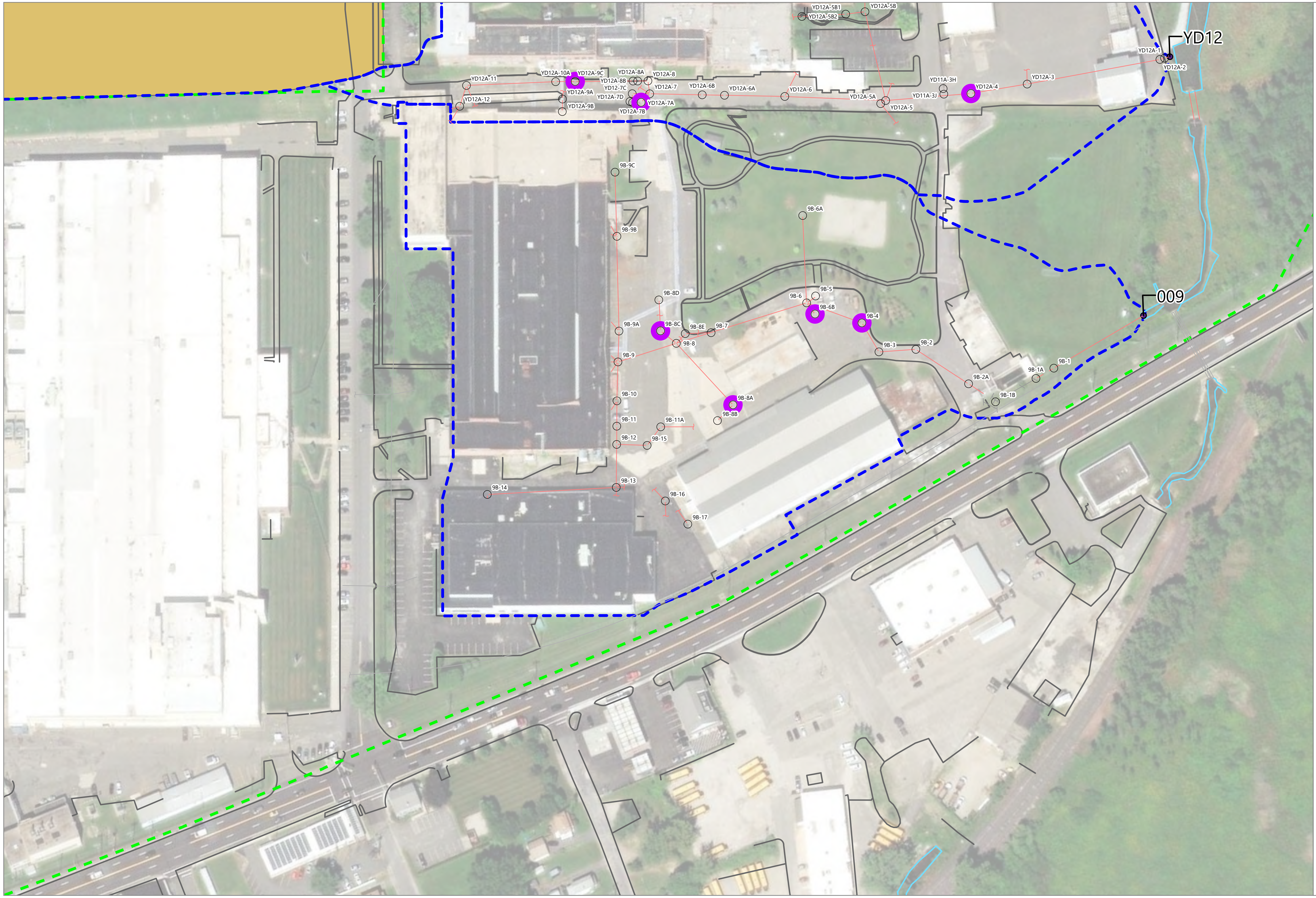
ANCHOR QEA

Figure 5-5
Catch Basin Filter Bags to be Installed and Inspected - 005 South Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- ◎ Catch Basin Filter Bag Location
- ○ Manhole/Catch Basin
- — Storm Sewer Piping
- — Historical Storm Sewer
- ⊢⊣ Storm Sewer Abandoned
- ● Outfall
- — Water Boundary
- ╍ Drainage Basin Limits
- ╍ General Electric Company Facility Boundary
- — Road
- 🟨 Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

0 250
Feet

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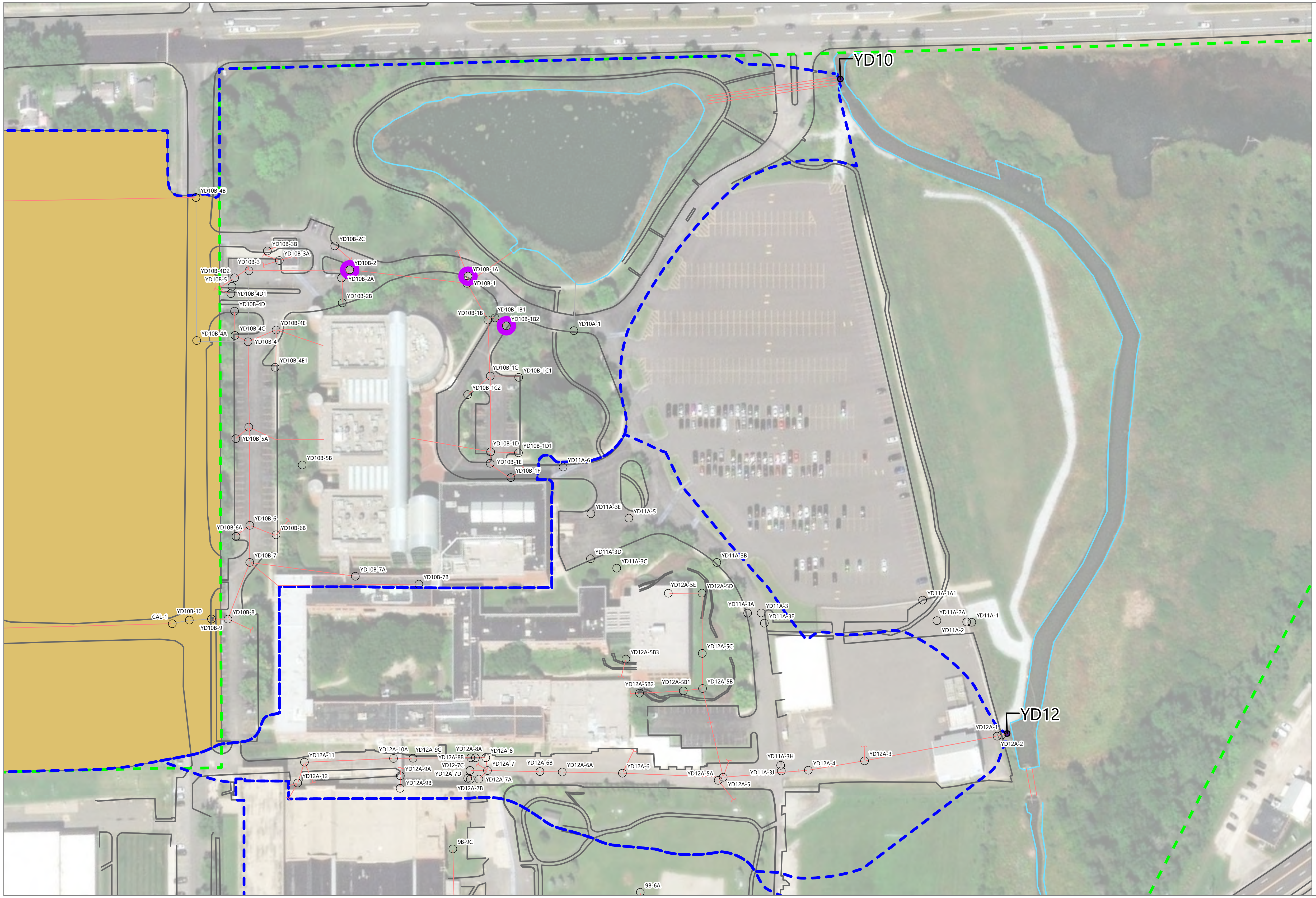
ANCHOR QEA

Figure 5-6
Catch Basin Filter Bags to be Installed and Inspected - 009 and YD12 Drainage Area
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

●	Catch Basin Filter Bag Location
○	Manhole/Catch Basin
—	Storm Sewer Piping
—	Historical Storm Sewer
●	Outfall
—	Water Boundary
▬	Drainage Basin Limits
▬	General Electric Company Facility Boundary
—	Road
▨	Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

0 250
Feet

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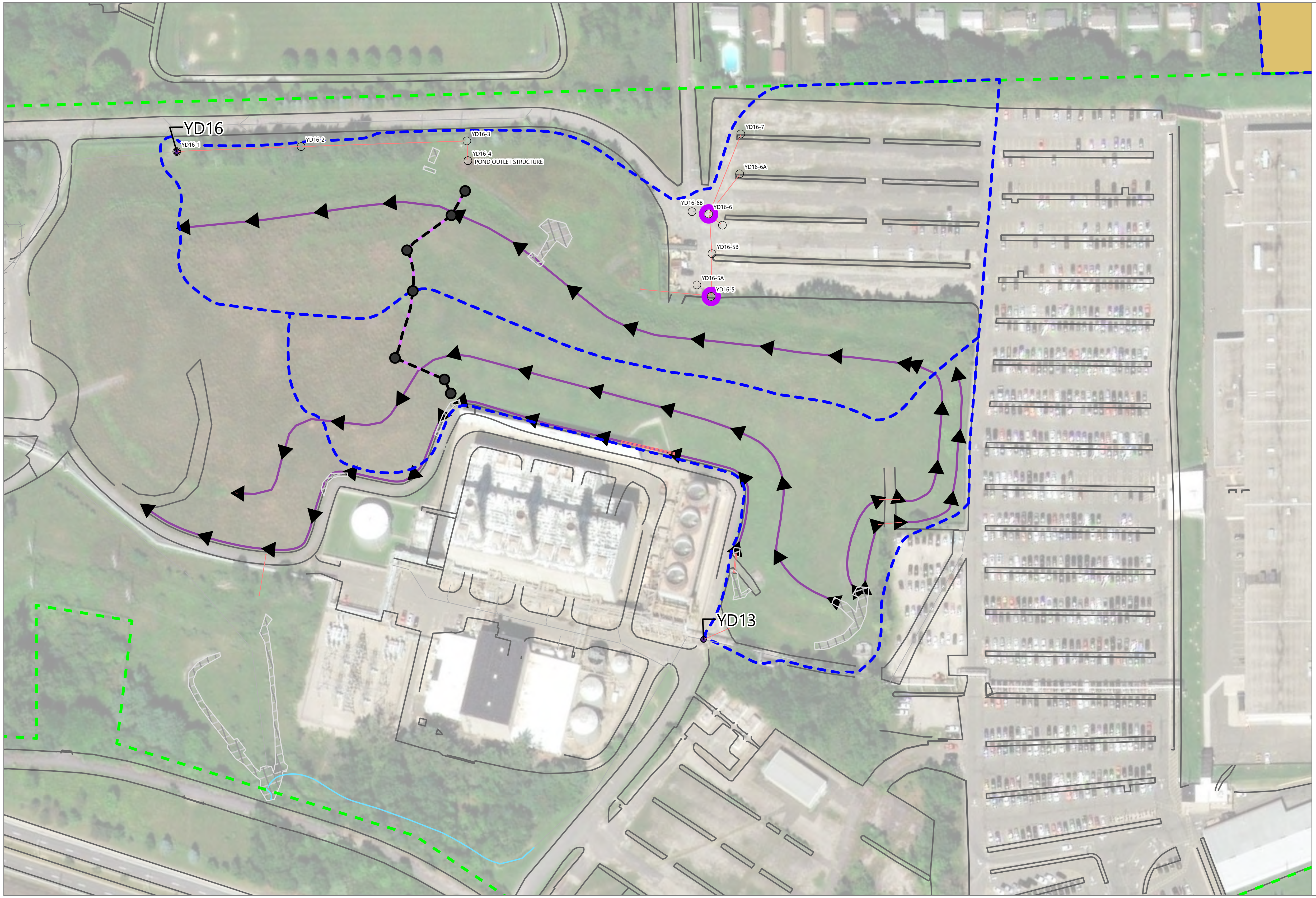
ANCHOR QEA

Figure 5-7
Catch Basin Filter Bags to be Installed and Inspected - YD10 and YD12 Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts



LEGEND:

- ○ Catch Basin Filter Bag Location
- Hill 78/Building 71 OPCA Transition
- ○ Manhole/Catch Basin
- Storm Sewer Piping
- Historical Storm Sewer
- Storm Sewer Abandoned
- ● Outfall
- Water Boundary
- Drainage Basin Limits
- General Electric Company Facility Boundary
- ▨ Riprap
- ◀◀ Swale
- Road
- ▨ Pittsfield Stormwater Contribution

NOTES:
Aerial courtesy of ESRI

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ANCHOR QEA

Figure 5-8
Catch Basin Filter Bags to be Installed and Inspected - YD16 Drainage Basin
Surface Water Discharge Work Plan
General Electric Company - Pittsfield, Massachusetts

Appendix A
Stormwater Pollution Prevention Plan (SWPPP)

Appendix A

ARCADIS

Appendix A.

General Electric Company

Stormwater Pollution Prevention Plan

Pittsfield, Massachusetts

August 2025

Stormwater Pollution Prevention Plan

Pittsfield, Massachusetts

August 2025

Prepared By:
Arcadis U.S., Inc.
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Syracuse
New York 13202
Phone: 315 446 9120
Fax: 315 449 0017

Prepared For:
General Electric Company
Pittsfield, Massachusetts

Table of Contents

Tables

Figure

Attachments

Abbreviations

BMP	best management practice
CD	Consent Decree in *United States v. General Electric Company*, No. 99-30225-MAP, U.S. District Court for District of Massachusetts
CBRE	Coldwell Banker Richard Ellis
CD	Consent Decree
CEPP	Contingency and Emergency Procedures Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
DMR	Discharge Monitoring Report
EPA	United States Environmental Protection Agency
Facility	GE's facility located in Pittsfield, Massachusetts
GE	General Electric Company
GMA	Groundwater Management Area
GWTF	Groundwater Treatment Facility
MassDEP	Massachusetts Department of Environmental Protection
NAPL	non-aqueous phase liquid
NPDES	National Pollutant Discharge Elimination System
OPCA	On-Plant Consolidation Area
OWS	oil/water separator
PCB	polychlorinated biphenyl
POP	Project Operations Plan
RD/RA	Removal Design/Removal Action
RQ	reportable quantity
SABIC	SABIC Innovative Plastics
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC Plan	Spill Prevention, Control and Countermeasure Plan
SVOC	semi-volatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TSS	total suspended solids

VOC	volatile organic compound
WTP	Water Treatment Plant

1 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) addresses stormwater runoff discharges from the General Electric Company (GE) facility located in Pittsfield, Massachusetts (the Facility) to adjacent surface waters. It is an appendix to the Surface Water Discharge Work Plan (Work Plan) submitted by GE pursuant a Modification to the Statement of Work for Removal Actions Outside the River (SOW), which is part of the Consent Decree (CD) executed by GE, the United States, the Commonwealth of Massachusetts, and other parties in 1999 and approved by a federal court in 2000 (EPA and GE 2000).

1.1 Background

The GE Facility occupies an approximately 225-acre parcel of land adjacent to the Housatonic River and Unkamet Brook. Historically, discharges from the Facility were covered by a National Pollutant Discharge Elimination System (NPDES) permit issued jointly by the United States Environmental Protection Agency (EPA) under the federal Clean Water Act and the Massachusetts Department of Environmental Protection (MassDEP) under the state Clean Waters Act. That permit was originally sought and obtained when the Facility included multiple process outfalls from active manufacturing operations. On May 1, 2025, the United States prepared and filed with the federal court a Non-Material Modification of the CD, which modified the SOW, effective on that date, to transfer regulatory authority over point source discharges from the Facility to adjacent surface waters (the Housatonic River and Unkamet Brook) from the former NPDES permit to EPA under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the CD.

The SOW modification required GE to submit a Surface Water Discharge Work Plan to govern the point source discharges from the Facility, which, upon EPA approval, will govern GE's responsibilities for such discharges and supersede any provisions of the former NPDES permit. GE has prepared and is submitting that Work Plan. Section 2.9.2 of the SOW modification specifies that the Work Plan must contain details regarding the development and implementation of a revised SWPPP. GE has elected, instead, to prepare a revised SWPPP as an appendix to the Work Plan. This document constitutes that revised SWPPP. It has been organized to describe the design, installation/operation, and maintenance of control measures, including best management practices (BMPs), to minimize pollutant discharges in stormwater from the GE Facility.

1.2 Plan Organization

This SWPPP is organized into the following sections:

- **Section 1. Introduction** – provides background, organization of this document, and Facility information.
- **Section 2. Potential Pollutant Sources** – presents an inventory of the potential pollutant sources.
- **Section 3. Stormwater Control Measures** – presents the pollution prevention system components and control measures applicable to stormwater discharges.
- **Section 4. Stormwater Monitoring**– describes the stormwater sampling locations and sampling procedures.
- **Section 5. Inspections** – presents the procedures for conducting and reporting routine inspections as part of the SWPPP.

- **Section 6. SWPPP Modifications and Corrective Actions** – describes the protocol for amending the SWPPP as well as corrective actions and corrective action reporting for non-compliance with this SWPP.
- **Section 7. References** – lists the references cited in this SWPPP.

1.3 Facility Information

The Facility is located on the eastern side of Pittsfield in an area that consists primarily of industrial and commercial facilities. A General Site Location Map showing the surrounding area is provided on Figure 1-1, while more detailed Facility maps, showing the various drainage systems, are provided in **Attachment A** (Figures A-1 through A-9).

1.3.1 Site Operations and Buildings

Currently, operations at the Facility site are functionally coordinated by two primary groups: (1) GE Remedial and (2) GE Real Estate/Coldwell Banker Richard Ellis (CBRE). GE leases portions of the Facility site to SABIC Innovative Plastics (SABIC), General Dynamics, and IHI Power Services Corporation (Pittsfield Generating Company). SABIC has processing evaluation and development operations located at Building 100. General Dynamics has U.S. Defense Department-related operations located at Building 130; and the Pittsfield Generating Company owns and operates a power generation plant connected to the electrical grid. In general, GE Remedial conducts operations related to the ongoing implementation of CD activities at the Facility, including groundwater monitoring, operation of treatment plant buildings and non-aqueous phase liquid (NAPL) recovery systems, and routine inspections of remediated areas, as well as preparing and conducting remediation activities outside the Facility on the Housatonic River. GE Real Estate/CBRE conducts operations to support plant utilities, plant maintenance, and office building services including managing lease agreements with tenants.

1.3.2 Site Access

Access to the Facility is limited by use of employee/contractor access badges. Visitors must check in with plant security before entering the Facility. Within GE, SABIC, and General Dynamics areas, contractors are required to check in at Gate 130 to be issued a contractor access badge or a day pass and to ensure all contractors have participated in the mandatory safety training. Contract workers receive training about potential hazards that may be encountered while working at the Facility as well as instruction on evacuation procedures. All Facility areas are designed for adequate movement of emergency personnel and equipment.

1.3.3 Storm Sewer Mapping

Stormwater runoff discharged from outfalls is collected and conveyed via a series of manholes, catch basins, and piping. Figures depicting the Facility's updated storm sewer systems are presented on Figures A-1 through A-9 in **Attachment A**. All manholes and catch basins that are hydraulically connected to the authorized outfalls were inspected in 2009 (to the extent practicable) to determine pipe type, pipe sizes, connections, and approximate locations of structures. In accordance with the Work Plan, GE will perform additional hydraulic pressure washing and video inspection of existing storm sewer piping in 2026. The results of that effort will be used to further update GE's storm sewer mapping as necessary.

1.4 Stormwater Pollution Prevention

GE maintains a Spill Prevention, Control, and Countermeasure (SPCC) Plan, a Hazardous Waste Facility Contingency Plan, and a Project Operations Plan covering the overall CD Site (POP; Arcadis 2024). These plans identify specific individuals responsible for implementing the activities outlined in the plans. GE Facility leadership is responsible for maintaining consistency among the SWPPP and these plans. Copies of these plans will be kept at the Facility with this SWPPP at all times.

2 Potential Pollutant Sources

The following section presents a brief overview of each drainage area associated with the outfalls included in the Work Plan. The drainage areas at the Facility and surrounding City of Pittsfield contributions are shown on Figures A-1 through A-9 in **Attachment A**. In addition, this section includes a summary of potential pollutant sources and a description of non-stormwater discharges.

2.1 Drainage Areas and Stormwater Controls

An overview of the drainage areas and associated stormwater controls is presented below.

- Drainage Area 005 – In general, this area encompasses most of the central and western portions of the area south of East Street and some portions north of East Street. Additionally, City of Pittsfield property (i.e., portions of Tyler Street and East Street) discharges stormwater conveyed to this drainage area. Runoff from Drainage Area 005 is collected and conveyed through a series of manholes, catch basins, and treatment systems before discharging to the Housatonic River via Outfalls 005, 05A, and 05B. Treatment systems in Drainage Area 005 include oil/water separators (OWSs) 64Z, OWS 64W, and the Building 64T Water Treatment Plant (WTP).

- Drainage Area 006 – This area encompasses most of the eastern portion of the area south of East Street, directly west of Newell Street, and includes portions north of East Street. The drainage area includes the baseball field west of Newell Street, the grassed area to the east of 64V and 64R, and the Building 64G Groundwater Treatment Facility (GWTF). Drainage areas north of East Street include the area south of Merrill Road. In addition, stormwater runoff from portions of the area west of Newell Street, East Street, and Merrill Road is conveyed to this drainage area. Additionally, stormwater runoff from City of Pittsfield property, including portions of East Street and Newell Street, is conveyed to this drainage area. Runoff from Drainage Area 006 is collected via a series of manholes and catch basins and conveyed to OWS 64X for treatment before discharging to the Housatonic River through Outfalls 006, 06A, and SRO5.

- Drainage Area 009 – This drainage area encompasses the area east of Plastics Avenue and north of Merrill Road. Runoff from this area is collected via a series of manholes and catch basins and conveyed to OWS 119W for treatment before discharging to Unkamet Brook through Outfall 009.

- Drainage Area YD10 – This drainage area encompasses the High Bay Building 130; the stormwater detention pond adjacent to Dalton Avenue; and the residential neighborhood bounded by Dalton Avenue, Allendale Road, Maryland Avenue, and Plastics Avenue. A portion of the YD10 drainage area (approximately 19.7 acres) is an adjacent residential area located outside of the Facility. Runoff from Drainage Area YD10 is collected via a series of manholes, catch basins, and the stormwater detention pond and is discharged to Unkamet Brook through Outfall YD10.

- Drainage Area YD12 – This drainage area encompasses the area east of Plastics Avenue north of Drainage Area 009 and south of Drainage Area YD10. The area encompasses Buildings 51A, 105X, 116, 118, 121, and 125 as well as the roadway from Gate 51 to Building 120X. Runoff from Drainage Area YD12 drains via a series of manholes and catch basins and discharges to Unkamet Brook through Outfall YD12.

- Drainage Area YD13 – Drainage Area YD13 encompasses a portion of the capped On-Plant Consolidation Areas (OPCAs), referred to as the Building 71 and Hill 78 OPCAs. Stormwater runoff from the OPCAs enters the Pittsfield Generating Company storm drain system via the stormwater collection basin at Outfall YD13. Flows from Drainage Area YD13 combine with runoff form the General Dynamics parking area and the

Pittsfield Generating Company and ultimately discharge into a small stream that leads to the Housatonic River.

- Drainage Area YD16 – This drainage area encompasses portions of the General Dynamics employee parking lot east of YD16 and a portion of the capped OPCAs. Stormwater runoff from the General Dynamics parking lot and a portion of the OPCAs enters the storm drain via the stormwater collection basin, which then flows into the YD16 outlet manhole. Stormwater collected in the outlet manhole is discharged via Outfall YD16 and then flows approximately 400 feet through a 12-inch-diameter pipe entering a stormwater structure, where it then combines with City of Pittsfield stormwater and ultimately discharges into the Housatonic River.

2.2 Identification of Pollutants and Potential Pollutant Sources

Table 2-1 below identifies the specific activities and potential pollutant sources within each drainage area and for each associated outfall that are subject to SWPPP requirements. Further, the figures in **Attachment A** include tables showing the locations of potential pollutants in the depicted drainage areas.

Table 2-1: Site Activity and Potential Pollutant Sources

Drainage Area ID	Associated Outfalls	Site Activity	Potential Associated Pollutant Sources	Spills and Leaks	Salt Storage	Sampling Data Summary
005	005, 05A, and 05B	Activities include those associated with the operation of OWS 64W and 64Z, the Building 64T WTP, the Building 64G GWTF, and associated groundwater/NAPL recovery/storage operations; Bldg. 100 SABIC; and OWS 64W and 64Z, manhole, and catch basin cleaning.	Oil & grease from vehicular traffic; Miscellaneous chemicals or raw materials from leaks or spills from delivery trucks traveling on City streets and access roads inside the Facility; Building 64T WTP and Building 64G GWTF water treatment operation chemicals; Groundwater/NAPL from recovery systems; and Impacted soils, groundwater, and subsurface NAPL including residual-impacted sediment and debris in the stormwater drainage system.	There have been no outdoor spills or leaks of significant materials in reportable quantities (RQs) within a minimum of three years preceding this SWPPP.	This area is not used for salt storage.	Stormwater discharge sampling data collected under the former NPDES permit have been summarized and submitted to EPA monthly in Discharge Monitoring Report (DMRs). Soil sampling data for areas within this drainage area were presented in GE's Conceptual and Final Removal Design/Removal Action (RD/RA) Work Plans and Final Completion Reports for East Street Area 2-North and East Street Area 2-South. Groundwater monitoring data under GE's long-term monitoring program for Groundwater Management Area (GMA) 1 are summarized in semi-annual reports to EPA.

Drainage Area ID	Associated Outfalls	Site Activity	Potential Associated Pollutant Sources	Spills and Leaks	Salt Storage	Sampling Data Summary
006	006,06A, and SR05	Activities include those associated with the operation of OWS 64X and groundwater/NAPL recovery/storage operations; and OWS 64X, manhole, and catch basin cleaning.	Oil & grease from vehicular traffic; Miscellaneous chemicals or raw materials from leaks or spills from delivery trucks traveling on City streets and access roads inside the Facility; Groundwater/NAPL from recovery systems; and Impacted soils, groundwater, and subsurface NAPL including residual-impacted sediment and debris in the stormwater drainage system.	There have been no outdoor spills or leaks of significant materials in RQs within a minimum of three years preceding this SWPPP.	This area is not used for salt storage.	Stormwater discharge sampling data collected under the former NPDES permit have been summarized and submitted to EPA monthly in DMRs. Soil sampling data for areas within this drainage area were presented in GE's Conceptual and Final RD/RA Work Plans and Final Completion Reports for East Street Area 2-North and East Street Area 2-South. Groundwater monitoring data under GE's long-term monitoring program for GMA 1 are summarized in semi-annual reports to EPA.

Drainage Area ID	Associated Outfalls	Site Activity	Potential Associated Pollutant Sources	Spills and Leaks	Salt Storage	Sampling Data Summary
009	009	Activities include those associated with the operation of OWS 119W and groundwater/NAPL recovery/storage operations; GE Real Estate/CBRE grounds material cleanup and staging; Bldg. 51 Emergency Generator and Heating Fuel Oil Storage. Dumpster on the Bldg 130 loading dock	Oil & grease from vehicular traffic; Miscellaneous chemicals or other materials from leaks or spills from delivery trucks; Groundwater/NAPL from recovery systems; Staged grounds cleanup materials (e.g., sand, mulch); Diesel fuel; General refuse from management of wastes related to the dumpsters; and Impacted soils, groundwater, and subsurface NAPL including residual-impacted sediment and debris in the stormwater drainage system.	There have been no outdoor spills or leaks of significant materials in RQs within a minimum of three years preceding this SWPPP.	This area is not used for salt storage.	Stormwater discharge sampling data collected under the former NPDES permit have been summarized and submitted to EPA monthly in a DMR. Stormwater sampling of outfall discharges has been performed under submerged conditions. Soil sampling data for areas within this drainage area were presented in GE's Conceptual and Final RD/RA Work Plans and Final Completion Report for the Unkamet Brook Area. Groundwater monitoring data under GE's long-term monitoring program for GMA 3 are summarized in semi-annual reports to EPA.

Drainage Area ID	Associated Outfalls	Site Activity	Potential Associated Pollutant Sources	Spills and Leaks	Salt Storage	Sampling Data Summary
YD10	YD10	Access roads in the area serve only as employee parking for the adjacent office buildings.	Oil & grease from vehicular traffic; Miscellaneous chemicals or other materials from leaks or spills from delivery trucks traveling on City of Pittsfield streets; and Impacted soils and groundwater, including residual-impacted sediment and debris, in the stormwater drainage system.	There have been no outdoor spills or leaks of significant materials in RQs within a minimum of three years preceding this SWPPP.	This area is not used for salt storage.	Stormwater discharge sampling data collected under the former NPDES permit have been summarized and submitted to EPA in attachments to the monthly DMRs. Sampling has been performed within the outfall discharge pipes. Soil sampling data for areas within this drainage area were presented in GE's Conceptual and Final RD/RA Work Plans and Final Completion Report for the Unkamet Brook Area. Groundwater monitoring data under GE's long-term monitoring program for GMA 3 are summarized in semi-annual reports to EPA.

Drainage Area ID	Associated Outfalls	Site Activity	Potential Associated Pollutant Sources	Spills and Leaks	Salt Storage	Sampling Data Summary
YD12	YD12	Building 116 emergency generator and paved areas that serve only as access roads and employee parking.	Oil & grease from vehicular traffic; Miscellaneous chemicals or raw materials from leaks or spills from delivery trucks traveling on access roads inside the Facility; General refuse from management of wastes related to the dumpsters; Diesel fuel; and Impacted soils and groundwater, including residual-impacted sediment and debris, in the stormwater drainage system.	There have been no outdoor spills or leaks of significant materials in RQs within a minimum of three years preceding this SWPPP.	A portion of Building 121, which houses the GE Real Estate/CBRE winter salt and sand pile, is included in Drainage Area YD12. The building has a roof, concrete slab floor, full-height walls on the north and west sides, and 3-foot-high walls on the south and east sides. Materials stored in Building 121 are not exposed to precipitation.	Stormwater discharge sampling data collected under the former NPDES permit have been summarized and submitted to EPA in attachments to the monthly DMRs. Due to the submerged nature of the outlet, samples have been collected from the manhole immediately upgradient of the discharge to Unkamet Brook. Soil sampling data for areas within this drainage area were presented in GE's Conceptual and Final RD/RA Work Plans and Final Completion Report for the Unkamet Brook Area. Groundwater monitoring data under GE's long-term monitoring program for GMA 3 are summarized in semi-annual reports to EPA.

Drainage Area ID	Associated Outfalls	Site Activity	Potential Associated Pollutant Sources	Spills and Leaks	Salt Storage	Sampling Data Summary
YD13	YD13	Paved areas serve only as access roads.	Oil & grease from vehicular traffic; and Impacted soils and groundwater, including residual-impacted sediment and debris in the stormwater drainage system.	There have been no outdoor spills or leaks of significant materials in RQ within a minimum of three years preceding this SWPPP.	This area is not used for salt storage.	Stormwater discharge sampling data collected under the former NPDES permit have been summarized and submitted to EPA in attachments to the monthly DMRs. Sampling has been performed at the outlet structure of the stormwater detention basin. Soil sampling data for areas within this drainage area were presented in GE's Conceptual and Final RD/RA Work Plans and Final Completion Report for Hill 78-Remainder. (This drainage area also includes the OPCAs, described in GE's Final Completion Report for the OPCAs.) Groundwater monitoring data under GE's long-term monitoring program for GMA 4 are summarized in semi-annual reports to EPA.
YD16	YD16	Paved areas serve only as access roads and parking lots.	Oil & grease from vehicular traffic; and Impacted soils and groundwater, including residual-impacted sediment and debris, in the stormwater drainage system.	There have been no outdoor spills or leaks of significant materials in RQ within a minimum of three years preceding this SWPPP.	This area is not used for salt storage.	Stormwater discharge sampling data collected under the former NPDES permit have been summarized and submitted to EPA in attachments to the monthly DMRs. Sampling has been performed at the outlet structure of the stormwater detention basin. Soil sampling data for areas within this drainage area were presented in the Conceptual and Final RD/RA Work Plans and Final Completion Reports for the Unkamet Brook Area and Hill

Drainage Area ID	Associated Outfalls	Site Activity	Potential Associated Pollutant Sources	Spills and Leaks	Salt Storage	Sampling Data Summary
						78 Area-Remainder. (This drainage area also includes the OPCAs, described in GE's Final Completion Report for the OPCAs.) Groundwater monitoring data under GE's long-term monitoring program for GMA 4 are summarized in semi-annual reports to EPA.

2.3 Dry-Weather Flow Discharges

GE monitored dry-weather flow and implemented dry-weather flow reduction measures (i.e., BMPs) at the Facility beginning in 2009. Table 2-1 of the Work Plan provides a summary of the dry-weather flow reduction activities completed by GE to date. As summarized in the Work Plan, dry-weather flows at the Facility are currently limited to the 005 and 006 Drainage Basins. These flows are generally attributable to areas owned and controlled by the City of Pittsfield. The short-term BMPs focused on eliminating any remaining GE contributions to dry-weather flow are described in Section 5.3.4.1 of the Work Plan.

3 Non-Numeric Stormwater Control Measures

This section presents the non-numeric stormwater control measures that GE uses or will use to reduce the likelihood for potential pollutant sources listed in Table 2-1 to enter the Facility's stormwater discharges. Non-numeric effluent limits (i.e., BMPs) have been selected to comply with Section 2.9.2 of the SOW modification in all drainage areas. As described below, these controls include good housekeeping (including recurring BMPs), employee training, facility security, preventive maintenance, spill prevention and response, management of stormwater runoff, sediment and erosion control, record keeping, and incident reporting. In addition, GE will perform short-term and long-term BMPs presented in Section 5.3.4 of the Work Plan.

3.1 Good Housekeeping

When used in conjunction with routine inspections (see Section 5.1), good housekeeping can be a highly effective method of pollution prevention. The following are examples of good housekeeping practices:

- Scheduling regular pickup and disposal of garbage and waste materials;
- Inspecting for leaks and observing conditions of drums, tanks, and containers;
- Promptly cleaning up spilled materials;
- Ensuring that employees review and understand cleanup procedures;
- Keeping an up-to-date inventory of all materials present at the Facility and clearly labeling containers; and
- Maintaining clean ground surfaces with regular sweeping, vacuuming, and housekeeping.

GE has used and will continue to use the appropriate above-referenced housekeeping practices within all drainage areas. Solid waste contractors remove and dispose of refuse. Areas around the waste collection vessels are inspected in accordance with Section 5.1. These inspections also include all significant material storage and handling areas and are designed to uncover leak or spill conditions that could potentially impact stormwater runoff. Spills are cleaned up in accordance with Section 3.6 of this SWPPP.

3.2 Recurring BMPs

In addition to the good housekeeping practices described above, GE will perform the following recurring BMPs:

- Annual inspection and cleaning of manholes and catch basins - All manholes and catch basins located at the Facility (approximately 360 structures) will be inspected and cleaned. Approximately 90 structures will be cleaned each year on a rotational basis. This rotational schedule targets each structure for cleaning once every four years at a minimum.
- Annual OWS sediment cleaning – Annual sediment/debris cleaning will be performed at OWSs 64W, 64X, 64Z, and 119W starting in 2026. OWS cleaning will include the removal of sediment and debris from walls and floors and grouting of cracks in the OWS floors/walls with a non-shrink epoxy grout as necessary.
- Semi-annual sweeping in paved and other impervious areas – In paved and other impervious areas, sweepings will be performed to reduce pollutants in stormwater discharges. Sweeping frequency will be based on the rates of accumulation of particulate materials and their potential impact on stormwater discharges. At a minimum, sweepings will be performed semi-annually (spring and fall). GE will use an industrial vac-sweeper to further reduce pollutants.

- Installation of catch basin filter bags – GE will install catch basin filter bags in locations with the potential to collect roadway and impervious cover sediments and debris. GE anticipates that these locations will primarily be in high-traffic areas associated with Drainage Areas 005,009, YD12, and YD16. The filter bag locations are shown on figures referenced in Section 5.3.4.3 of the Work Plan. The filter bags will be inspected monthly for a period of one year to determine their effectiveness at removing solids.

3.3 Employee Training

As with all of GE's environment, health, and safety programs, well-trained GE employees play a critical role in achieving the objectives of this SWPPP. Therefore, operations managers, contractors, and other site personnel working where materials that could contain pollutants are handled will be given instruction and information regarding:

- Environmental laws and regulations;
- Pollution prevention concepts;
- Content of this SWPPP;
- Measures and controls to be used in each drainage area to minimize the pollutants in Facility stormwater discharges; and
- Site spill/release emergency response procedures.

Employee training will also cover procedures for cleaning and washing equipment. The training will emphasize the potential human hazards and environmental impacts from the discharge of residual wash water.

Refresher training sessions will be held at least once per year or more frequently when appropriate.

3.4 Site Security

The Facility site security staff is present 24 hours per day, seven days per week. Access to the Facility is restricted by fencing and electronically controlled gates that are monitored from a security station by closed-circuit television. All contractors and persons on extended visits are issued badges for access to the Facility. All contractors and persons on extended visits to the Facility are pre-approved by GE before entry. Infrequent visitors must register at the reception desk and are escorted to their on-site destination by GE personnel.

3.5 Preventive Maintenance

A preventive maintenance program for outdoor equipment will be used in conjunction with routine inspections (see Section 5.1). The inspections are designed to reveal conditions that could cause breakdowns or failures that may result in the discharge of pollutants. In addition, routine maintenance is conducted on the stormwater management controls located at the Facility (e.g., OWSs and Building 64T WTP). Copies of completed maintenance reports are kept at the Facility.

3.6 Spill Prevention and Response Procedures

In the event of a spill, trained Facility personnel will perform specific response procedures as outlined in the GE Integrated Emergency Response Plan, which is Exhibit F-1 to GE's Contingency and Emergency Procedures Plan (CEPP) included as Attachment F to the 2024 POP. All personnel designated to engage in emergency spill response are fully trained and properly equipped. GE's treatment plant operators are also available to respond to minor chemical releases and incidents at the Facility in support of GE personnel. In addition, GE maintains relationships with nearby emergency response contractors for assistance with larger spills or incidents.

All spills, releases, inspection results, and maintenance issues related to stormwater are to be immediately brought to the attention of the manager listed in the GE Integrated Emergency Response Plan. Reporting is discussed in Section 3.7, and a complete list of spill response procedures is presented in the GE Integrated Emergency Response Plan.

To minimize the potential for leaks, spills, and other releases that may be exposed to stormwater, the following preventative measures will be carried out to the extent practicable:

- Plainly labeling containers (e.g., "Universal Waste," "Hazardous Waste") that could be susceptible to spillage and/or leakage to encourage the proper handling of the container and material and to facilitate a rapid response if spills or leaks occur;
- Installing barriers between material storage and traffic areas;
- Providing secondary containment around material storage areas; and
- Reviewing and posting signage related to material storage and handling areas in plain sight.

3.7 Incident Reporting

All spills, releases, inspection results, and maintenance issues related to stormwater pollution prevention are to be immediately brought to the attention of GE leadership.

In the event of an emergency or other release of hazardous substances or materials, the notifications required by all applicable laws and regulations will be made, including those under CERCLA, the Emergency Planning and Community Right-to-Know Act, the Clean Water Act, the Toxic Substances Control Act, Massachusetts Chapter 21E, and/or the Massachusetts Contingency Plan. In particular, in cases where a stormwater discharge contains a hazardous substance or oil in an amount equal to or in excess of an RQ or standard established under 40 Code of Federal Regulations (CFR) Parts 110, 117, and 302 or 310 Code of Massachusetts Regulations (CMR) 40, the person in charge of the Facility will notify the National Response Center (800-424-8802) in accordance with the requirements of 40 CFR Parts 110, 117, and 302 as soon as he or she has knowledge of the discharge exceeding the RQ.

In addition, the CD establishes certain specific notification requirements for emergencies and certain other releases of hazardous substances. Those requirements are set forth in Section 5.1.3 of the CEPP.

3.8 Recordkeeping and Internal Reporting

Spill and pollution prevention efforts are enhanced by retaining records in an orderly manner at the Facility. Therefore, records regarding stormwater pollution prevention will be maintained on site. The records retained will include:

- All inspection reports;
- All corrective action reports (see Section 6.2);
- All spill reports;
- The SWPPP and all revisions thereto; and

- All stormwater monitoring records.

All reportable spills will be recorded and documented within this SWPPP. Spills will be noted with respect to date, time, location, volume, and contents of spill. Detailed reports, including date and time of the incident, weather conditions, response procedures, parties notified, recommended revisions to the BMP program, operating procedures, and/or equipment needed to prevent recurrence, will be filed or their file locations referenced in **Attachment C**. Spill response documentation forms are located with the GE Integrated Emergency Response Plan.

3.9 Sedimentation and Erosion Control

On an ongoing basis, during demolition and remediation-related projects at the Facility, sedimentation and erosion controls will be implemented in accordance with the project's work plan. These controls may include, but are not limited to, silt fence, hay bales, manhole/catch basin inlet protection, and pneumatic/mechanical pipe plugs. Before starting such activities, the project's stormwater system will be reviewed, and appropriate protection will be identified and implemented.

A large portion of the Facility consists of paved or other impervious surfaces, thus limiting the potential for erosion. Grass and other landscaped areas are monitored and will continue to be monitored for signs of erosion by on-site personnel.

4 Stormwater Monitoring

This section describes the quantitative monitoring to be performed for the stormwater pollution prevention program at the Facility.

4.1 Sample Locations

Surface water discharge sampling will be performed in accordance with the Work Plan. The specific sampling locations are shown on the Facility Drainage plans in **Attachment A**. The outfalls to be monitored are as follow:

- Outfalls 005, 05A, and 05B (bypass);
- Outfalls 006 and 06A (bypass);
- Outfall 009;
- Outfall YD10;
- Outfall YD12;
- Outfall YD13; and
- Outfall YD16.

4.2 Sample Parameters and Monitoring Schedule

The sampling parameters and associated monitoring for stormwater discharges are specified in Section 5.1 of the Work Plan.

4.3 Sampling and Analytical Procedures

The procedures to be used for the collection and analysis of samples are provided in Section 5.2.1 of the Work Plan and in Standard Operating Procedures (SOPs) attached to or referenced in the Work Plan. These procedures include:

- Composite (24-hour, 3-hour, and 40-minute) sampling for total suspended solids (TSS) and polychlorinated biphenyls (PCBs);
- Grab sampling for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and oil and grease;
- Recordkeeping;
- Field measurements of water parameters;
- Sample handling, packing, and shipping;
- Chemical analytical procedures; and
- Procedures for equipment cleaning.

5 Inspections

Routine inspections will be conducted at the Facility. The results of these inspections will be documented and maintained as part of the SWPPP. The procedures for conducting and documenting these inspections are discussed below.

5.1 Routine Inspections

Visual inspections, designed to uncover potential spill conditions and other conditions with a potential to release pollutants into a stormwater discharge, will be conducted under this SWPPP. Inspections will be carried out by a qualified individual at the prescribed time. The areas to be inspected and inspection frequencies are listed in Table 5-1. Copies of the Facility inspection forms and associated Facility inspection figures used to document the inspections are included in **Attachment D**. At least once each calendar year, the routine site inspection will be conducted during stormwater discharge conditions.

Each routine inspection will include an examination of the following:

- Industrial materials, residue, or trash that may have or could come in contact with stormwater;
- Leaks or spills from industrial equipment, drums, tanks, or other containers;
- Evidence of pollutants discharging to surface waters at the Facility outfall(s);
- Off-site tracking of sediments or waste materials;
- Evidence of, or potential for, pollutants entering the Facility drainage system; and
- Inspection of the OWSs and outfalls in accordance with the inspection forms and associated figures in **Attachment D** of this SWPPP.

Table 5-1: Site Inspections

Area of Inspection	Drainage Area	Frequency of Inspection
Oil/Water Separator 64Z	005	Quarterly
Oil/Water Separator 64W	005	Quarterly
Outfalls (005, 05A, 05B) to Housatonic River	005	Annually
Drainage Area 005 Roadways, Parking Lots, and Entrances	005	Semi-Annually
Plugged Outfalls (SRO2, SRO3, SRO4, YD4, YD5, 007, YD7, YD8, YD9)	005	Annually
Oil/Water Separator 64X	006	Quarterly
Outfalls (006, 06A, and SRO5) to Housatonic River	006	Annually
Drainage Area 006 Roadways, Parking Lots, and Entrances	006	Semi-Annually
Oil/Water Separator 119W	009	Quarterly
Outfall 009 to Unkamet Brook	009	Annually

Area of Inspection	Drainage Area	Frequency of Inspection
Plugged Outfalls (09A and 09B)	009	Annually
Drainage Area 009 Roadways, Parking Lots, and Entrances	009	Semi-Annually
Outfall YD10	YD10	Annually
Detention Pond Outlet Structure	YD10	Quarterly
Drainage Area YD10 Roadways, Parking Lots, and Entrances	YD10	Semi-Annually
Outfall YD12	YD12	Annually
Building 121 Salt Storage Area	YD12	Quarterly
Drainage Area YD12 Roadways, Parking Lots, and Entrances	YD12	Semi-Annually
Stormwater Detention Basin	YD13	Quarterly
Outfall YD13	YD13	Annually
Plugged Outfall YD14	YD13	Annually
Drainage Area YD13 Roadways, Parking Lots, and Entrances	YD13	Semi-Annually
Stormwater Detention Basin	YD16	Quarterly
Outfall YD16	YD16	Annually
Drainage Area YD16 Roadways, Parking Lots, and Entrances	YD16	Semi-Annually

5.2 Inspection Reports

Following the completion of each inspection, the inspector will prepare an inspection report. Copies of the inspection reports and the potential corrective actions (if necessary) will be maintained as part of the SWPPP, with copies provided in the annual report discussed in Section 6 of the Work Plan. At a minimum, the following information will be documented for each routine inspection:

- Inspection date and time;
- Name(s) and signature(s) of the inspector(s);
- Weather information and a description of any discharges occurring at the time of the inspection;
- Any previously unidentified discharges of pollutants from the Facility;
- Any control measures needing maintenance or repairs;
- Any failed control measures that need replacement;
- Any incidents of non-compliance observed; and
- Any additional control measures needed to comply with the requirements in the Work Plan.

6 SWPPP Modifications and Corrective Actions

6.1 SWPPP Modifications

At a minimum, the SWPPP will be reviewed annually, and if changes are required, an updated version of the SWPPP will be submitted with the annual report described in Section 6 of the Work Plan. Additionally, the SWPPP will be amended if:

1. There is a change in design, construction, operation, or maintenance that will have a significant impact on the potential for the discharge of pollutants to the receiving waters;
2. The SWPPP proves to be ineffective at eliminating or significantly minimizing pollutants from sources; or
3. The SWPPP proves to be ineffective at achieving the general objectives of controlling pollutants in the Facility's stormwater discharges.

6.2 Corrective Actions

If situations of non-compliance with this SWPPP are observed, the discovery of the non-compliance condition will be documented within 24 hours of making such discovery. Subsequently, within 14 days of such discovery, the corrective action(s) to be taken to eliminate or further investigate the deficiency is to be documented. If no corrective action is needed, the basis for that determination will be documented. If changes are necessary following the review, any modifications to control measures will be made before the next storm event if possible or as soon as practicable following the storm event. A corrective action will be considered if any of the following non-compliance conditions occurs:

- An unauthorized release or discharge (e.g., spill, leak, or discharge of non-stormwater not authorized by the Work Plan) occurs at the Facility.
- A discharge violates a numeric effluent limit in the approved Work Plan.
- GE determines that control measures are not being maintained properly during the routine facility inspection or comprehensive site inspection.

Within 24 hours of discovery of a non-compliance condition, the following will be documented:

- Identification of the condition triggering the need for corrective action review;
- Description of the problem identified; and
- Date on which the problem was identified.

Within 14 days of discovery of a non-compliance condition, the following will be documented in a Corrective Action Report:

- Summary of corrective action taken or to be taken (or if corrective action is not necessary, the basis for the determination);
- SWPPP modifications required (if any) as a result of the corrective action;
- Date on which the corrective action is initiated; and
- Date on which the corrective action is completed or expected to be completed.

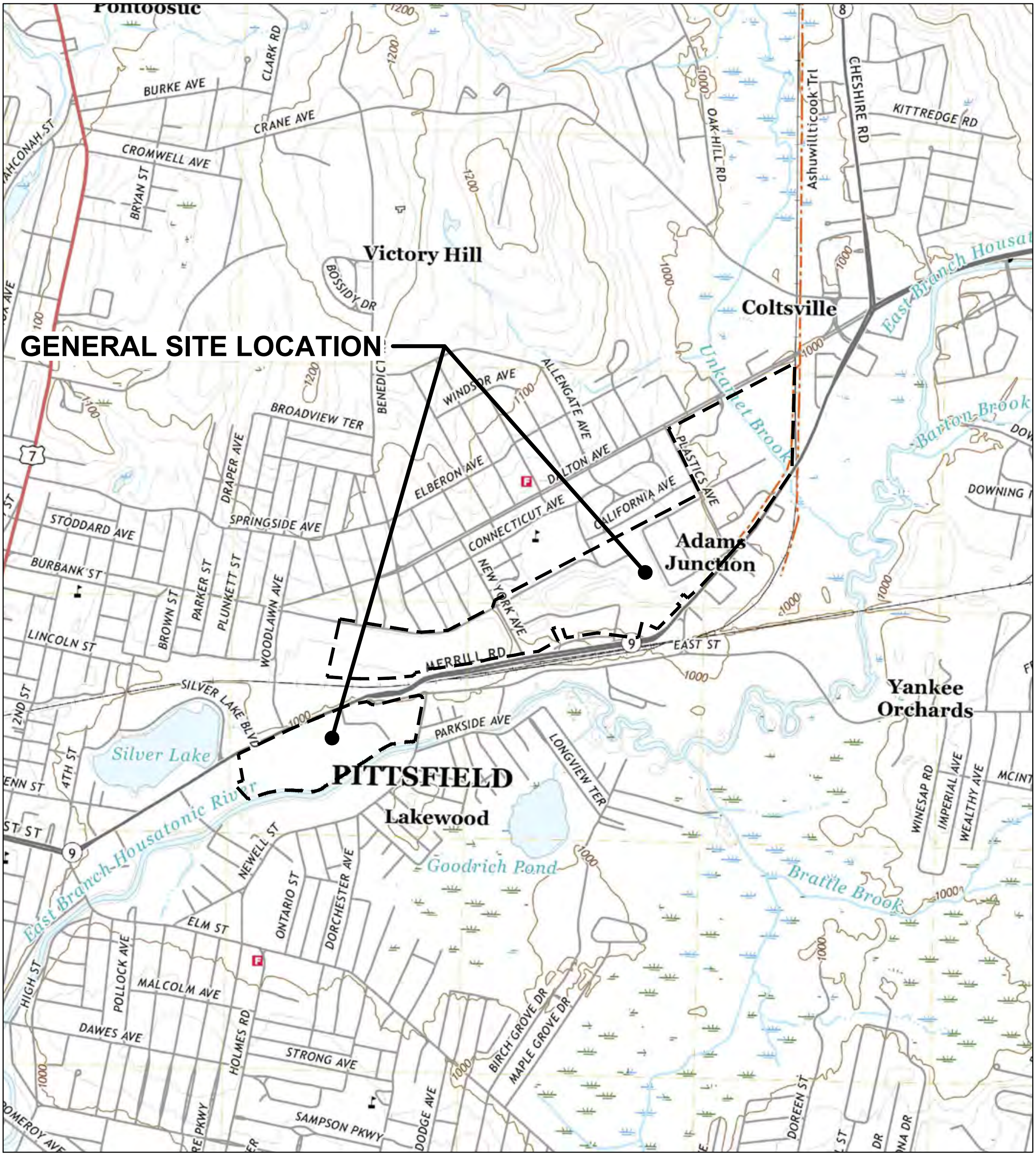
This documentation will be submitted with the annual report described in Section 6 of the Work Plan, and a copy will be retained on site with this SWPPP.

7. References

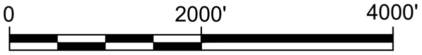
Arcadis. 2024. *Project Operations Plan*. GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised November 2024.

United States Environmental Protection Agency (EPA) and General Electric Company (GE). 2000. Consent Decree in *United States of America, State of Connecticut, and Commonwealth of Massachusetts v. General Electric Company*. Civil Action Nos. 99-30225, 99-30226, 99-30227-MAP, entered by the United States District Court for the District of Massachusetts. October 27, 2000.

Figure



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., PITTSFIELD EAST, MASSACHUSETTS, 2021.



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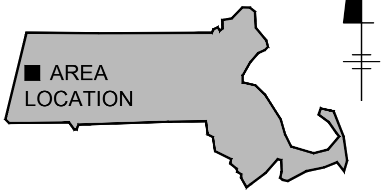

MASSACHUSETTS

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

SITE LOCATION MAP

ARCADIS

FIGURE
1-1

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IMAGES: MA_Pittsfield_East_20210415_TM_geo.tif

Attachment A

Site Drainage Plans

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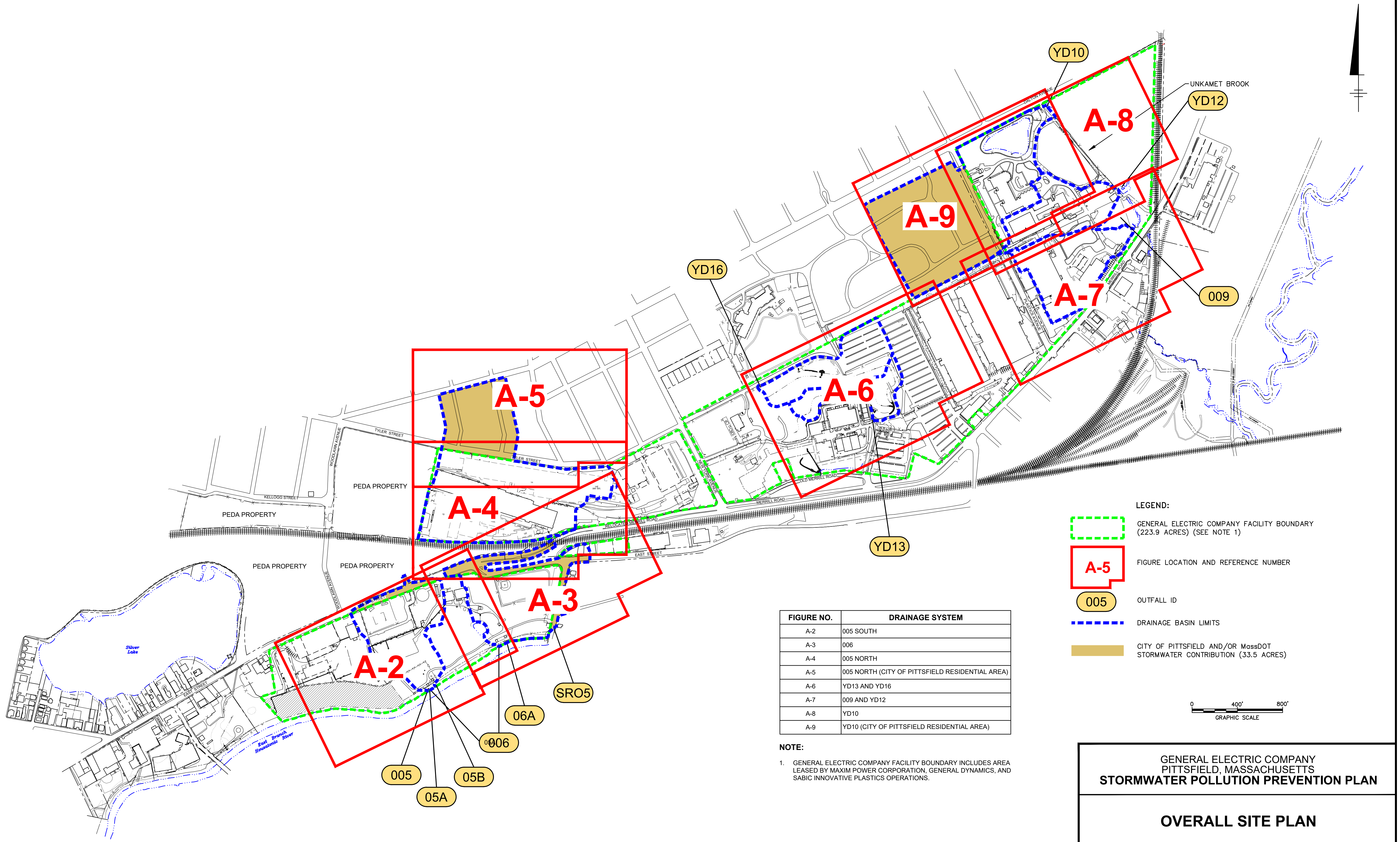

FIGURE NO.	DRAINAGE SYSTEM
A-2	005 SOUTH
A-3	006
A-4	005 NORTH
A-5	005 NORTH (CITY OF PITTSFIELD RESIDENTIAL AREA)
A-6	YD13 AND YD16
A-7	009 AND YD12
A-8	YD10
A-9	YD10 (CITY OF PITTSFIELD RESIDENTIAL AREA)

NOTE:

1. GENERAL ELECTRIC COMPANY FACILITY BOUNDARY INCLUDES AREA LEASED BY MAXIM POWER CORPORATION, GENERAL DYNAMICS, AND SABIC INNOVATIVE PLASTICS OPERATIONS.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

OVERALL SITE PLAN

ARCADIS

FIGURE
A-1

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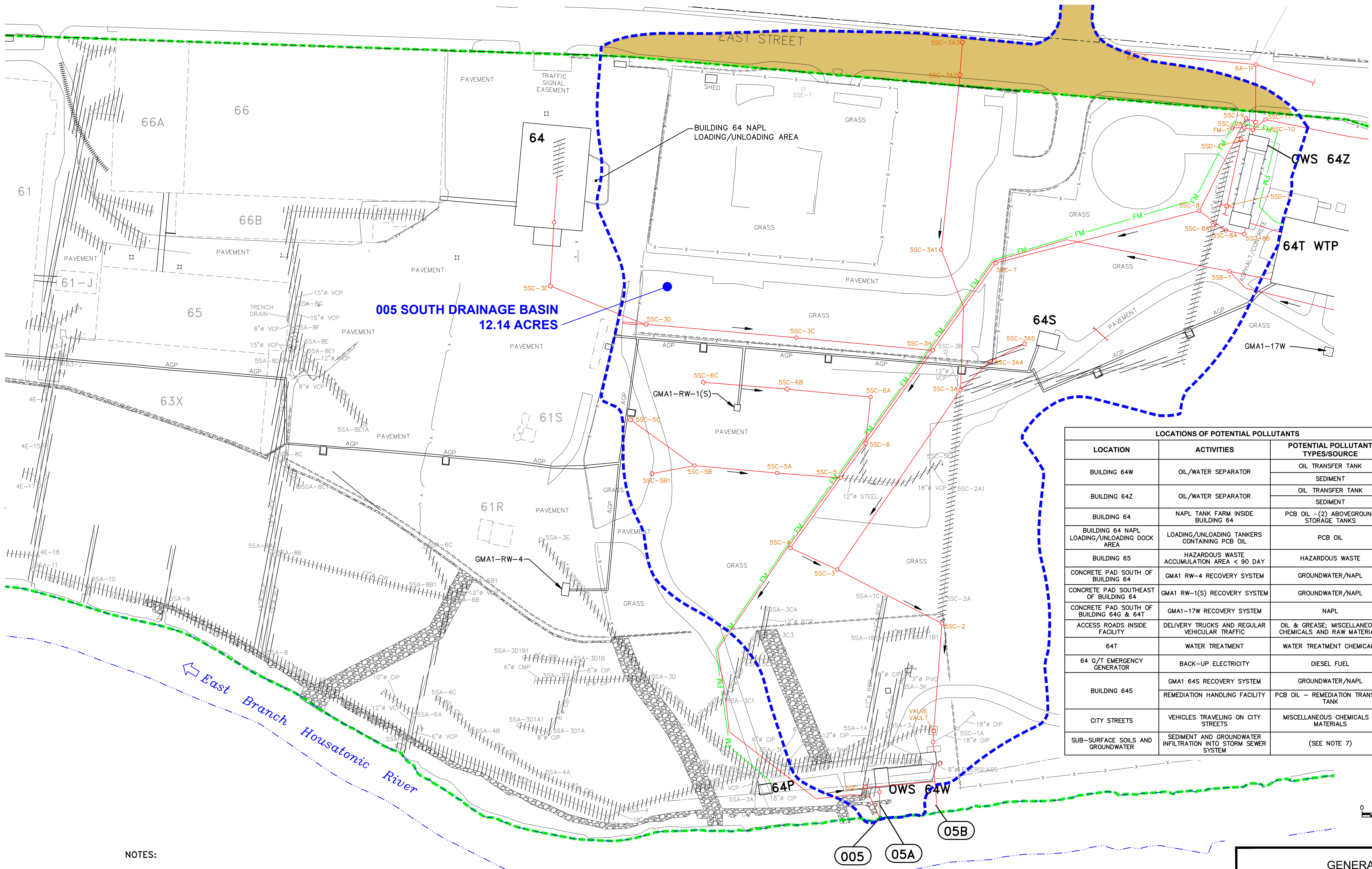

LOCATIONS OF POTENTIAL POLLUTANTS		
LOCATION	**ACTIVITIES**	**POTENTIAL POLLUTANT TYPES/SOURCE**
BUILDING 64W	OIL/WATER SEPARATOR	OIL TRANSFER TANK
		SEDIMENT
BUILDING 64Z	OIL/WATER SEPARATOR	OIL TRANSFER TANK
		SEDIMENT
BUILDING 64	NAPL TANK FARM INSIDE BUILDING 64	PCB OIL -(2) ABOVEGROUND STORAGE TANKS
BUILDING 64 NAPL LOADING/UNLOADING DOCK AREA	LOADING/UNLOADING TANKERS CONTAINING PCB OIL	PCB OIL
BUILDING 65	HAZARDOUS WASTE ACCUMULATION AREA < 90 DAY	HAZARDOUS WASTE
CONCRETE PAD SOUTH OF BUILDING 64	GMA1 RW-4 RECOVERY SYSTEM	GROUNDWATER/NAPL
CONCRETE PAD SOUTHEAST OF BUILDING 64	GMA1 RW-1(S) RECOVERY SYSTEM	GROUNDWATER/NAPL
CONCRETE PAD SOUTH OF BUILDING 64G & 64T	GMA1-17W RECOVERY SYSTEM	NAPL
ACCESS ROADS INSIDE FACILITY	DELIVERY TRUCKS AND REGULAR VEHICULAR TRAFFIC	OIL & GREASE; MISCELLANEOUS CHEMICALS AND RAW MATERIALS
64T	WATER TREATMENT	WATER TREATMENT CHEMICALS
64 G/T EMERGENCY GENERATOR	BACK-UP ELECTRICITY	DIESEL FUEL
BUILDING 64S	GMA1 64S RECOVERY SYSTEM	GROUNDWATER/NAPL
	REMEDIATION HANDLING FACILITY	PCB OIL - REMEDIATION TRANSFER TANK
CITY STREETS	VEHICLES TRAVELING ON CITY STREETS	MISCELLANEOUS CHEMICALS & MATERIALS
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 7)

LEGEND:

005	NPDES OUTFALL LOCATION
🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
	GUARDRAIL
//////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
5SC-3B	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
5SC-8A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
FM	FORCE MAIN
←	STORMWATER FLOW DIRECTION
	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
65	BUILDING LOCATION AND ID
66	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
CMP	CORRUGATED METAL PIPE
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE PIPE
VCP	VITRIFIED CLAY PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
▨	RIPRAP DRAINAGE SWALE
🟨	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION (0.96 ACRES)
■ ■ ■ ■	DRAINAGE BASIN LIMITS

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1081-1, DATED MARCH 24, 2004. TOPOGRAPHIC FEATURES HAVE BEEN UPDATED BASED ON FINAL GRADING PLAN FOR AVERAGING AREA 4E DATED 4/2/2010; AND SURFACE FEATURES AND ITEMS SUBJECT TO INSPECTION FIGURE DATED 12/30/2011 DEVELOPED BY ARCADIS. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. THE STORM SEWER ABANDONMENT AND REMEDIATION/RESTORATION ACTIVITIES (I.E., BACKFILLED/RESTORED, ENGINEERED BARRIER, ENHANCED PAVEMENT, ENGINEERED BARRIER ACCESS ROAD, AND RIPRAP DRAINAGE SWALE AREAS) WERE PERFORMED BETWEEN 6/28/2010 AND 11/11/2011 IN ACCORDANCE WITH GE'S REVISED FINAL RD/RA WORK PLAN FOR EAST STREET AREA 2-SOUTH (APRIL, 2010), AS CONDITIONALLY APPROVED BY EPA ON 5/3/2010.
6. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.
7. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORT FOR EAST STREET AREA 2-SOUTH. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 1.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

005 SOUTH DRAINAGE SYSTEM

ARCADIS

FIGURE
A-2

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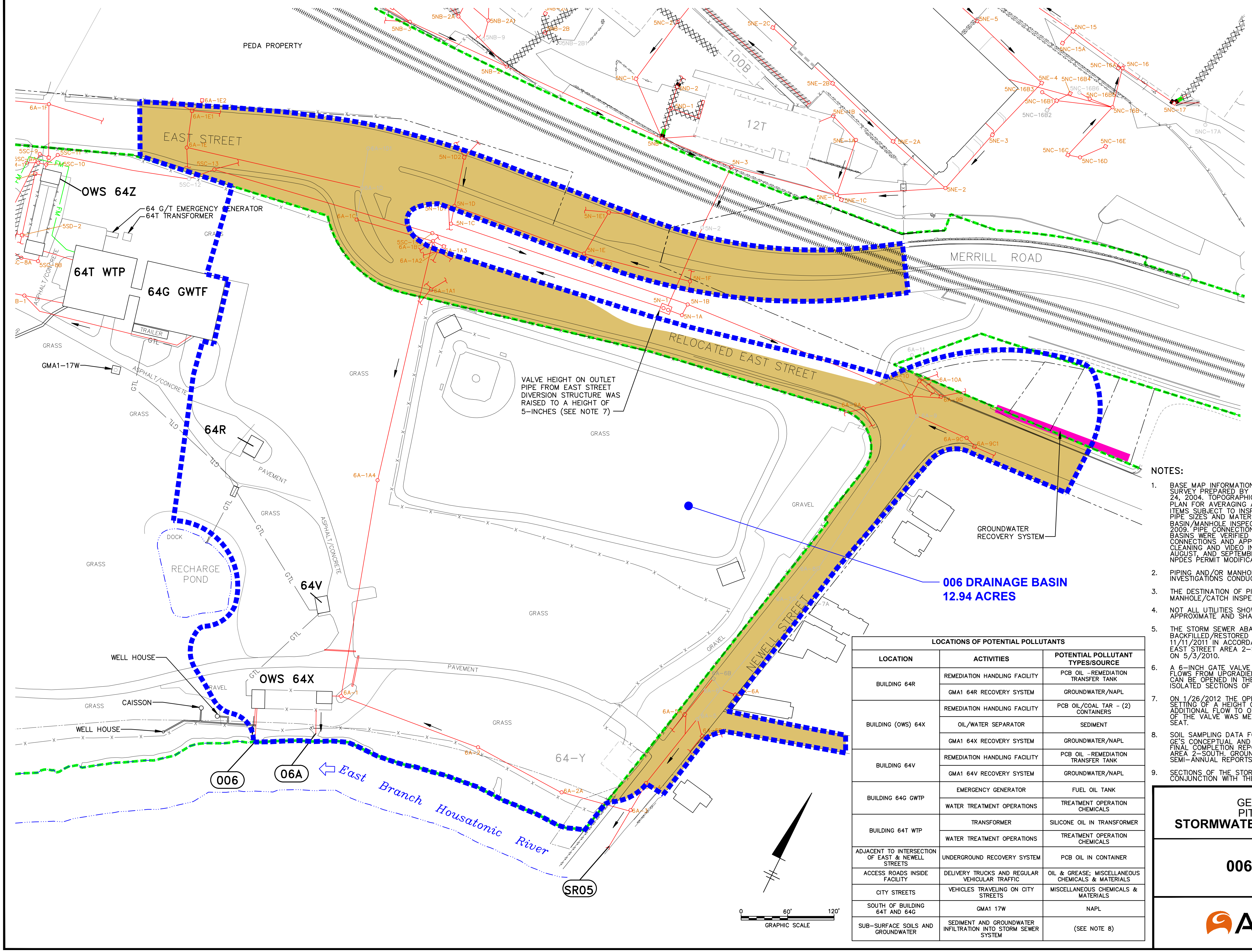

LEGEND:

006	NPDES OUTFALL LOCATION
🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
	GUARDRAIL
////////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
▨	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 9)
	EXISTING STORM SEWER PIPING ABANDONED WITH 6" DRAIN VALVE
5NC-17A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
5NC-16C	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
FM	FORCE MAIN
←	STORMWATER FLOW DIRECTION
GTL	GROUNDWATER TRANSFER LINE
	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
🟩	6-INCH GATE VALVE (SEE NOTE 6)
64R	BUILDING LOCATION AND ID
64Y	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
CMP	CORRUGATED METAL PIPE
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE PIPE
VCP	VITRIFIED CLAY PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
▨	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION (4.0 ACRES)
■ ■ ■ ■	DRAINAGE BASIN LIMITS

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1081-1, DATED MARCH 24, 2004. TOPOGRAPHIC FEATURES HAVE BEEN UPDATED BASED ON FINAL GRADING PLAN FOR AVERAGING AREA 4E DATED 4/2/2010; AND SURFACE FEATURES AND ITEMS SUBJECT TO INSPECTION FIGURE DATED 12/30/2011 DEVELOPED BY ARCADIS. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. THE STORM SEWER ABANDONMENT AND REMEDIATION/RESTORATION ACTIVITIES (i.e., BACKFILLED/RESTORED AREA) WERE PERFORMED BETWEEN 6/28/2010 AND 11/11/2011 IN ACCORDANCE WITH GE'S REVISED FINAL RD/RA WORK PLAN FOR EAST STREET AREA 2-SOUTH (APRIL, 2010), AS CONDITIONALLY APPROVED BY EPA ON 5/3/2010.
6. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.
7. ON 1/26/2012 THE OPENING OF THE VALVE WAS MODIFIED FROM ITS HISTORICAL SETTING OF A HEIGHT OF 4-INCHES AND WAS RAISED ONE INCH TO DIVERT ADDITIONAL FLOW TO OWS 64Z AND REDUCE FLOW TO OUTFALL SR05. THE OPENING OF THE VALVE WAS MEASURED FROM THE CENTER OF THE VALVE BLADE TO THE SEAT.
8. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORTS FOR EAST STREET AREA 2-NORTH AND EAST STREET AREA 2-SOUTH. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 1.
9. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2024/25 IN CONJUNCTION WITH THE DEMOLITION OF THE BUILDINGS 12 AND 14 COMPLEXES.

LOCATIONS OF POTENTIAL POLLUTANTS

LOCATION	ACTIVITIES	POTENTIAL POLLUTANT TYPES/SOURCE
BUILDING 64R	REMEDIATION HANDLING FACILITY	PCB OIL -REMEDIATION TRANSFER TANK
	GMA1 64R RECOVERY SYSTEM	GROUNDWATER/NAPL
BUILDING (OWS) 64X	REMEDIATION HANDLING FACILITY	PCB OIL/COAL TAR - (2) CONTAINERS
	OIL/WATER SEPARATOR	SEDIMENT
	GMA1 64X RECOVERY SYSTEM	GROUNDWATER/NAPL
BUILDING 64V	REMEDIATION HANDLING FACILITY	PCB OIL -REMEDIATION TRANSFER TANK
	GMA1 64V RECOVERY SYSTEM	GROUNDWATER/NAPL
BUILDING 64G GWTP	EMERGENCY GENERATOR	FUEL OIL TANK
	WATER TREATMENT OPERATIONS	TREATMENT OPERATION CHEMICALS
BUILDING 64T WTP	TRANSFORMER	SILICONE OIL IN TRANSFORMER
	WATER TREATMENT OPERATIONS	TREATMENT OPERATION CHEMICALS
ADJACENT TO INTERSECTION OF EAST & NEWELL STREETS	UNDERGROUND RECOVERY SYSTEM	PCB OIL IN CONTAINER
ACCESS ROADS INSIDE FACILITY	DELIVERY TRUCKS AND REGULAR VEHICULAR TRAFFIC	OIL & GREASE; MISCELLANEOUS CHEMICALS & MATERIALS
CITY STREETS	VEHICLES TRAVELING ON CITY STREETS	MISCELLANEOUS CHEMICALS & MATERIALS
SOUTH OF BUILDING 64T AND 64G	GMA1 17W	NAPL
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 8)

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

006 DRAINAGE SYSTEM

ARCADIS

FIGURE
A-3

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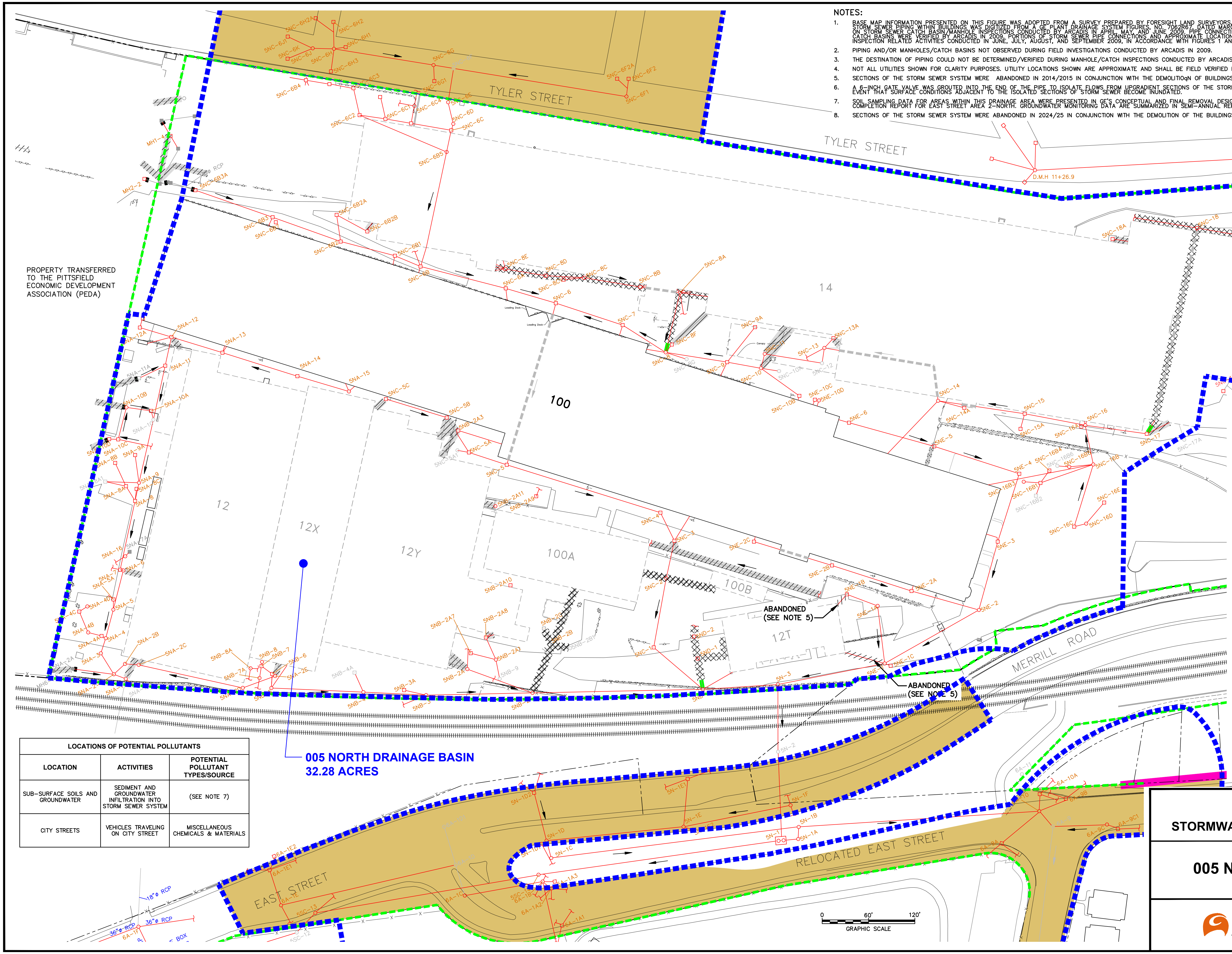

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY FORESIGHT LAND SURVEYORS, DRAWING NO. S2059W01, DATED FEBRUARY 9, 2005. STORM SEWER PIPING WITHIN BUILDINGS WAS DIGITIZED FROM A GE PLANT DRAINAGE SYSTEM FIGURES, NO. 7062R67, DATED MARCH 1, 1985. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
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4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2014/2015 IN CONJUNCTION WITH THE DEMOLITIOqN OF BUILDINGS 100A AND 100B.
6. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.
7. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORT FOR EAST STREET AREA 2-NORTH. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 1.
8. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2024/25 IN CONJUNCTION WITH THE DEMOLITION OF THE BUILDINGS 12 AND 14 COMPLEXES.

LEGEND:

🟩 🟩 🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
▽▽▽▽	GUARDRAIL
//////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
▨▨▨	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 8)
XXXXXX	EXISTING STORM SEWER PIPING ABANDONED WITH 6" DRAIN VALVE
—○— 5NC-17A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
—○— 5NC-16C	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
⊢—	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
■	CONCRETE PIPE PLUG
🟩	6-INCH GATE VALVE (SEE NOTE 6)
12	BUILDING LOCATION AND ID
3	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
CMP	CORRUGATED METAL PIPE
RCP	REINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE
CIP	CAST IRON PIPE
●	MANHOLE FILLED WITH CONCRETE
■	CATCH BASIN FILLED WITH CONCRETE
🟨	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION
🟦 🟦 🟦	DRAINAGE BASIN LIMITS

LOCATIONS OF POTENTIAL POLLUTANTS

LOCATION	ACTIVITIES	POTENTIAL POLLUTANT TYPES/SOURCE
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 7)
CITY STREETS	VEHICLES TRAVELING ON CITY STREET	MISCELLANEOUS CHEMICALS & MATERIALS

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

005 NORTH DRAINAGE SYSTEM

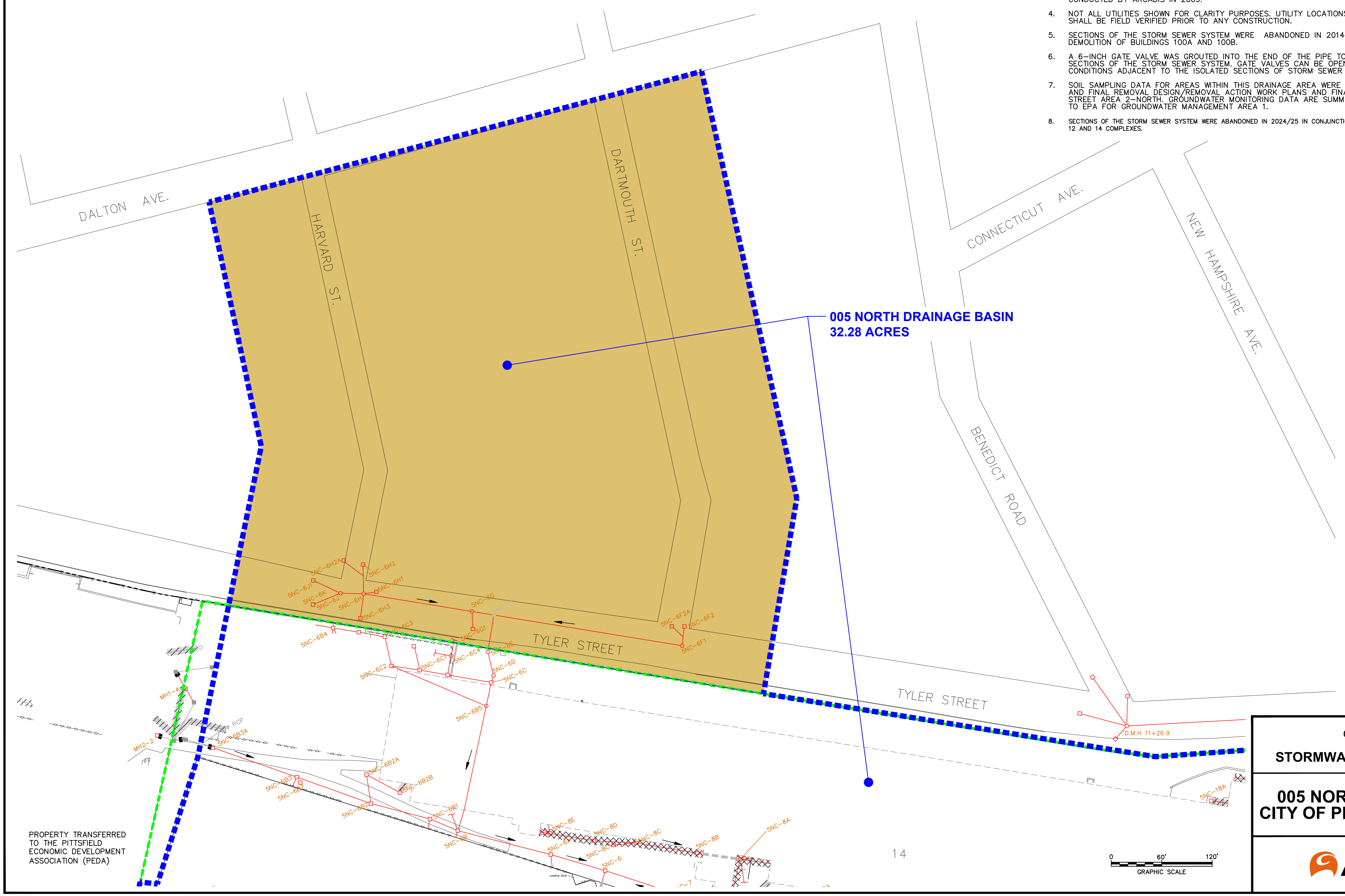
ARCADIS

FIGURE
A-4

LOCATIONS OF POTENTIAL POLLUTANTS		
LOCATION	ACTIVITIES	POTENTIAL POLLUTANT TYPES/SOURCE
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 7)
CITY STREETS	VEHICLES TRAVELING ON CITY STREET	MISCELLANEOUS CHEMICALS & MATERIALS

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY FORESIGHT LAND SURVEYORS, DRAWING NO. S2059W01, DATED FEBRUARY 9, 2005. STORM SEWER PIPING WITHIN BUILDINGS WAS DIGITIZED FROM A GE PLANT DRAINAGE SYSTEM FIGURES, NO. 7062R67, DATED MARCH 1, 1985. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2014/2015 IN CONJUNCTION WITH THE DEMOLITION OF BUILDINGS 100A AND 100B.
6. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.
7. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORT FOR EAST STREET AREA 2-NORTH. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 1.
8. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2024/25 IN CONJUNCTION WITH THE DEMOLITION OF THE BUILDINGS 12 AND 14 COMPLEXES.



LEGEND:

🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
—	GUARDRAIL
//////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
▨	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 8)
××××××	EXISTING STORM SEWER PIPING ABANDONED WITH 6" DRAIN VALVE
5NC-17A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
5NC-16C	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
⟝	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
■	CONCRETE PIPE PLUG
🟩	6-INCH GATE VALVE (SEE NOTE 6)
12	BUILDING LOCATION AND ID
3	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
CMP	CORRUGATED METAL PIPE
RCP	REINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE
CIP	CAST IRON PIPE
●	MANHOLE FILLED WITH CONCRETE
■	CATCH BASIN FILLED WITH CONCRETE
▨	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION
■■■■■■	DRAINAGE BASIN LIMITS

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

005 NORTH DRAINAGE SYSTEM AND CITY OF PITTSFIELD RESIDENTIAL AREA

ARCADIS

FIGURE
A-5

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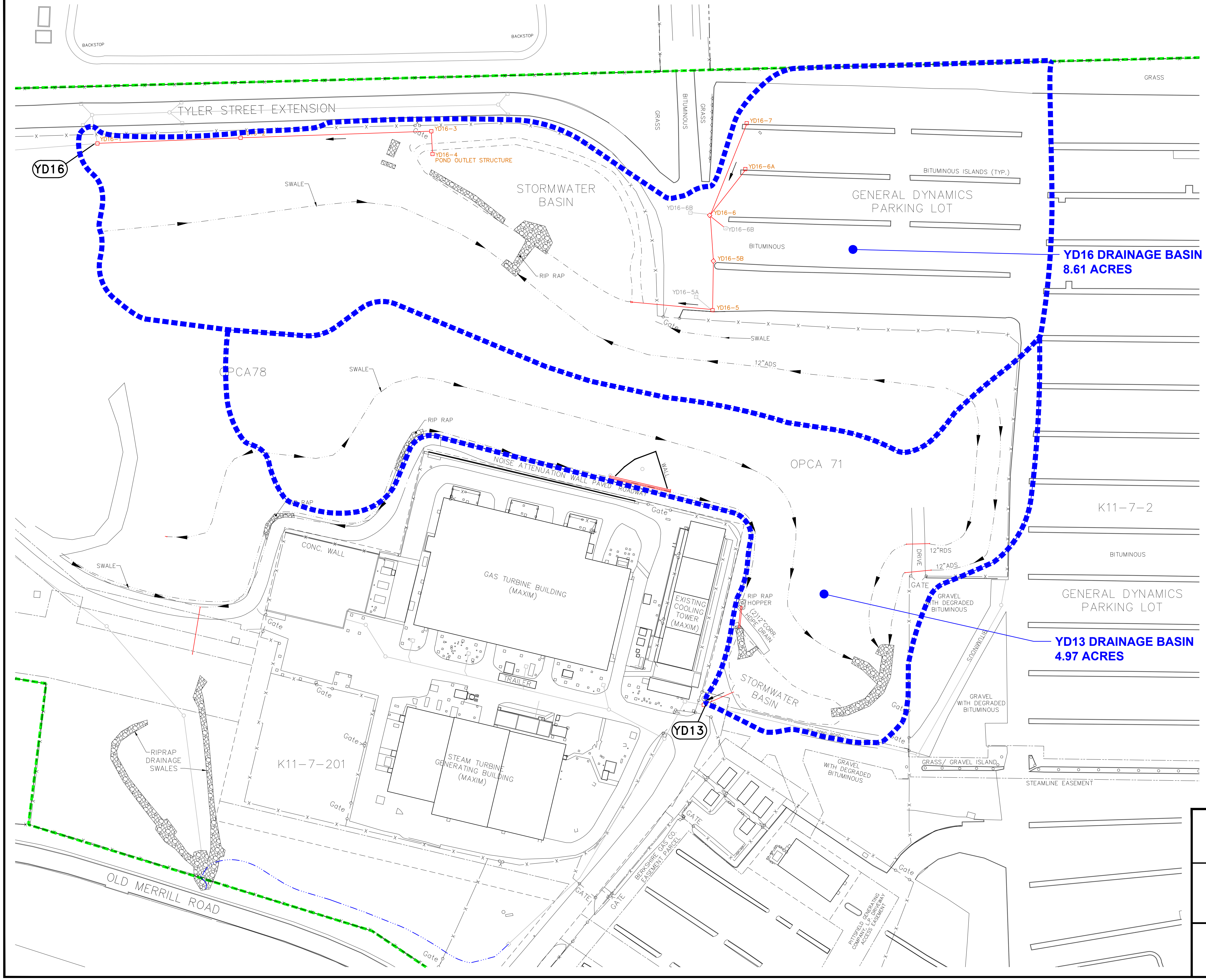

LEGEND:

YD13	NPDES OUTFALL LOCATION
🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
YD16-6C	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
YD16-6C	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
‑ · ‑	SWALE
▭	BUILDING LOCATION
○	MANHOLE
□	CATCH BASIN
CMP	CORRUGATED METAL PIPE
HDPE	HIGH DENSITY POLYETHLYENE
VCP	VITRIFIED CLAY PIPE
■■■■■■■	DRAINAGE BASIN LIMITS

LOCATIONS OF POTENTIAL POLLUTANTS

LOCATION	ACTIVITIES	POTENTIAL POLLUTANT TYPES/SOURCE
OPCA 71	STORMWATER DETENTION BASIN	SEDIMENT
OPCA 78	STORMWATER DETENTION BASIN	SEDIMENT
ACCESS ROADS AND PARKING LOTS	VEHICULAR TRAFFIC	OIL & GREASE; MISCELLANEOUS CHEMICALS & MATERIALS
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 4)

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM SURVEYS PREPARED BY FORESIGHT LAND SURVEYORS, DRAWING NO. S2149W01 AND HILL ENGINEERS, DRAWING NO. GE-1110-003-CX101-M (8/1/07), GE-1110-CX101-M (9/5/07), AND GE-1110-CX102 (6/14/07). PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
4. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORTS FOR HILL 78 AREA-REMAINDER AND FOR THE UNKAMET BROOK AREA. THIS DRAINAGE ARE ALSO INCLUDES THE ON-PLANT CONSOLIDATION AREAS (OPCAS), DESCRIBED IN GE'S FINAL COMPLETION REPORT FOR THE OPCAS. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 4 AND GROUNDWATER AT THE OPCAS.

0 60' 120'
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

YD13 AND YD16 DRAINAGE SYSTEM

ARCADIS

FIGURE
A-6

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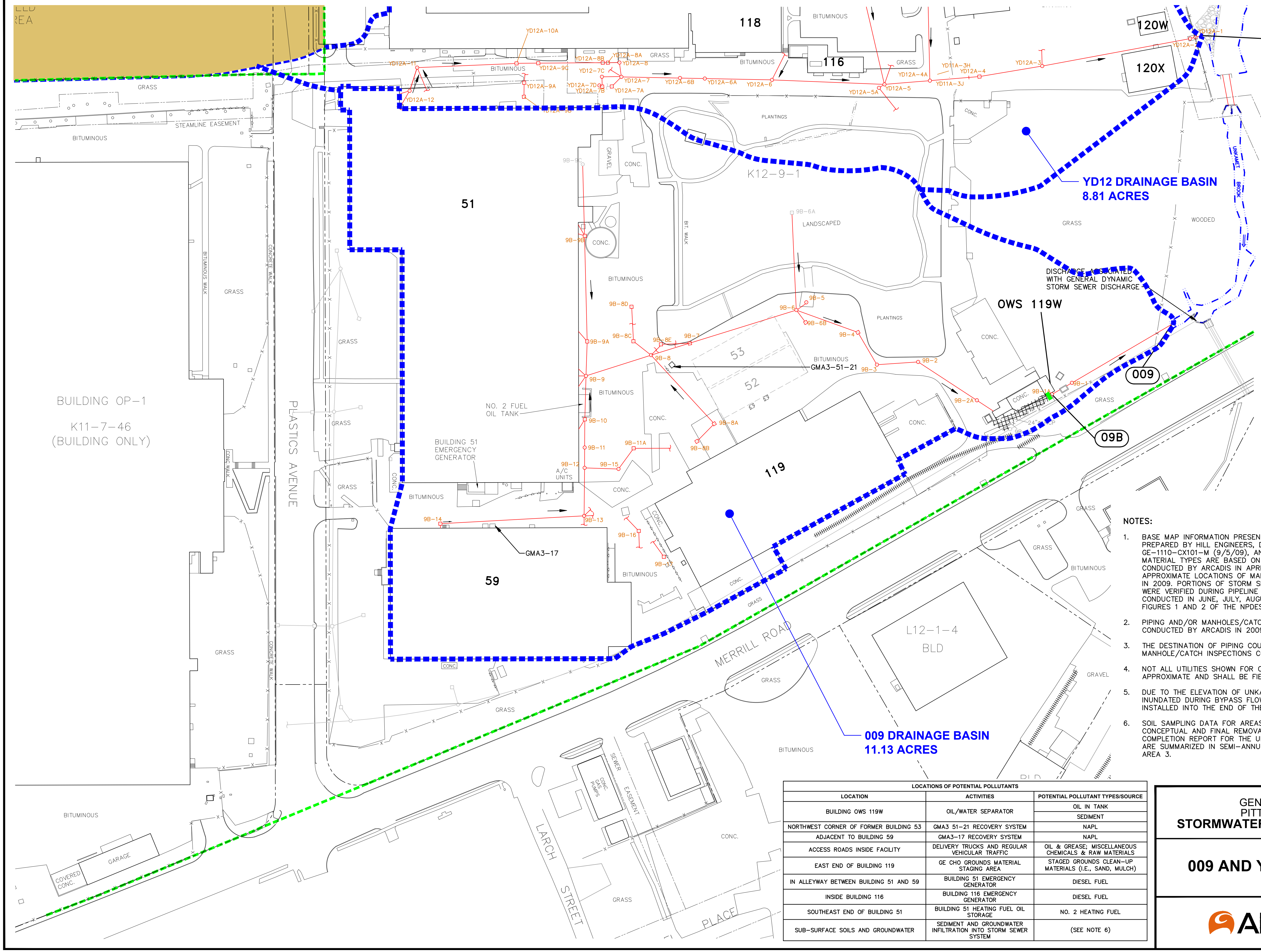

LEGEND:

009	NPDES OUTFALL LOCATION
- - -	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
×××××	EXISTING STORM SEWER PIPING ABANDONED WITH 30-INCH MECHANICAL PLUG
9B-6A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
9A-5B	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
⊢	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
119	BUILDING LOCATION AND ID
52	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
CMP	CORRUGATED METAL PIPE
RCP	REINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE
CIP	CAST IRON PIPE
🟩	30-INCH MECHANICAL PLUG
🟨	CITY OF PITTSFIELD STORMWATER CONTRIBUTION
■■■■	DRAINAGE BASIN LIMITS

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1110-003-CX101-M (8/1/07), GE-1110-CX101-M (9/5/09), AND GE-1110-CX102 (6/14/07). PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. DUE TO THE ELEVATION OF UNKAMET BROOK THIS SECTION OF STORM SEWER IS INUNDATED DURING BYPASS FLOW CONDITIONS. A 30-INCH MECHANICAL PLUG WAS INSTALLED INTO THE END OF THE PIPE IN MANHOLE 9B-1A.
6. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORT FOR THE UNKAMET BROOK AREA. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 3.

0 60' 120'
GRAPHIC SCALE

LOCATIONS OF POTENTIAL POLLUTANTS

LOCATION	ACTIVITIES	POTENTIAL POLLUTANT TYPES/SOURCE
BUILDING OWS 119W	OIL/WATER SEPARATOR	OIL IN TANK
		SEDIMENT
NORTHWEST CORNER OF FORMER BUILDING 53	GMA3 51-21 RECOVERY SYSTEM	NAPL
ADJACENT TO BUILDING 59	GMA3-17 RECOVERY SYSTEM	NAPL
ACCESS ROADS INSIDE FACILITY	DELIVERY TRUCKS AND REGULAR VEHICULAR TRAFFIC	OIL & GREASE; MISCELLANEOUS CHEMICALS & RAW MATERIALS
EAST END OF BUILDING 119	GE CHO GROUNDS MATERIAL STAGING AREA	STAGED GROUNDS CLEAN-UP MATERIALS (I.E., SAND, MULCH)
IN ALLEYWAY BETWEEN BUILDING 51 AND 59	BUILDING 51 EMERGENCY GENERATOR	DIESEL FUEL
INSIDE BUILDING 116	BUILDING 116 EMERGENCY GENERATOR	DIESEL FUEL
SOUTHEAST END OF BUILDING 51	BUILDING 51 HEATING FUEL OIL STORAGE	NO. 2 HEATING FUEL
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 6)

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

009 AND YD12 DRAINAGE SYSTEM

ARCADIS

FIGURE
A-7

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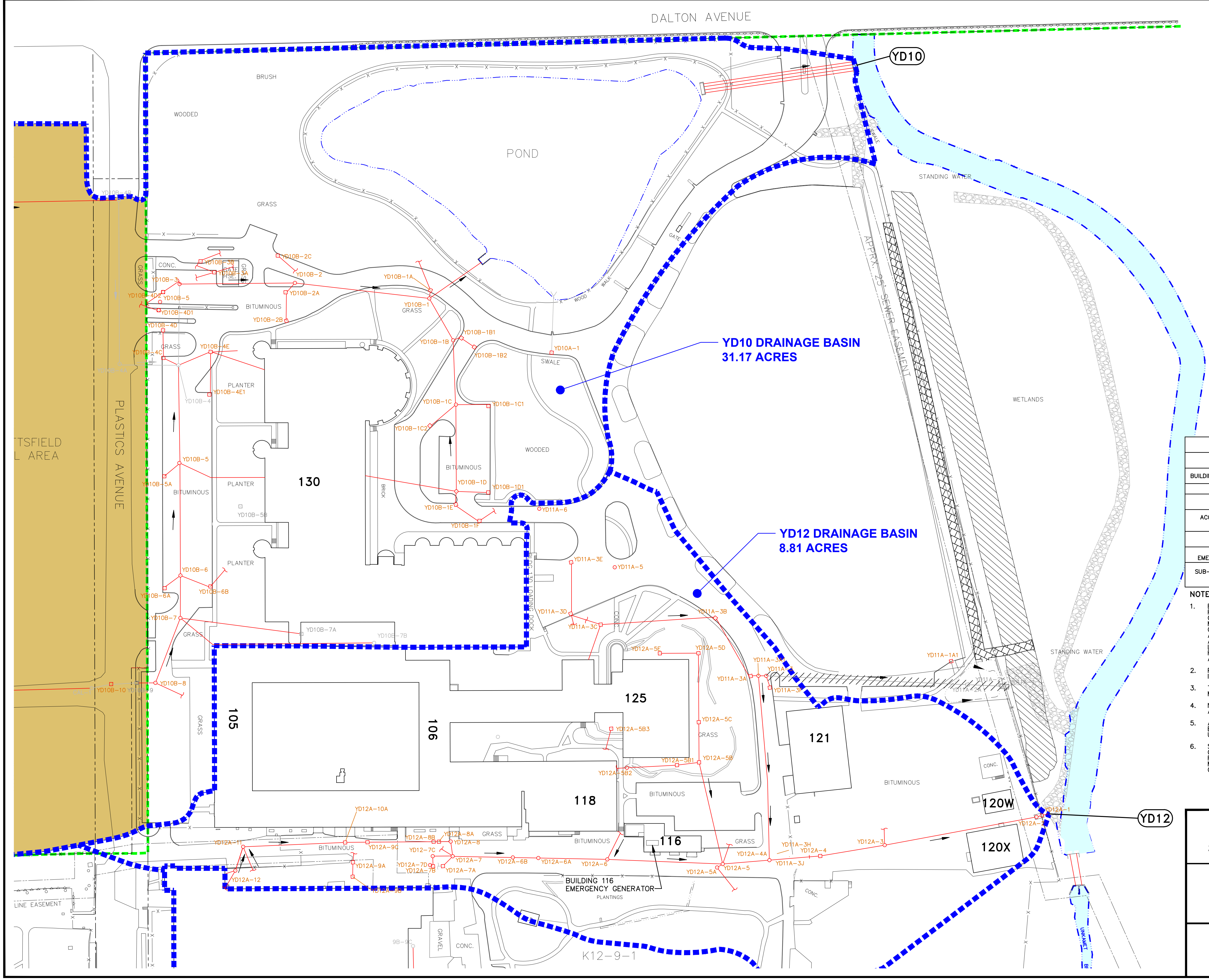


LEGEND:

YD12	NPDES OUTFALL LOCATION
🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
YD11A-2A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
YD10A-1	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
▨ YD10A-1	EXISTING STORM SEWER HAS BEEN ABANDONED (SEEN NOTE 5)
←	STORMWATER FLOW DIRECTION
⊣	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
121	BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
CMP	CORRUGATED METAL PIPE
HDPE	HIGH DENSITY POLYETHYLENE
RCP	REINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE
— - —	PROPERTY LINE
— · —	LIMIT OF BROOK CHANNEL
▦	GRAVEL ACCESS ROAD
🟦	UNKAMET BROOK
▩	RIP-RAP
🟫	CITY OF PITTSFIELD STORMWATER CONTRIBUTION
■ ■ ■	DRAINAGE BASIN LIMITS

LOCATIONS OF POTENTIAL POLLUTANTS

LOCATION	ACTIVITIES	POTENTIAL POLLUTANT TYPES/SOURCE
BUILDING 130 LOADING DOCK	DUMPSTER OUTSIDE BUILDING 130 LOADING DOCK FOR MANAGEMENT OF WASTES	GENERAL REFUSE DUMPSTER
BUILDING 121	SALT STORAGE AREA INSIDE BUILDING 121	WINTER SALT AND SAND PILE
BUILDING 121	DUMPSTER OUTSIDE BUILDING 121 FOR MANAGEMENT OF WASTES	GENERAL REFUSE DUMPSTER
ACCESS ROADS INSIDE FACILITY	REGULAR VEHICULAR TRAFFIC AND EMPLOYEE PARKING	OIL & GREASE; MISCELLANEOUS CHEMICALS & MATERIALS
CITY STREETS	VEHICLES TRAVELING ON CITY STREETS	MISCELLANEOUS CHEMICALS & OTHER MATERIALS
BUILDING 116 EMERGENCY GENERATOR	EMERGENCY USE DURING POWER OUTAGES	FUEL, OIL AND GREASE
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 6)

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1110-003-CX101-M (8/1/07), GE-1110-CX101-M (9/5/09), AND GE-1110-CX102 (6/14/07). PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. ABANDONMENT ACTIVITIES ASSOCIATED WITH THE FORMER YD11 DRAINAGE AREA IS BASED ON GE'S REVISED FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLAN FOR UNKAMET BROOK AREA-WEST (2011).
6. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORT FOR THE UNKAMET BROOK AREA. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 3.

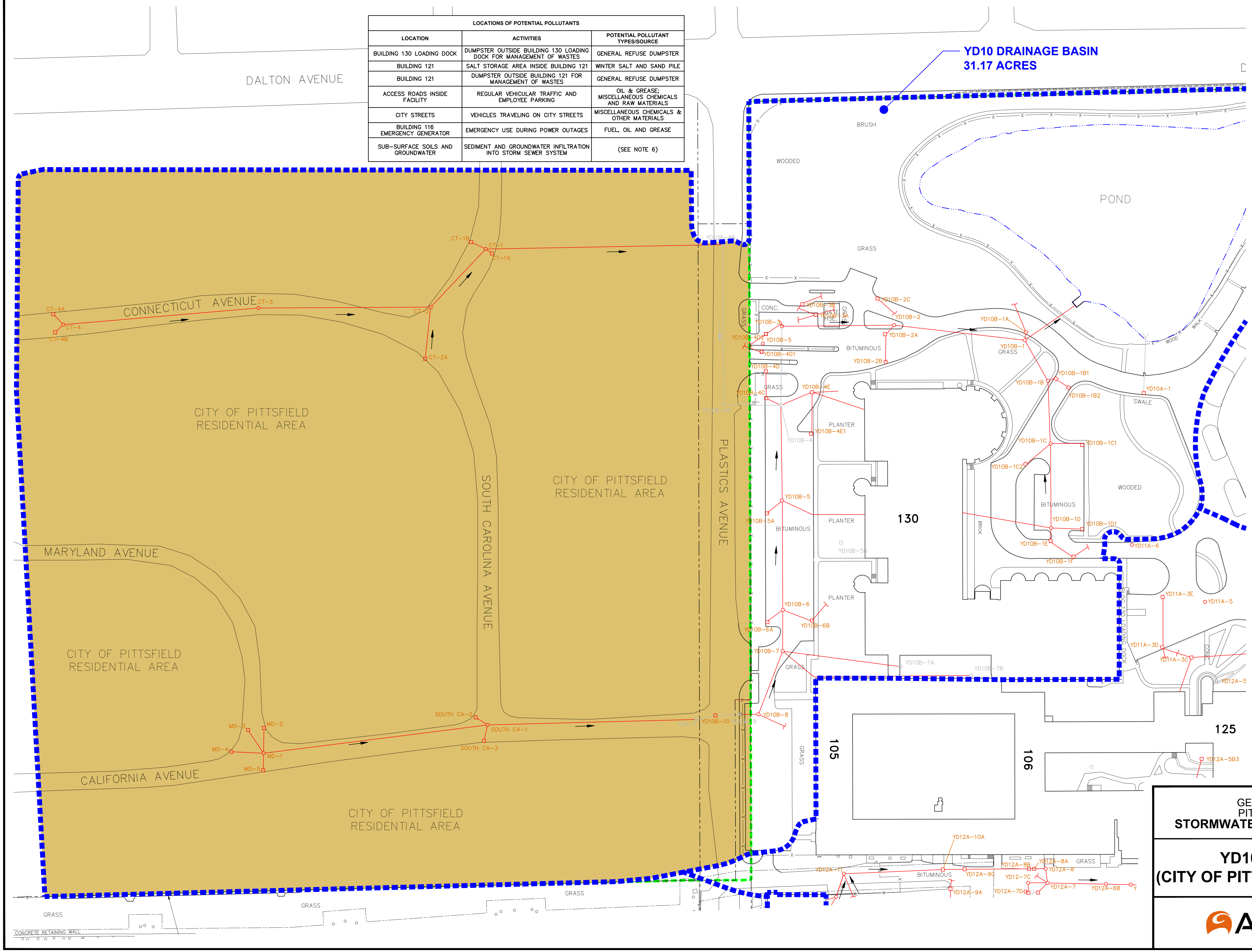
0 60' 120'
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

YD10 AND YD12 DRAINAGE SYSTEM

ARCADIS

FIGURE
A-8



LOCATIONS OF POTENTIAL POLLUTANTS		
LOCATION	**ACTIVITIES**	**POTENTIAL POLLUTANT TYPES/SOURCE**
BUILDING 130 LOADING DOCK	DUMPSTER OUTSIDE BUILDING 130 LOADING DOCK FOR MANAGEMENT OF WASTES	GENERAL REFUSE DUMPSTER
BUILDING 121	SALT STORAGE AREA INSIDE BUILDING 121	WINTER SALT AND SAND PILE
BUILDING 121	DUMPSTER OUTSIDE BUILDING 121 FOR MANAGEMENT OF WASTES	GENERAL REFUSE DUMPSTER
ACCESS ROADS INSIDE FACILITY	REGULAR VEHICULAR TRAFFIC AND EMPLOYEE PARKING	OIL & GREASE; MISCELLANEOUS CHEMICALS AND RAW MATERIALS
CITY STREETS	VEHICLES TRAVELING ON CITY STREETS	MISCELLANEOUS CHEMICALS & OTHER MATERIALS
BUILDING 116 EMERGENCY GENERATOR	EMERGENCY USE DURING POWER OUTAGES	FUEL, OIL AND GREASE
SUB-SURFACE SOILS AND GROUNDWATER	SEDIMENT AND GROUNDWATER INFILTRATION INTO STORM SEWER SYSTEM	(SEE NOTE 6)

LEGEND:

- - -	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
YD10B-4B	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
YD10A-1	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
⊣	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
125	BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
HDPE	HIGH DENSITY POLYETHYLENE
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE PIPE
VCP	VITRIFIED CLAY PIPE
CIP	CAST IRON PIPE
▨	CITY OF PITTSFIELD STORMWATER CONTRIBUTION (19.65 ACRES)
■■■■■■■	DRAINAGE BASIN LIMITS

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE EAST OF RESIDENTIAL AREAS WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1110-003-CX101-M (8/1/07), GE-1110-CX101-M (9/5/09), AND GE-1110-CX102 (6/14/07). RESIDENTIAL AREA STREETS DIGITIZED FROM 2005 AERIAL PHOTO ACQUIRED FROM MASSACHUSETTS GIS WEBSITE. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO RELATED INSPECTION ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009.
3. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
4. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
5. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
6. SOIL SAMPLING DATA FOR GE-OWNED AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORT FOR THE UNKAMET BROOK AREA. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 3.

0 60' 120'
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
STORMWATER POLLUTION PREVENTION PLAN

YD10 DRAINAGE SYSTEM
(CITY OF PITTSFIELD RESIDENTIAL AREA)

ARCADIS

FIGURE
A-9

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Attachment B

SWPPP Training Roster

To Be Updated Annually

Attachment C

Description of Reportable Quantity (RQ) Releases

To Be Updated Annually

Attachment D

Inspection Form and Associated Figures

FORM-A

ROUTINE STORMWATER CONTROL INSPECTIONS

STORMWATER POLLUTION PREVENTION PLAN
GENERAL ELECTRIC COMPANY - PITTSFIELD, MASSACHUSETTS

Inspection Date: ____________________ **Time:**__________ **Weather:** ____________________ **Inspector Name/Affiliation:** ____________________

Instructions: Inspections will be carried out by a qualified individual at the prescribed frequency and at a minimum should including the following:

- All areas: Identify sources of pollution or potential pollution including:
  - Industrial materias, residue, or trash that may have or could come in contact with stormwater;
  - Leaks or spills from industrial equipment, drums, tanks, or other containers;
  - Evidence of pollutants discharging to surface waters at the Facility Outfalls;
  - Evidence of off-site tracking of sediments or waste materials; and
  - Evidence of, or potential for, pollutants entering the Facility drainage system.
- Outfalls: Inspect the condition of the outfall and surrounding area for signs of erosion or maintenance needs.
- Oil/Water Separators (OWS): Inspect the OWS for proper functioning including all mechanical equipment and the excessive accumulation of debris.
- Plugged Outfalls: Inspect the plug seal and surrounding areas for signs of leaks and/or erosion.

Complete the attached Photographic Documentation as required. Following completion of the inspections, the inspection results will be discussed with the GE or GE's representative who will arrange to have the appropriate responses to the actual or potential problems identified. Note any corrective actions that were implemented to remedy the inspection checklist items identified.

Item	Inspection Area	Inspection Frequency	Figure Reference	Condition and/or Inspection Findings	Corrective Action Date
Drainage Area 005					
1	Inspection of Roadways, Parking Lots, Entrances (e.g., sand, debris)	Semi-Annually	1/3		
2	Oil/Water Separator 64Z	Quarterly	1		
3	Oil/Water Separator 64W	Quarterly	1		
4	Outfalls (005, 05A, 05B) - To Housatonic River	Annually	1		
5	Plugged Outfalls (SRO2, SRO3, SRO4, YD4, YD5, 007, YD7, YD8, YD9)	Annually	1/7		
Drainage Area 006					
6	Inspection of Roadways, Parking Lots, Entrances (e.g., sand, debris)	Semi-Annually	2		
7	Oil/Water Separator 64X	Quarterly	2		
8	Outfalls (006, 06A, SRO5) - To Housatonic River	Annually	2		

FORM-A

Item	Inspection Area	Inspection Frequency	Figure Reference	Condition and/or Inspection Findings	Corrective Action Date
Drainage Area 009					
9	Inspection of Roadways, Parking Lots, Entrances (e.g., sand, debris)	Semi-Annually	4		
10	Oil/Water Separator 119W	Quarterly	4		
11	Outfall 009 - To Unkamet Brook	Annually	4		
12	Plugged Outfalls (09A and 09B)	Annually	4		
Drainage Basin YD10					
13	Inspection of Roadways, Parking Lots, Entrances (e.g., sand, debris)	Semi-Annually	5		
14	Outfall YD10	Annually	5		
15	Detention Pond Outlet Structure	Quarterly	5		
Drainage Basin YD12					
16	Inspection of Roadways, Parking Lots, Entrances (e.g., sand, debris)	Semi-Annually	5		
17	Outfall YD12	Annually	5		
18	Building 121 Salt Storage Area	Quarterly	5		

FORM-A

Item	Inspection Area	Inspection Frequency	Figure Reference	Condition and/or Inspection Findings	Corrective Action Date
Drainage Basin YD13					
19	Inspection of Roadways, Parking Lots, Entrances (e.g., sand, debris)	Semi-Annually	6		
20	Stormwater Detention Basin	Quarterly	6		
21	Outfall YD13	Annually	6		
22	Plugged Outfall YD14	Annually	6		
Drainage Basin YD16					
23	Inspection of Roadways, Parking Lots, Entrances (e.g., sand, debris)	Semi-Annually	6		
24	Stormwater Detention Basin	Quarterly	6		
25	Outfall YD16	Annually	6		

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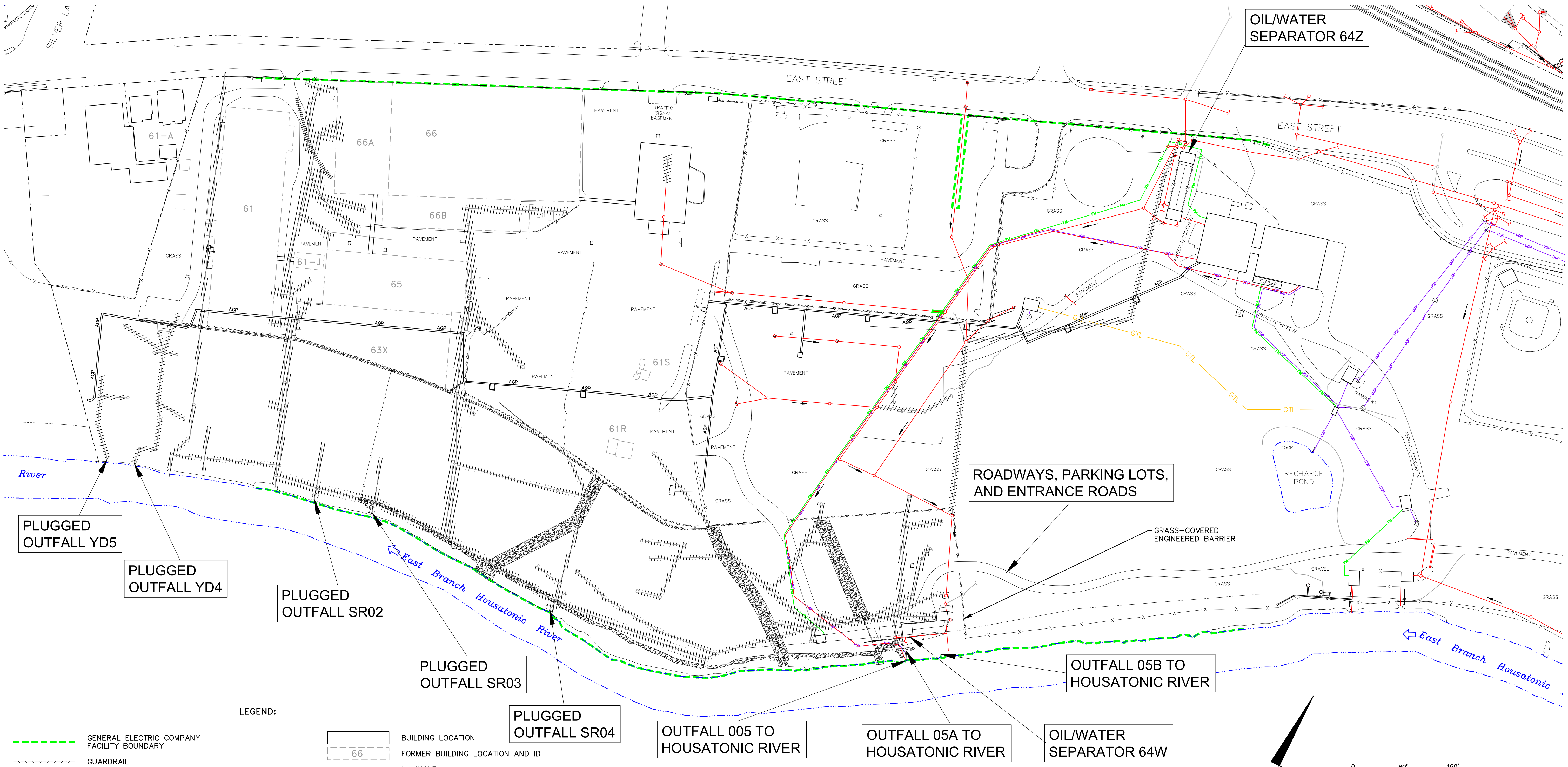


0 80' 160'
GRAPHIC SCALE

LEGEND:

▬ ▬ ▬	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
─▽─▽─▽─	GUARDRAIL
//////////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
───○───	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
───○───	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
── FM ──	FORCE MAIN
←	STORMWATER FLOW DIRECTION
⊢──	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
▬	6-INCH GATE VALVE (SEE NOTE 6)
── UGP ──	GROUNDWATER RELATED PIPING
AGP	ABOVE GROUND PIPING

☐	BUILDING LOCATION
66	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
▨	RIPRAP DRAINAGE SWALE
OIL/WATER SEPARATOR 64W	INSPECTION FORM ITEM AND ITEM NUMBER (SEE FORMS A AND B)

NOTES:

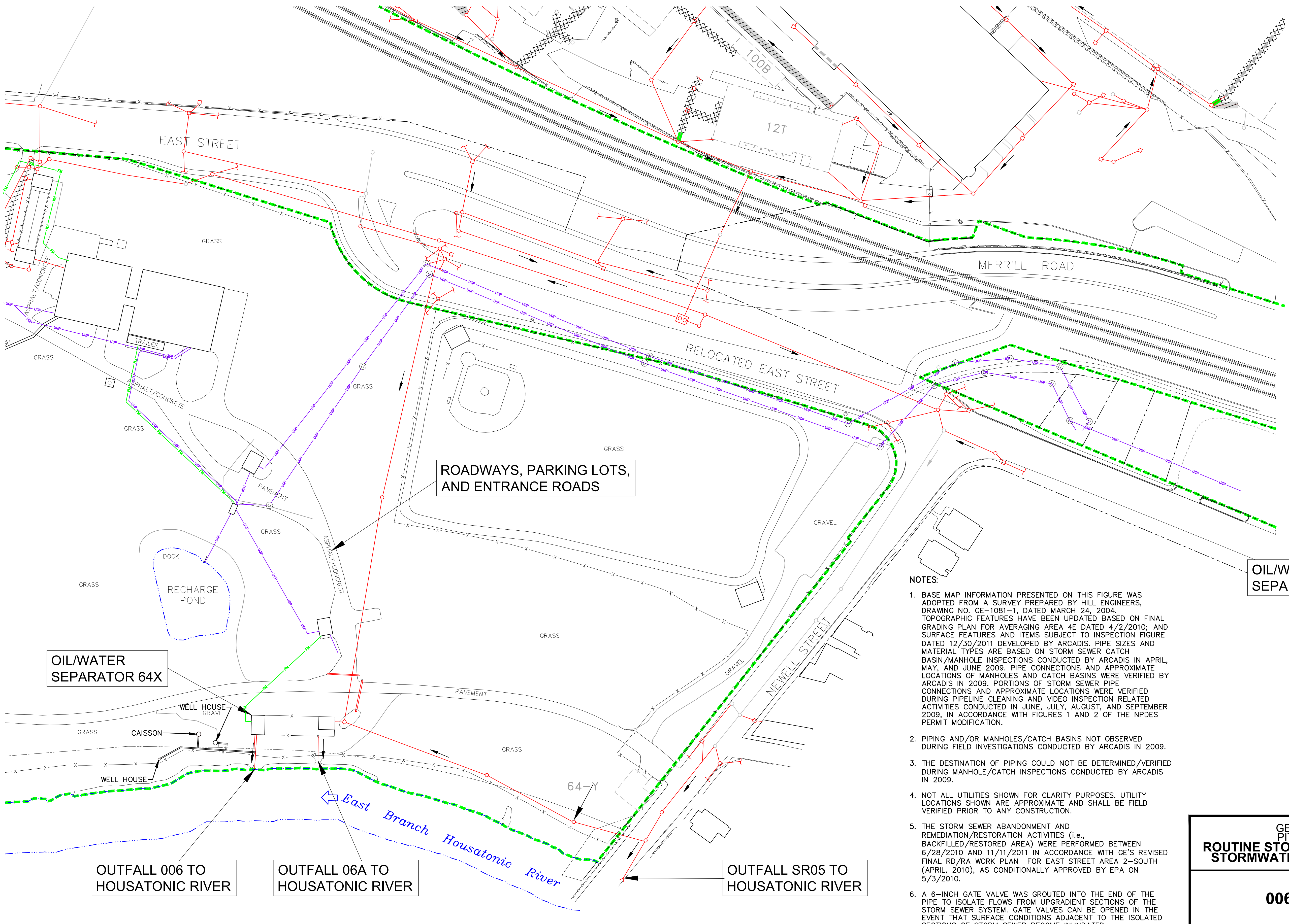
1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1081-1, DATED MARCH 24, 2004. TOPOGRAPHIC FEATURES HAVE BEEN UPDATED BASED ON FINAL GRADING PLAN FOR AVERAGING AREA 4E DATED 4/2/2010; AND SURFACE FEATURES AND ITEMS SUBJECT TO INSPECTION FIGURE DATED 12/30/2011 DEVELOPED BY ARCADIS. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. THE STORM SEWER ABANDONMENT AND REMEDIATION/RESTORATION ACTIVITIES (i.e., BACKFILLED/RESTORED, ENGINEERED BARRIER, ENHANCED PAVEMENT, ENGINEERED BARRIER ACCESS ROAD, AND RIPRAP DRAINAGE SWALE AREAS) WERE PERFORMED BETWEEN 6/28/2010 AND 11/11/2011 IN ACCORDANCE WITH GE'S REVISED FINAL RD/RA WORK PLAN FOR EAST STREET AREA 2-SOUTH (APRIL, 2010), AS CONDITIONALLY APPROVED BY EPA ON 5/3/2010.
6. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
ROUTINE STORMWATER CONTROL INSPECTIONS
STORMWATER POLLUTION PREVENTION PLAN

005 SOUTH DRAINAGE SYSTEM

ARCADIS

FIGURE
1



ROADWAYS, PARKING LOTS, AND ENTRANCE ROADS

OIL/WATER SEPARATOR 64X

OIL/WATER SEPARATOR 64X

OUTFALL 006 TO HOUSATONIC RIVER

OUTFALL 06A TO HOUSATONIC RIVER

OUTFALL SR05 TO HOUSATONIC RIVER

0 60' 120'
GRAPHIC SCALE

LEGEND:

▬ ▬ ▬	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
▽▽▽	GUARDRAIL
//////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
▨	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 7)
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
FM	FORCE MAIN
←	STORMWATER FLOW DIRECTION
}—	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
UGP	GROUNDWATER RELATED PIPING
AGP	ABOVE GROUND PIPING
▬	6–INCH GATE VALVE (SEE NOTE 6)
☐	BUILDING LOCATION
64Y	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
OIL/WATER SEPARATOR 64X	INSPECTION FORM ITEM AND ITEM NUMBER (SEE FORMS A AND B)

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE–1081–1, DATED MARCH 24, 2004. TOPOGRAPHIC FEATURES HAVE BEEN UPDATED BASED ON FINAL GRADING PLAN FOR AVERAGING AREA 4E DATED 4/2/2010; AND SURFACE FEATURES AND ITEMS SUBJECT TO INSPECTION FIGURE DATED 12/30/2011 DEVELOPED BY ARCADIS. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. THE STORM SEWER ABANDONMENT AND REMEDIATION/RESTORATION ACTIVITIES (i.e., BACKFILLED/RESTORED AREA) WERE PERFORMED BETWEEN 6/28/2010 AND 11/11/2011 IN ACCORDANCE WITH GE'S REVISED FINAL RD/RA WORK PLAN FOR EAST STREET AREA 2–SOUTH (APRIL, 2010), AS CONDITIONALLY APPROVED BY EPA ON 5/3/2010.
6. A 6–INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.
7. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2024/25 IN CONJUNCTION WITH THE DEMOLITION OF THE BUILDINGS 12 AND 14 COMPLEXES.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
ROUTINE STORMWATER CONTROL INSPECTIONS
STORMWATER POLLUTION PREVENTION PLAN

006 DRAINAGE SYSTEM

ARCADIS

FIGURE
2

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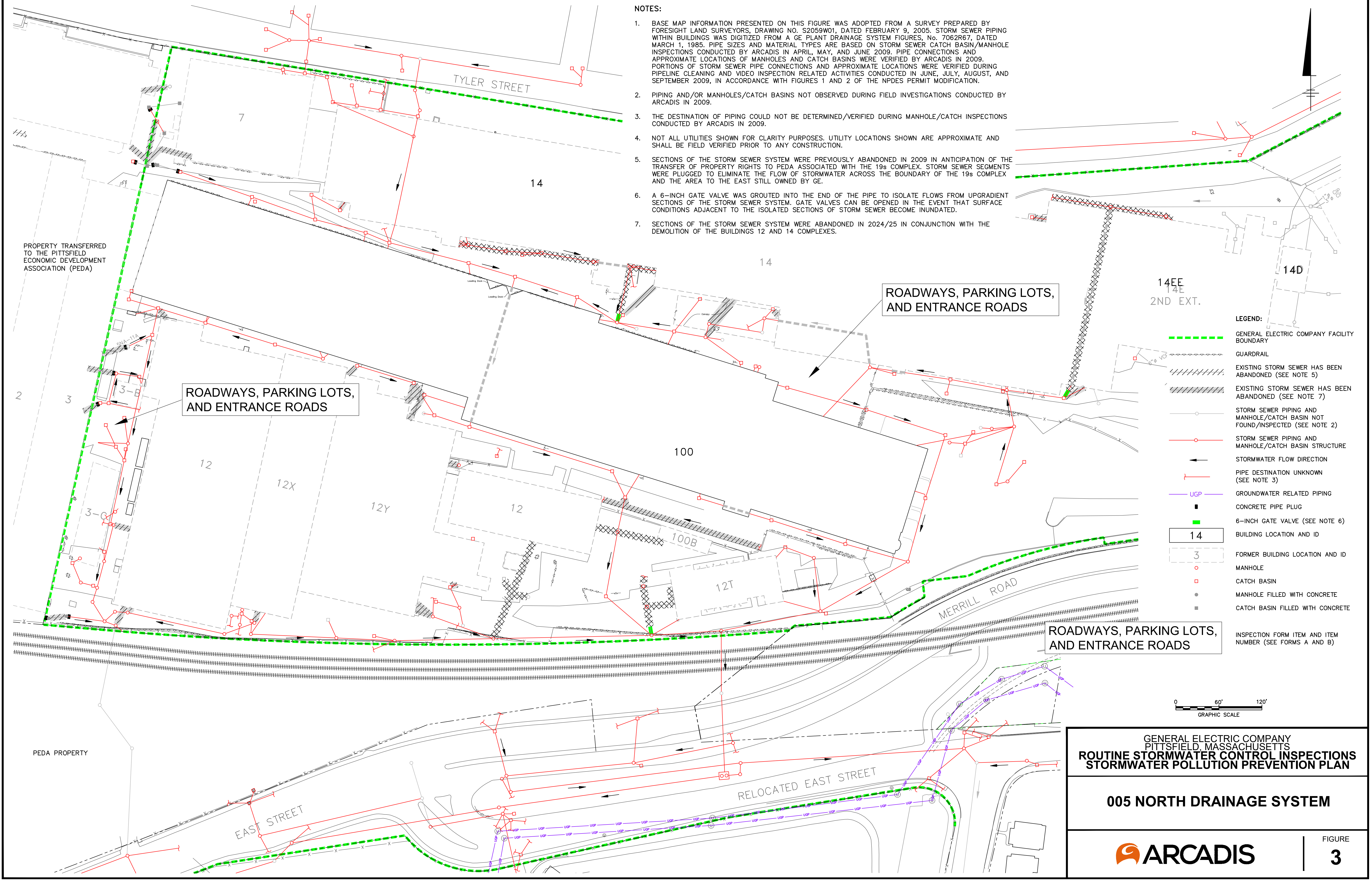

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY FORESIGHT LAND SURVEYORS, DRAWING NO. S2059W01, DATED FEBRUARY 9, 2005. STORM SEWER PIPING WITHIN BUILDINGS WAS DIGITIZED FROM A GE PLANT DRAINAGE SYSTEM FIGURES, No. 7062R67, DATED MARCH 1, 1985. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.

2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.

3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.

4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.

5. SECTIONS OF THE STORM SEWER SYSTEM WERE PREVIOUSLY ABANDONED IN 2009 IN ANTICIPATION OF THE TRANSFER OF PROPERTY RIGHTS TO PEDA ASSOCIATED WITH THE 19s COMPLEX. STORM SEWER SEGMENTS WERE PLUGGED TO ELIMINATE THE FLOW OF STORMWATER ACROSS THE BOUNDARY OF THE 19s COMPLEX AND THE AREA TO THE EAST STILL OWNED BY GE.

6. A 6–INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.

7. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2024/25 IN CONJUNCTION WITH THE DEMOLITION OF THE BUILDINGS 12 AND 14 COMPLEXES.

LEGEND:

🟩 🟩 🟩 🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
▽▽▽▽	GUARDRAIL
//////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
▨▨▨	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 7)
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
⊢—	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
— UGP —	GROUNDWATER RELATED PIPING
▮	CONCRETE PIPE PLUG
🟩	6–INCH GATE VALVE (SEE NOTE 6)
14	BUILDING LOCATION AND ID
3	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
●	MANHOLE FILLED WITH CONCRETE
■	CATCH BASIN FILLED WITH CONCRETE
	INSPECTION FORM ITEM AND ITEM NUMBER (SEE FORMS A AND B)

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
ROUTINE STORMWATER CONTROL INSPECTIONS
STORMWATER POLLUTION PREVENTION PLAN

005 NORTH DRAINAGE SYSTEM

ARCADIS

FIGURE
3

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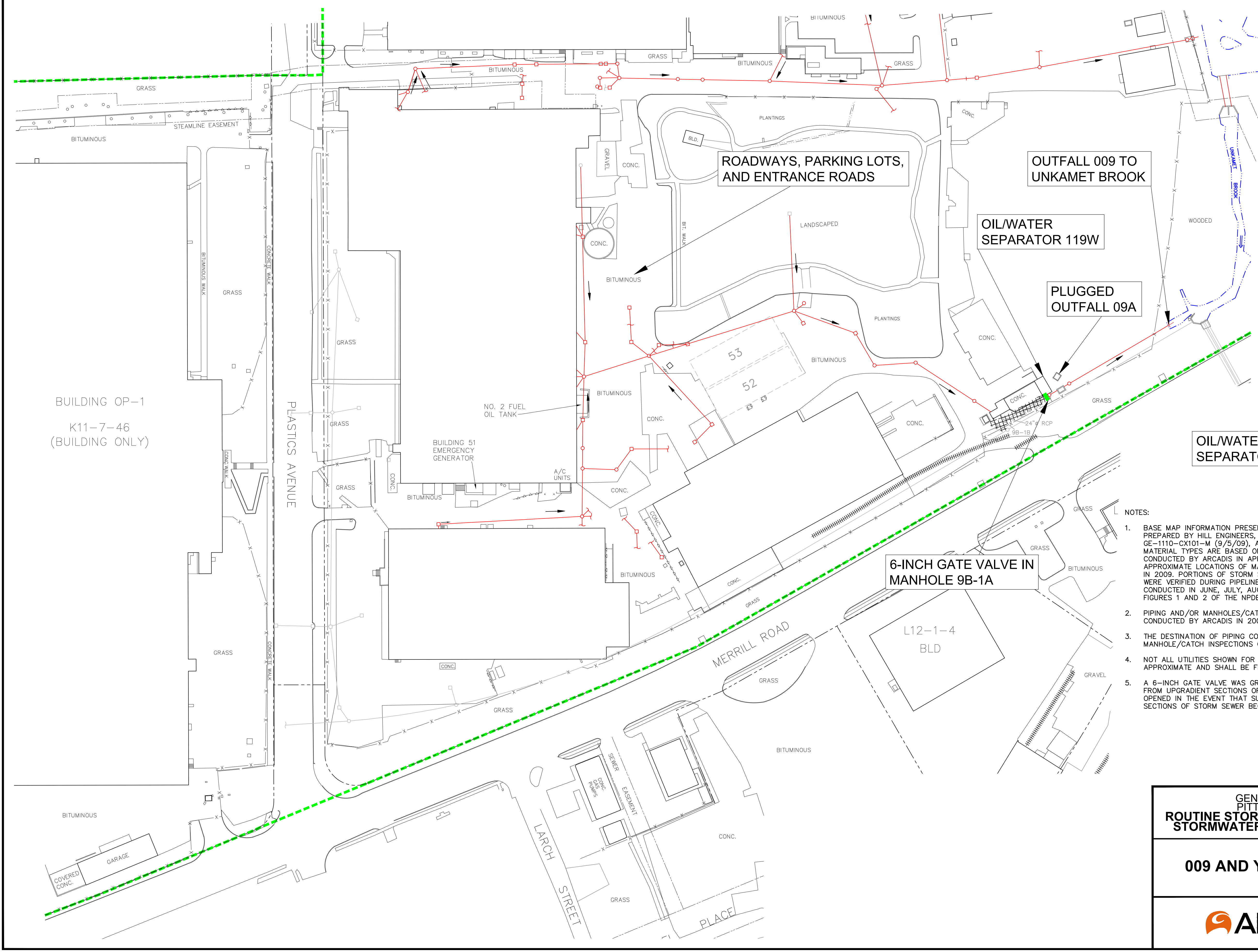

LEGEND:

▬ ▬ ▬	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
////○////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
──○──	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
──○──	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
◄──	STORMWATER FLOW DIRECTION
⟝──	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
🟩	6-INCH GATE VALVE (SEE NOTE 5)
▭	BUILDING LOCATION AND ID
52	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
OIL/WATER SEPARATOR 119W	INSPECTION FORM ITEM AND ITEM NUMBER (SEE FORMS A AND B)
⊢	BACKFLOW PREVENTION VALVE

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE–1110–003–CX101–M (8/1/07), GE–1110–CX101–M (9/5/09), AND GE–1110–CX102 (6/14/07). PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. A 6–INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
ROUTINE STORMWATER CONTROL INSPECTIONS
STORMWATER POLLUTION PREVENTION PLAN

009 AND YD12 DRAINAGE SYSTEM

ARCADIS

FIGURE
4

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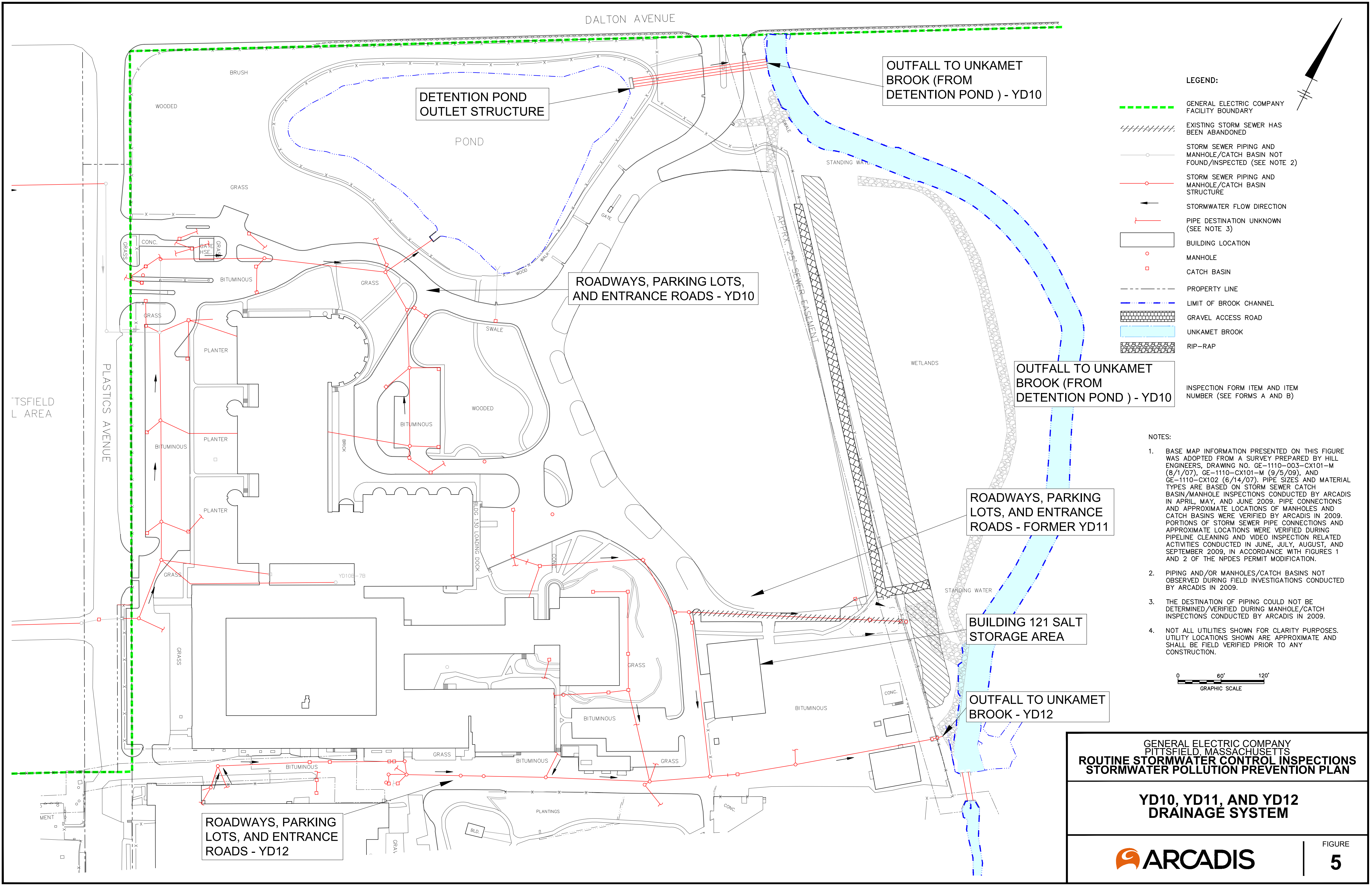

LEGEND:

🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
⁄⁄⁄⁄⁄⁄⁄⁄	EXISTING STORM SEWER HAS BEEN ABANDONED
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
}—	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
▭	BUILDING LOCATION
○	MANHOLE
□	CATCH BASIN
— - - —	PROPERTY LINE
—·—·	LIMIT OF BROOK CHANNEL
▦	GRAVEL ACCESS ROAD
▭	UNKAMET BROOK
▩	RIP–RAP
▭	INSPECTION FORM ITEM AND ITEM NUMBER (SEE FORMS A AND B)

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE–1110–003–CX101–M (8/1/07), GE–1110–CX101–M (9/5/09), AND GE–1110–CX102 (6/14/07). PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
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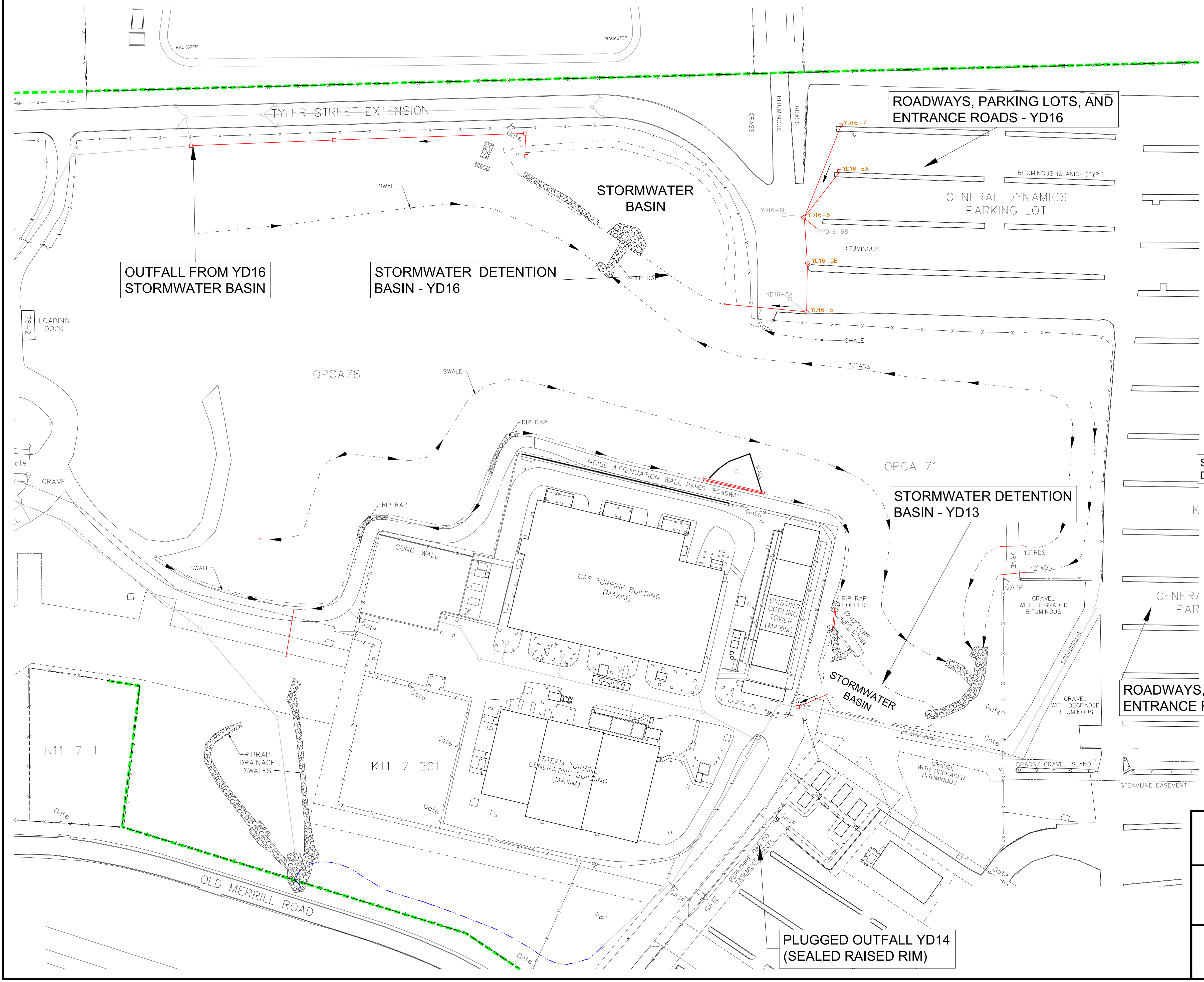
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
ROUTINE STORMWATER CONTROL INSPECTIONS
STORMWATER POLLUTION PREVENTION PLAN

YD10, YD11, AND YD12 DRAINAGE SYSTEM

ARCADIS

FIGURE
5



LEGEND:

▬ ▬ ▬	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
—□—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
– · ◀ · –	SWALE
▭	BUILDING LOCATION
○	MANHOLE
□	CATCH BASIN
STORMWATER DETENTION BASIN - YD13	INSPECTION FORM ITEM AND ITEM NUMBER (SEE FORMS A AND B)

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM SURVEYS PREPARED BY FORESIGHT LAND SURVEYORS, DRAWING NO. S2149W01 AND HILL ENGINEERS, DRAWING NO. GE-1110-003-CX101-M (8/1/07), GE-1110-CX101-M (9/5/07), and GE-1110-CX102 (6/14/07). PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009.
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3. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
ROUTINE STORMWATER CONTROL INSPECTIONS
STORMWATER POLLUTION PREVENTION PLAN

YD13 AND YD16 DRAINAGE SYSTEM

ARCADIS

FIGURE
6

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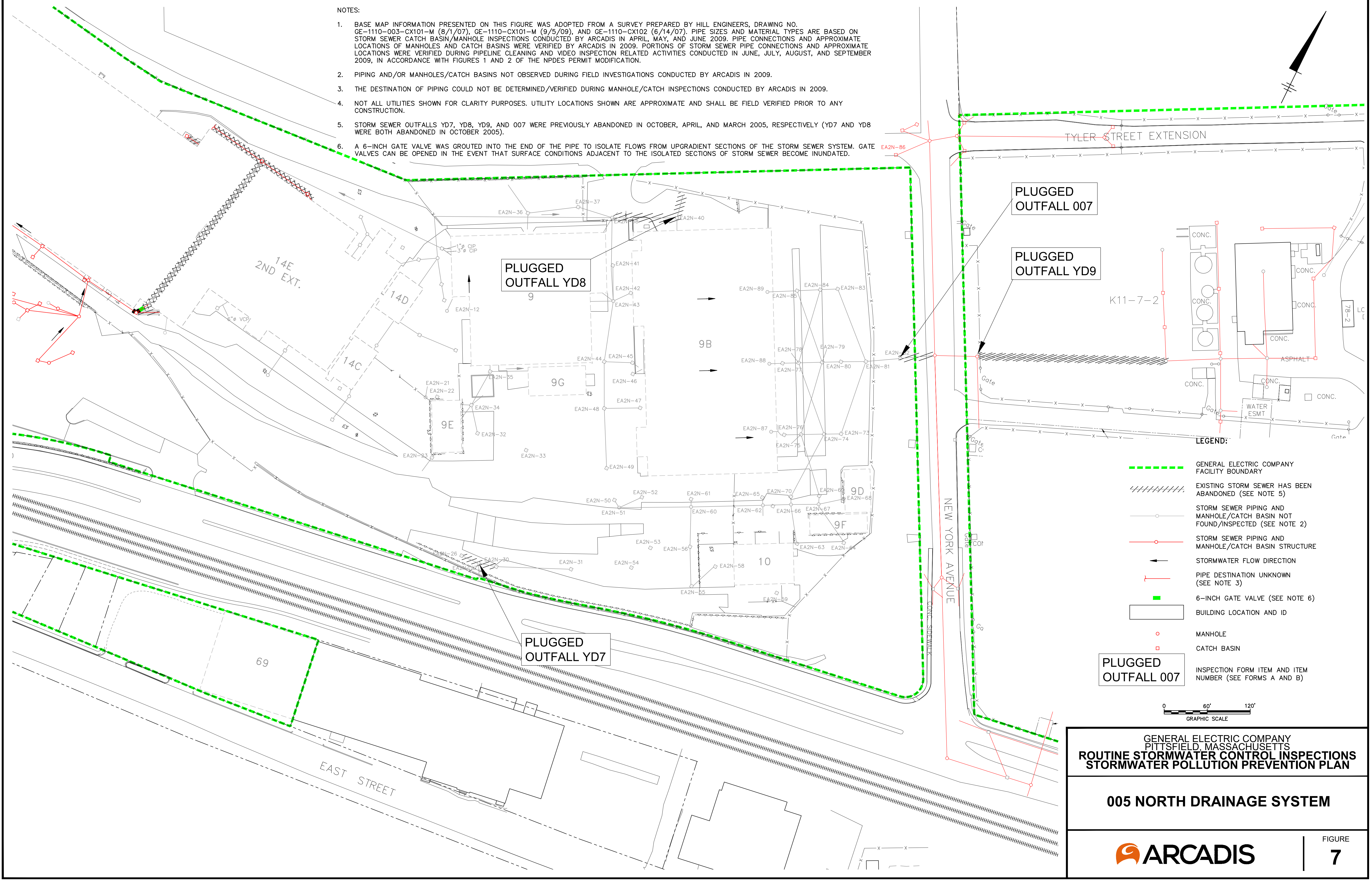

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE–1110–003–CX101–M (8/1/07), GE–1110–CX101–M (9/5/09), AND GE–1110–CX102 (6/14/07). PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. STORM SEWER OUTFALLS YD7, YD8, YD9, AND 007 WERE PREVIOUSLY ABANDONED IN OCTOBER, APRIL, AND MARCH 2005, RESPECTIVELY (YD7 AND YD8 WERE BOTH ABANDONED IN OCTOBER 2005).
6. A 6–INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.

LEGEND:

🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
//////////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
—○—	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
├—	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
■	6–INCH GATE VALVE (SEE NOTE 6)
▭	BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
PLUGGED OUTFALL 007	INSPECTION FORM ITEM AND ITEM NUMBER (SEE FORMS A AND B)

0 60' 120'
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
ROUTINE STORMWATER CONTROL INSPECTIONS
STORMWATER POLLUTION PREVENTION PLAN

005 NORTH DRAINAGE SYSTEM

ARCADIS

FIGURE
7

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Syracuse
New York 13202
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Fax: 315 449 0017
www.arcadis.com

Appendix B

Standard Operating Procedures

Appendix B-1

Standard Operating Procedures for Discharge Water Grab Sampling

I. Scope and Application

This appendix to the Surface Water Discharge Work Plan for the General Electric (GE) Pittsfield Facility sets forth the standard operating procedure (SOP) for grab sampling of discharge water. These include procedures for collecting water samples at discharge outfalls by manual grab sampling for subsequent chemical analysis of semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and Oil and Grease (O&G).

Health and safety protocols are addressed in the most current site Health and Safety Plan (HASP; Arcadis 2023a or superseding version).

II. Personnel Qualifications

Field personnel who work in areas that may result in exposure to hazardous substances or health hazards must be trained in compliance with 29 Code of Federal Regulations (CFR) 1910.120 (Occupational Safety and Health Administration [OSHA] Hazardous Waste Operations [HAZWOPER] training) and annual refresher courses, and participate in a medical monitoring program before engaging in field sampling activities. Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

III. Surface Water Grab Sampling For Chemical Analysis

This section specifies the procedures for collecting discharge water samples by manual grab sampling for chemical analysis of VOCs/SVOCs and O&G. Several methods for collecting water grab samples are available, depending on the type of water sample to be collected. This section specifies the procedures for collecting stormwater samples from a discharge point.

Materials

The following materials will be available, as required, during discharge water grab sampling.

- Health and safety equipment (as required by the most current site HASP);
- Cleaning equipment (as required in Appendix EE of GE's revised Field Sampling Plan / Quality Assurance Project Plan for the GE-Pittsfield/Housatonic River Site (FSP/QAPP; Arcadis 2023b);
- Surface Water Telescopic Sampling Tool;
- Field notebook;
- Temperature meter;
- pH meter;
- Appropriate blanks (trip), if necessary;
- Appropriate sampling containers and forms;
- Appropriate preservatives (as required); and
- Coolers with ice or "blue" ice.

Procedures

A. The following procedures will be used to obtain grab samples:

Step 1 - Identify surface water sampling location (i.e., Outfall discharge) on appropriate sampling log sheet (Attachment B1-3) and/or field notebook along with other appropriate information.

Step 2 - Don health and safety equipment (as required by the most current site HASP).

Step 3 - Clean the sampling equipment in accordance with the procedures in Appendix EE of the FSP/QAPP.

Step 4 - Assemble the telescopic sampling tool. Make sure that the sampling bottle and the bolts and nuts that secure the clamp to the end of the pole are tightened properly.

Step 5 - Obtain sample by slowly submerging the bottle into the outfall discharge.

Step 6 – For O&G the sample must be collected from the surface of the water column and must be collected directly into the appropriate sampling containers (i.e.,1-liter wide-mouth amber glass jar).

Step 7 - Retrieve the water sampler from the outfall discharge.

Step 8 - Remove the cap from the large glass or stainless-steel mixing container and slightly tilt the mouth of the container below the sampling device.

Step 9 - Empty the sampler slowly, allowing the sample stream to flow gently down the side of the container with minimal entry turbulence.

Step 10 - Continue delivery of the sample until the mixing container contains a sufficient volume for all laboratory samples.

Step 11 - The sample collection order (as appropriate) will be as follows:

1. Volatile Organic Compounds (VOCs);
2. Semi-Volatile Organic Compounds (SVOCs); and
3. Oil and Grease (O&G).

Step 12 - Secure the sample jar cap(s) tightly.

Step 13 - Label all sample containers as appropriate, as discussed in Appendix DD of the FSP/QAPP.

Step 14 - After sample containers have been filled, fill a beaker or glass container with the water sample and measure the pH, as discussed in Appendix A-1 of the FSP/QAPP.

Step 15 - Measure the water temperature from the outfall effluent or from a beaker or glass container filled with the water sample if an outfall effluent measurement is not possible, and record the ambient air temperature.

Step 16 - Record required information on the appropriate forms and/or field notebook.

Step 17 - Handle, pack, and ship the samples in accordance with the procedures in Appendix DD of the FSP/QAPP.

IV. Field Duplicates

Collection of duplicates involves the collection of additional volume at a sample location following the procedures in Section IV above. The duplicate sample will be labeled in such a way that the sample descriptions will not indicate the duplicate nature of the samples. Field duplicate samples will be collected in accordance with the FSP/QAPP.

V. Field Equipment Blanks

A field equipment blank will be prepared by filling certified pre-cleaned glassware with analyte-free water following decontamination. As required by the FSP/QAPP, one equipment blank will be collected for every 20 samples if multiple samples are collected during a sampling event; at a minimum, one equipment blank will be collected per sampling event.

VI. Trip Blanks

Trip blanks will be used for samples to be submitted for analysis of VOCs. Trip blanks will be pre-packaged analyte-free method blank water samples provided by the analytical laboratory in the same type of container to be used for the analytical samples. The trip blank will remain unopened once received from the laboratory and will accompany the sample containers for analysis of VOCs throughout the sampling and shipping process. As required by the FSP/QAPP, one trip blank will be in each cooler carrying samples for analysis of VOCs.

VII. Equipment Cleaning

Equipment cleaning will occur at the beginning of each sampling event and between each sampling location as described in Appendix EE of the FSP/QAPP.

VIII. Disposal Methods

Rinse water, personal protective equipment, and other residuals generated during the equipment cleaning procedures will be placed in appropriate containers. Containerized waste will be disposed of by GE consistent with its ongoing disposal practices.

IX. Data Recording and Management

Data from sample collection will be recorded in the field database using a laptop computer or field logbook. Upon completion of sampling at one location, all data from the location will be entered into the database. Blank field log sheets or a field book can also be used to record information manually in case difficulties with data entry using the computer are encountered. Manually recorded data will be transcribed into the field database.

X. References

Arcadis. 2023a. Site Health and Safety Plan - GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised July.

Arcadis. 2023b. Field Sampling Plan / Quality Assurance Project Plan – GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised December.

Appendix B-2
Standard Operating Procedure for Discharge Water Composite Sampling (24-Hour Flow-Weighted Composite)

I. Scope and Application

This appendix to the Surface Water Discharge Work Plan sets forth a Standard Operating Procedure (SOP) for collection of discharge water samples at Outfall 64G using an automated sampler. This SOP contains methods for sample collection requirements and general safety considerations.

II. Health and Safety

Health and safety protocols are addressed in the most current site Health and Safety Plan (HASP) for the GE-Pittsfield/Housatonic River Site (Arcadis 2023a or superseding version). The HASP will be followed during all activities conducted by field personnel.

III. Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, General Electric's (GE's) Surface Water Discharge Work Plan (Anchor QEA 2025), and any other applicable project-specific work plan requirements calling for the collection of discharge water samples using automated samplers. Field personnel will also work under the direct supervision of qualified professionals who are experienced in performing the tasks described herein.

IV. Contamination and Interferences

Potential sources of contamination and interferences during sampling at the automated sampling stations include the presence of residual analytes and/or accumulation of solids within the sample collection system. The automatic sampler tubing will be inspected each time the automatic sampler is serviced and cleaned as needed. Automated sampler collection vessels will be decontaminated at the facility prior to reusing or certified precleaned glassware will be utilized.

V. Equipment and Supplies

Equipment needed for the collection of water samples using the automated station includes the following. Additional equipment may be required depending on field conditions.

- Operational automated sampling equipment:
  - ISCO automatic sampler
  - 100-amp hour battery
  - ISCO intake tubing and strainer
- Sample containers
- Disposable gloves (talc free)
- Laboratory-supplied analyte-free water
- Cooler with ice
- Resealable storage bags
- Laptop computer and printer
- Field application

VI. Procedures

Water samples will be collected from the automated station installed at the outfall discharge and composited for analysis. The procedure provided below is for collection of a 24-hour composite sample; however, this procedure can be modified for other sampling intervals as needed. Following the initial deployment of the system (prior to collection of the first sample), the system will be calibrated to ensure the correct sample volume is being collected. Additional calibration would also be performed subsequent to the initial deployment as needed if any changes to the system are made (e.g., modifications to intake tubing length) or if it is determined that sample volumes collected are incorrect.

Initial ISCO Program Setup

Program Summary

- A 200-milliliter (mL) aliquot of surface water is collected from the outfall every 30 minutes and delivered to a 3.8-liter (L; i.e., 1 gallon) sample bottle.
- One 3.8-liter (L; i.e., 1 gallon) bottle is filled over a 24-hour period.
- At the main menu, type “6712.2” to enter extended programming mode.

Program Setup

To program the ISCO sampler, follow the prompts on the sampler screen and select or enter the following information. For more information, reference the 6712 Portable Samplers: Installation and Operation Guide (Operation Guide; Teledyne ISCO 2019).

1. Main Menu
    1.1 Program
2. Units
    2.1 “ft”
3. Data interval
    3.1 “1-minute”
4. Pump settings
    4.1 One, 3.8 L bottle
    4.2 _ ft suction line (Enter suction line length in feet)
    4.3 Auto suction head
    4.4 1 rinse, 0 retries
5. Program
    5.1 One part program
6. Pacing
    6.1 On “Time”

    6.2 Every 30 minutes

7. No Select
8. No Select
9. No Select
10. No delay
11. Program running
    11.1 Run continuously “Yes”
12. Sample volume
    12.1 200 mL samples
13. Sample Enable
    13.1 “none”
14. Enable/Disable
    14.1 “once enabled, stay enabled”
    14.2 “sample at enable”
    14.3 “0 pauses and resumes”
15. No Select
16. Run Program
    16.1 “Yes”
17. Note: Sampler should not be pumping, display screen should state “first sample at __:__”

VII. Composite Sample Collection

Samples collected as programed using the above procedures will be 24-hour composites. Each 24-hour compositing period will start at 00:00 a.m. on the day of sample collection. To provide sufficient sample volume to meet these potential contingencies, the automated ISCO sampling system has been programmed to collect aliquots that represent approximately 1/24 of the total sample volume needed each hour of each day. The following procedures will be used for the 24-hour composite sample collection at Outfall 64G:

1. Upon arrival at the automated station (Outfall 64G), confirm that the ISCO sampler is operational.
2. Start the ISCO sampler at 00:00 a.m.
3. Following the duration of the 24-hour sample event, inspect the ISCO sampler and confirm the sampler has dispensed the correct volume into the sample container (3.8-liter bottle).

4. Put on new disposable gloves.
5. Select which samples will be submitted for laboratory analysis and prepare the appropriate sample containers.
6. Swirl the container to resuspend any settled solids, and then fill each of the required sample containers.
7. After all of the sample containers have been filled, fill a beaker or glass container with the water sample and measure field parameters as described in Appendix A1 of the revised Field Sampling Plan / Quality Assurance Project Plan for the GE-Pittsfield/Housatonic River Site (FSP/QAPP; Arcadis 2023b).
8. Enter the required information in the field application.
9. Use the field application to generate and print a label for the containers.
10. Dry the outside of the containers with a paper towel, and label appropriately.
11. Place the labeled containers in a cooler with ice for transport to the analytical laboratory.
12. Use the field database to generate field logs and chain-of-custody forms.
13. Confirm that the sampling system is operating and that the next 24-hour composite container is installed.

VIII. Field Duplicates

Collection of duplicates involves the collection of additional volume at a sample location following the procedures in Section IV above. The duplicate sample will be labeled in such a way that the sample descriptions will not indicate the duplicate nature of the samples. Field duplicate samples will be collected in accordance with the FSP/QAPP.

IX. Field Equipment Blanks

A field equipment blank will be prepared by filling certified pre-cleaned glassware with analyte-free water following decontamination. As required by the FSP/QAPP, one equipment blank will be collected for every 20 samples if multiple samples are collected during a sampling event; at a minimum, one equipment blank will be collected per sampling event.

X. Decontamination

The sample collection vessel will be decontaminated in a well-ventilated area between uses as follows:

1. Clean with a phosphate-free detergent and water.
2. Rinse with distilled water.
3. Rinse thoroughly with acetone.
4. Rinse thoroughly with hexane.
5. Rinse with distilled water.

6. Allow to air dry.

Acetone and hexane rinsate will be collected and placed in appropriate containers for subsequent proper disposal.

Alternatively, certified pre-cleaned glassware may be utilized and then disposed of following use.

XI. References

Anchor QEA (Anchor QEA, Inc.). 2025. Surface Water Discharge Work Plan for General Electric Pittsfield Facility. Prepared for General Electric Company, Pittsfield, Massachusetts. August.

Arcadis. 2023a. Site Health and Safety Plan – GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised July.

Arcadis. 2023b. Field Sampling Plan / Quality Assurance Project Plan – GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised December.

Teledyne ISCO, 2019. 6712 Portable Samplers: Installation and Operation Guide. Available at: https://www.teledyneisco.com/en-us/Water_/Sampler%20Documents/Manuals/6712%20 Portable%20Sampler%20User%20Manual.pdf.

Appendix B-3

Standard Operating Procedure for Discharge Water Composite Sampling (3-Hour Flow-Weighted Composite)

I. Scope and Application

This appendix to the Surface Water Discharge Work Plan sets forth a Standard Operating Procedure (SOP) for collection of discharge water samples at Outfalls 005, 05A, 006, 009, YD10, YD12, YD13, and YD16 using automated samplers installed at each location. This SOP contains methods for sample collection requirements and general safety considerations.

II. Health and Safety

Health and safety protocols are addressed in the most current site Health and Safety Plan (HASP) for the GE-Pittsfield/Housatonic River Site (Arcadis 2023a or superseding version). The HASP will be followed during all activities conducted by field personnel.

III. Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, General Electric's (GE's) Surface Water Discharge Work Plan (Anchor QEA 2025), and any other applicable project-specific work plan requirements calling for the collection of discharge water samples using automated samplers. Field personnel will also work under the direct supervision of qualified professionals who are experienced in performing the tasks described herein.

IV. Contamination and Interferences

Potential sources of contamination and interferences during sampling at the automated sampling stations include the presence of residual analytes and/or accumulation of solids within the sample collection system. The automatic sampler tubing will be inspected each time the automatic sampler is serviced and cleaned as needed. Automated sampler collection vessels will be decontaminated at the facility prior to reusing or certified precleaned glassware will be utilized.

V. Equipment and Supplies

Equipment needed for the collection of water samples using the automated stations includes the following. Additional equipment may be required depending on field conditions.

- Operational automated sampling station equipment:
  - ISCO automatic sampler
  - 100-amp hour battery
  - ISCO intake tubing and strainer
- Sample containers
- Disposable gloves (talc free)
- Laboratory-supplied analyte-free water
- Cooler with ice
- Resealable storage bags
- Laptop computer and printer
- Field application

VI. Procedures

At each outfall, stormwater samples will be collected from automated stations installed at each discharge and composited for analysis. The procedure provided below is for collection of a 3-hour composite sample; however, this procedure can be modified for other sampling intervals as needed. Following the initial deployment of the system (prior to collection of the first sample), the system will be calibrated to ensure the correct sample volume is being collected. Additional calibration would also be performed subsequent to the initial deployment as needed if any changes to the system are made (e.g., modifications to intake tubing length) or if it is determined that sample volumes collected are incorrect.

Initial ISCO Program Setup

Program Summary

- One 2.0-liter bottle is filled every 25 minutes.
- A 200-milliliter (mL) aliquot of surface water is collected from the outfall every 25 minutes and delivered to the sample bottle.
- A total of eight (8) 2.0-liter bottles are filled over a 3-hour period.
- ISCO switches bottles every 25 minutes.
- At the main menu, type “6712.2” to enter extended programming mode.

Program Setup

To program the ISCO sampler, follow the prompts on the sampler screen and select or enter the following information. For more information, reference the 6712 Portable Samplers: Installation and Operation Guide (Operation Guide; Teledyne ISCO 2019).

1. Main Menu
    1.1 Program
2. Units
    2.1 “ft”
3. Data interval
    3.1 “1-minute”
4. Pump settings
    4.1 Eight, 2.0 L bottles
    4.2 _ ft suction line (Enter suction line length in feet)
    4.3 Auto suction head
    4.4 1 rinse, 0 retries
5. Program
    5.1 One part program

6. Pacing
    6.1 On “Time”
    6.2 Every 25 minutes
7. Bottles
    7.1 1 bottle per sample
    7.2 Set Switching
8. Switch sets on time
9. Switch sets every 25 minutes
10. No delay
11. Program running
    11.1 Run continuously “Yes”
12. Sample volume
    12.1 200 mL samples
13. Sample Enable
    13.1 “none”
14. Enable/Disable
    14.1 “once enabled, stay enabled”
    14.2 “sample at enable”
    14.3 “0 pauses and resumes”
15. No Select
16. Run Program
    16.1 “Yes”
17. Note: Sampler should not be pumping, display screen should state “first sample at __:__”

VII. Composite Sample Collection

Samples collected as programed using the above procedures will be 3-hour composites or less. Composite samples will be collected over the duration of the storm or for three hours, whichever is less, and will be collected at equal time intervals and combined proportional to flow. The 3-hour compositing period will start within the first 30 minutes of the outfall discharge. If it is not practicable to collect the sample during the first 30 minutes, the composting period will start within the first 30 to 60 minutes of discharge and describe why collecting a grab-sample during the first 30 minutes was impracticable. To provide sufficient sample volume to meet these potential contingencies, the automated ISCO sampling system has been programmed to collect aliquots that represent approximately 1/8 of the total sample volume needed. The following procedures will be used for storm duration or 3-hour composite sample collection at each outfall:

1. Assess weather conditions for rainfall and confirm dry-weather precedence (approximately 24-hours prior to initiating sampling).
2. Upon arrival at the automated station (Outfall), confirm that the ISCO sampler is operational.
3. Confirm wet weather conditions (rainfall greater than 0.1 inches) and visually confirm outfall discharge.
4. Within 30 minutes of outfall discharge, start the ISCO sampler.
5. Following the duration of the storm event or 3-hours (whichever is less), inspect the ISCO sampler and confirm the sampler has dispensed the correct volume into the sample containers.
6. Retrieve flow values for the duration of the storm event or the 3-hour sampling period, whichever is less, from the flow monitoring data collector. Flow values retrieved will be on 25-minute intervals.
7. Using a flow-composite work sheet (an example work sheet is attached), calculate the volume of sample from each ISCO container that is required to achieve a total sample volume of seven (7) liters.
8. Put on new disposable gloves.
9. Swirl each of the containers to resuspend any settled solids and using a decontaminated glass graduated cylinder measure the required sample volume and add it to the pre-cleaned glass 2.5 gallon jar.
10. Select which samples will be submitted for laboratory analysis and prepare the appropriate sample containers.
11. After the appropriate sample volumes from each of the containers have been added to the pre-cleaned glass 2.5 gallon jar, swirl the flow proportioned composite sample and fill each of the required sample containers.
12. After all of the sample containers have been filled, fill a beaker or glass container with the water sample and measure field parameters as described in Appendix A1 the revised Field Sampling Plan / Quality Assurance Project Plan for the GE-Pittsfield/Housatonic River Site (FSP/QAPP; Arcadis 2023b).
13. Enter the required information in the field application.
14. Use the field application to generate and print a label for the containers.

15. Dry the outside of the containers with a paper towel, and label appropriately.
16. Place the labeled containers in a cooler with ice for transport to the analytical laboratory.
17. Use the field database to generate field logs and chain-of-custody forms.
18. Confirm that the sampling system is operating and that the next 3-hour composite containers are installed.

VIII. Field Duplicates

Collection of duplicates involves the collection of additional volume at a sample location following the procedures in Section IV above. The duplicate sample will be labeled in such a way that the sample descriptions will not indicate the duplicate nature of the samples. Field duplicate samples will be collected in accordance with the FSP/QAPP.

IX. Field Equipment Blanks

A field equipment blank will be prepared by filling certified pre-cleaned glassware with analyte-free water following decontamination. As required by the FSP/QAPP, one equipment blank will be collected for every 20 samples if multiple samples are collected during a sampling event; at a minimum, one equipment blank will be collected per sampling event.

X. Decontamination

The eight sample collection vessels will be decontaminated in a well-ventilated area between uses as follows:

1. Clean with a phosphate-free detergent and water.
2. Rinse with distilled water.
3. Rinse thoroughly with acetone.
4. Rinse thoroughly with hexane.
5. Rinse with distilled water.
6. Allow to air dry.

Acetone and hexane rinsate will be collected and placed in appropriate containers for subsequent proper disposal.

Alternatively, certified pre-cleaned glassware may be utilized and then disposed of following use.

XI. References

Anchor QEA (Anchor QEA, LLC). 2025. Surface Water Discharge Work Plan For General Electric Pittsfield Facility. Prepared for General Electric Company, Pittsfield, Massachusetts. August.

Arcadis. 2023a. Site Health and Safety Plan – GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised July.

Arcadis. 2023b. Field Sampling Plan / Quality Assurance Project Plan – GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised December.

Teledyne ISCO, 2019. 6712 Portable Samplers: Installation and Operation Guide. Available at: https://www.teledyneisco.com/en-us/Water_/Sampler%20Documents/Manuals/6712%20Portable%20Sampler%20User%20Manual.pdf.

FLOW COMPOSITE WORKSHEET
SURFACE WATER DISCHARGE WORK PLAN
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

Outfall ID ______

Composite Volume (mL) **7000**

Date Time	Flow (gallons)	Aliquot	mL in Comp
		1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
	Total	**Total**	**Total**
		8	

This composite was prepared by __________________ on ______________ at ______________

(print name) (date) (time)

_____________________________________ _________________________

(signature) (date)

Appendix B-4
Standard Operating Procedure for Discharge Water Composite Sampling (40-Minute Flow-Weighted Composite)

I. Scope and Application

This appendix to the Surface Water Discharge Work Plan sets forth a Standard Operating Procedure (SOP) for collection of discharge water samples at Bypass Outfalls 05B and 06A using automated samplers installed at each location. This SOP contains methods for sample collection requirements and general safety considerations.

II. Health and Safety

Health and safety protocols are addressed in the most current site Health and Safety Plan (HASP) for the GE-Pittsfield/Housatonic River Site (Arcadis 2023a or superseding version). The HASP will be followed during all activities conducted by field personnel.

III. Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, General Electric's (GE's) Surface Water Discharge Work Plan (Anchor QEA 2025), and any other applicable project-specific work plan requirements calling for the collection of discharge water samples using automated samplers. Field personnel will also work under the direct supervision of qualified professionals who are experienced in performing the tasks described herein.

IV. Contamination and Interferences

Potential sources of contamination and interferences during sampling at the automated sampling stations include the presence of residual analytes and/or accumulation of solids within the sample collection system. The automatic sampler tubing will be inspected each time the automatic sampler is serviced and cleaned as needed. Automated sampler collection vessels will be decontaminated at the facility prior to reusing or certified precleaned glassware will be utilized.

V. Equipment and Supplies

Equipment needed for the collection of water samples using the automated stations includes the following. Additional equipment may be required depending on field conditions.

- Operational automated sampling equipment:
  - ISCO automatic sampler
  - 100-amp hour battery
  - ISCO intake tubing and strainer
- Sample containers
- Disposable gloves (talc free)
- Laboratory-supplied analyte-free water
- Cooler with ice
- Resealable storage bags
- Laptop computer and printer
- Field application

VI. Procedures

At each bypass Outfall, stormwater samples will be collected from automated stations installed at each discharge and composited for analysis. Bypass Outfalls 05B and 06A discharge when flows reach approximately 2,800 and 2,100 gpm, respectively. In general, Outfalls 05B and 06A do not discharge for periods greater than 45 minutes to one hour. Accordingly, to capture a representative flow weighted composite sample, the sample duration has been modified from three hours to 40 minutes. The procedure provided below is for the collection of a 40-minute composite sample. Following the initial deployment of the system (prior to collection of the first sample), the system will be calibrated to ensure the correct sample volume is being collected. Additional calibration would also be performed subsequent to the initial deployment as needed if any changes to the system are made (e.g., modifications to intake tubing length) or if it is determined that sample volumes collected are incorrect.

Initial ISCO Program Setup

Program Summary

- One 2.0-liter bottle is filled every five minutes.
- A 200-milliliter (mL) aliquot of surface water is collected from the outfall every 5 minutes and delivered to the sample bottle.
- A total of eight 2.0-liter bottles are filled over a 40-minute period.
- ISCO switches bottles every five minutes.
- At the main menu, type “6712.2” to enter extended programming mode.

Program Setup

To program the ISCO sampler, follow the prompts on the sampler screen and select or enter the following information. For more information, reference the 6712 Portable Samplers: Installation and Operation Guide (Operation Guide; Teledyne ISCO 2019).

1. Main Menu
    1.1 Program
2. Units
    2.1 “ft”
3. Data interval
    3.1 “1-minute”
4. Pump settings
    4.1 Eight, 2.0 L bottles
    4.2 _ ft suction line (Enter suction line length in feet)
    4.3 Auto suction head
    4.4 1 rinse, 0 retries

5. Program
    5.1 One part program
6. Pacing
    6.1 On “Time”
    6.2 Every 5 minutes
7. Bottles
    7.1 1 bottle per sample
    7.2 Set Switching
8. Switch sets on time
9. Switch sets every 5 minutes
10. No delay
11. Program running
    11.1 Run continuously “Yes”
12. Sample volume
    12.1 200 mL samples
13. Sample Enable
    13.1 “none”
14. Enable/Disable
    14.1 “once enabled, stay enabled”
    14.2 “sample at enable”
    14.3 “0 pauses and resumes”
15. No Select
16. Run Program
    16.1 “Yes”
17. Note: Sampler should not be pumping, display screen should state “first sample at __:__”

VII. Composite Sample Collection

Samples collected as programed using the above procedures will be 40-minute composites or less. Composite samples will be collected over the duration of the storm or for 40 minutes, whichever is less, and will be collected at equal time intervals and combined proportional to flow. The 40-minute compositing period will start within the first 10 minutes of the outfall discharge. To provide sufficient sample volume to meet these potential contingencies, the automated ISCO sampling system has been programmed to collect aliquots that represent approximately 1/8 of the total sample volume needed. The following procedures will be used for storm duration or 40-minute composite sample collection at each outfall:

1. Assess weather conditions for rainfall and confirm dry-weather precedence (approximately 24-hours prior to initiating sampling).
2. Upon arrival at the automated station (Outfall), confirm that the ISCO sampler is operational.
3. Confirm wet weather conditions (rainfall greater than 0.1 inches) and visually confirm outfall discharge.
4. Within 10 minutes of outfall discharge, start the ISCO sampler.
5. Following the duration of the storm event or 40 minutes (whichever is less), inspect the ISCO sampler and confirm the sampler has dispensed the correct volume into the sample containers.
6. Retrieve flow values for the duration of the storm event or the 40-minute sampling period, whichever is less, from the flow monitoring data collector. Flow values retrieved will be on 5-minute intervals.
7. Using a flow-composite work sheet (an example work sheet is attached), calculate the volume of sample from each ISCO container that is required to achieve a total sample volume of seven (7) liters.
8. Put on new disposable gloves.
9. Swirl each of the containers to resuspend any settled solids and using a decontaminated glass graduated cylinder measure the required sample volume and add it to the pre-cleaned glass 2.5 gallon jar.
10. Select which samples will be submitted for laboratory analysis and prepare the appropriate sample containers.
11. After the appropriate sample volumes from each of the containers have been added to the pre-cleaned glass 2.5 gallon jar, swirl the flow proportioned composite sample and fill each of the required sample containers.
12. After all of the sample containers have been filled, fill a beaker or glass container with the water sample and measure field parameters as described in Appendix A1 of the revised Field Sampling Plan / Quality Assurance Project Plan for the GE-Pittsfield/Housatonic River Site (FSP/QAPP; Arcadis 2023b).
13. Enter the required information in the field application.

14. Use the field application to generate and print a label for the containers.
15. Dry the outside of the containers with a paper towel, and label appropriately.
16. Place the labeled containers in a cooler with ice for transport to the analytical laboratory.
17. Use the field database to generate field logs and chain-of-custody forms.
18. Confirm that the sampling system is operating and that the next 40-minute composite containers are installed.

VIII. Field Duplicates

Collection of duplicates involves the collection of additional volume at a sample location following the procedures in Section IV above. The duplicate sample will be labeled in such a way that the sample descriptions will not indicate the duplicate nature of the samples. Field duplicate samples will be collected in accordance with the FSP/QAPP.

IX. Field Equipment Blanks

A field equipment blank will be prepared by filling certified pre-cleaned glassware with analyte-free water following decontamination. As required by the FSP/QAPP, one equipment blank will be collected for every 20 samples if multiple samples are collected during a sampling event; at a minimum, one equipment blank will be collected per sampling event.

X. Decontamination

The eight sample collection vessels will be decontaminated in a well-ventilated area between uses as follows:

1. Clean with a phosphate-free detergent and water.
2. Rinse with distilled water.
3. Rinse thoroughly with acetone.
4. Rinse thoroughly with hexane.
5. Rinse with distilled water.
6. Allow to air dry.

Acetone and hexane rinsate will be collected and placed in appropriate containers for subsequent proper disposal.

Alternatively, certified pre-cleaned glassware may be utilized and then disposed of following use.

XI. References

Anchor QEA (Anchor QEA, LLC). 2025. Surface Water Discharge Work Plan For General Electric Pittsfield Facility. Prepared for General Electric Company, Pittsfield, Massachusetts. August.

Arcadis. 2023a. Site Health and Safety Plan – GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised July.

Arcadis. 2023b. Field Sampling Plan / Quality Assurance Project Plan – GE-Pittsfield/Housatonic River Site. Prepared for General Electric Company, Pittsfield, Massachusetts. Revised December.

Teledyne ISCO, 2019. 6712 Portable Samplers: Installation and Operation Guide. Available at: https://www.teledyneisco.com/en-us/Water_/Sampler%20Documents/Manuals/6712%20Portable%20Sampler%20User%20Manual.pdf.

FLOW COMPOSITE WORKSHEET
SURFACE WATER DISCHARGE WORK PLAN
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

Outfall ID ____________

Composite Volume (mL) **7000**

Date Time	Flow (gallons)	Aliquot	mL in Comp
		1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
	Total	**Total**	**Total**
		8	

This composite was prepared by ____________________ on _______________ at _______________
(print name) (date) (time)

____ ____________________________
(signature) (date)

Appendix B-5

Laboratory Qualifications and Analytical Standard Operating Procedures for ALS, Rochester, New York

The Commonwealth of Massachusetts

Department of Environmental Protection

Division of Environmental Analysis
Senator William X. Wall Experiment Station

certifies

M-NY032 **ALS ENVIRONMENTAL ROCHESTER**

1565 JEFFERSON RD
BUILDING 300, SUITE 360
ROCHESTER, NY 14623-0000

Laboratory Director: **CHRISTINE KUTZER**

for the analysis of **NON POTABLE WATER (CHEMISTRY)**

pursuant to 310 CMR 42.00

This certificate supersedes all previous Massachusetts certificates issued to this laboratory. The laboratory is regulated by and shall be responsible for being in compliance with Massachusetts regulations at 310 CMR 42.00.

This certificate is valid only when accompanied by the latest dated Certified Parameter List as issued by the Massachusetts D.E.P. Contact the Division of Environmental Analysis to verify the current certification status of the laboratory.

Certification is no guarantee of the validity of the data. This certification is subject to unannounced laboratory inspections.

Oscar C. Pancorbo

Director, Division of Environmental Analysis

Issued: **01 JUL 2025**
Expires: **30 JUN 2026**

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 02 APR 2025

M-NY032 ALS ENVIRONMENTAL ROCHESTER
ROCHESTER NY

NON POTABLE WATER (CHEMISTRY) **Effective Date** **02 APR 2025** **Expiration Date** **30 JUN 2026**

Analytes	Methods
ALUMINUM	EPA 200.7
ANTIMONY	EPA 200.7
ANTIMONY	EPA 200.8
ARSENIC	EPA 200.7
ARSENIC	EPA 200.8
BERYLLIUM	EPA 200.7
BERYLLIUM	EPA 200.8
CADMIUM	EPA 200.7
CADMIUM	EPA 200.8
CHROMIUM	EPA 200.7
CHROMIUM	EPA 200.8
COBALT	EPA 200.7
COBALT	EPA 200.8
COPPER	EPA 200.7
COPPER	EPA 200.8
IRON	EPA 200.7
LEAD	EPA 200.7
LEAD	EPA 200.8
MANGANESE	EPA 200.7
MANGANESE	EPA 200.8
MERCURY	EPA 245.1
MOLYBDENUM	EPA 200.7
MOLYBDENUM	EPA 200.8
NICKEL	EPA 200.7
NICKEL	EPA 200.8
SELENIUM	EPA 200.7
SELENIUM	EPA 200.8
SILVER	EPA 200.7
SILVER	EPA 200.8
THALLIUM	EPA 200.7
THALLIUM	EPA 200.8
VANADIUM	EPA 200.7
VANADIUM	EPA 200.8
ZINC	EPA 200.7
ZINC	EPA 200.8
SPECIFIC CONDUCTIVITY	EPA 120.1
TOTAL DISSOLVED SOLIDS	SM 2540C
HARDNESS (CACO3), TOTAL	SM 2340B
CALCIUM	EPA 200.7
MAGNESIUM	EPA 200.7
SODIUM	EPA 200.7
POTASSIUM	EPA 200.7
ALKALINITY, TOTAL	SM 2320B

Certified Parameter List as of: 02 APR 2025

M-NY032 ALS ENVIRONMENTAL ROCHESTER
ROCHESTER NY

NON POTABLE WATER (CHEMISTRY) **Effective Date** **02 APR 2025** **Expiration Date** **30 JUN 2026**

Analytes	Methods
CHLORIDE	EPA 300.0
FLUORIDE	EPA 300.0
SULFATE	EPA 300.0
AMMONIA-N	EPA 350.1
NITRATE-N	EPA 300.0
NITRATE-N	EPA 353.2
KJELDAHL-N	EPA 351.2
ORTHOPHOSPHATE	EPA 365.1
PHOSPHORUS, TOTAL	EPA 365.1
CHEMICAL OXYGEN DEMAND	EPA 410.4
BIOCHEMICAL OXYGEN DEMAND	SM 5210B
TOTAL ORGANIC CARBON	SM 5310B
CYANIDE, TOTAL	EPA 335.4
NON-FILTERABLE RESIDUE	SM 2540D
OIL AND GREASE	EPA 1664
PHENOLICS, TOTAL	EPA 420.4
VOLATILE HALOCARBONS	EPA 624.1
VOLATILE AROMATICS	EPA 624.1
SVOC-ACID EXTRACTABLES	EPA 625.1
SVOC-BASE/NEUTRAL EXTRACTABLES	EPA 625.1
POLYCHLORINATED BIPHENYLS (WATEF	EPA 608.3

STANDARD OPERATING PROCEDURE
ALS | Environmental - Rochester, NY

SOP CHANGE FORM

SOP Title: Volatile Organic Compounds by GC/MS		
SOP Code: VOC-8260	Revision No: 18	SOP Date: 2/26/24
SOP Section(s) Affected by Change: 12.1		

Description of Change:

Add to 12.1 – Samples received with only one vial are not to be screened with the PID meter since the PID screening procedure compromises the sample and may cause low bias.

Reason for Change:
Need to ensure that sample is not compromised before analysis.

Change(s) Submitted by: Vicky Collom	Date: 5/19/25

Approvals:

Supervisor Signature:	Date: 5/20/25
QA Signature:	Date: 5/19/25
Laboratory Supervisor Signature:	Date: 5/20/25

QA:

Does the approved change require further SOP user attestations? (If so, complete below. Note: Attestations may be kept separately on file and need not be scanned to the SOP)	Y
If the change will have a future effective date, or past definitive date what is that date? If blank, the effective date is the date of this SOP change form and reflects current practice.	

Attestations: I, the undersigned, have read, understood, and agree to implement and follow the above referenced SOP. I agree to follow this procedure without modification unless otherwise approved and directed to do so in a client-specific quality assurance plan or by a client-specific communication requirement.

5/22/25
5/27/25

SOP CHANGE FORM

SOP Title: Volatile Organic Compounds by GC/MS		
SOP Code: VOC-8260	Revision No: 18	SOP Date: 2/26/2004
SOP Section(s) Affected by Change: 10.12, 9.4.3		

Description of Change:

Add MS#18

LCS is prepped at 20ppb; 5ul of second source freons (200ppb) and 2ul of the other SS standards (500ppb) in 50ml DI

Remove the Supelco trap and replace with: Teledyne purge trap 9 (U-shape) "stratum PTC"

Remove DB-VRX column; all systems use the same DB-624 column.

Reason for Change:
New instrument
Update supplies/processes that reflect current practice.

Change(s) Submitted by: Kelli Ruest	Date: 2/11/2025

Approvals:

Supervisor Signature:	Date: 2/12/25
QA Signature:	Date: 2/13/25
Laboratory Director Signature:	Date: 2/13/25

QA:

Does the approved change require further SOP user attestations? (If so, complete below. Note: Attestations may be kept separately on file and need not be scanned to the SOP)	N
If the change will have a future effective date, or past definitive date what is that date? If blank, the effective date is the date of this SOP change form and reflects current practice.	

Attestations: I, the undersigned, have read, understood, and agree to implement and follow the above referenced SOP. I agree to follow this procedure without modification unless otherwise approved and directed to do so in a client-specific quality assurance plan or by a client-specific communication requirement.

_______________ _______________ _______________

Volatile Organic Compounds by GCMS

DOCUMENT ID: VOC-8260, REV 18

Approved By: ______________________ Date: 2/7/24
Operations Manager, Bill Allgeier

Approved By: ______________________ Date: 2/7/24
Quality Manager, Vicky Collom

Approved By: ______________________ Date: 2/7/24
Supervisor, Alec Moses

Approved By: Meghan Pedro Date: 2/7/24
Technical Director, Meghan Pedro

Approved By: Christine Kutzer Date: 2/7/24
Lead Technical Director, Christine Kutzer

TABLE OF CONTENTS

1) Scope and Applicability

1.1 This SOP uses USEPA SW-846 method 8260C and 8260D to determine the concentration of volatile organic compounds (VOCs) in water and soil, sediment and sludge. The preparation of solids by Method 5035A is discussed in a separate SOP (VOC-5035). Sample introduction by Method 5030 (purge and trap) is discussed in this SOP. The base chromatography, QC, and calibration method used is USEPA SW-846 method 8000C. This method may also be applicable to various types of aqueous and nonaqueous waste samples. Samples may be analyzed after a leachate procedure (MET-TZHE or MET-SPLPZHE). The Data Quality Objectives Table lists the compounds that are routinely determined by this method with the associated Reporting Limits and Quality Control Limits. The reported compound list and reporting limits may be adjusted if required for specific project requirements and supported by current detection and quantitation studies. The method can quantitate most volatile organic compounds with a boiling point <200°C. This SOP may be used for work requiring DOD QSM, Massachusetts CAM, or Connecticut RCP by following the special conditions in the Quality Control Summary (Table 3).

1.2 This SOP also uses EPA method 624.1 for the determination of volatile organic compounds in wastewater (municipal and industrial discharges). Samples for Method 624.1 can be analyzed with 8260 samples and under this 8260 SOP with clarifications provided throughout. 8260 criteria is typically stricter than 624.1 criteria. Where differences exist between 8260 and 624.1, samples will be analyzed under the stricter criteria of the two methods, but samples need only meet the criteria of the method reported.

2) Summary of Procedure

2.1 This method gives gas chromatographic/mass spectrometric (GC/MS) conditions for the detection of parts per billion (ppb) levels of volatile organic compounds. A sample aliquot is injected into the gas chromatograph (GC) by the purge and trap method. The compounds are separated on a small bore fused silica capillary column. The compounds are detected by a mass selective detector (MSD), which gives both qualitative as well as quantitative information.

2.2 In the purge and trap process an inert gas, helium, is bubbled through the sample aliquot, at room temperature. This gas stream sweeps the volatile organic compounds out of the aqueous phase and into the gas stream - it purges the compounds out of the sample. The gas stream then passes through a sorbent column which selectively adsorbs (traps) these compounds out of the helium. After the purging sequence is done, the sorbent column (the trap) is heated and backflushed onto the GC column. The GC column separates the compounds and passes them onto the MSD for identification and quantification.

2.3 Differences from published methods – For the tune scan selection - Although the published 8260C method describes the use of only the average of the peak apex scan and the scans immediately preceding and following the apex, the newer EPA methods 8260D and 8270E allow the single peak apex to be used and allow more flexibility in which scans can be averaged. This laboratory allows the scan selection options of the newer methods and details the options in the Tuning section of this SOP.

3) Definitions

3.1 Analysis Window - Samples are analyzed in a set referred to as "a window". In 624.1, this window is referred to as a “shift”. The window begins with the injection of the tune verification standard. Standards, required QC samples, and samples may be run until the close of this window (12 hours for 8260 and 14 hours for 624.1). A new window must be opened to continue analysis.

3.2 Initial Calibration Curve – analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the detector to the target compounds.

3.3 Laboratory Control Sample (LCS) or Reference Standard – An aliquot of analyte-free water or other blank matrix to which known quantities of analytes of interest from a second source are added in the laboratory. The LCS is analyzed the same as a sample. Its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate measurements. The LCS contains a full list of compounds. The LCS is evaluated for all client targets in the batch, however only a subset of compounds designated to represent the targets is typically reported. For 624.1, the LCS is the QC Check Sample designated in the 624.1 method and evaluated against 624.1 limits.

3.4 Matrix Spike/ Matrix Spike Duplicate Analysis (MS/MSD) – An aliquot of a sample to which known amounts of compounds of interest from a second source are added in the laboratory prior to analysis. The MS/MSD are analyzed the same as a sample. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the compounds determined by the analysis. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the samples is calculated and used to assess analytical precision. The LCS is evaluated for all of the targets for which the system is calibrated. Corrective action is taken if acceptance criteria is not met for targets in the client’s target list.

3.5 Method Blank (MB) - A volume of analyte-free water treated and analyzed exactly the same as a sample. The purpose of the blank is to determine if any of the analytes of interest or other interferences are present in the analytical system, particularly in regards to carry-over of analytes from highly contaminated samples into other analyses.

3.6 Percent Drift or Percent Difference (%D) - Used to compare two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference).

3.7 % Relative Standard Deviation (%RSD): statistical measure of variation. Used in this method to measure the relative variation of initial calibration standards. Calculated by dividing the standard deviation of the individual response factors by the average response factor and multiplying by 100 to express as a percentage.

3.8 Relative Percent Difference (RPD) – The absolute value of the difference of two values divided by the average of the same two values. Used to compare the precision of the analysis. The result is always a positive number.

3.9 Surrogate - Surrogates are organic compounds which are similar to the analytes of interest in chemical composition, and chromatography, but which are not normally found in environmental samples. The purpose of the surrogates is to help determine matrix effects and to evaluate the preparation and analysis of samples. These compounds were spiked into all blanks, standards, and samples prior to analysis. Percent recovery is calculated for each surrogate.

3.10 Internal Standards - Internal standards are organic compounds which are similar to the analytes of interest but which are not found in the samples. The chosen internal standards are used to calibrate the instrument's response.

3.11 Batch – group of samples (not to exceed 20) of the same matrix analyzed together within sequence. See ADM-BATCH for further discussion.

3.12 Independent Calibration Verification (ICV) - Verification of the ratio of instrument response to analyte amount. ICV solutions (also referred to as laboratory control samples or reference samples) are made from a stock solution which is different from the stock used to prepare calibration standards (Second Source).

3.13 Continuing Calibration Verification Standard (CCV) - A standard injected into the instrument at specified intervals and is used to verify the initial calibration. The source of this standard is the same as that used for calibration purposes.

3.14 4-Bromofluorobenzene (BFB) Tune Standard – 50 ng or less (on-column) of BFB (a solution in methanol) is analyzed to open an analysis window.

3.15 Limit of Quantitation (LOQ) – The minimum levels, concentrations, or quantities of a target that can be reported with a specified degree of confidence. For DOD, the lowest concentration that produces a quantitative result within specified limits of precision and bias. The LOQ shall be set at or above the concentration of the lowest initial calibration standard.

3.16 Limit of Detection (LOD) – An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory – dependent. For DOD, the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.

3.17 Target Analyte – a compound of interest for which the method is capable of measuring. The compounds that the client requests to be reported.

4) Health and Safety Warnings

4.1 Chemicals, reagents and standards must be handled as described in the company safety policies, approved methods and in MSDSs where available. Refer to the Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

4.2 The use of pressurized gases is required for this procedure. Care should be taken when moving cylinders. All gas cylinders must be secured to a wall or an immovable counter with a chain or a cylinder clamp at all times. Sources of flammable gases (e.g., pressurized hydrogen) should be clearly labeled.

4.3 The proper use of syringes should be part of employee training. Care should be taken to avoid personal injury as a result of improper handling techniques.

4.4 Refer to the Safety Manual for further discussion of general safety procedures and information.

4.5 Waste Management and Pollution Prevention

- It is the laboratory’s practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when recycled or disposed of properly.

- The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the EH&S Manual.
- Excess, unused sample and testing byproducts are disposed following the procedures in the SMO-SPDIS.

5) Cautions

5.1 Typical preventive maintenance measures include, but are not limited to, the following items:

- Check gas supply
- Change in-line filters, septum, gold seal, and injection port liner, as needed
- Clip column as needed
- Clean source

5.2 Specific instructions for these maintenance activities and other troubleshooting activities are found in the appropriate instrument manuals.

5.3 Maintenance log - All Preventive maintenance, as well as instrument repair, should be documented in the appropriate instrument maintenance log. Most routine maintenance and troubleshooting are performed by staff. Other maintenance or repairs may, or may not require factory service, depending upon the nature of the task. Any maintenance performed by outside services must also be documented – either through notes in the log or through documents provided by the service. The log entries will include the date maintenance was performed, symptoms of the problem, serial numbers of major equipment upgrades or replacements. The datafile name of the first acceptable run after maintenance is to be documented in the maintenance log.

5.4 All syringes used for sample and standard preparation are monitored by the analyst for wear. Parts are replaced as needed to ensure all syringes remain gas tight.

5.5 All glassware must be cleaned prior to use and includes the use of Liquinox detergent, rinse 8-10 times with hot tap water, rinse 3 times with Millipore DI and 3 times with Purge and Trap grade Methanol.

6) Interferences

6.1 Interferences include but are not limited to impurities in the inert purge gas, dirty plumbing/purge vessels, cross contamination of highly contaminated samples, in transport and storage, and carry over from one analysis to subsequent ones.

6.2 Avoid using non-PTFE thread sealants, plastic tubing, and rubber components, since such materials out-gas organic compounds, which will concentrate in the trap during, purge operation.

6.3 If a sample containing low concentration of VOCs is analyzed immediately after a sample containing high concentration of VOCs, a blank may be analyzed between samples to rinse the system and avoid carry-over. If samples are being injected using a syringe, the syringe should also be rinsed with sufficient volumes of methanol or DI between samples. Screening samples using the PID or Hnu (see VOC-SCREEN) may also be used to avoid injecting sample with high VOC concentration.

6.4 Storage blanks (cooler blanks) are placed in the walk-in coolers containing samples to be tested for VOCs. These blanks are prepared, held/sampled, and analyzed according to VOC-BLANK.

6.5 Trip blanks are collected with aqueous samples and carried through the sampling, handling, and storage to check for contamination of volatile compounds capable of diffusion such as methylene chloride and fluorocarbons.

6.6 Residual chlorine can degrade some organic compounds, generating trihalomethanes (THMs). If chlorine is known or suspected to be present, add 25 mg of ascorbic acid to each 40 mL sample bottle just prior to collection. Residual chlorine is checked after analysis for method 624.1.

6.7 Vinyl chloride and styrene are subject to loss due to chemical reactivity. Preservation by acidification does not prevent this.

6.8 Compounds that are gases at room temperature (e.g., chlorofluorocarbons, chloromethane, and vinyl chloride) are prone to loss through vial seals and handling. In addition, compounds co-eluting with water and methanol will have their responses suppressed.

6.9 Heavier compounds (e.g., naphthalene, 1,2-dibromo-3-chloropropane and hexachlorobutadiene) will have lower overall response and greater variability with conditions and concentrations.

6.10 Aldehydes (e.g., acrolein) have poor stability under the analytical conditions used in this method.

6.11 Alcohols, ketones, ethers and other water-soluble compounds will have low responses.

6.12 Dehydrohalogenation may degrade pentachloroethane and other halogenated compounds (e.g., dichlorobutenes and 1,1,2,2-tetrachloroethane) to other target analytes (especially tetrachloroethene and thrichloroethene) if the pH is >4 or if hydrogen is used as a carrier gas.

7) Personnel Qualifications and Responsibilities

- It is the responsibility of the analyst to perform the analysis according to the instructions in this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are only to be performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.
- Training – see ADM-TRAINING.

8) Sample Containers, Collection, Preservations, and Storage

8.1 Aqueous Samples

8.1.1 Containers supplied by the lab – purchased precleaned and certified from major lab equipment suppliers. All containers should be of glass or amber glass and equipped with a screw top cap and PFTE (Teflon) lined septa and capable of containing a minimum of 40 mL of aqueous sample. New lots of vials are routinely checked for cleanliness and target compound contamination. Three vials packed in single bag are sent for triplicate collection of each client sample.

8.1.2 Preservatives and Holding Times - See the table below for preservative for different methods and target compounds. If acrolein is a target compound, the sample is analyzed within 3 days of sampling. If chlorine residual is known to be present, 25 mg of ascorbic acid should be added to the sample bottle just prior to collection (this is not typically supplied by the lab as this is typically not necessary). The laboratory checks 624.1 samples for residual chlorine after analysis and must make a note in the case narrative if chlorine residual was present. Because 2-chloroethylvinyl ether degrades in the presence of acid, 2-chloroethylvinyl ether must be analyzed from a vial without acid preservative. The lab will not report 2-chloroethylvinyl ether from a preserved vial.

	624.1/8260C	2-cleve	Acrolein624.1/8260
HCL	14 days	NA	NA
Unpreserved	7 days	7 days	3 days

8.1.3 Collection - Field personnel are to slowly fill sample vials to just overflowing, taking care not to flush out any preservative or to trap air bubbles in the samples. Collect all samples in triplicate. Seal the bottles with PFTE lined septa toward the sample and invert to check for trapped air bubbles. If residual chlorine is known or suspected to be present (not typical), add 25 mg of ascorbic acid to each 40 mL sample bottle just prior to collection. Pack with ice and ship to the laboratory for analysis. Refer to SMO-GEN for sample receiving requirements. Samples will be refrigerated to 0-6°C upon sample login.

8.2 Soil Samples

Soil samples are collected per individual state, agency, or QAP requirements. The following options are available:

8.2.1 Option 1 - preferred. Terracore kits

Terracore kits include 3 VOA vials with stir bars (2 with DI and one with methanol as described for Encores). The field personnel put the soil plugs directly into the vials (see VOC-5035 for further sampling instructions). The laboratory may send out pre-prepared vials or the client may purchase Terracore kits. Once the sample is closed in the vial, the sample will not be opened again. Upon receipt, SMO delivers the vials to personnel in the VOA laboratory to be stored in the freezer. Holding time is 14 days from sample collection to analysis.

8.2.2 Option 3: Soil Jar – this is not a 5035 allowed collection option and soil jars are not recommended. When the lab receives samples collected in soil jars, the lab is required to qualify the data as potentially low biased for results <200 ug/kg. Transferring the soil into sealed vials within 48 hours does not alleviate the laboratory's responsibility to qualify the data and the lab does not perform this transfer.

If using, soil jars with PFTE lined septa are used to collect soil samples. The soil is pressed into the jar to the top to eliminate any headspace. Samples are stored at 0-6 °C. Holding time is 14 days from sample collection to analysis. No chemical preservatives are used.

8.3 Oily Waste samples - When oily waste samples are known to be soluble in methanol, sample vials may be prepared as described for soils. However, when the solubility of the waste is unknown, the sample should be collected in a vial without the use of a preservative.

8.4 See VOC-5035, SMO-GEN and SMO-ICOC for further discussion of sample handling, storage, and custody procedures

9) Equipment and Supplies

9.1 Gas chromatograph/Mass Selective Detector Systems

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Year Acquired
GC/MS #10 (R-MS-10)	Gas Chromatograph	Agilent 6890N	CN10633045	2006
	Mass Spec Detector	Agilent 5975B	US62723782	
	Purge and Trap Autosampler	Atomx	US15195006	
	Computer Workstation	Dell E520	8PT52C1	
	Analytical Software	Chemstation	D.03.00.552	
GC/MS #14 (R-MS-14)	Gas Chromatograph	Agilent 7890A	CN10945114	2010
	Mass Spec Detector	Agilent 5975C	US94333887	
	Autosampler and Concentrator	Atomx	US13271003	
	Computer Workstation	IBM 8212KUE	LKTAK9B	
	Analytical Software	Enviroquant Chemstation Core Software Software Upgrade Entech Smartlab v4.17b	USK0104163 91701EA	
R-MS-16	Gas Chromatograph	Agilent 7890B	CN13473179	Used 2021
	Mass Spec Detector	Agilent 5975C	US10263617	
	Purge and Trap Autosampler and Concentrator	Tekmar Atomx XYZ	US21084010	
	Computer Workstation	HP Prodesk NARCEWX013	MXK0122RGM	
	Firmware	GC B.02.02 MS 7.02.29		

	Analytical Software	Mass Hunter B.07.06.2704		
GC/MS #17 (R-MS-17)	Gas Chromatograph	Agilent 8890	US2146A055	2022 - used
	Mass Spec Detector	Agilent 5977B	US143M008	
	Purge and Trap Autosampler and Concentrator	Teledyne Atomx XYZ	US21355008	
	Computer Workstation	HP Z25FF65 NARCEWX048	MXL1361WHM	
	Firmware	GC 2.5.1.9 MS 6.00.34		
	Analytical Software	Mass Hunter 10.2.489		

9.2 GC Column Options:

Type	Internal Diameter (mm)	Length (meters)	Film Thickness (μ)
DB624	0.18	20	1.0
DB-VRX	0.18	20	1.0

9.3 Appropriate analytical balance (0.0001 g recommended for standard preparation and 0.01 g for sample weighing), volumetric flasks, syringes, vials, and bottles for standards preparation. Calibrate the balance according to ADM-DALYCK.

9.4 Purge and Trap with Autosampler

9.4.1 Each volatile GC/MS analytical system uses a purge and trap concentrator system to introduce the sample onto the GC column. Each purge and trap system has an autosampler (A/S) attached to run multiple samples, one at a time, and run unattended for extended periods of time.

9.4.2 Teledyne Tekmar Atomx Autosampler – these autosamplers add internal standards and surrogates separately and automatically from two individual receptacles.

9.4.3 Adsorbent Traps: Supelco K-Traps Carboxen Vocarb 3000.

9.5 PH indicator Paper – wide range – examples: pHydrion by Mikro 1-12 or EMD colorpHast 0-14.

9.6 Appropriate volume gas tight syringes with certificate of accuracy.

9.7 Appropriate volume glassware (50 mL graduated cylinders) for diluting standards, soil extracts, etc. Cleaned according to section 5.

9.8 See VOC-5035 for further equipment related to soil sample collection, preservation, and extraction.

10) Standards and Reagents

10.1 Solvents must be of sufficient purity to permit usage without lessening the accuracy of the determination or introducing interferences. Solvents are to be checked for contamination before use. See ADM-PUR.

- Methanol, purge and trap grade or equivalent. Purchased commercially. Store at room temperature. Expires per Expiration Policy (ADM-PUR).

10.2 See VOC-5035 for soil preservatives.

10.3 Standards storage and expiration – All of the standards in this SOP are stored in the freezer and are allowed to warm to room temperature before using. Standards expire per the Expiration policy (ADM-PUR). Protect all standards from light. Samples and standards must be stored separately.

10.4 Standards Preparation General Information and Disclaimers

All of the preparation instructions are general guidelines. Other technical recipes may be used to achieve the same results. Example – a 20 mg/L standard may be made by adding 1 mL of 200 mg/L to 10 mL or may be made by adding 4 mL of 50 mg/L to 10 mL. The preparation depends upon the final volume needed and the initial concentration of the stock. Reasonable dilution technique is used.

The initial calibration curves given are typical, but also subject to variation due to targets and detection levels needed. The curves will always be at least 5 points (typically more). At least 6 levels are required for quadratic regression. The lowest concentration level shall be at the method reporting level. The remaining levels should define the working linear range of the analytical system.

Vendors and vendors' products are sometimes listed for the ease of the analyst using this SOP, but products and purchased concentrations are examples only and subject to change at any time. All purchased standards are certified by the vendor. Certificates of Analysis are maintained electronically and are available upon request. Purchased standards are routinely checked against an independent source for both analyte identification and analyte concentration.

All Standards must be traceable using the lab lot system (ADM-DATANTRY).

All targets are routinely spiked in the LCS, MS, and MSD.

10.5 Internal Standards and Surrogates - The surrogates used are Dibromofluoromethane, toluene-d8, 4-bromofluorobenzene, and 1,2-dichloroethane-d4. The internal standards are pentafluorobenzene, 1,4-difluorobenzene, 1,4-dichlorobenzene-d4 and chlorobenzene-d5. All surrogates and internal standards are added to every standard, sample, blank and spike at 50 ug/L (see the standards preparation of the ICAL standards for details) for water and soils. 1,2-Dichlorethane-d4 is reported and evaluated only if requested, even though it is always added.

10.5.1 Stock standards (purchased) –

10.5.1.1 Internal Standard Mix (2500 ug/mL) - Supelco 86-1299 IS Mix.

10.5.1.2 Surrogate Mix (2500 ug/mL) –VWR 8260B ULSTM-530 Surrogate Mix

10.5.2 IS/Surr Working Standard (prepared) – Dilute volumes of the stock standards with methanol, singly or combined, to result in the desired concentration (see ICAL standards for desired final concentrations). This standard contains the BFB for the tune and the tune is evaluated from the injection of a blank, allowing the auto sampler to inject the internal standards and surrogates and analyzing as a normal sample.

10.6 Preparation of Primary Mixed Stocks for 8260C Full List Targets

STD	Purchased Stock	Conc (PPM)	Stock Volume (mL) used	Final Volume (MeOH)
OCC (500)	Chlorinated Aromatics Mix (Absolute)	5000	0.5	5
	Oxygenates (Restek)	2000	1.25	
	n-butyl alcohol (prepared from 6.259g neat to 50 mL MeOH)	125000	1.0	
Freons (500)	8260 Extra Compounds Mix (Absolute)	2000/4000	1.25	5
	8260 Primary Freon Std (Absolute)	2000	1.25	
	n-butyl Acetate (Prepared from 0.257g neat to 25 mL MeOH)	10000	0.243	
Target/ Gases (500)	8260 Cal Mix 5 (O2Si)	2000/4000/ 10000/40000	1.25	5
	8260 combined MIX 1/ MIX 6 (O2Si)	2000	1.25	
HSL (500)	8260 Cal Mix 2+ (O2Si)	2500	1.00	5
	8260 Acrolein (O2Si)	25000	0.5	
236 TCT (500)	2,3,6-Trichlorotoluene (O2Si)	1000	1.0	2

10.7 Preparation of 5 ppm Primary Stock for ICAL – Add 10uL of each of the above mixed stocks to a 1.0 mL volumetric flask and dilute to volume with DI Water.

10.8 CCV - 50 ppb – Add 5uL of each of the above mixed stocks to a 50 mL volumetric flask and dilute to volume with DI Water

10.9 Preparation of ICAL standards

ICAL Level (nominal ppb)	Volume (uL) of 5ppm	Volume of 500 ppm	Volume (uL) of Surr (added by Atomx)	Final volume (mL) DI
0.5*	5	-	-	50
1.0	10	-	-	50
2.0	20	-	-	50
5.0	50	-	1	50
20	-	2	2	50
50	-	5	5	50
100	-	10	10	50
150	-	15	20	50
200	-	20	-	50

*The 0.5 level is not used for the Soil ICAL.

10.10 Preparation of Secondary Mixed Stocks

STD	Purchased Stock	Conc (PPM)	Stock Volume (mL) used	Final Volume (MeOH)
OCC (500)	Chlorinated Aromatics Mix (Absolute)	5000	0.5	5
	SS Oxygenates (Accustandard)	2500	1.0	
	n-butyl alcohol (prepared from 6.26g neat to 50 mL MeOH)	125000	1.0	
Freons (200)	SS n-butyl Acetate (Absolute)	1000	1.0	5
	8260 Custom SS Freon Std (O2Si)	1000	1.0	
	8260 Extra Compounds SS (Absolute)	1000/20000	1.0	
Target/ Gases (500)	SS Cal Mix 1 (Absolute)	2000	1.25	5
	SS Cal Mix 5 (Absolute)	2000/4000/ 10000/40000	1.25	
	SS Cal Mix 6 (Absolute)	2000	1.25	
HSL (500)	8260 SS Cal Mix 2+ (Absolute)	2500	1.00	5
	8260 SS Acrolein (Restek)	5000	1.00	
236 TCT (500)	SS 2,3,6-Trichlorotoluene (O2Si)	1000	1.0	2

10.11 Preparation of 50 ppb Secondary Stock (ICV) – Add 12.5uL of the Freon (200) and 5uL of each of the above (500) mixed stocks to a 50 mL volumetric flask and dilute to volume with DI water.

10.12 LCS (50 ppb) – prepare the same as the ICV except:

For acid preserved water samples, spike into acidified DI.

For a DI soil batch, spike 5 g of clean sand with 5 mL of the prepared water LCS and analyze as a sample.

For a methanol extracted soil batch, prepare by spiking 1 mL of methanol with the LCS spikes and dilute to 50 mL with DI.

10.13 MS/MSD 624/8260 (50 ppb)- Add to 43 mL sample:

4.3 uL of Secondary Target/Gases Working stock,

4.3 uL of Secondary HSL Working Stock,

10.8 uL of Secondary Freons Plus working stock,

4.3 uL of Secondary OCC working stock.

10.14 Method Blank – For waters, analyze DI or acidified DI as a sample. For soils analyzed from the DI vial, analyze clean sand as a sample. For soils extracted in methanol, analyze a methanol method blank prepared by diluting 1 mL of methanol to 50 mL with DI.

11) Method Calibration

11.1 Instrument Performance Check –Tuning

11.1.1 Verify that the MS meets standard mass spectral abundance criteria prior to initiation of any samples by injecting the 4-bromofluorobenzene (BFB) tune standard. Perform the tune check by purging a blank sample, allowing the auto sampler to add the internal standards and surrogates. 50 ng or less of BFB is injected on column. The tune standard must be analyzed prior to initial calibration. For 8260C and 624.1, the tune standard must be analyzed at the beginning of the analytical sequence. All samples and QC must be analyzed within 12-hours (8260C) or 14-hours (624.1) of the tune injection. For 8260D, the tune standard is required only prior to initial calibration. Evaluate the ion abundance using the following scenarios:

- Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the BFB peak or part of any other closely eluting peak.
- Use one scan at the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the BFB peak or part of any other closely eluting peak.
- Use the average across the entire peak up to a total of 5 scans. Peak integration must be consistent with standard operating procedure. If the

peak is wider than 5 scans, the tune will consist of the peak apex scan and the two scans immediately preceding and following the apex. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the BFB peak or part of any other closely eluting peak.

- Use the average across the entire peak. Peak integration must be consistent with standard operating procedure. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the BFB peak or part of any other closely eluting peak.

11.1.2 Each volatile GC/MS system must meet the BFB ion abundance criteria shown in Table 1 for a 50 ng or less injection of BFB. The criteria listed is the most stringent of the 624.1 and 8260 methods.

11.1.3 If tuning criteria cannot be met, the source may need cleaning, filaments replaced or other maintenance. Record the corrective action taken in the run log or maintenance log and re-inject the tune standard. Sample analysis may not proceed until the tune meets these criteria. If the tune file is adjusted, including adjusting the EM, a new ICAL is required.

11.2 Initial Calibration – follow policies and practices in ADM-ICAL unless otherwise stated in this SOP. Optimize conditions for analyte separation and sensitivity. Once optimized, the same conditions must be used for the analysis of all standards, samples, and QC. The typical operating conditions are in the Appendix.

11.2.1 Tune the instrument.

11.2.2 Run an instrument blank to demonstrate that the instrument is free of contamination before analyzing the standards.

11.2.3 Calibrate the instrument initially before sample analysis and whenever calibration criteria cannot be maintained. At least 5 calibration points must be analyzed. More points can be used, and more are required if non-linear regression is used. The standards must be analyzed the same as the samples (example: if samples are to be heated, the standards are to be heated). Typical calibration levels are given in the Standards and Reagents Section but may be modified to meet client requirements. Analyze each calibration standard and tabulate the area response of the characteristic quantitation ions versus concentration for each compound, internal standards and surrogate. The low level standard used during calibration shall be at or below the reporting level for the analysis. The midpoint standard of the initial calibration curve establishes the retention time window position for each analyte and surrogate.

11.2.4 The internal standards should permit most of the components of interest in a chromatogram to have retention times of 0.80 - 1.20, relative to one of the internal standards. Use the base peak ion from the specific internal standard as the primary ion for quantitation (see instrument specific addendum - attached). If interferences are noted, use the next most intense ion as the quantitation ion.

11.2.5 Calculate the response factors (RF) for each compound and surrogate relative to the specified internal standard by:

$$RF_x = \frac{(A_x)(C_{ISTD})}{(A_{ISTD})(C_x)}$$

Where:

A_x = Area of the characteristic quantitation ion for compound x.
A_{ISTD} = Area of the characteristic quantitation ion for the specified internal standard.
C_x = The concentration of the compound added (ppb).
C_{ISTD} = The concentration of the specified internal standard (ppb).

11.2.6 Calculate the mean response factor $(\overline{RF_x})$ for each analyte and surrogate from the calibration levels. Calculate standard deviation (SD) and the percent relative standard deviations (%RSD) for each analyte from the mean with:

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(RF_i - \overline{RF})^2}{N - 1}}$$

where:

RF_i= RF for each of the calibration levels
$\overline{RF}$= mean of initial RFs for a compound.
N = Number of RF values

$$\%RSD = \frac{(SD)}{(\overline{RF_x})} 100.$$

where:

RSD = relative standard deviation.
$\overline{RF}$ = mean of initial RFs for a compound.
SD = standard deviation of average RFs for a compound.

11.2.7 Initial Calibration criteria and corrective action

11.2.7.1 The % RSD should be less than 20% for each target compound. If ≥10% of the target compounds in the ICAL do not meet criteria, the curve is invalid and may not be used for quantitation. (For DOD, all targets must be <15% - QSM5.4 only). Any target compounds >20%RSD must be <40%RSD (<35% for 624.1) if the curve is to be used for quantitation. Samples which historically do not have results above the reporting limit for the failing compound may be analyzed under a failing curve if a refit of the MRL standard is within 70-130%. If the samples do quantitate above the reporting limit, they must be repeated under a compliant curve. If failing compounds are known to be sensitive to a project, the samples in that project must be analyzed under an ICAL which meets 20%RSD (or >0.99 as described below).

11.2.7.2 If the % RSD for any target compound is 20% or less, linearity can be assumed over the calibration range, and the average relative response factor for each analyte and surrogate is used to quantitate sample analytes.

11.2.7.3 If the % RSD of any target compound is > 20%, construct a linear regression calibration curve of area ratio (A/Ais) versus concentration, or the inverse of the concentration, using the equation of a line (see below). The origin (0,0) may not be used as a calibration point, but the regression may be forced through zero. The Correlation Coefficient must be ≥ 0.99 (≥0.995 for DOD, >0.92 for 624.1) and a refit of each standard into the curve must produce a result which meets 70-130% recovery. The MRL level standard needs to meet 50-150% recovery. If the Calibration Correlation and refit is not met, linear regression may not be used to quantitate the target. Non-linear calibrations may be used if they meet the requirements of 8000C. It is good lab practice to mark all target compounds on a curve to identify target compounds calculated using linear regression.

The equation of a line: $y=mx+b$

where:
y = Instrument response (peak area or height)
m = Slope of the line (also called the coefficient of x)
x = Concentration of the calibration standard
b = The intercept

11.2.7.4 The response factor for each compound should meet the Minimum Relative Response Factor in Table 4. If minimum relative response factors are not met and sensitivitiy and accuracy can be demonstrated for the initial calibration, no further qualification is required, and the curve is acceptable.

11.2.7.5 Initial Calibration Verification Standard (ICV)- inject and analyze the ICV to verify the initial calibration immediately after the calibration. The % recovery must meet 70-130% (80-120% for DOD QSM 5.4, but 70-130% for DOD QSM 6.0) for all targets. See ADM-ICAL. If an analyte’s percent recovery is outside the limits, corrective action should be taken. Due to the poor performance of reactive compounds, some failures in the ICV may arise. Analysis may continue if these targets are not detected in samples. If the non-compliant targets are detected in the samples, recalibrate, obtain a compliant ICV, and reanalyze the samples.

11.2.7.6 All targets which do not meet 20%RSD or 0.99 must be flagged and narrated in the report.

11.2.8 Only after the calibration has passed all of the above criteria shall samples be analyzed.

11.3 Daily GC/MS Calibration Verification and Analytical Sequence

11.3.1 The start of the analysis window begins with the tune check (except 8260D). See the Method Calibration Section for details. The tune criteria must be met before proceeding with analysis. All samples and QC must be analyzed within 12-hours (8260C) or 14-hours (624.1) of the tune injection or 12 hours of the opening CCV (8260D). Note that medium soils (prepared by method 5035) are run on water curves on any autosampler. Client samples are analyzed on an instrument running an appropriate calibration for the target compound list needed for the sample.

11.3.2 CCV (8260 only since 624.1 only requires an LCS prior to starting samples. When running both methods simultaneously, only the LCS is used in the evaluation of the 624.1 sample data) –

11.3.2.1 Frequency - 8260C- After the tuning criteria have been verified. 8260D – As the first injection of the sequence. For DOD, a closing CCV must also be analyzed.

11.3.2.2 Concentration - The 50 ppb level is recommended. DOD requires that the concentration be greater than the low point of the calibration and less than or equal to the mid-point calibration standard. NELAC requires this calibration check standard to vary in concentration over time. An injection of the CCV and LCS standards shall satisfy this requirement as long as the standards are two different concentrations.

11.3.2.3 RRF - Each compound should meet it's Minimum Relative Response Factor (Table 4). This is the same check that is applied to the initial calibration. If the minimum RRF is not met, the CCV may still be acceptable when sensitivity and accuracy can be demonstrated. Use professional judgment.

11.3.2.4 %D - Calculate the %D for each compound using the calculations below.

- For **linear regression calibrations** , calculate the percent drift using:

$$\% \, Drift = \frac{C_c - C_T}{C_T} \, x \, 100$$

where:

C_c = Calculated concentration of standard.

C_T = Theoretical concentration of prepared standard.

- For **calibrations based on RF**, calculate the percent difference using:

$$\% \, Difference = \frac{RF_v - \overline{RF}}{\overline{RF}} \, x \, 100$$

where RF_v is the response factor from the analysis of the verification standard and $\overline{RF}$ is the mean response factor from the initial calibration.

For target compounds, the %D should (must for DOD) meet ≤20%. Analysis may continue if up to 20% of the compounds are >20%D. Those that fail must be within 40%D. If failing compounds are known to be sensitive to a project, those samples must be repeated under a compliant CCV. If the CCV fails with a high bias, all associated non-detect samples (<RL or <MDL, depending on reporting requirements) may be reported, even if the MB or LCS fails high or if >20% of the compounds failed. Any samples with hits that are associated with a CCV>20%D must be flagged or analyzed under a compliant CCV. For

DOD, the closing CCV must be 50-150% recovery for the targets of interest. For DOD QSM 5.4, the corrective action exception for a high bias CCV with non-detect samples does not apply to DOD samples unless this SOP is superseded by a project-specific QAP. For DOD QSM 6.0, high bias CCVs with non-detect samples may be reported with a qualifier (M4 7.1.2.f.iv.a).

11.3.2.5 Corrective Action - If routine corrective action procedures fail to immediately produce an acceptable CCV, then either the lab has to demonstrate acceptable performance after documented corrective action with two consecutive CCVs, or a new ICAL must be performed.

11.3.2.6 Corrective Action - For DOD QSM 5.4 - if a CCV fails, immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, or if two consecutive CCVs cannot be run, perform corrective action(s) and repeat CCV and all associated DOD samples since last successful CCV.

11.3.2.7 Corrective Action - For DOD QSM 6.0 - if a CCV fails and there is an assignable cause isolated only to the CCV, one CCV may be reanalyzed immediately (within one hour and no samples analyzed). IF the immediate CCV is acceptable, proceed with analysis. Sample reanalysis is not required. Otherwise, correct problem an analyze passing CCV or recalibrate. All affected samples since last passing CCV shall be reanalyzed. If samples cannot be reanalyzed, apply qualifier to affected results and explain in the case narrative.

11.3.2.8 Qualification - When any data is reported with a non-compliant CCV, the CCV is flagged in the report and explained in the case narrative. Associated sample results are to be considered less reliable. For DOD, the laboratory must notify the client prior to reporting data associated with a noncompliant CCV. For DOD, data reported with a non-compliant CCV must be flagged and explained in the case narrative. Reporting samples with an unacceptable CCV is only appropriate in cases where the samples cannot be reanalyzed.

11.3.2.9 Internal Standards - evaluate the retention times of all compounds, surrogates, and internal standards against the initial calibration. If the retention time for any internal standard changes by more than 30 seconds from the current initial calibration mid-point standard, the system must be inspected for malfunctions and corrections must be made, as required. If the area for any of the internal standards changes by a factor of 2 (-50% to +100%) from the current initial calibration mid-point std., corrections must be made to the system. Reanalyze any samples associated with malfunctioning system.

11.3.3 Analyze the LCS. Evaluate the LCS according to the instructions in the Quality Control Section.

11.3.4 Analyze a method blank to check the system for contamination. Evaluate the MB according to the instructions in the Quality Control Section.

11.3.5 When all of the above criteria are met, client sample analysis may begin. Follow sequence requirement in ADM-BATCH. Analyze client samples from unopened vials without headspace whenever possible. If a sample is analyzed from a vial that has been opened or was received with headspace, note on the Runlog and note the sample condition in the case narrative using the “HS” code.

11.4 Identification of Analytes and Data Interpretation, and Client Sample Analysis

11.4.1 The qualitative identification of compounds determined by this method is based on retention time, and comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds should be identified as present when the criteria below are met. If there is no peak found for an analyte in the expected retention time window and the mass spectra does not match according to the below, then the analyte is "not found".

11.4.1.1 The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion.

11.4.1.2 The RRT of the sample component is to be within ± 0.06 RRT units of the RRT of the standard component. If the RRT has changed by more than 0.06 RRT units since the last update, this indicates a significant change in system performance and corrective action must be taken and the ICAL must be rerun to reestablish the retention times. Calculation and evaluation are performed in a separate spreadsheet. Calculation of the RRT:

$$RRT = \frac{RT\ of\ analyte}{RT\ of\ Internal\ Stndard}$$

11.4.1.3 For each sample after the opening CCV, the retention time of the internal standards must be within ± 10 seconds (0.17min) of the retention time of the internal standard in the opening CCV (or midpoint standard of the ICAL if RTs are not updated with the CCV). If any internal standard retention time is not within the limits, inspect the system for malfunctions and correct the problem. Once the system is stable and retention times are re-established, reanalyze samples that were run while the system was malfunctioning.

11.4.1.4 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

11.4.1.5 Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

11.4.1.6 Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important.

11.4.1.7 Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes coelute (i.e., only one chromatographic peak is apparent), the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.

11.4.2 TICs - For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. When repeating samples for overrange (DL), the library search does not need to be re-performed. Use the following guidelines for making tentative identifications:

11.4.2.1 Major ions in the library reference spectrum (ions greater than 10% of the most abundant ion) are present in the sample spectrum at similar relative intensities.

11.4.2.2 The molecular ion in the library reference spectrum is present in the sample spectrum. If the molecular ion is not present, carefully review library matches in order to avoid misidentification.

11.4.2.3 Major ions present in the sample spectrum but not in the reference spectrum are reviewed to determine whether they may be contributed by co-eluting compounds.

11.4.2.4 Ions present in the reference spectrum but not in the sample mass spectra are reviewed for unintended subtraction. Data system library reduction programs can sometimes create these discrepancies.

11.4.2.5 Mass spectral library search algorithms typically assign a match factor to the peak identity based on comparison of an unknown mass spectrum to library spectra. For spectra meeting the above conditions, match factors greater than 0.8 (80%) may be considered confirming evidence. Where a known limitation in data collection is identified (e.g., the presence of an incompletely resolved spectral interference), a lower match factor may be considered confirmatory. For multiple library spectra with similar match factors (e.g., hydrocarbons with low abundance molecular ions, or structural isomers), the tentative identification assigned to the unknown may be better represented as a more generic structure (e.g, unknown hydrocarbon, C4 benzene structural isomer).

11.4.3 Dilutions - If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, dilute the sample (from a fresh vial if available) according to the Sample Analysis section and ADM-DIL. If a fresh vial is not available, the use of a compromised vial must be documented in the runlog and on the case narrative.

11.4.4 If the detector becomes saturated from a high concentration sample run a blank after the sample to demonstrate the instrument is free from carry-over. If there is contamination, take corrective action. The instrument must be demonstrated to be free from contamination before analysis may continue.

12) Sample Preparation and Analysis

12.1 Sample Preparation –allow samples to come to room temperature. Samples are screened according to VOC-SCREEN.

12.2 Water Samples

12.2.1 No preparation is generally required, other than dilution with reagent water to bring analytes into the upper half of the calibration range. Thus, sample volume is run straight from the sample vial for a 5 mL purge.

12.2.2 After analysis, the pH of all water samples are to be checked with pH paper. The pH shall be noted in the run log. If the pH is not <2, and if the analysis was performed outside of 7 days from sampling, note the discrepancy on the data review checklist and in the case narrative. For 624.1, if the sample is preserved and halocarbons are targets, note the preservation in the case narrative. pH shall not be checked prior to analysis to avoid compromising the sample volume.

12.2.3 After analysis, check all 624.1 water samples for free chlorine. Use an unopened vial of the sample, if possible. Be sure the sample is at room temperature before testing the chlorine. The strips are sensitive to temperature changes.

12.2.3.1 Dip one test strip into the vial for 20 seconds with constant, gentle back and forth motion that maximizes the liquid flow-through the indicator pad.

12.2.3.2 Remove and shake strip once briskly to remove excess water. Wait 20 seconds and match the strip with the color chart on the strip container to determine concentration. Complete color matching within one minute.

12.2.3.3 If the sample tests positive for residual chlorine, note in the case narrative.

12.2.4 Samples requiring dilutions due to targets above the linear range of the instruments are prepared as follows according to ADM-DIL:

- (1/5) = 10 mL sample adjusted to 50 mL in a 50 mL ground glass graduated cylinder inverted once and transferred to a 40 mL VOA vial.
- (1/25) = 2.0 mL sample adjusted to 50 mL in a 50 mL ground glass graduated cylinder inverted once and transferred to a 40 mL VOA vial.
- (1/50) = 1.0 mL sample adjusted to 50 mL in a 50 mL ground glass graduated cylinder inverted once and transferred to a 40 mL VOA vial.

12.2.5 Samples requiring preparation by way of compositing multiple aliquots or grab samples into one representative composite sample shall be prepared using the same techniques as discussed in SOPs for Preparing Dilutions (ADM-DIL) and Sample Preparation, Compositing and Subsampling (ADM-SPLPREP) using equal portions of each grab sample or other instructions provided by the client. Detailed volumes used for each composite sample preparation must be documented and retained with the submission in the run logbook or other instruction sheet(s) provided. The vial identification number shall be referenced with a “C” to indicate it as a composite sample. Documentation must be provided to ensure the composite sample is traceable to the grab samples and total volumes used to create the composite.

12.2.6 Internal standards and surrogates are added to the diluted sample by the autosampler.

> *Note: At no time should less than 1 mL of the original sample fraction be used for the preparation of the diluted sample. This ensures a representative fraction of sample is diluted.*

12.3 Soil samples

For Encores, Terracores, and soils received in bulk in vials or jars, follow VOC-5035 for preparation of soils by 5035. The VOC-5035 SOP describes the preparation, however bulk soils will be reported as being prepared by 5030 because bulk jars do not meet the 5035 requirements for sampling and is enforced by NYSDOH.

13) Troubleshooting

13.1 Maintenance log - All Preventive maintenance, as well as instrument repair, should be documented in the appropriate instrument maintenance log. Most routine maintenance and troubleshooting are performed by LABORATORY staff. Other maintenance or repairs may, or may not require factory service, depending upon the nature of the task. Any maintenance performed by outside services must also be documented – either through notes in the log or through documents provided by the service. The log entries will include the date maintenance was performed, symptoms of the problem, serial numbers of major equipment upgrades or replacements. The datafile name of the first acceptable run after maintenance is to be documented in the maintenance log. Typical preventive maintenance measures include, but are not limited to, the following items:

- Check gas supply
- Check in-line filters, septum, and injection port liner, as needed
- Clip column and change guard column, as needed
- Clean source

13.2 See instrument manual and maintenance log for help with solving specific analytical or instrument problems.

14) Data Acquisition

14.1 The data acquired is transferred via Chemstation™ to LIMS electronically.

14.2 Specifics pertaining to data review are contained in ADM-DREV.

14.3 Data reporting is handled by the LIMS. More information is in ADM-RG

15) Calculations and Data Reduction Requirements

15.1 Calculations

The GC/MS data stations, in current use, all use the H-P RTE Integrator to generate the raw data used to calculate the standards $\overline{RF}_x$ values, the sample amounts, and the spike values. The software does three passes through each data file. The first two identify and integrate each internal standard and surrogate. The third pass uses the time-drift information from the first two passes to search for all method analytes in the proper retention times and with the proper characteristic quantitation ions. The primary and secondary quantitation ions are given in Table 2. The internal standard with which the analytes are associated changes with each column and is documented in the Initial Calibration Summary Report. The current associations per instrument are attached to this SOP in the Instrument Specific Addendum.

15.1.1 The results for a water sample are calculated as follows when $\overline{RF}_x$ is used:

$$A_x = \frac{(Resp_x)(Amt_{ISTD})}{(Resp_{ISTD})(\overline{RF}_x)} \times DilFactor$$

Where:
A_x = the amount, in ppb, of the analytes in the sample;
$Resp_x$ = the peak area of the analytes of interest;
$Resp_{ISTD}$ = the peak area of the associated internal standard;
Amt_{ISTD} = the amount, in ppb, of internal standard added; and
$\overline{RF}_x$ the average response from the five-point for the analytes of interest.

15.1.2 The results for a soil sample are broken into two types, the low-level type and the medium-level type. The medium level type are corrected for moisture in the methanol according to the calculation in 8000C.

15.1.2.1 The low-level type is a direct heated purge of soil and requires its own separate ICAL. For soil, 5 grams is weighed out into the sample vial, and is purged with 5 mL of blank reagent water at a temperature of 40°C ±2°. The results for low-level soil work are calculated by taking the normal print out, in ppb, (see the water results outlined above) and correcting for the total, dry soil sample actually purged (the dry weight is determined according to GEN-DWPS in the General Chemistry Department and the 8260 correction is made in LIMS):

$$(A_x) * \frac{(5\ grams)}{(ASW_t\ gr)(\%\ Solids)} = A_x\ Low\text{-}Level\ Soil$$

Where:
A_x = the amount, in ppb, from the data station;
5 grams = the nominal amount of soil that is heated and purged;
ASW_t = the actual soil wet weight, in grams, that is purged
% Solids = the correction factor for dry weight in decimal form.

15.1.2.2 The medium-level type is based on an extraction (see VOC-5035). A mass of soil (usually 4 g wet weight) is extracted with a volume (usually 10 mL) of purge-and-trap methanol. The extract is diluted 50 fold with DI and analyzed and calculated as follows:

$$(A_x)\left[\frac{(Dilution)(V_t)}{(ASW_t)(\%\ Solids)}\right] = High\text{-}Level\ Soil\ Amt(ug/kg).$$

Where:
A_x = the data station results, in ug/L;
Dilution = the dilution of the extract.
V_t = the amount (mL) of methanol used to extract the soil (usually 10 mL);
ASW_t = the actual wet weight of soil extracted (g)
% Solids = the dry soil correction in decimal form.

It should be noted that some states and governing agencies require different amounts of soil and Methanol ratios be maintained. These ratios are generally, 1:2.5, 1:2, 1:1. The amount of extract added is never greater than 100 uL per 5 mL DI. As an example, the Archon autosampler would require the addition of 1.0 mL to 49 mL DI. This is then transferred to a 40 mL VOA vial.

15.1.3 Solid samples with a significant moisture content (>10%), designated for volatile organic analysis, that are extracted prior to analysis in a water miscible solvent such as methanol are diluted by not only the methanol, but also the water in the soil. The total mixture (MeOH + soil water) volume can only be calculated based on the sample moisture present as determined by the % moisture determination. This total volume is then expressed as V_t in the sample concentration calculations provided above. This total solvent and water volume is calculated as follows:

$$V_t = mL\ \ methanol + [(1 - \%solids) * ASW_t]$$

15.2 The RPD of the MS/MSD for 5035 soils is calculated from the % recovery instead of the concentration due to varying masses of soil.

15.3 All sample data and QC data, including calibration verification must reference the name (date or filename) of the ICAL on the raw data report.

15.4 Manual Integration – When the data system incorrectly quanititates or identifies analytes, manual integration is necessary. Data must be integrated consistently between standards, samples, and QC. See ADM-INT.

15.5 Data Review and Reporting

All data is transferred electronically from the instrument into STARLIMS. The data is reviewed by a qualified peer with applicable checklists (see ADM-DREV) before the data is acceptable and able to be reported to the client (see ADM-RG). Labcoat is typically used to generate the report from STARLIMS. For 8260, results are reported to 2 significant figures. For 624.1, results are reported to 3 significant figures and must be reported to the MDL. Significant figure exceptions apply near the reporting limit. See ADM-SIGFIG.

16) Quality Control, Acceptance Limits, and Corrective Action

16.1 Method Blank –

16.1.1 Frequency – Analyze at least one method blank for each applicable preservation matrix per analysis window (20 samples maximum) after meeting the tune (if applicable) and continuing calibration criteria. When batches are less than 20 samples, the MB is performed on a per batch basis

16.1.2 Acceptance criteria - All target analytes must be <1/2 MRL or LOQ except Acetone and Methylene Chloride which must be <LOQ for DOD, <MRL for 624.1 and 8260 (the lab MRL is less than the MDL in Table 1 of EPA 624.1 method). Samples affected should be marked with the appropriate lab flag. Samples with targets concentrations >10x the method blank contamination are not affected.

16.1.3 Corrective action - Reanalyze the MB until the system is shown to meet the acceptance criteria. Reanalyze any affected samples associated with a non-compliant method blank.

16.2 LCS-

16.2.1 Frequency - Analyze at least one LCS for each applicable preservation matrix per analysis window (20 samples maximum) after meeting the tune (if applicable) and continuing calibration criteria. When batches are less than 20 samples, the LCS is performed on a per batch basis. The LCS is prepared by spiking a blank with the matrix spike solution, and going through the entire preparation and analysis. An LCS duplicate (LCSD) may be required for certain projects or if there is not enough sample to demonstrate precision with an MSD.

16.2.2 Acceptance Criteria –

Calculate percent recovery (%R) as follows:

$$\%R = X/TV \times 100$$

Where: X = Concentration of the analyte recovered
TV = True value of amount spiked

Acceptance criteria for lab control samples are listed in the Data Quality Objectives Table (see Attachment IV for DOD). If LCSD is performed, both LCS and LCSD must pass recovery criteria. The precision between the LCS and LCSD must meet RPD limits in the Data Quality Objectives Table. The table lists different limits for 8260 and 624.1. The LCS is evaluated against the limits for the method being used for the samples in the batch.

Exceptions: Client-specific QAPP requirements also may supersede lab control limits listed in the Data Quality Objectives Table.

16.2.3 Corrective Action - If the LCS recovery for any target fails acceptance limits, corrective action is required except as described below. If instrument corrective action is not applicable or ineffective, re-analysis of the associated samples is required. If any other analyte fails the acceptance limits, the analyst must evaluate the impact on data quality and take any necessary corrective action, which may include re-analysis of the associated samples. Project-specific requirements may dictate use of project acceptance criteria.

16.2.4 Sample analysis may continue under the following circumstances when recoveries fall outside the control limits listed in The Data Quality Objectives Table of the Quality Assurance Manual.

- High outlying recovery associated with a non-detect sample result since the high bias would have negligible effect on non-detect sample results.
- Reanalysis would result in a worse quality scenario such as holding time issues or insufficient sample volume.

16.3 MS/MSD –

16.3.1 Frequency - For each batch of samples (20 samples maximum from either 624.1 or 8260 in a mixed batch), a minimum of one MS/MSD pair for each matrix must be analyzed to assess sample matrix and to ensure instrument performance. If there is not enough sample to process MS/MSD, an LCS/LCSD will be processed to show precision in the batch. See below.

16.3.2 Precision and Recovery Limits - The limits for MS recovery and MS/MSD RPD are given in The Data Quality Objectives Table. Acceptance criteria for DOD is Attachment IV of this SOP (MS criteria is the same as LCS criteria).

16.3.3 Recovery Corrective Action -

- The results of the MS/MSD analysis is used for client assessment of sample matrix and is not used to control the analysis. Outlying MS/MSD recoveries associated with an acceptable LCS may indicate sample matrix interferences but does not warrant reanalysis or confirmation. All data shall be reported with the appropriate flags or mentioned in the Case Narrative.
- If the MS/MSD does not pass precision or accuracy requirements, evaluate the associated LCS. If the LCS passes QC requirements it is presumed that matrix has affected the spiked samples and the run may continue. If the concurrent LCS fails for the same compound or any other compound the validity of the LCS should be examined and any samples prior to the LCS and after the last CCV should be reanalyzed, including the MS/MSD.

16.3.4 RPD Corrective Action - if the RPD value between samples or MS/MSD results exceed limits listed in The Data Quality Objectives Table (<20 RPD for DOD), examine the chromatograms and benchsheets for potential matrix interferences. Examples may include product layers on aqueous samples that may result in non-homogenous subsampling, non-homogenous soil samples, chromatographic interferences resulting in poor peak resolution and inconsistent integrations, or poor purging efficiencies (indicated by surrogate recovery). Reanalyze the pair if deemed appropriate. The outlying RPD should be mentioned in the Case Narrative so that data may be flagged appropriately.

16.4 Surrogates and Internal Standards –

16.4.1 Frequency – Added to all injections

16.4.2 Acceptance Criteria –

16.4.2.1 Surrogates - The limits for surrogate recovery is given in The Data Quality Objectives Table. Dichlorethane-d4 is evaluated and reported only if requested. The limits for DOD are given in the Quality Control Summary attachment.

16.4.2.2 Internal Standards - The limit for internal standard response is half to double (-50% to +100%) the response of the ICAL midpoint standard or opening CCV. The RT must be ±10 seconds from the RT of the midpoint standard in the ICAL or opening CCV.

16.4.3 Corrective Action - When instances of Surrogate or internal area count failures occur, the associated sample is repeated and the results are compared. If the questioned samples fail a second analysis, the first run is reported to the client and the sample flagged with an "*" indicating a probable matrix interference exists. In the case where Tier package work is required and the appropriate forms need to be generated, the second analytical analysis is also reported to the client. If the second analysis passes, report these data.

16.4.4 If a surrogate(s) fails acceptance, the sample must be evaluated for matrix interferences and "historical results". Reanalyze the sample to confirm the interference. If needed contact client and flag the data in the report. If surrogates are diluted more than 10 times, report as "D", diluted below calibration. For package reports, include initial and confirmation analysis results. High outlying recoveries associated with non-detect sample results need not be reanalyzed. They need only be noted in the case narrative as high bias with non-detect results.

17) Data Records Management

- Records are maintained according to ADM-ARCH.

18) Contingencies for Handling Out of Control Data

- If data is produced that is out of control and is not to be re-analyzed due to sample volume restrictions, holding times, or QC controls cannot be met, flag and narrate appropriately.

19) Method Performance

- Detection and Quantitation limits are determined according to the requirements in ADM-MDL. Precision and bias of the surrogates and targets at the LCS level are available through control charts.
- LLOQ Verification – The average of the MDL spikes, as documented in the annual MDL study report, are typically used to verify recovery at 0.5-2 times the LLOQ (MRL). When MDL spikes are not at the correct concentration, the LOD spikes or LOQ spikes may be used instead. Limits for the LLOQ verification are calculated from the population of LLOQ level spikes. If the LLOQ verification fails, investigate the cause of the problem and determine whether the MRL should be raised.
- Demonstration of Capability is performed according to ADM-TRAINING.
- Accuracy and Precision Data is available in SW-846 method 8260C.

20) Summary of Changes

- Added reference and requirements for 8260D.
- Incorporated 4/2/2020 change form for requiring the RT of the ISs in the samples be within 10 seconds of the RT of the ISs in the opening CCV.
- Incorporated 9/25/2020 change form for analyzing client samples from unopened vials without headspace whenever possible and to use case narrative "HS" code if run from a vial with headspace.
- Updated primary and secondary standards and spiking concentrations to current practice.
- Interferences – added to the list from wording taken from 8260D section 1.3.
- 8-removed Encores
- Removed MS 12. Added MS 16 and MS 17.
- TICs – added wording from 8260D
- 19 Added LLOQ verification
- Updated QC Summaries in Appendix
- Specified where QSM 5.4 and 6.0 are different throughout.

21) References and Related Documents

- Method 8260C Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA SW-846, August 2006.
- Method 8260D Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA SW-846, Revision 4, June 2018.
- Method 8000C Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA SW-846, March 2003.
- Method 8000D Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA SW-846, Revision 5, March 2018.
- Method 624.1: Purgeables by GC/MS, EPA 821-R-16-008 December 2016, 40 CFR Part 136 August 28, 2017.
- DOD Quality Systems Manual for Environmental Laboratories – Version 5.4, 6.0 or most current version.
- Massachusetts Compendium of Analytical Methods (CAM), Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup, July 1, 2010
- Connecticut Department of Energy and Environmental Protection Recommended Reasonable Confidence Protocols, Laboratory Quality Assurance and Quality Control Requirements, Volatile Organics by Method 8260 SW-846 version 3.0, July 2006.

22) Appendix

Table 1	BFB Tune QC Criteria
Table 2	Characteristic Masses for Purgeable Organic Compounds
Table 3	8260/624 Quality Control Summary. This table also applies to 624.1.
Table 4	Minimum Relative Response Factor Criteria for Initial and Continuing Calibration Verification
Attachment II	CURRENT IS/ANALYTE ASSOCIATIONS Attached are the printouts from the GC/MS instruments running 8260C showing which analytes are associated with which internal standard. The instrument is the third item in the first line (Data File) of the report. Example: Data File: J:\ACQUDATA\MSVOA#. The internal standards are the first compound in each section (always have an AvgRF and CCRF of 1.000) and the associated analytes are listed below the internal standard.
Attachment III	Current Specific Operating Conditions
Attachment IV	DOD Summary and QC Criteria.

TABLE 1
4-BROMOFLUOROBENZENE CHARACTERISTIC ION ABUNDANCE CRITERIA

Mass/é ratio	Ion Abundance Criteria
50	15 - 40% of mass/é 95
75	30 - 60% of mass/é 95
95	base peak, 100% relative abundance
96	5 - 9% of mass/é 95
173	<2% of mass/é 174
174	>50% of mass/é 95
175	5 - 9% of mass/é 174
176	>95%; <101% of mass/é 174
177	5 - 9% of mass/é 176

TABLE 2

CHARACTERISTIC MASSES (m/z) FOR PURGEABLE ORGANIC COMPOUNDS

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Acetone	58	43
Acetonitrile	41	40, 39
Acrolein	56	55, 58
Acrylonitrile	53	52, 51
Allyl alcohol	57	58, 39
Allyl chloride	76	41, 39, 78
Benzene	78	-
Benzyl chloride	91	126, 65, 128
Bromoacetone	136	43, 138, 93, 95
Bromobenzene	156	77, 158
Bromochloromethane	128	49, 130
Bromodichloromethane	83	85, 127
Bromoform	173	175, 254
Bromomethane	94	96
iso-Butanol	74	43
n-Butanol	56	41
2-Butanone	72	43
n-Butylbenzene	91	92, 134
sec-Butylbenzene	105	134
tert-Butylbenzene	119	91, 134
Carbon disulfide	76	78
Carbon tetrachloride	117	119
Chloral hydrate	82	44, 84, 86, 111
Chloroacetonitrile	48	75
Chlorobenzene	112	77, 114
1-Chlorobutane	56	49
Chlorodibromomethane	129	208, 206
Chloroethane	64 (49*)	66 (51*)
2-Chloroethanol	49	44, 43, 51, 80
Bis(2-chloroethyl) sulfide	109	111, 158, 160
2-Chloroethyl vinyl ether	63	65, 106
Chloroform	83	85
Chloromethane	50 (49*)	52 (51*)
Chloroprene	53	88, 90, 51
3-Chloropropionitrile	54	49, 89, 91
2-Chlorotoluene	91	126
4-Chlorotoluene	91	126
1,2-Dibromo-3-chloropropane	75	155, 157
Dibromochloromethane	129	127
1,2-Dibromoethane	107	109, 188
Dibromomethane	93	95, 174

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
1,2-Dichlorobenzene	146	111, 148
1,2-Dichlorobenzene-d_4	152	115, 150
1,3-Dichlorobenzene	146	111, 148
1,4-Dichlorobenzene	146	111, 148
cis-1,4-Dichloro-2-butene	75	53, 77, 124, 89
trans-1,4-Dichloro-2-butene	53	88, 75
Dichlorodifluoromethane	85	87
1,1-Dichloroethane	63	65, 83
1,2-Dichloroethane	62	98
1,1-Dichloroethene	96	61, 63
cis-1,2-Dichloroethene	96	61, 98
trans-1,2-Dichloroethene	96	61, 98
1,2-Dichloropropane	63	112
1,3-Dichloropropane	76	78
2,2-Dichloropropane	77	97
1,3-Dichloro-2-propanol	79	43, 81, 49
1,1-Dichloropropene	75	110, 77
cis-1,3-Dichloropropene	75	77, 39
trans-1,3-Dichloropropene	75	77, 39
1,2,3,4-Diepoxybutane	55	57, 56
Diethyl ether	74	45, 59
1,4-Dioxane	88	58, 43, 57
Epichlorohydrin	57	49, 62, 51
Ethanol	31	45, 27, 46
Ethyl acetate	88	43, 45, 61
Ethylbenzene	91	106
Ethylene oxide	44	43, 42
Ethyl methacrylate	69	41, 99, 86, 114
Hexachlorobutadiene	225	223, 227
Hexachloroethane	201	166, 199, 203
2-Hexanone	43	58, 57, 100
2-Hydroxypropionitrile	44	43, 42, 53
Iodomethane	142	127, 141
Isobutyl alcohol	43	41, 42, 74
Isopropylbenzene	105	120
p-Isopropyltoluene	119	134, 91
Malononitrile	66	39, 65, 38
Methacrylonitrile	41	67, 39, 52, 66
Methyl acrylate	55	85
Methyl-t-butyl ether	73	57
Methylene chloride	84	86, 49
Methyl ethyl ketone	72	43
Methyl iodide	142	127, 141

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Methyl methacrylate	69	41, 100, 39
4-Methyl-2-pentanone	100	43, 58, 85
Naphthalene	128	-
Nitrobenzene	123	51, 77
2-Nitropropane	46	-
2-Picoline	93	66, 92, 78
Pentachloroethane	167	130, 132, 165, 169
Propargyl alcohol	55	39, 38, 53
β-Propiolactone	42	43, 44
Propionitrile (ethyl cyanide)	54	52, 55, 40
n-Propylamine	59	41, 39
n-Propylbenzene	91	120
Pyridine	79	52
Styrene	104	78
1,2,3-Trichlorobenzene	180	182, 145
1,2,4-Trichlorobenzene	180	182, 145
1,1,1,2-Tetrachloroethane	131	133, 119
1,1,2,2-Tetrachloroethane	83	131, 85
Tetrachloroethene	164	129, 131, 166
Toluene	92	91
1,1,1-Trichloroethane	97	99, 61
1,1,2-Trichloroethane	83	97, 85
Trichloroethene	95	97, 130, 132
Trichlorofluoromethane	151	101, 153
1,2,3-Trichloropropane	75	77
1,2,4-Trimethylbenzene	105	120
1,3,5-Trimethylbenzene	105	120
Vinyl acetate	43	86
Vinyl chloride	62	64
o-Xylene	106	91
m-Xylene	106	91
p-Xylene	106	91
Internal Standards/Surrogates:		
Benzene-d_6	84	83
Bromobenzene-d_5	82	162
Bromochloromethane-d_2	51	131
1,4-Difluorobenzene	114	
Chlorobenzene-d_5	117	
1,4-Dichlorobenzene-d_4	152	115, 150
1,1,2-Trichloroethane-d_3	100	
4-Bromofluorobenzene	95	174, 176
Chloroform-d_1	84	
Dibromofluoromethane	113	

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Internal Standards/Surrogates		
Dichloroethane-d_4	102	
Toluene-d_8	98	
Pentafluorobenzene	168	
Fluorobenzene	96	77

* Characteristic ion for an ion trap mass spectrometer (to be used when ion-molecule reactions are observed).

TABLE 3

8260/624.1 QUALITY CONTROL SUMMARY

8260/ 624.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
MDL study, LOD and LOQ determination and verification	See ADM-MDL				Same - ongoing verification thru LOD study	Special RL's 2µg/L for water; 5-10µg/kg for LL Soil and 100-200µg/kg for Medium soils.	No RCP requirements
Tuning	Prior to ICAL and at the beginning of each period (12 hour for 8260C, 14 hour for 624.1, only prior to ICAL for 8260D). Select scans as described in SOP.	Ion criteria in SOP	Retune instrument and verify. If criteria cannot be met, maintenance may be required.	Problem must be corrected. No samples may be accepted without a valid tune.	Requirements met.	Requirements met (Table 4 of 8260B=same as 8260C).	Same
ICAL	Initially, when QC criteria cannot be maintained, after major maintenance. Instrument blank prior to 5 or more points with low point at or below reporting level. Point dropping policy and assignable causes defined in ADM-ICAL.	RSD for each ≤20% or another curve model such as linear regression ≥0.99, may force thru zero to improve low end accuracy, but not to include (0,0) as an extra point. For LR, refit low point within 50-150%recovery and all highe points at 70-130%. Minimum RF required for all compounds (8260C only). If >10% of compounds do not meet 20% or 0.99, curve is invalid. All outliers must be discussed in case narrative.	Correct problem then repeat ICAL	Problem must be corrected. No samples may be run until ICAL has passed. 5 or more points (6 if non-linear regression is used); Low standard ≤ to RL; must contain all analytes; performed under same conditions as samples.	QSM5.4:RSD <15% for each analyte and surrogate. or QSM5.4/6.0:LR or quad r2>0.99 Force through 0 OK. Must pass RF and refit method requirements. Flagging not appropriate. For 6.0, curving of surrogates is not required.	If <10% compounds exceed criteria, recalibration is not required as long as %RSD <40, r<0.98 Data rejected if RF<0.05 MUST meet 70-130% refit for linear or non-linear. If not met, report RL as estimated or raise RL to the next cal std that meets refit.	RSD for each < 15% except CCCs <30%. Up to 20% allowed out up to 30%RSD, but note outliers in case narrative. Min RF for all compounds 0.05. If quadratic curve is used for quantitation, note compounds in case narrative.

8260/ 624.1 Quality Control Summary

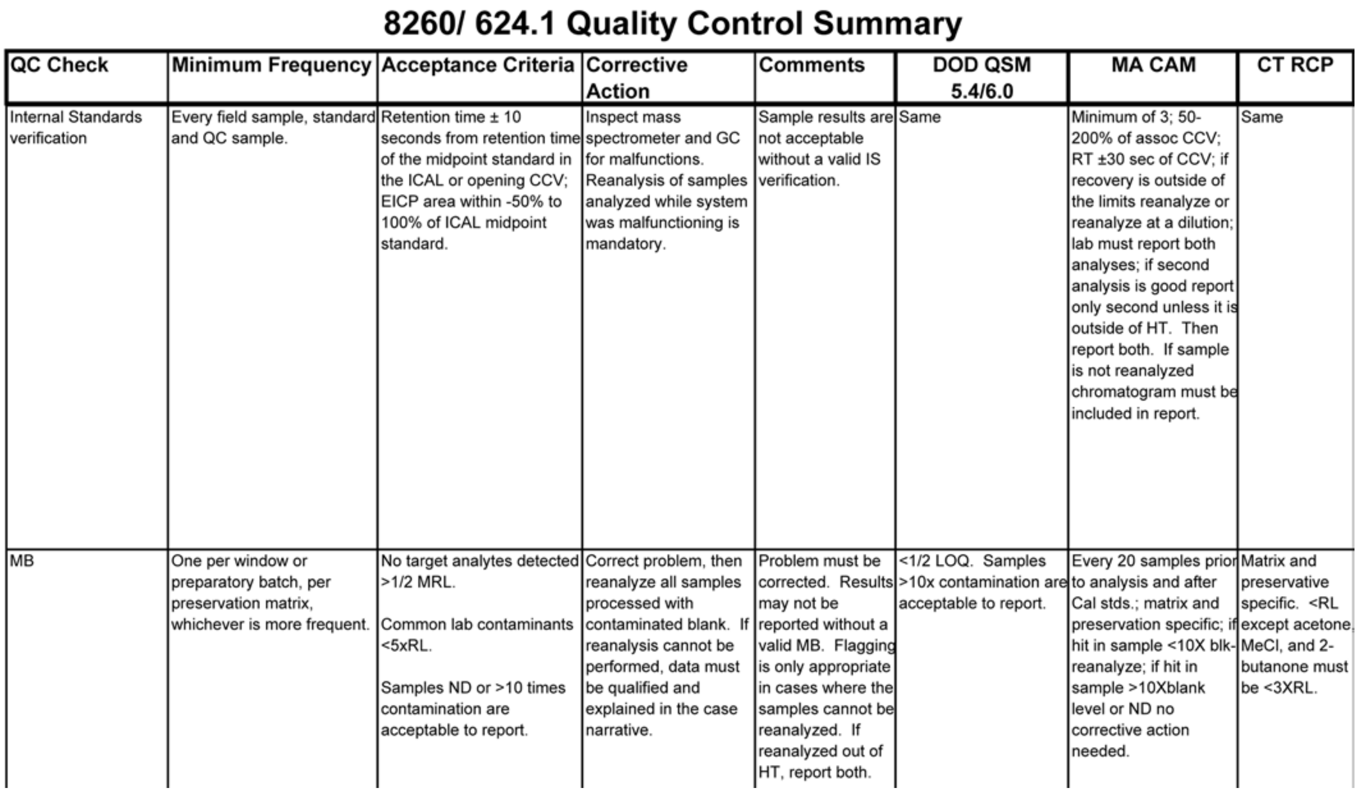
QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
ICV	Immediately after ICAL.	All target analytes within 70-130% CAS allows difficult compounds (ketones, 1,4-dioxane, bromomethane, and chloromethane) 40-160%	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.	Second source containing all targets. Concentration nea midpoint.	QSM 5.4: 80-120% Recovery. Flagging no appropriate. Must correct problem - no samples run until ICAL verification passes. QSM6.0: no special requirements.	70-130% except 40-160% for difficult compounds. Recalibrate if >10% compounds outside criteria.	80-120%. Up to 20% of compounds allowed out as long as all compounds recover 65-135%
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. May use opening CCV on other days	NA	NA	Same	No specific requirements	No RCP requirements

8260/ 624.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
Analyte Identification and Evaluation of relative retention times (RRT)	With each sample.	8260C: RRT of each target analyte within ± 0.06 RRT units of the standard component. 8260D: RT within 10 seconds of RT of midpoint ICAL or opening CCV or within 10 sec relative to shif of IS. 8260C/D: Relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the refernce spectrum. Isomers to be identified individually if height of the valley between isomer peaks is less than 25% of the sum of the two peak heights. Otherwise identify as isomeric pairs.	Correct problem, then rerun ICAL	NA	RRT evaluation required for all GCMS methods.	No specific requirements	No RCP requirements

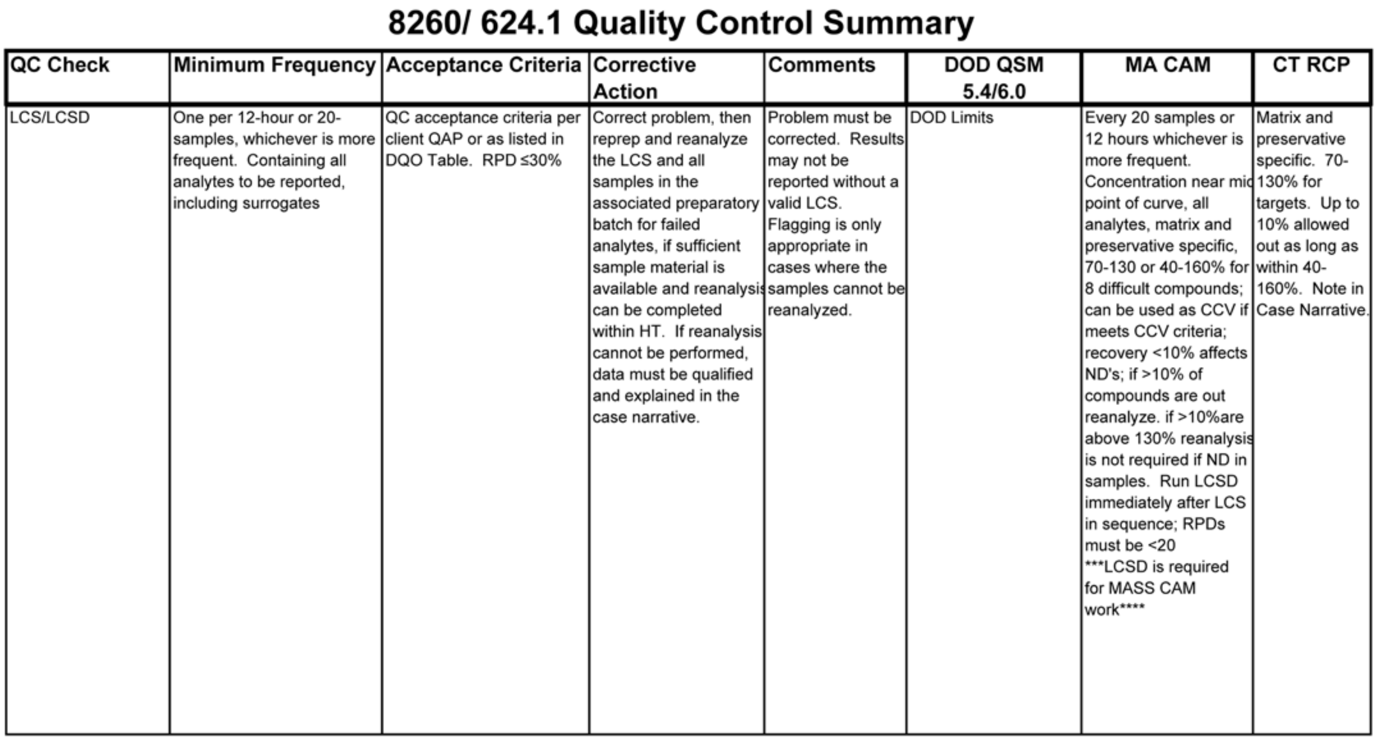
8260/ 624.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
CCV	Daily, all targets, after tuning and before sample analysis and every 12 hours of analysis time.	1. Minimum RFs as per SOP (Table 4 of method 8260C). 2.%Difference/Drift for all target compounds and surrogates: ≤20%D. Up to 20% of compounds may fail 20%D up to 40%D and be reported with a note in the case narrative. 3.EICP area within -50% to 100% of ICAL midpoint standard. 4.Internal standards must have retention time ± 30 seconds from retention time of the midpoint standard in the ICAL. Non-detect samples may be reported with a high-bias CCV.	Correct problem, then rerun CCV. If that fails, the lab may make further corrective action, but must demonstrate acceptable performance with 2 consecutve CCVs. If this fails, repeat ICAL. Reanalyze all samples since last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Flag all results for the specific analytes in all samples since the last acceptable CCV.		END OF RUN CCV required with limits of± 50%. If fails, reanalyze samples with acceptable CCVs. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed. DOD must be notified PRIOR to reporting samples with an unacceptable CCV.	Conc near midpoint; %D≤20 except for 8 difficult compounds<60; Area counts for CCV must meet 50-200% of the mid level ICAL std.; If ≤20% of compounds exceed criteria recalibration is not requred as long as %D<40. Data rejected if RF<0.05.	%D<20 for CCCs and <30 for all others. Up to 10% of compounds may be >30.



8260/ 624.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
Internal Standards verification	Every field sample, standard and QC sample.	Retention time ± 10 seconds from retention time of the midpoint standard in the ICAL or opening CCV; EICP area within -50% to 100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Sample results are not acceptable without a valid IS verification.	Same	Minimum of 3; 50-200% of assoc CCV; RT ±30 sec of CCV; if recovery is outside of the limits reanalyze or reanalyze at a dilution; lab must report both analyses; if second analysis is good report only second unless it is outside of HT. Then report both. If sample is not reanalyzed chromatogram must be included in report.	Same
MB	One per window or preparatory batch, per preservation matrix, whichever is more frequent.	No target analytes detected >1/2 MRL. Common lab contaminants <5xRL. Samples ND or >10 times contamination are acceptable to report.	Correct problem, then reanalyze all samples processed with contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Problem must be corrected. Results may not be reported without a valid MB. Flagging is only appropriate in cases where the samples cannot be reanalyzed. If reanalyzed out of HT, report both.	<1/2 LOQ. Samples >10x contamination are acceptable to report.	Every 20 samples prior to analysis and after Cal stds.; matrix and preservation specific; if hit in sample <10X blk-reanalyze; if hit in sample >10Xblank level or ND no corrective action needed.	Matrix and preservative specific. <RL except acetone, MeCl, and 2-butanone must be <3XRL.



8260/ 624.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
LCS/LCSD	One per 12-hour or 20-samples, whichever is more frequent. Containing all analytes to be reported, including surrogates	QC acceptance criteria per client QAP or as listed in DQO Table. RPD ≤30%	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available and reanalysis can be completed within HT. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	DOD Limits	Every 20 samples or 12 hours whichever is more frequent. Concentration near mid point of curve, all analytes, matrix and preservative specific, 70-130 or 40-160% for 8 difficult compounds; can be used as CCV if meets CCV criteria; recovery <10% affects ND's; if >10% of compounds are out reanalyze. if >10%are above 130% reanalysis is not required if ND in samples. Run LCSD immediately after LCS in sequence; RPDs must be <20 ***LCSD is required for MASS CAM work****	Matrix and preservative specific. 70-130% for targets. Up to 10% allowed out as long as within 40-160%. Note in Case Narrative.

8260/ 624.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
MS/MSD	One pair per 12-hour window or 20-sample batch, whichever is more frequent.	Recovery acceptance criteria per client QAP or as listed in DQO Table. RPD ≤30%	Recovery - assume matrix interference if LCS is acceptable. Flag parent sample. RPD - Examine chromatogram for interferences. Examine sample for possible heterogeneity. Reanalyze pair if appropriate. Flag and narrate.	Outlying MS/MSD results with acceptable LCS results indicates matrix interferences are likely the cause.	LCS limits	Every 20 samples Matrix Specific; at midpoint of curve, all analytes 70-130%; RPD's <20 for water <30 for solids. <10% recovery affects ND's; if LCS is good narrate. MSD only required if requested since LCSD is required.	70-130%
Surrogate	Added to All field and QC samples	QC acceptance criteria per client QAP or as listed in DQO Table.	Correct problem then reprep and reanalyze al failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, or historical results verify interference, reanalysis may not be necessary. If surrogates are diluted more than 10 times, report with flag.		DOD Limits	Min. of 3 across run; 70-130%; recovery <10% affects ND. If surr is out low reanalyze or reanalyze at a dilution; if out high and ND do not reanalyze. For methanol samples-if%moisure >25 and surr>10%re-analysis is not required; if sample is not analyzed provide chromatogram in report.	Min. of 3. 70-130% recovery. Methanol preserved not required to be repeated if moiture >25% and recoveries are >10%. Repeat not required if High surrogate recovery is associated with ND compounds.

8260/ 624.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	CT RCP
Reporting					J-flag all results between the MDL and LOQ.	TIC's- section 3.3, MeOH correction 3.2.1; soils-dry weight basis, Appendix II A-1 for COC, temp sheet, HT's	Use "ND" at reporting limit.

TABLE 4

MINIMUM RELATIVE RESPONSE FACTOR CRITERIA FOR INITIAL AND CONTINUING CALIBRATION VERIFICATION

Compound	Minimum RF	Compound	Minimum RF
Dichlorodifluoromethane	0.100	Trans-1,3-Dichloroprepene	0.100
Chloromethane	0.100	4-Methyl-2-pentanone	0.050
Vinyl Chloride	0.100	Toluene	0.400
Bromomethane	0.100	1,1,2-Trichloroethane	0.100
Chloroethane	0.100	Tetrachlorethene	0.200
Trichlorofluoromethane	0.100	2-Hexanone	0.050
1,1-Dichloroethene	0.100	Dibromochloromethane	0.100
1,1,2-Trichloro-1,2,2-trifluoroethane	0.100	1,2-Dibromoethane	0.100
Acetone	0.050	Chlorobenzene	0.500
Carbon disulfide	0.100	Ethylbenzene	0.100
Methyl Acetate	0.100	M,p-Xylene	0.100
Methylene Chloride	0.100	o-Xylene	0.300
Trans-1,2-Dichloroethene	0.100	Styrene	0.300
Cis-1,2-Dichloroethene	0.100	Bromoform	0.100
Methyl tert-Butyl Ether	0.100	Isopropylbenzene	0.100
1,1-Dichloroethane	0.200	1,1,2,2-Tetrachloroethane	0.300
2-Butanone	0.050	1,3-Dichlorobenzene	0.600
Chloroform	0.200	1,4-Dichlorobenzene	0.500
1,1,1-Trichloroethane	0.100	1,2-Dichlorobenzene	0.400
Cyclohexane	0.100	1,2-Dibromo-3-chloropropane	0.050
Carbon tetrachloride	0.050	1,2,4-Trichlorobenzene	0.200
Benzene	0.500		
1,2-Dichloroethane	0.100		
Trichloroethene	0.200		
Methylcyclohexane	0.100		
1,2-Dichloropropane	0.100		
Bromodichloromethane	0.200		
Cis-1,3-Dichloroprepene	0.200		

ATTACHMENT II

CURRENT IS/ANALYTE ASSOCIATIONS
(subject to change - based on analytical column)

- IS/Analyte Associations for all instruments

```
            Compound
  -----------------------------------
  1 I       Pentafluorobenzene
  2 P       Dichlorodifluoromethane
  3 P       Chloromethane
  4 P       Vinyl Chloride
  5 P       Bromomethane
  6 P       Chloroethane
  7         Freon 21
  8 P       Trichlorofluoromethane
  9         Diethyl Ether
 10         Freon 123a
 11         Freon 123
 12         Acrolein
 13 P       1,1-Diclethene
 14 P       Freon 113
 15 P       Acetone
 16         2-Propanol
 17         Iodomethane
 18 P       Carbon Disulfide
 19         Acetonitrile
 20         Allyl Chloride
 21 P       Methyl Acetate
 22 P       Methylene Chloride
 23         TBA
 24         Acrylonitrile
 25 P       Methyl-t-Butyl Ether
 26 P       trans-1,2-Dichloroethene
 27         Halothane
 28 P       1,1-Diclethane
 29         Vinyl Acetate
 30         DIPE
 31         2-Chloro-1,3-Butadiene
 32         ETBE
 33         2,2-Dichloropropane
 34 P       cis-1,2-Dichloroethene
 35 P       2-Butanone
 36         Propionitrile
 37         Bromochloromethane
 38         Methacrylonitrile
 39         Tetrahydrofuran
 40 P       Chloroform
 41 P       1,1,1-Trichloroethane
 42         TAME

 43 I       1,4-Difluorobenzene
 44 P       Cyclohexane
 45 s       surr4,Dibrflmethane
 46 P       Carbontetrachloride
 47         1,1-Dichloropropene
 48 s       surr1,1,2-dichloroethane-d4
 49 P       Benzene
 50 P       1,2-Dichloroethane
 51         Iso-Butyl Alcohol

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            Compound
  -----------------------------------
 52         n-Heptane
 53         1-Butanol
 54 P       Trichloroethene
 55 P       Methylcyclohexane
 56 P       1,2-Diclpropane
 57         Dibromomethane
 58         1,4-Dioxane
 59         Methyl Methacrylate
 60 P       Bromodichloromethane
 61         2-Nitropropane
 62         2-Chloroethylvinyl Ether
 63 P       cis-1,3-Dichloropropene
 64 P       4-Methyl-2-pentanone
 65 s       SURR3,Toluene-d8
 66 P       Toluene
 67 P       trans-1,3-Dichloropropene
 68         Ethyl Methacrylate
 69 P       1,1,2-Trichloroethane
 70 s       SURR2,BFB

 71 I       d5-Chlorobenzene
 72 P       Tetrachloroethene
 73 P       2-Hexanone
 74         1,3-Dichloropropane
 75 P       Dibromochloromethane
 76         N-Butyl Acetate
 77 P       1,2-Dibromoethane
 78 P       Chlorobenzene
 79         3-CBTF
 80         4-CBTF
 81         1,1,1,2-Tetrachloroethane
 82 P       Ethylbenzene
 83 P       (m+p)Xylene
 84 P       o-Xylene
 85 P       Styrene

 86 I       1,4-Dichlorobenzene-d4
 87 P       Bromoform
 88         2-CBTF
 89 P       Isopropylbenzene
 90         Cyclohexanone
 91         trans-1,4-Dichloro-2-Butene
 92 P       1,1,2,2-Tetrachloroethane
 93         Bromobenzene
 94         1,2,3-Trichloropropane
 95         n-Propylbenzene
 96         2-Chlorotoluene
 97         3-Chlorotoluene
 98         4-Chlorotoluene
 99         1,3,5-Trimethylbenzene
100         tert-Butylbenzene
101         1,2,4-Trimethylbenzene

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         Compound                          .
  -------------------------------------
102      3,4-DCBTF
103      sec-Butylbenzene
104      p-Isopropyltoluene
105 P    1,3-Dclbenz
106 P    1,4-Dclbenz
107      2,4-DCBTF
108      2,5-DCBTF
109      n-Butylbenzene
110 P    1,2-Dclbenz
111 P    1,2-Dibromo-3-chloropropane
112      Trielution Dichlorotoluene
113      1,3,5 Trichlorobenzene
114      Coelution Dichlorotoluene
115 P    1,2,4-Tcbenzene
116      Hexachlorobt
117      Naphthalen
118      1,2,3-Tclbenzene
119      2,4,5-Trichlorotolene
120      2,3,6-Trichlorotoluene
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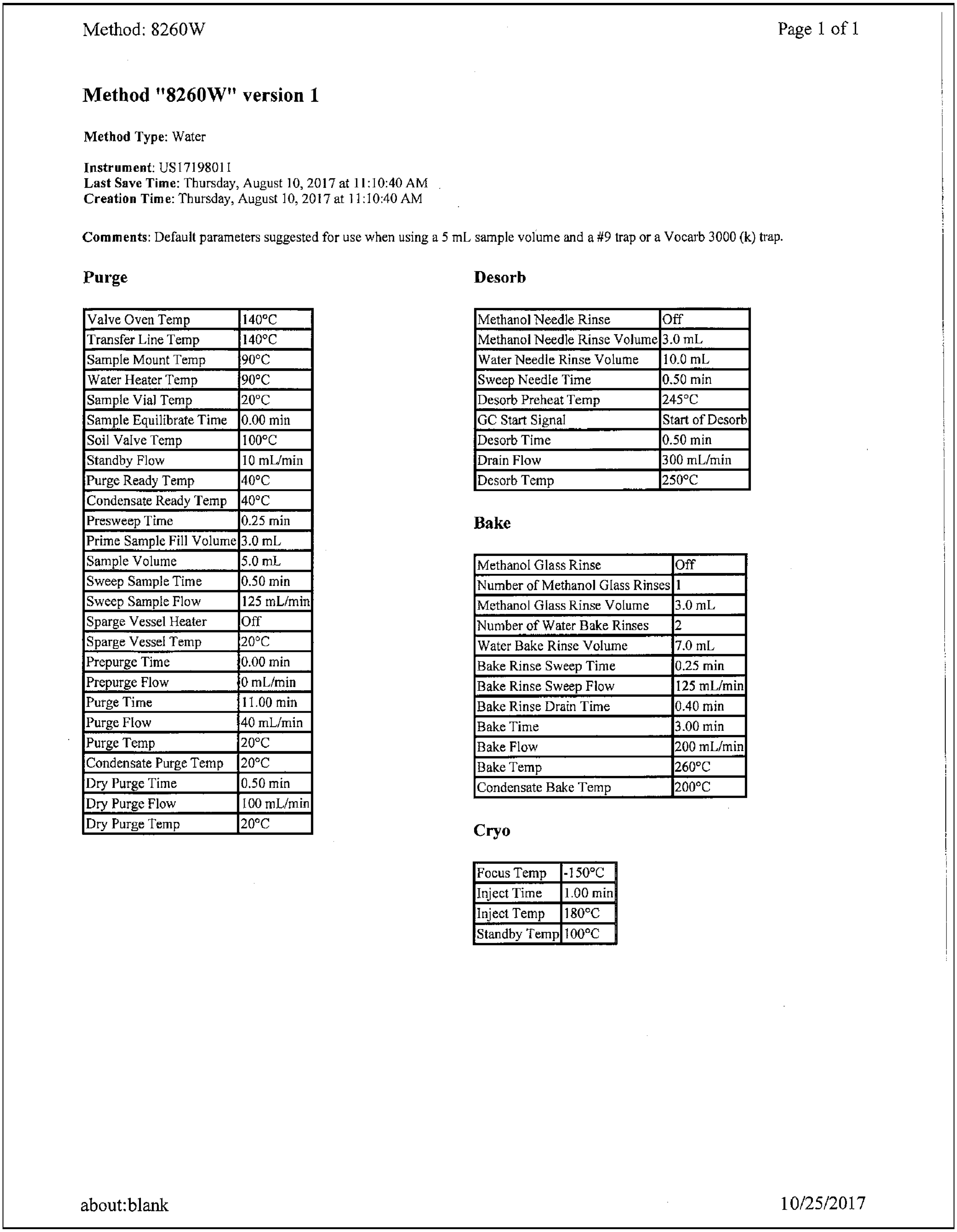
ATTACHMENT III

INSTRUMENT SPECIFIC OPERATING CONDITIONS



Method "8260W" version 1

Method Type: Water

Instrument: US17198011
Last Save Time: Thursday, August 10, 2017 at 11:10:40 AM
Creation Time: Thursday, August 10, 2017 at 11:10:40 AM

Comments: Default parameters suggested for use when using a 5 mL sample volume and a #9 trap or a Vocarb 3000 (k) trap.

Purge

Valve Oven Temp	140°C
Transfer Line Temp	140°C
Sample Mount Temp	90°C
Water Heater Temp	90°C
Sample Vial Temp	20°C
Sample Equilibrate Time	0.00 min
Soil Valve Temp	100°C
Standby Flow	10 mL/min
Purge Ready Temp	40°C
Condensate Ready Temp	40°C
Presweep Time	0.25 min
Prime Sample Fill Volume	3.0 mL
Sample Volume	5.0 mL
Sweep Sample Time	0.50 min
Sweep Sample Flow	125 mL/min
Sparge Vessel Heater	Off
Sparge Vessel Temp	20°C
Prepurge Time	0.00 min
Prepurge Flow	0 mL/min
Purge Time	11.00 min
Purge Flow	40 mL/min
Purge Temp	20°C
Condensate Purge Temp	20°C
Dry Purge Time	0.50 min
Dry Purge Flow	100 mL/min
Dry Purge Temp	20°C

Desorb

Methanol Needle Rinse	Off
Methanol Needle Rinse Volume	3.0 mL
Water Needle Rinse Volume	10.0 mL
Sweep Needle Time	0.50 min
Desorb Preheat Temp	245°C
GC Start Signal	Start of Desorb
Desorb Time	0.50 min
Drain Flow	300 mL/min
Desorb Temp	250°C

Bake

Methanol Glass Rinse	Off
Number of Methanol Glass Rinses	1
Methanol Glass Rinse Volume	3.0 mL
Number of Water Bake Rinses	2
Water Bake Rinse Volume	7.0 mL
Bake Rinse Sweep Time	0.25 min
Bake Rinse Sweep Flow	125 mL/min
Bake Rinse Drain Time	0.40 min
Bake Time	3.00 min
Bake Flow	200 mL/min
Bake Temp	260°C
Condensate Bake Temp	200°C

Cryo

Focus Temp	-150°C
Inject Time	1.00 min
Inject Temp	180°C
Standby Temp	100°C

Method: 8260S

Page 1 of 1

Method "8260S" version 1

Method Type: Soil

Instrument: US17198011
Last Save Time: Thursday, August 10, 2017 at 4:25:40 PM
Creation Time: Thursday, August 10, 2017 at 4:25:40 PM

Comments: Imported from "I:\ACQUDATA\msvoa12\8260S.atomxmethod.csv".

Purge

Valve Oven Temp	140°C
Transfer Line Temp	140°C
Sample Mount Temp	90°C
Water Heater Temp	90°C
Sample Vial Temp	40°C
Prepurge Time	0.00 min
Prepurge Flow	0 mL/min
Preheat Mix Speed	Medium
Sample Preheat Time	1.00 min
Soil Valve Temp	100°C
Standby Flow	10 mL/min
Purge Ready Temp	40°C
Condensate Ready Temp	40°C
Presweep Time	0.25 min
Water Volume	5.0 mL
Sweep Water Time	0.25 min
Sweep Water Flow	100 mL/min
Sparge Vessel Heater	On
Sparge Vessel Temp	40°C
Purge Mix Speed	Medium
Purge Time	11.00 min
Purge Flow	40 mL/min
Purge Temp	20°C
Condensate Purge Temp	20°C
Dry Purge Time	1.00 min
Dry Purge Flow	100 mL/min
Dry Purge Temp	20°C

Desorb

Methanol Needle Rinse	Off
Methanol Needle Rinse Volume	3.0 mL
Water Needle Rinse Volume	7.0 mL
Sweep Needle Time	0.25 min
Desorb Preheat Temp	245°C
GC Start Signal	Start of Desorb
Desorb Time	0.50 min
Drain Flow	300 mL/min
Desorb Temp	250°C

Bake

Bake Time	4.00 min
Bake Flow	200 mL/min
Bake Temp	260°C
Condensate Bake Temp	180°C

Cryo

Focus Temp	-150°C
Inject Time	1.00 min
Inject Temp	180°C
Standby Temp	100°C

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10/25/2017

GCMS#10, 14, 16 and 17 OPERATING CONDITIONS

GC	Agilent 6890
Column	DB-624 0.18mm ID x 20m, 1.0um film
Carrier gas	Helium
Carrier gas mode	Constant Flow
Flow rate	0.8 mL/min
Injection port	Split/Splitless, EPC
Split ratio	75:1
Injection port temp.	200 deg.C
Autosampler	Atomx
Oven program	42 deg.C, hold 5.0 min. 16 deg.C/min to 100 deg.C, hold 0.0 min. 20 deg.C/min to 220 deg.C, hold 0.56 min.
Mass spectrometer	Agilent 5975
MS interface temp.	220 deg.C
MS source temp	230 deg.C
MS quad. temp	150 deg.C
Detection mode	EI full scan; mass range 35-300m/z

ATTACHMENT IV

DOD SUMMARY AND QC CRITERIA

DOD SUMMARY

For work for the Department of Defense – the DOD Quality Systems Manual must be followed. The DOD Manual is based on the NELAC Standards and ISO/IEC 17025:2017 with some additional requirements. The following are the requirements which are different or additional to routine analysis and must be followed for DOD work:

- The RSD of the ICAL must be <15 (QSM 5.4 only).
- The Second Source Calibration Verification (ICV) must have a recovery of 80-120% of the true value. (QSM 5.4 only)
- CCV - All targets and surrogates must <20%D. Client must be notified in advance to reporting any data to be reported with out of control CCV. When CCV fails, all samples must be reanalyzed since last successful CCV.
- Closing CCV – a closing CCV is required for DOD with limits of 50-150% recovery. Repeat samples bound by failing CCVs.
- Apply J flag to all hits between LOD and LOQ.
- The ICAL and CCV associated with DOD samples must be compliant for all targets (do not allow 10% of targets to be out).
- The limits for surrogates, LCS, and MS are different from The Data Quality Objectives Table. Follow the DOD limits given in the following tables. All DOD targets must be in control. All DOD targets are spiked and evaluated.

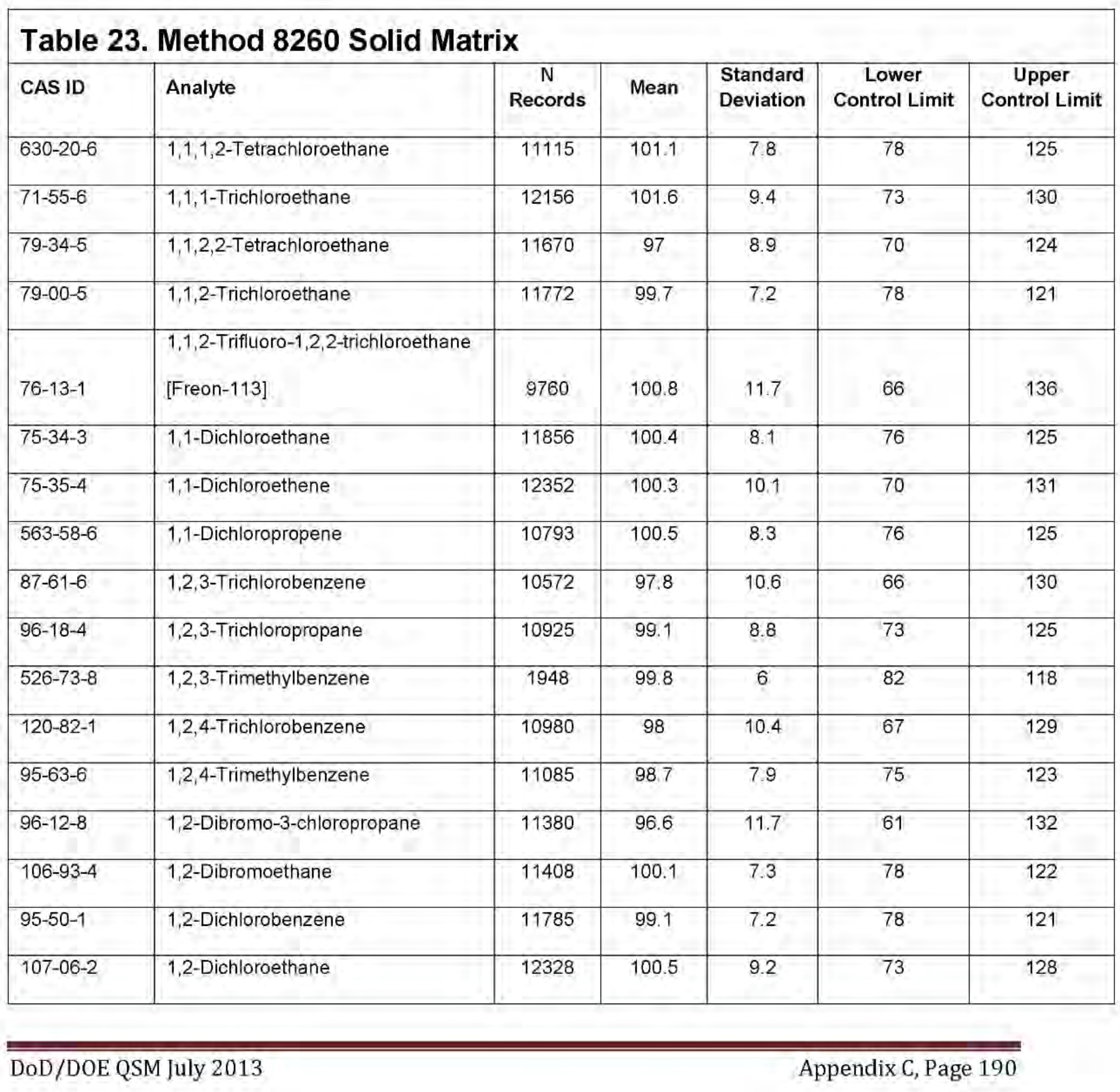

Table 23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	11115	101.1	7.8	78	125
71-55-6	1,1,1-Trichloroethane	12156	101.6	9.4	73	130
79-34-5	1,1,2,2-Tetrachloroethane	11670	97	8.9	70	124
79-00-5	1,1,2-Trichloroethane	11772	99.7	7.2	78	121
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	9760	100.8	11.7	66	136
75-34-3	1,1-Dichloroethane	11856	100.4	8.1	76	125
75-35-4	1,1-Dichloroethene	12352	100.3	10.1	70	131
563-58-6	1,1-Dichloropropene	10793	100.5	8.3	76	125
87-61-6	1,2,3-Trichlorobenzene	10572	97.8	10.6	66	130
96-18-4	1,2,3-Trichloropropane	10925	99.1	8.8	73	125
526-73-8	1,2,3-Trimethylbenzene	1948	99.8	6	82	118
120-82-1	1,2,4-Trichlorobenzene	10980	98	10.4	67	129
95-63-6	1,2,4-Trimethylbenzene	11085	98.7	7.9	75	123
96-12-8	1,2-Dibromo-3-chloropropane	11380	96.6	11.7	61	132
106-93-4	1,2-Dibromoethane	11408	100.1	7.3	78	122
95-50-1	1,2-Dichlorobenzene	11785	99.1	7.2	78	121
107-06-2	1,2-Dichloroethane	12328	100.5	9.2	73	128

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Table 23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
17060-07-0	1,2-Dichloroethane-d4	5951	103.1	10.8	71	136
540-59-0	1,2-Dichloroethene	7748	99.9	7.3	78	122
78-87-5	1,2-Dichloropropane	12145	99.5	7.8	76	123
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	1269	97.8	11.3	64	132
108-70-3	1,3,5-Trichlorobenzene	4723	99.4	9.6	71	128
108-67-8	1,3,5-Trimethylbenzene	11080	98.4	8.4	73	124
541-73-1	1,3-Dichlorobenzene	11619	98.9	7.4	77	121
142-28-9	1,3-Dichloropropane	10713	99.1	7.3	77	121
542-75-6	1,3-Dichloropropene	3714	101.6	8.1	77	126
106-46-7	1,4-Dichlorobenzene	11848	97.5	7.6	75	120
105-05-5	1,4-Diethylbenzene	1896	96.6	5.9	79	114
123-91-1	1,4-Dioxane	7698	96.4	13.7	55	138
544-10-5	1-Chlorohexane	2543	100.4	9.8	71	130
594-20-7	2,2-Dichloropropane	10703	99.7	11.1	67	133
78-93-3	2-Butanone [MEK]	11514	99.6	16.3	51	148
126-99-8	2-Chloro-1,3-butadiene	6667	99	11.3	65	133
110-75-8	2-Chloroethyl vinyl ether	6957	96.1	17.6	43	149
95-49-8	2-Chlorotoluene	10838	98.5	7.9	75	122
591-78-6	2-Hexanone	11004	99.1	15.4	53	145
79-46-9	2-Nitropropane	4969	98.3	17.1	47	150
67-63-0	2-Propanol [Isopropyl alcohol]	1696	99.8	13.4	60	140
460-00-4	4-Bromofluorobenzene	6267	98.9	6.8	79	119
106-43-4	4-Chlorotoluene	10785	98.3	8.6	72	124
108-10-1	4-Methyl-2-pentanone [MIBK]	11364	99.6	11.6	65	135
67-64-1	Acetone	11089	99.6	21.4	36	164

Table 23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
75-05-8	Acetonitrile	5697	98.5	14.8	54	143
107-02-8	Acrolein [Propenal]	7528	101.1	18	47	155
107-13-1	Acrylonitrile	8293	99.7	11.4	65	134
107-05-1	Allyl chloride	6908	101.1	11.2	68	135
71-43-2	Benzene	12853	99.2	7.4	77	121
100-44-7	Benzyl chloride	2743	92.1	9.4	64	120
108-86-1	Bromobenzene	10974	99.3	7.3	78	121
74-97-5	Bromochloromethane	11023	101.4	7.8	78	125
75-27-4	Bromodichloromethane	11850	101	8.5	75	127
75-25-2	Bromoform	11890	99.1	10.8	67	132
74-83-9	Bromomethane	11416	98.3	15	53	143
75-15-0	Carbon disulfide	11132	97.9	11.5	63	132
56-23-5	Carbon tetrachloride	12090	102.3	10.7	70	135
108-90-7	Chlorobenzene	12382	99.7	6.9	79	120
124-48-1	Chlorodibromomethane	11852	100.2	8.7	74	126
75-00-3	Chloroethane	11444	98.8	13.3	59	139
67-66-3	Chloroform	12344	100.3	7.6	78	123
74-87-3	Chloromethane	11876	93.3	14.3	50	136
156-59-2	cis-1,2-Dichloroethene	11645	99.9	7.6	77	123
10061-01-5	cis-1,3-Dichloropropene	11805	99.8	8.7	74	126
1476-11-5	cis-1,4-Dichloro-2-butene	977	106	12.4	69	143
110-82-7	Cyclohexane	8827	98.9	10.6	67	131
108-94-1	Cyclohexanone	3764	93.2	20.9	30	156
1868-53-7	Dibromofluoromethane	2142	98.1	6.8	78	119
74-95-3	Dibromomethane	10913	101.1	7.9	78	125
75-71-8	Dichlorodifluoromethane [Freon-12]	11467	88.9	20.1	29	149

Table 23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
75-43-4	Dichlorofluoromethane	717	100.8	18	47	155
60-29-7	Diethyl ether	6283	99.6	9.6	71	129
108-20-3	Diisopropyl ether	8542	98.3	9.7	69	127
64-17-5	Ethanol	3958	102.2	18.9	45	159
141-78-6	Ethyl acetate	4516	95.4	14.5	52	139
97-63-2	Ethyl methacrylate	7075	98.9	9.9	69	129
637-92-3	Ethyl tert-butyl ether	7514	98.9	9.1	72	126
100-41-4	Ethylbenzene	12427	99.1	7.7	76	122
462-06-6	Fluorobenzene	689	97.3	5.4	81	114
142-82-5	Heptane	5420	93.4	14.9	49	138
87-68-3	Hexachlorobutadiene	10264	98.1	12.4	61	135
67-72-1	Hexachloroethane	3265	102.5	10.1	72	133
110-54-3	Hexane	7116	93.6	16.1	45	142
74-88-4	Iodomethane	9457	100.9	10.1	71	131
78-83-1	Isobutyl alcohol	6162	97.5	12.6	60	135
108-21-4	Isopropyl acetate [Acetic acid]	2885	94.2	12.2	58	131
98-82-8	Isopropylbenzene	11596	100.8	11.1	68	134
179601-23-1	m/p-Xylene [3/4-Xylene]	10612	100.4	7.7	77	124
126-98-7	Methacrylonitrile	6736	99.2	11.1	66	132
79-20-9	Methyl acetate	8320	98.7	15.2	53	144
80-62-6	Methyl methacrylate	7050	98.4	11.9	63	134
1634-04-4	Methyl tert-butyl ether [MTBE]	11253	98.9	8.7	73	125
108-87-2	Methylcyclohexane	8565	99.4	11.2	66	133
75-09-2	Methylene chloride	12024	98.9	9.7	70	128
123-86-4	n-Butyl acetate	2981	95.1	11	62	128
71-36-3	n-Butyl alcohol	4800	92.9	12.6	55	131

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Table 23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
104-51-8	n-Butylbenzene	10921	98.7	9.7	70	128
103-65-1	n-Propylbenzene	10947	98.9	8.8	73	125
91-20-3	Naphthalene	10602	95.6	11.2	62	129
95-47-6	o-Xylene	11940	100	7.7	77	123
99-87-6	p-Isopropyltoluene [p-Cymene]	10953	100.3	9	73	127
76-01-7	Pentachloroethane	5957	102	11.1	69	135
107-12-0	Propionitrile [Ethyl cyanide]	6734	101	11.1	68	134
135-98-8	sec-Butylbenzene	10960	99	8.8	73	126
100-42-5	Styrene	11809	100.2	8	76	124
994-05-8	tert-Amyl methyl ether [TAME]	7153	99.8	8.9	73	126
75-65-0	tert-Butyl alcohol	7492	100.5	10.7	68	133
98-06-6	tert-Butylbenzene	10974	98.8	8.6	73	125
127-18-4	Tetrachloroethene	12091	100.5	9.2	73	128
109-99-9	Tetrahydrofuran	8039	98	12.4	61	135
108-88-3	Toluene	12499	99.3	7.3	77	121
2037-26-5	Toluene-d8	6232	100.7	5.2	85	116
156-60-5	trans-1,2-Dichloroethene	11849	99.2	8.6	74	125
10061-02-6	trans-1,3-Dichloropropene	11805	100.9	9.8	71	130
110-57-6	trans-1,4-Dichloro-2-butene	8307	98.6	12.3	62	136
79-01-6	Trichloroethene	12440	100.2	7.6	77	123
75-69-4	Trichlorofluoromethane [Freon-11]	11530	101	13.1	62	140
108-05-4	Vinyl acetate	7260	100.3	16.9	50	151
75-01-4	Vinyl chloride	12129	95.6	13.2	56	135
1330-20-7	Xylenes [total]	8623	100.7	7.7	78	124

Table 24. Method 8260 Water Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	24511	101.1	7.6	78	124
71-55-6	1,1,1-Trichloroethane	28223	102.7	9.6	74	131
79-34-5	1,1,2,2-Tetrachloroethane	27450	96.4	8.3	71	121
79-00-5	1,1,2-Trichloroethane	27338	99.5	6.5	80	119
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	21122	103	11.1	70	136
75-34-3	1,1-Dichloroethane	28154	101.3	8	77	125
75-35-4	1,1-Dichloroethene	29436	101	10	71	131
563-58-6	1,1-Dichloropropene	23631	102	7.8	79	125
87-61-6	1,2,3-Trichlorobenzene	24271	98.7	10.1	69	129
96-18-4	1,2,3-Trichloropropane	24525	97.5	8	73	122
526-73-8	1,2,3-Trimethylbenzene	2965	100.9	6.2	82	120
120-82-1	1,2,4-Trichlorobenzene	25290	99.8	10.1	69	130
95-63-6	1,2,4-Trimethylbenzene	27917	99.6	8	76	124
96-12-8	1,2-Dibromo-3-chloropropane	24955	94.9	11.1	62	128
106-93-4	1,2-Dibromoethane	29096	99	7.2	77	121
95-50-1	1,2-Dichlorobenzene	27583	99.4	6.5	80	119
107-06-2	1,2-Dichloroethane	32965	100.3	9.2	73	128
17060-07-0	1,2-Dichloroethane-d4	8673	99.5	6.1	81	118
540-59-0	1,2-Dichloroethene	18667	100.2	7.1	79	121
78-87-5	1,2-Dichloropropane	27787	100.1	7.2	78	122
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	3144	103.1	10.9	70	136
108-70-3	1,3,5-Trichlorobenzene	10037	102.1	9.2	75	130
108-67-8	1,3,5-Trimethylbenzene	27820	99.5	8.1	75	124

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Table 24. Method 8260 Water Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
106-99-0	1,3-Butadiene	1202	100.6	19.2	43	158
541-73-1	1,3-Dichlorobenzene	26951	99.7	6.5	80	119
142-28-9	1,3-Dichloropropane	23811	99.1	6.5	80	119
542-75-6	1,3-Dichloropropene	9784	99.9	7.6	77	123
106-46-7	1,4-Dichlorobenzene	27715	98.3	6.5	79	118
105-05-5	1,4-Diethylbenzene	1980	98.4	6.4	79	118
123-91-1	1,4-Dioxane	17866	99	13.4	59	139
544-10-5	1-Chlorohexane	5790	99.6	8	76	124
540-84-1	2,2,4-Trimethylpentane [Isooctane]	5432	95.2	12.3	58	132
594-20-7	2,2-Dichloropropane	23775	99.7	13.2	60	139
75-85-4	2-Butanol	4332	92.7	9.1	66	120
78-93-3	2-Butanone [MEK]	26659	99.6	14.6	56	143
126-99-8	2-Chloro-1,3-butadiene	15673	100	11.7	65	135
110-75-8	2-Chloroethyl vinyl ether	18225	94.7	14.7	51	139
95-49-8	2-Chlorotoluene	23750	100	7.2	79	122
591-78-6	2-Hexanone	25368	97.9	13.5	57	139
91-57-6	2-Methylnaphthalene	3754	79.4	20.9	17	142
79-46-9	2-Nitropropane	10213	92.6	14.5	49	136
67-63-0	2-Propanol [Isopropyl alcohol]	2034	98.8	14.4	56	142
624-95-3	3,3-Dimethyl-1-butanol	6491	90.9	13.9	49	133
460-00-4	4-Bromofluorobenzene	9971	99.7	4.9	85	114
106-43-4	4-Chlorotoluene	23616	99.9	7.4	78	122
108-10-1	4-Methyl-2-pentanone [MIBK]	25796	98.5	10.6	67	130
67-64-1	Acetone	25006	99.5	20.1	39	160
75-05-8	Acetonitrile	13308	95.8	15.2	50	142

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Table 24. Method 8260 Water Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
107-02-8	Acrolein [Propenal]	16380	96.8	19.3	39	155
107-13-1	Acrylonitrile	20173	99	11.9	63	135
107-05-1	Allyl chloride	15758	99	10.4	68	130
71-43-2	Benzene	34376	99.4	6.9	79	120
100-44-7	Benzyl chloride	10675	90.1	15.9	42	138
108-86-1	Bromobenzene	23762	99.7	6.7	80	120
74-97-5	Bromochloromethane	24356	100.8	7.5	78	123
75-27-4	Bromodichloromethane	26888	101.8	7.8	79	125
75-25-2	Bromoform	27675	97.8	10.8	66	130
74-83-9	Bromomethane	26717	97	14.7	53	141
75-15-0	Carbon disulfide	25719	98.8	11.5	64	133
56-23-5	Carbon tetrachloride	28870	103.8	10.7	72	136
108-90-7	Chlorobenzene	29802	100	6.1	82	118
124-48-1	Chlorodibromomethane	27424	100	8.5	74	126
75-45-6	Chlorodifluoromethane	7197	84.4	14.9	40	129
75-00-3	Chloroethane	27069	99	13	60	138
67-66-3	Chloroform	29373	101.1	7.5	79	124
74-87-3	Chloromethane	27697	94.5	15	50	139
156-59-2	cis-1,2-Dichloroethene	27935	100.1	7.5	78	123
10061-01-5	cis-1,3-Dichloropropene	27197	99.5	8	75	124
1476-11-5	cis-1,4-Dichloro-2-butene	1524	101.5	14.9	57	146
110-82-7	Cyclohexane	20438	100.4	10	71	130
1868-53-7	Dibromofluoromethane	5702	99.1	6.5	80	119
74-95-3	Dibromomethane	24473	101.1	7.3	79	123
75-71-8	Dichlorodifluoromethane [Freon-12]	25410	92	20.1	32	152

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Table 24. Method 8260 Water Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
75-43-4	Dichlorofluoromethane	1504	101.5	9.8	72	131
60-29-7	Diethyl ether	17189	98.6	10.2	68	129
108-20-3	Diisopropyl ether	22989	97.5	10.3	67	128
64-17-5	Ethanol	9543	99.2	17.1	48	151
141-78-6	Ethyl acetate	9208	96.8	13.9	55	138
97-63-2	Ethyl methacrylate	16674	98.7	9	72	126
637-92-3	Ethyl tert-butyl ether	19841	98.3	9.4	70	127
100-41-4	Ethylbenzene	33325	99.8	7	79	121
462-06-6	Fluorobenzene	1373	97.9	6.1	80	116
142-82-5	Heptane	11878	94.4	15	49	140
87-68-3	Hexachlorobutadiene	23535	100.1	11.3	66	134
67-72-1	Hexachloroethane	8718	102.9	10.3	72	134
110-54-3	Hexane	15545	95.5	15.9	48	143
74-88-4	Iodomethane	20229	100	10.4	69	131
78-83-1	Isobutyl alcohol	14123	97.7	11.7	63	133
108-21-4	Isopropyl acetate [Acetic acid]	7216	97.8	11.6	63	133
98-82-8	Isopropylbenzene	28636	101.5	9.9	72	131
179601-23-1	m/p-Xylene [3/4-Xylene]	28168	100.5	6.9	80	121
126-98-7	Methacrylonitrile	15982	97.9	11.6	63	133
79-20-9	Methyl acetate	19698	96	13.2	56	136
80-62-6	Methyl methacrylate	16524	97.7	10.2	67	128
1634-04-4	Methyl tert-butyl ether [MTBE]	29660	97.3	8.8	71	124
108-87-2	Methylcyclohexane	20025	101.8	10.1	72	132
75-09-2	Methylene chloride	27659	99.4	8.3	74	124
123-86-4	n-Butyl acetate	7247	96.8	9.4	69	125

Table 24. Method 8260 Water Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
71-36-3	n-Butyl alcohol	10122	95.1	12	59	131
104-51-8	n-Butylbenzene	24088	101.1	8.8	75	128
109-60-4	n-Propyl acetate	602	100.8	8.3	76	126
103-65-1	n-Propylbenzene	24419	101	8.5	76	126
91-20-3	Naphthalene	27847	94.6	11.3	61	128
95-47-6	o-Xylene	31776	100	7.2	78	122
99-87-6	p-Isopropyltoluene [p-Cymene]	24335	102	8.5	77	127
76-01-7	Pentachloroethane	11688	101.1	10.7	69	133
109-66-0	Pentane	3915	74.8	19.7	16	134
107-12-0	Propionitrile [Ethyl cyanide]	15701	99.9	12	64	136
135-98-8	sec-Butylbenzene	24191	101.1	8.1	77	126
100-42-5	Styrene	26985	100.5	7.6	78	123
994-05-8	tert-Amyl methyl ether [TAME]	19726	98.1	10.1	68	128
75-65-0	tert-Butyl alcohol	21112	98.6	10.1	68	129
762-75-4	tert-Butyl formate	6651	98.1	11.1	65	132
98-06-6	tert-Butylbenzene	23919	101	7.7	78	124
127-18-4	Tetrachloroethene	29017	101.3	9.3	74	129
109-99-9	Tetrahydrofuran	18021	95	12.8	57	133
108-88-3	Toluene	33510	100.1	6.8	80	121
2037-26-5	Toluene-d8	9809	100.4	3.8	89	112
156-60-5	trans-1,2-Dichloroethene	27663	99.5	8.2	75	124
10061-02-6	trans-1,3-Dichloropropene	27134	100	8.9	73	127
110-57-6	trans-1,4-Dichloro-2-butene	19320	91.5	16.1	43	140
79-01-6	Trichloroethene	30150	101.1	7.3	79	123
75-69-4	Trichlorofluoromethane	26108	103	12.8	65	141

Table 24. Method 8260 Water Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
	[Freon-11]					
108-05-4	Vinyl acetate	18941	100.2	15.3	54	146
75-01-4	Vinyl chloride	29472	97.4	13.2	58	137
1330-20-7	Xylenes [total]	23426	100.1	7	79	121

Semivolatile Organic Compounds by GCMS

DOCUMENT ID: SOC-8270, REV 16

Approved By: Department Supervisor, Alec Moses Date: 2/14/25

Approved By: Quality Assurance Manager, Vicky Collom Date: 2/13/25

Approved By: Lead Technical Director, Christine Kutzer Date: 2/14/25

Approved By: Organics Technical Director, Meghan Pedro Date: 2/14/25

Approved By: Laboratory Supervisor, Bill Allgeier Date: 2/13/25

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1) Scope and Applicability

1.1 This SOP uses EPA SW-846 Method 8270D and 8270E and EPA 625.1 to determine the concentrations of Semi-Volatile Organic Compounds in extracts prepared from water, TCLP extracts, and many types of solid waste matrices, soils, sediment, and sludge.. EPA 625.1 is typically used for the determination of compounds in municipal and industrial discharges as provided under 40 CFR Part 136.1 See the Data Quality Objectives Table for a list of the analytes which may be analyzed by this SOP with the associated reporting limits for water, soil,. The reported compound list and reporting limits may be adjusted based on the client's needs.

1.2 This SOP can be used to quantitate most neutral, acidic, and basic organic compounds that are soluble in methylene chloride and capable of being eluted without derivatization as sharp peaks from a gas chromatographic fused-silica capillary column coated with a slightly polar silicone phase. Such compounds include polynuclear aromatic hydrocarbons, chlorinated hydrocarbons and pesticides, phthalate esters, organophosphate esters, nitrosamines, haloethers, aldehydes, ethers, ketones, anilines, pyridines, quinolines, aromatic nitro compounds, and phenols, including nitrophenols.

1.3 Samples for Method 625.1 can be analyzed with 8270 samples and under this 8270 SOP with clarifications provided throughout. 8270 criteria is typically stricter than 625.1 criteria. Where differences exist between 8270 and 625.1, samples will be analyzed under the stricter criteria of the two methods, but samples need only meet the criteria of the method reported.

2) Summary of Procedure

2.1 This method provides Gas Chromatography/Mass Spectrometry (GC/MS) conditions for the detection of Semi-volatile Organic Compounds. Prior to the use of this method, an appropriate sample preparation method must be used to recover the analytes of interest. A measured aliquot of the extract is injected into the gas chromatograph (GC). The compounds are separated on a fused silica capillary column. Compounds of interest are detected by a mass spectrometer. Identification of the analytes of interest is performed by comparing the retention times of the analytes with the respective retention times of an authentic standard, and by comparing mass spectra of analytes with mass spectra of reference materials. Quantitative analysis is performed by using the authentic standard to produce a response factor and calibration curve, and using the calibration data to determine the concentration of an analyte in the extract. The concentration in the sample is calculated using the sample weight or volume and the extract volume.

2.2 The following compounds may require special treatment when being determined by this method:

- Benzidine can be subject to oxidative losses during solvent concentration and the chromatography for this compound is poor.
- Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the gas chromatograph and is subject to a chemical reaction in acetone, and can undergo photochemical decomposition.
- N-nitrosodimethylamine is difficult to separate from the solvent under the chromatographic conditions described.
- N-nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot

be separated from diphenylamine.

- 1,2-diphenylhydrazine decomposes and cannot be separated from azobenzene.
- Pentachlorophenol, 2,4-dinitrophenol, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

3) Definitions

3.1 Initial Calibration - analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the detector to the target compounds.

3.2 Laboratory Control Sample (LCS)- a blank matrix with at least all of the target compounds needed for the batch. This sample is used to document laboratory performance including all of the extraction and analysis steps for each batch.

3.3 Matrix - the predominant material, component, or substrate (e.g., water or soil.) of which the sample to be prepared is composed.

3.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)- duplicate aliquots of sample are spiked with a known concentration of all target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix. The MSD is used as a measure of precision.

3.5 Method Blank (MB)- an analyte-free matrix to which all reagents are added in the sample volumes or proportions as used in sample processing. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

3.6 Percent Drift or Percent Difference (%D) - Used to compare two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference).

3.7 Sample - a portion of material to be analyzed that is contained in single or multiple containers and identified by a unique sample number.

3.8 Surrogates (Surrogate Standards) - an organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process. For semivolatiles and pesticides/Aroclors, surrogate compounds are added to every blank, sample, matrix spike, matrix spike duplicate, LCS, matrix spike blank, and standard. These are used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in environmental media.

3.9 Continuing Calibration Verification Standard (CCV) - A mid-level standard injected into the instrument at specified intervals and is used to verify the validity of the initial calibration.

3.10 Independent Calibration Verification Standard (ICV) – a mid-level standard injected into the instrument after the calibration curve from a different source than the standards in the curve and is used to verify the validity of the initial calibration.

3.11 Relative Percent Difference (RPD) – The absolute value of the difference of two values divided by the average of the same two values. Used to compare the precision of the analysis. The result is always a positive number.

3.12 Analysis Window - Samples are analyzed in a set referred to as "a window". In 625.1, this window is referred to as a “shift”. The window begins with the injection of the tune verification standard. Standards, required QC samples, and samples may be run until the close of this window (12 hours for 8260 and 15 hours for 625.1). A new window must be opened to continue analysis.

3.13 % Relative Standard Deviation (%RSD): statistical measure of variation. Used in this method to measure the relative variation of initial calibration standards. Calculated by dividing the standard deviation of the individual calibration factors by the average calibration factor and multiplying by 100 to express as a percentage.

3.14 Internal Standards – Internal standards are organic compounds which are similar to the analytes of interest, but which are not found in the samples. The chosen internal standards are used to calibrate the instrument’s response.

3.15 Preparation Batch – A group of 20 or fewer samples of the same matrix prepared together on the same day. See ADM-BATCH for further discussion.

3.16 Analytical Batch – A group of 20 or fewer samples analyzed together. See ADM-BATCH for further discussion.

3.17 Limit of Detection (LOD) – An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory – dependent. For DOD, the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.

3.18 Limit of Quantitation (LOQ) / Reporting Limit / MRL – The minimum levels, concentrations, or quantities of a target that can be reported with a specified degree of confidence. For DOD, the lowest concentration that produces a quantitative result within specified limits of precision and bias. The LOQ shall be set at or above the concentration of the lowest initial calibration standard

3.19 Target Analyte – a compound of interest for which the method is capable of measuring.

4) Health and Safety Warnings

4.1 All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

4.2 This method uses Methylene Chloride, a known human carcinogen. Viton brand gloves are good protection to use while rinsing, pouring or transferring the solvent.

4.3 Sodium Hydroxide (NaOH) is a strong caustic and a severe health and contact hazard. Use nitrile or latex gloves while handling pellets or preparing solutions.

4.4 Hydrochloric Acid is used in this method. These acids are extremely corrosive and care must be taken while handling them. A face shield should be used while pouring acids. And safety glasses should be worn while working with the solutions. Lab coat and gloves should always be worn while working with these solutions

4.5 Chemicals, reagents and standards must be handled as described in the company safety policies, approved methods and in MSDSs where available. Refer to the Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

4.6 The use of pressurized gases is required for this procedure. Care should be taken when moving cylinders. All gas cylinders must be secured to a wall or an immovable counter with a chain or a cylinder clamp at all times. Sources of flammable gases (e.g., pressurized hydrogen) should be clearly labeled.

4.7 Refer to the Safety Manual for further discussion of general safety procedures and information.

4.8 Waste Management and Pollution Prevention

- It is the laboratory’s practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when recycled or disposed of properly.
- The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the EH&S Manual.
- For further information see SMO-SPLDIS.

5) Cautions

5.1 Be sure glassware is clean – see EXT-GC.

6) Interferences

6.1 Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Determine if the source of interference is in the preparation of the samples. Corrective action should be taken to eliminate the interferences.

6.2 Accurate determination of phthalate esters can pose difficulties when using this methodology. Common flexible plastics contain varying amounts of phthalates. These phthalates are easily extracted or leached from such materials during laboratory operations. Cross contamination of clean glassware may occur when plastics are handled during extraction steps, especially when solvent-wetted surfaces are handled. Interferences from phthalates can best be minimized by avoiding contact with any plastic materials. Exhaustive cleanup of reagents and glassware may be required to eliminate background phthalate contamination. Follow glassware cleaning procedures in EXT-GC.

6.3 Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed out between samples with solvent. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of solvent to check for cross contamination.

7) Personnel Qualifications and Responsibilities

7.1 It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

7.2 Training – see ADM-TRAINING.

8) Sample Collection, Containers, Preservation, and Storage

8.1 Collect samples in purchased, precleaned, certified sample containers. Plastic containers or lids may NOT be used for the storage of samples due to the possibility of sample contamination from the phthalate esters and other hydrocarbons within the plastic. Sample containers should be filled with care so as to prevent any portion of the collected sample coming in contact with the sampler's gloves, thus causing contamination. Samples should not be collected or stored in the presence of exhaust fumes. If the sample comes in contact with the sampler (e.g., if an automatic sampler is used), run reagent water through the sampler and use the rinsate as a field blank.

8.2 Containers provided by the laboratory for:

8.2.1 Waters – 250 mL amber glass bottles with-Teflon lined caps. For Low level, collect 1000 mL.

8.2.2 Solid samples - 2 or 4 ounce glass jars with Teflon lined lids. Alternatively, soil samples may be received in brass sleeves prepared in the field.

8.2.3 Waste samples such as oils can be collected (received) in a variety of sample containers.

8.3 Water and Soil samples are to be iced or refrigerated to 0-6°C from the time of collection until extraction.

8.4 625.1 samples are to be checked for chlorine residual upon receipt. If chlorinated, dechlorinate with 0.008% sodium thiosulfate.

8.5 Holding Time - Water samples must be extracted within 7 days and the extracts analyzed within 40 days following extraction. Soil, non-aqueous liquids, and tissue samples must be extracted within 14 days and the extract analyzed within 40 days following extraction. These samples should be analyzed within a reasonable timeframe to meet the needs of the client.

8.6 Sample receipt, handling, and custody are discussed in SMO-GEN and SMO-ICOC.

9) Equipment and Supplies

9.1 Vials and caps - 20 mL scintillation vials with screw cap and aluminum foil liner, 2 mL capacity glass with crimp tops for GC auto sampler.

9.2 Pipets- glass, class A, volumetric 1 mL or 2 mL.

9.3 Gas Chromatograph/Mass Spectrometer System - See Appendix A of this SOP for Instrument Operating Conditions. Instruments are subject to change without updating this SOP. The instrument used for sample analysis is documented with the raw data.

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Year Acquired
R-MS-64	Gas Chromatograph	7890A	CN10923101	Used 2021
	Mass Spec Detector	HP5977A	US1352L201	
	AutoSampler	HP7683	CN51032422	
	Injector	HP7683	CN74143962	
	Computer Workstation	HP ProDesk NARCEWX015	MXL0122QBY	
	Firmware	GC A.01.16 MS 6.00.34		
	Analytical Software	Mass Hunter GCMS B.07.06.2704		
R-MS-65	Gas Chromatograph	8890 (G3542A)	US2051A032	2022
	Mass Spec Detector	5977B	US2151M037	
	AutoSampler	7693A	R021077008	
	Injector	G4513A	R022015070	
	Computer Workstation	HPZ2 SFF G5 NARCEWX035	MXL1413GFD	
	Firmware	GC 2.4.1.10 MS 6.00.34		
	Analytical Software	Mass Hunter V10		

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Year Acquired
R-MS-66 **For Low Level**	Gas Chromatograph	7890A	CN11451177	Used 2022 from Ft.Collins
	Mass Spec Detector	5975C Triple Axis	US11423931	
	AutoSampler	7693	CN11360005	
	Injector	G4513A	CN1139001	
	Computer Workstation	HP Elitedesk 800 G6 NARCEWX045	MXL2125MN3	
	Firmware	GC A.01.13 MS 5.02.14		
	Analytical Software	Chemstation G1701EA E.02.02.1431		
GC/MS 5973C **(R-MS-53)** **For Low level**	Gas Chromatograph	Agilent 6890N (G1530N)	US10232036	2002
	Mass Spec Detector	Agilent 5973 (G2578A)	US21853642	
	AutoSampler	Agilent 7683 (G2614A)	US00307019	
	Injector	Agilent 7683 (G2613A)	US81501041	
	Computer Workstation	Gateway P7-450	13645026	
	Analytical Software	HP Chemstation Enviroquant G1701 v.D.00.00.38		

9.3.1 Columns:

- Phenomenex Zebron ZB-Semivolatiles – 30m x 0.25 mm ID x 0.25 µm df fused-silica capillary column with a 5 meter guard column attached, or equivalent.
- Agilent HP5MS – 30m x 0.25 mm ID x 0.25 µm.

9.3.2 Appropriate analytical balance (0.0001 g) for standards preparation – calibrated according to ADM-DALYCK.

9.3.3 Volumetric flasks, syringes, vials, and bottles for standards preparation.

10) Standards and Reagents

10.1 General Information and Disclaimers

- All of the preparation instructions are general guidelines. Other technical recipes may be used to achieve the same results. Example – a 20 mg/L standard may be made by adding 1 mL of 200 mg/L to 10 mLs or may be made by adding 4 mL of 50 mg/L to 10 mL. The preparation depends upon the final volume needed and the initial concentration of the stock. Reasonable dilution technique is used.
- The initial calibration curves given are typical, but also subject to variation due to targets and detection levels needed. The curves will always be at least 5 points. The lowest concentration level shall be at the method reporting level. The remaining levels should define the working linear range of the analytical system.
- Vendors and vendors' products are sometimes listed for the ease of the analyst using this SOP, but products and purchased concentrations are examples only and subject to change at any time. All purchased standards are certified by the vendor. Certificates of Analysis are kept on file and are available upon request. Purchased standards are routinely checked against an independent source for both analyte identification and analyte concentration.
- All Standards must be traceable using the laboratory lot system (ADM-DATANTRY).
- Stock standard solutions-are purchased as certified solutions and expire per manufacturer recommendations. Protect all standards from light. Samples, sample extracts and standards must be stored separately.
- All standards should be stored below -10°C. They expire according to the Expiration Policy (ADM-PUR) if no other indication is given.

10.2 Solvents: Hexane, acetone, methylene chloride, methanol, and other appropriate solvents. Solvents must be of sufficient purity to permit usage without lessening the accuracy of the determination or introducing interferences. Solvents are to be checked for contamination before use. See ADM-PUR.

10.3 Standards

10.3.1 Internal Standard Solutions Purchased at 4000ppm - The internal standards are 1,4-dichlorobenzene-d4, naphthalene-d8, acenaphthene-d10, phenanthrene-d10, chrysene-d12, and perylene-d12 (See method for corresponding compounds). Each 1 mL sample extract undergoing analysis should be spiked with 10 µL of the internal standard solution, resulting in a concentration of 40 mg/L of each internal standard.

10.3.2 Surrogate Standards - Determine what concentration should be in the blank extracts after all extraction, cleanup, and concentration steps. Determine recovery of surrogate standards in all blanks, spikes, and sample extracts. Take into account all dilutions of sample extracts. If surrogates are diluted more than 10 times, report as "D", diluted below calibration.

10.3.3 Tune standard solution (50 ppm) – Add 1 mL of 1000 ppm purchased stock DFTPP to a 20 mL flask and dilute to volume with methylene chloride. For the tune, inject a quantity of this solution to equal 50 ng of DFTPP.

10.3.4 CCV Standard

Prepare 0.25 mL of 40 ppm calibration standard containing all semivolatile targets, including all required surrogates, and store in 2-mL autosampler vial. Add 2.5µL of 4000 ppm internal standard.

10.3.5 Surrogate

10.3.5.1 B/N Surrogate Mix 100 ppm (Nitrobenzene-d5, 2-fluorobiphenyl, Terphenyl-d14)

10.3.5.2 AE Surrogate Mix 200 ppm (2-fluorophenol, phenol-d6, 2,4,5-Tribromophenol)

10.3.5.3 Spike each sample with 0.1 mL surrogate solution for an on-column concentration of 10 ppm for BNs and 20 ppm for AEs.

10.3.6 LCS and MS Spiking Solution - Prepared 100ppm in methanol. All targets are routinely spiked in the LCS and MS/MSD.

Add 2.5mL alpha-terpineol 2000ppm, 2.5mL benzoic acid 2000ppm, 5mL 8270 mega mix to a 50mL flask and dilute to volume with methanol.

10.3.7 OLM/SOM additionals spike – prepared 100ppm in methanol.

Add 0.5mL 1,4-dioxane 10000ppm, 0.5mL 1,2,4,5 tetrachlorobenzene 5000ppm, 1mL 1,2,3,4-tetrachlorobenzene 5000ppm, 0.5mL 1-methyl-2-pyrrolidone 10000ppm, 2.5mL BNA additional mix to a 50mL flask and dilute to volume with acetone.

10.3.8 Low Level LCS and MS Spiking Solution - Prepared 4ppm in methanol. All targets are routinely spiked in the LCS and MS/MSD.

Add 4mL OLM/SOM additionals spike, 4mL 8270 spike to a 100mL flask and dilute to volume with methanol.

10.3.9 LCS and MB – prepare according to the appropriate extraction SOP. The LCS and MB are carried through all preparation and analysis steps.

10.4 Calibration Standards For Regular Level Analysis

Prepare 500 ppm calibration mid-stocks in methylene chloride

STD	Purchased Stock	Conc (PPM)	Volume of stock used (mL)	Final volume
1	BNA Surrogate	4000	0.5	4
	a,a-Dimethylphenylamine	2000	1	
	Atrazine	2000	1	
	Methyl Methanesulfonate	5000	0.4	
	Custom Semi-Volatile Mix	2000	1	
2	Custom Semi-Volatile Mix 2	2000	1	4
	n-nitrosodiethylamine	2000	1	
	4-chloroaniline	2000	1	
	8270 + APP IX Acid Cal	2000	1	
3	Safrole	1000	2	4
	1,4-Dioxane	10000	0.2	
	Methapyrilene/p-phenylenediamine	5000	0.4	
	Benzidines Mix #2	2000	1	
4	Benzoic Acid	5000	0.4	4
	Benzaldehyde	5000	0.4	
5 (special Phenols)	Custom Semivolatile Mix	2000	1	4
625 KO STD (200PPM)	625 Ko Custom Pesticide Mix 24	1000	1	5
	BNA Surrogate	4000	0.25	

Calibration Standards

Calibration STD	Volume(uL) of 500 PPM stocks (1,2,3,4 only)	Final Vol (mL)	amt of 4000ppm ISTD (uL)
1	2	1	10
2	4	1	10
5	10	1	10
10	10	0.5	5
20	20	0.5	5
40	20	0.25	2.5
60	30	0.25	2.5
80	40	0.25	2.5
100	50	0.25	2.5
ICV	40uL ICV Stocks #1/3, 20uL #2/4	0.25	2.5

ICV Standards
Prepare ICV STD mid-stocks with Second Sources from vendor.

Prepare 500 ppm calibration mid-stocks in methylene chloride.

STD	Purchased Stock	Conc (PPM)	Volume of stock used (mL)	Final volume
1	Appendix IX #2	1000	1	4
	Alpha-terpineol	2000	0.5	
	Dinoseb	1000	1	
2	Methapyriline	2000	1	4
	Benzidines mix	2000	1	
	Appendix IX Mix #1	2000	1	
	EPA 8270 Organophosphorous Pest Mix	2000	1	
3	1,2,3,4-Tetrachlorobenzene	1000	1	4
	8270 Mega mix	1000	1	
	Octachlorocyclopentene	1000	1	
	1-Methyl-2-pyrrolidinone	1000	1	
4	Benzoic Acid	2000	1	4

10.5 Calibration Standards for Low Level Analysis

Calibration STD		Final Vol (mL)	amt of 4000ppm ISTD (uL)
0.05	100ul of 0.5ppm	1	4.5
0.1	100uL of 1ppm	1	4.5
0.2	100uL of 2ppm	1	4.5
0.5	100uL of 5ppm	1	4.5
1	100uL of 10ppm	1	4.5
2	200uL of 10ppm	1	4
3	200uL of 15ppm	1	4
5	10uL Stocks 1,2,3,4	1	5
8	16uL Stocks 1,2,3,4	1	5
10	20uL Stocks 1,2,3,4	1	5
15	30uL Stocks 1,2,3,4	1	5
ICV	20uL ICV Stocks #1/3, 10uL #2/4	1	5

11) Method Calibration

11.1 Set up instrument with run conditions as attached in Appendix A.

11.2 Tuning –

11.2.1 Frequency – Verify that the MS meets standard mass spectral abundance criteria prior to initiation of any samples by injecting the DFTPP tune standard. The tune standard must be analyzed prior to initial calibration. For 8270D and 625.1, the tune standard must be analyzed at the beginning of the analytical sequence. All samples and QC must be analyzed within 12-hours (8270D) or 15-hours (625.1) of the tune injection. For 8270E. the tune standard is required only prior to initial calibration. Evaluate the ion abundance using the following scenarios:

11.2.2 Acquisition – Background subtraction is required and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak. Obtain the spectrum for evaluation using one of the following options:

- Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged.
- Use one scan at the apex of the peak.
- Use one scan either directly preceding or following the apex of the peak.
- Use the average across the entire peak up to a total of 5 scans. Peak integration must be consistent with standard operating procedure. If the peak is wider than 5 scans, the tune will consist of the peak apex scan and the two scans immediately preceding and following the apex.

11.2.3 Acceptance Criteria

11.2.3.1 Ion abundance - The GC/MS system must meet the DFTPP ion abundance criteria shown in Table 1. If hardware tuning criteria can not be met, the source may need cleaning, filaments replaced or other maintenance. Record the corrective action taken in the run log or maintenance log and re-inject the tune standard. The sample analysis may not proceed until the tune meets these criteria. If the tune file is adjusted, including adjusting the EM, a new ICAL is required for 8270E.

11.2.3.2 Breakdown Check - The GC/MS tuning standard solution should also be used to assess GC column performance and injection port inertness. Degradation of DDT to DDE and DDD should not exceed 20%.

Calculate percent breakdown as follows:

$$\%\ Breakdown = \frac{Total\ DDT\ degradation\ peak\ area\ (DDE + DDD)}{Total\ DDT\ peak\ area\ (DDT + DDE + DDD)} \times 100$$

11.2.3.3 Tailing Factor - Lastly, Benzidine and Pentachlorophenol should be present at their normal responses and the tailing factors must be equal or less than 2. The Tailing Factor is calculated at 10% peak height using the equation and diagram in Figure 1.

11.2.3.4 Corrective Action for Breakdown and Tailing Factor Checks - If degradation is excessive and/or poor chromatography is noted, the injection port may require cleaning. It may also be necessary to break off the first 6-12 in. of the capillary column. The use of a guard column between the injection port and the analytical column may help prolong analytical column performance.

11.3 Initial Calibration – Follow policies and practices in ADM-ICAL unless otherwise stated in this SOP.

11.3.1 Frequency - Each GC/MS system must be initially calibrated prior to conducting any sample analysis, whenever major instrument maintenance or modification is performed or if the calibration verification technical acceptance criteria have not been met.

11.3.2 Run an instrument blank to demonstrate that the instrument is free of contamination before analyzing the standards. The result must be less than the reporting limit.

11.3.3 At least 5 calibration points must be analyzed. More points are usually run to ensure proper response of poorly performing compounds. At least 6 points are required if quadratic fit is used. The lowest concentration level must be at or below the reporting level. The remaining levels define the working linear range of the analytical system. Starting with the lowest level, analyze each calibration standard and tabulate the area response of the characteristic quantitation ions vs. concentration for each compound, internal standard and surrogate. Typical calibration levels are given in the Standards and Reagents Section but may be modified to meet client requirements.

11.3.4 Retention time window position establishment – Retention time positions shall be set using the midpoint standard of the ICAL when ICAL is performed.

11.3.5 The internal standards should permit most of the components of interest in a chromatogram to have retention times of 0.80-1.20 relative to one of the internal standards. Use the base peak ion from the specific internal standard as the primary ion for quantitation (See instrument specific addendum - attached). If interferences are noted, use the next most intense ion as the quantitation ion (i.e. for 1,4-dichlorobenzene-d4, use 152 m/z for quantitation).

11.3.6 Analyze each calibration standard (containing internal standards) and tabulate the area of the primary characteristic ion against concentration for each compound, internal standard, and surrogate. The volume of the injection may vary, but will be the same between the ICAL and subsequent injections that are associated with that ICAL. Calculate response factors (RFs) for each compound relative to one of the internal standards as follows:

$$RF_x = \frac{(A_x)(C_{ISTD})}{(A_{ISTD})(C_x)}$$

Where: A_x =Area of the characteristic ion being measured.
A_{ISTD} =Area of the characteristic ion for the specified internal standard.
C_x =The concentration of the compound being measured (mg/L).
C_{ISTD} =The concentration of the specified internal standard (mg/L).

11.3.7 Calculate the % Relative Standard Deviation as follows:

$$\%RSD = \frac{SD}{\overline{RF}} \times 100$$

where:

RSD = relative standard deviation.
RF = mean of 5 initial RFs for a compound.
SD = standard deviation of average RFs for a compound.

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(RF_i - RF)^2}{N - 1}}$$

1

where:

RF_i = RF for each of the 5 calibration levels
N = Number of RF values (i.e., 5)

11.3.8 Initial Calibration criteria and corrective action

11.3.8.1 8270 and 625.1 - The percent relative standard deviation (%RSD) should be less than or equal to 20% for 8270 (DOD – all targets must meet criteria, which is<15% for DOD QSM 5.4 and <20% for DOD QSM 6.0) and must be less than or equal to 35% for 625.1 for each compound. See below for 8270 exceptions. The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units. If the % RSD for any target compound is within limits, linearity can be assumed over the calibration range, and the average relative response factor for each analyte and surrogate is used to quantitate sample analytes.

11.3.8.2 8270 - Compare the average RFs to the minimum RFs in Table 4. For 8270D, the minimum response factor should be met. For 8270E, the minimum RFs are for guidance only. . Be sure minimum RFs are met for critical targets before the calibration curve is used. If RFs are not acceptable, do maintenance; replace septa, liner, disks and/or cut 6-12" off the column and recalibrate. Samples associated with RFs which do not meet minimum limits must be flagged or narrated.

11.3.8.3 8270 - The % RSD should be less than or equal to 20% for each target compound. If ≥10% of the target compounds in the ICAL do not meet criteria, the curve is invalid and may not be used for quantitation. (See table 5 for DOD). Any target compounds >20%RSD must be ≤40%RSD if the curve is to be used for quantitation. Samples which historically do not have results above the reporting limit for the failing compound (>40%RSD) may be analyzed under a failing curve if a refit of the MRL standard is within 70-130%. If the samples do quantitate above the reporting limit, they must be repeated under a compliant curve. If failing compounds are known to be sensitive to a project, the samples in that project must be analyzed under an ICAL which meets 20%RSD (or >0.99 as described below). The evaluation of the %RSD meets the requirements for evaluation of the Relative Standard Error.

11.3.8.4 8270 and 625.1 - If the % RSD of any target compound is > limits, construct a linear regression calibration curve of area ratio (A/A_{is}) versus concentration, or the inverse of the concentration, using the equation of a line (see below). The origin (0,0) may not be used as a calibration point, but the regression may be forced through zero. The Correlation Coefficient must be ≥ 0.99 and a refit of the low standard into the curve should produce a result which meets 70-130% recovery. The MRL level standard needs to meet 50-150% recovery If the Calibration Correlation is not met, linear regression may not be used to quantitate the target. Non-linear calibrations may be used if they meet the requirements of 8000C. It is good lab practice to mark all target compounds on a curve to identify target compounds calculated using linear regression. Delaware HSCA does not allow linear regression nor quadratic curves.

This method of quantitation uses the equation of a line ($y=mx+b$).

where:

y = Instrument response (area ratio of sample to IS)

m = Slope of the line (also called the coefficient of x)

x = Concentration, or inverse of concentration, of the calibration standard

b = The intercept

11.3.8.5 ICV- inject and analyze the ICV to verify the initial calibration immediately after the curve. The percent recovery should meet 70-130% (80-120% for DOD QSM 5.4, but 70-130% for DOD QSM 6.0) for all target compounds. See ADM-ICAL. If an analyte's percent recovery is outside the limits, corrective action should be taken. Due to the poor performance of reactive compounds (including, but not limited to, benzaldehyde, Aniline, 2,2’-oxybis (1-chloropropane, atrazine, and benzidine), some failures in the ICV may arise. Analysis may continue if these targets are not detected in the samples. These are not typical targets. If the non-compliant targets are detected in the samples, recalibrate, obtain a compliant ICV, and reanalyze the samples.

11.3.9 Only after the calibration has passed all of the above criteria may samples be analyzed.

11.4 Daily GC/MS Calibration Verification (CCV)

11.4.1 Frequency – A calibration standard (CCV) must be analyzed daily before sample analysis and every window as described in the Tuning section. For DOD , a closing CCV is also required.

11.4.2 Concentration - DOD requires that the concentration be greater than the low point of the calibration and less than or equal to the mid-point calibration standard.

11.4.3 Limits and Corrective Action –

11.4.3.1 Minimum RF requirements for 8270D (guidance for 625.1 and 8270E) - For each target compound, the minimum response factor should meet the limits in Table 4. For those compounds known to be critical to a project, the minimum RF limits must be met. This is the same check that is applied during the initial calibration. If the minimum response factors are not met for critical targets, the system must be evaluated, corrective action must be taken, and a compliant CCV must be obtained before sample analysis begins. Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system. N-nitroso-di-n-propylamine; hexachlorocyclopentadiene; 2,4-dintro-phenol; and 4-nitrophenol typically have very low RFs and tend to decrease in response as the chromatographic system begins to deteriorate or the standard material begins to deteriorate. They are usually the first to show poor performance.

11.4.3.2 Calculate the %D for each compound using the calculations below.

- For linear regression calibration, calculate the percent drift

$$\% \, Drift = \frac{C_c - C_T}{C_T} \, x \, 100$$

using:
where:
C_c = Calculated concentration of Calibration Check Compound standard.
C_T = Theoretical concentration of prepared standard.

- For calibrations based on RF, calculate the percent difference using:

$$\% \, Difference = \frac{RF_v - \overline{RF}}{\overline{RF}} \, x \, 100$$

where RF_v is the response factor from the analysis of the verification standard and $\overline{RF}$ is the mean response factor from the initial calibration.

11.4.3.3 %D Limits: For target compounds, the %D should (must for DOD) meet ≤20%. For 625.1, the limit is 30%D. Analysis may continue if up to 20% of the compounds included in the initial calibration are >20%D. Those that fail must be within 40%D. If failing compounds are known to be sensitive to a project, those samples must be repeated under a compliant CCV. If the CCV fails with a high bias, all associated non-detect samples may be reported, even if the MB or LCS fails high or if >20% of the compounds failed. Any samples with hits that are associated with a CCV>20%D must be flagged or analyzed under a compliant CCV. For the DOD QSM 5.4/6.0, the closing CCV limits are 50-150% recovery for the targets of interest. For DOD QSM 5.4, the corrective action exception for high bias CCV with non-detect samples does not apply unless this SOP is superseded by a project-specific QAP. For DOD QSM 6.0, high bias CCVs with non-detect samples may be reported with a qualifier (M4 7.1.2.f.iv.a).

11.4.3.4 If a CCV fails, a return to control must be demonstrated before samples are analyzed. A second CCV may be analyzed immediately following the first. If the second CCV fails to produce results within acceptance criteria, then either

- perform and document corrective action and then demonstrate acceptable performance with two consecutive CCVs, or
- perform a new ICAL

11.4.3.5 For DOD, if any CCV fails criteria for the target compounds with the analytical sequence;

Recalibrate and re-analyze all affected samples, or

Immediately analyze two consecutive CCVs, and if both pass, the samples may be reported without re-analysis or qualification. Immediately is defined as beginning within 1-hour of failed CCV, otherwise sample analyses cannot be used. If either fails, or if two consecutive CCVs cannot be run, perform corrective action(s) and repeat CCV and all associated DOD samples since last successful CCV.

Corrective Action - For DOD QSM 6.0 - if a CCV fails and there is an assignable cause isolated only to the CCV, one CCV may be reanalyzed immediately (within one hour and no samples analyzed). IF the immediate CCV is acceptable, proceed with analysis. Sample reanalysis is not required. Otherwise, correct problem an analyze passing CCV or recalibrate. All affected samples since last passing CCV shall be reanalyzed. If samples cannot be reanalyzed, apply qualifier to affected results and explain in the case narrative.

If outlying CCV analyses are to be reported with DOD samples, the client must be notified prior to reporting.

11.4.4 Qualification - When any data is reported with a non-compliant CCV, the CCV is flagged in the report and explained in the case narrative. For DOD, the laboratory must notify the client prior to reporting data associated with a noncompliant CCV. For DOD, data reported with a non-compliant CCV must be Q-flagged and explained in the case narrative. Reporting samples with an unacceptable CCV is only appropriate in cases where the samples cannot be reanalyzed.

11.4.5 Internal Standards Verification -

11.4.5.1 Internal standard retention time – the retention times of the internal standards in the CCV must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from that in the mid-point standard level of the ICAL, then the chromatographic system must be inspected for malfunctions and corrections must be made, as required. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is required.

11.4.5.2 Internal standard response - If the EICP area for any of the internal standards changes by a factor of two (-50% to +100%) from the mid-point standard of the ICAL, correct the problem – recalibration may be required. Once corrections have been made, reanalysis of associated samples is required unless a matrix interference can be clearly demonstrated by the first analysis and associated results from each outlying Internal Standard shall be flagged as estimated.

12) Sample Preparation and Analysis

12.1 Sample Preparation - Samples may be prepared using any of the following SOPs, depending upon requirements of the sample matrix and/or client request:

EXT-3510C	EXT-3541
EXT-3546	EXT-3620B
EXT-3660B	EXT-3580

12.2 GC/MS Analysis and Evaluation

12.2.1 Analyze sample and QC in an analytical batch in compliance with the frequency requirements in ADM-BATCH and this SOP.

12.2.1.1 If a daily analytical sequence will not include an extracted MB, analyze an instrument blank with the opening QC to demonstrate instrument cleanliness prior to sample analysis. The instrument blank has the same acceptance criteria as the MB. If the instrument blank fails, correct the problem and obtain an acceptable instrument blank before continuing analysis.

12.2.2 Spike the 1 mL extract obtained from sample preparation with 10 µL of the internal standard solution just prior to analysis. Use the same operating conditions as was used for initial calibration. Verify the internal standards for each sample, standard, and QC sample as per the QC Section.

12.2.3 Dilutions - If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, extract dilution must take place. Additional internal standard must be added to the diluted extract to maintain the required 40 ng/µL of each internal standard in the extracted volume. The diluted extract must be reanalyzed. Dilutions are performed as per the company ADM-DIL SOP.

12.2.4 Check for possible carryover. Pay particular attention to situations where samples containing low levels of target analyte were analyzed one or two injections after samples containing levels of target analyte near or over the high end of the calibration range. Reanalyze as needed to confirm.

12.2.5 If the software integrates a peak incorrectly, follow the policies and procedures for manual integration in ADM-INT.

12.2.6 Store the extracts at <-10°C, protected from light in screw-cap vials equipped with unpierced Teflon lined septa. Archive extract in freezer for 3 months after analysis.

12.3 Data Interpretation

12.3.1 The qualitative identification of compounds determined by this method is based on retention time, and comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds should be identified as present when the criteria below are met. If there is no peak found for an analyte in the expected retention time window and the mass spectra does not match according to the below, then the analyte is "not found".

12.3.1.1 The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion. See Table 2 for method-recommended ions for each analyte.

12.3.1.2 The RRT of the sample component is to be within ± 0.06 RRT units of the RRT of the standard component. If the RRT has changed by more than 0.06 RRT units since the last update, this indicates a significant change in system performance and corrective action must be taken and the ICAL must be rerun to reestablish the retention times. Calculation and evaluation are performed in a separate spreadsheet. Calculation of the RRT:

$$RRT = \frac{RT\ of\ analyte}{RT\ of\ Internal\ Stndard}$$

12.3.1.3 For each sample after the opening CCV, the retention time of the internal standards must be within ±10 seconds of the retention time of the internal standard in the opening CCV (or midpoint standard of the ICAL if RTs are not updated with the CCV). If any internal standard retention time is not within the limits, inspect the system for malfunctions and correct the problem. Once the system is stable and retention times are re-established, reanalyze samples that were run while the system was malfunctioning. .

12.3.1.4 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum (8270) or within half to double (625.1). If ambiguous, an experienced spectrometrist must determine the presence or absence of the compound.

12.3.1.5 Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 50% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

12.3.1.6 Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important.

12.3.1.7 Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes coelute (i.e., only one chromatographic peak is apparent), the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.

12.3.2 TICs - For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. When repeating samples for overrange (DL), the library search does not need to be re-performed, but when analyzing re-extracts, the library search is to be performed. Use the following guidelines for making tentative identifications:

12.3.2.1 Major ions in the library reference spectrum (ions greater than 10% of the most abundant ion) are present in the sample spectrum at similar relative intensities.

12.3.2.2 The molecular ion in the library reference spectrum is present in the sample spectrum. If the molecular ion is not present, carefully review library matches in order to avoid misidentification.

12.3.2.3 Major ions present in the sample spectrum but not in the reference spectrum are reviewed to determine whether they may be contributed by co-eluting compounds.

12.3.2.4 Ions present in the reference spectrum but not in the sample mass spectra are reviewed for unintended subtraction. Data system library reduction programs can sometimes create these discrepancies.

12.3.3 Mass spectral library search algorithms typically assign a match factor to the peak identity based on comparison of an unknown mass spectrum to library spectra. For spectra meeting the above conditions, match factors greater than 0.8 (80%) may be considered confirming evidence. Where a known limitation in data collection is identified (e.g., the presence of an incompletely resolved spectral interference), a lower match factor may be considered confirmatory. For multiple library spectra with similar match factors (e.g., hydrocarbons with low abundance molecular ions, or structural isomers), the tentative identification assigned to the unknown may be better represented as a more generic structure (e.g, unknown hydrocarbon, C4 benzene structural isomer

12.3.4 .

12.3.5 If the detector becomes saturated from a high concentration sample run a blank after the sample to demonstrate the instrument is free from carry-over. If there is contamination, take corrective action. The instrument must be demonstrated to be free from contamination before analysis may continue.

13) Troubleshooting

13.1 Glass Insert/ Sleeve- Replace as needed. The insert should always be replaced before a new calibration and the o-ring should be replaced with the insert. Indicators include:

- A significant or sudden change in chromatography, or
- Difficulty in meeting % deviation criteria for a calibration check, or
- Reduced sensitivity to key compounds (Nitrophenols, Hexachlorocyclopentadiene) is the best symptom of a dirty injector.

13.2 Septum - Replaced approximately every 150 injections. A retention time shift or poor baseline chromatography is a common symptom.

13.3 Autosampler syringe - Cleaned daily and after samples with a particularly bad matrix. The syringe should be rinsed with methylene chloride; the plunger is rinsed, wiped with a Kimwipe, and rinsed again. The syringe should be replaced with a new one if loose action is noted or inconsistent action is evident (uniform fluctuation in response, area counts) or obvious wear.

13.4 Injection Port - The port and the port/column interface should be cleaned as needed (when replacing the insert is ineffective and in conjunction with column pruning). Port should be reamed with a wire brush and swabbed with methylene chloride. Disc and washer can be sonicated in methylene chloride and then baked in the kiln at 400 °C for 30 minutes, but should be replaced if wear is evident. The capillary inlet should also be cleaned in methylene chloride and the septum nut is sonicated in methylene chloride also.

13.5 Column Pruning - Cut back one revolution as needed. Indicators are same as insert replacement and is another remedy if insert replacement does not yield the desired results. After initial cut a graphite ferrule should first be installed and then another short length of column removed (cut should be carefully examined for smoothness - no jagged edges). The column end should extend 6 mm past the ferrule when installed (use the white out or septum marking method for reference).

13.6 Column Replacement - As needed, usually every 2-3 months for moderate sample volumes. Symptoms are ineffectiveness of insert replacement, injector cleaning, or column pruning to rectify a problem or when resolution becomes difficult (such as key isomeric pairs: anthracene/ phenanthrene, chrysene/ benzo(a)anthracene, and benzo (b)/benzo(k)fluoranthene). All ferrules replaced with column change.

13.7 Syringe Rinse Solvent - Supply is replenished as needed. Old solvent is discarded and vial rinsed before refilling. Rinse waste and sample waste vials are replaced when residue appears.

13.8 Carrier Gas - Tank is changed before pressure reaches approximately 200psi to avoid impurities that may be delivered by a nearly empty tank. Leak check with snoop after change.

13.9 System Baking - When the system is to be idle oven temperature should be set to 100°C to avoid water vapor condensation in column. Baking of injector, column, interface may be done for short periods of time to eliminate contaminants due to sample matrix residuals. Temperatures should not exceed recommended column temperature limits.

13.10 Source Cleaning - Performed on an as-needed basis. Source is cleaned/replaced when persistent difficulty in meeting and maintaining acceptable DFTPP tune checks is encountered. This is indicated by : 1.) reduced high-mass sensitivity (DFTPP m/z 365<1% of 198 or PFTBA m/z 502<0.5%) 2.) High EM setting resulting in excessive signal and inconsistent response in both tune file and instrument methods. A dirty source can sometimes be diagnosed by jagged lens-ramp plots in addition to tune difficulties. The procedure for removing and cleaning the ion source is followed as in the instrument Manual.

13.11 Electron Multiplier - Preventive Maintenance or replacement as needed. Method of cleaning and conditioning a new EM can be found in accompanying literature from the manufacturer (Channeltron/Galileo). Cleaning is usually necessary when source replacement is not having a significant effect on instrument sensitivity. Replacement of the EM is necessary when cleaning does not yield the desired results, or when there is a catastrophic event (outlined in literature).

13.12 Leak Detection - A manual tune should be monitored at set intervals for peak characteristics of air leakage (abundance of ions corresponding to N2, H2O, O2), or an Ion gauge reading taken regularly can show changes in vacuum. Proper Ion gauge readings should be in the 10-5 - 10-6 torr range.

13.13 Internal Standard Syringe - Rinsed with methylene chloride before and after use. The Teflon tip is checked for wear regularly and the tip, plunger or entire syringe is replaced when necessary.

13.14 Splitless Liner Preparation - Remove dirty glass wool plug. Solvent rinse splitless liner with methylene chloride, pack with glass wool to an approximate 5mm thickness and then bake in the kiln at 400 °C for one hour.

13.15 Maintenance log - All Preventive maintenance, as well as instrument repair, should be documented in the appropriate instrument maintenance log. Most routine maintenance and troubleshooting are performed by laboratory staff. Other maintenance or repairs may, or may not require factory service, depending upon the nature of the task. Any maintenance performed by outside services must also be documented – either through notes in the log or through documents provided by the service. The log entries will include the date maintenance was performed, symptoms of the problem, serial numbers of major equipment upgrades or replacements. The datafile name of the first acceptable run after maintenance is to be documented in the maintenance log

14) Data Acquisition

14.1 The data acquired is transferred via Chemstation™ to LIMS electronically. PDF printouts are handled in the Annotator.

14.2 Specifics pertaining to data review are contained in ADM-DREV.

14.3 Data reporting is handled by the LIMS and Labcoat. More information is in ADM-RG.

15) Calculations and Data Reduction Requirements

15.1 Sample concentrations are reported in µg/L for waters and µg/kg for soils and other non-aqueous samples. For DOD, J-flag all results between the LOD and the LOQ.

15.2 The GC/MS data stations, in current use, all use the H-P RTE Integrator to generate the raw data used to calculate the standards $\overline{RF}_x$ values, the sample amounts, and the spike values. The software does three passes through each data file. The first two identify and integrate each internal standard and surrogate. The third pass uses the time-drift information from the first two passes to search for all method analytes in the proper retention times and with the proper characteristic quantitation ions. The eicp and secondary quantitation ions are given in Table 2. The internal standard with which the analytes are associated changes with each column and is documented in the Initial Calibration Summary Report.

15.3 Calculations: Once an analyte has been identified, the quantitation of that analyte is calculated as follows, depending upon matrix. See Table 3 for list of internal standards used for quantitation and their associated analytes.

15.4 Internal standard calibration

15.4.1 Aqueous samples

$$\text{Concentration } (\mu g/L) = \frac{(A_s)(C_{is})(D)(V_t)}{(A_{is})(\overline{RF})(V_s)(V_i*)}$$

Where:

A_s = Area (or height) of the peak for the analyte in the sample.

A_{is} = Area (or height) of the peak for the internal standard.

C_{is} = Concentration of the internal standard in the concentrated sample extract in mg/L.

D = Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution was made, D=1. The dilution factor is always dimensionless.

V_i= Volume of the extract injected (µL). The nominal injection volume for samples and calibration standards must be the same. *****V_i is not used in the equation. V_i is not needed when a mass/volume concentration (mg/L) is used for C_{is} . V_i is needed if only the mass (ng) is used for C_{is}.

$\overline{RF}$ = Mean response factor from the initial calibration. Unlike calibration factors for external standard calibration, the response factor is dimensionless.

V_s = Volume of the aqueous sample extracted or purged (mL). If units of liters are used for this term, multiply the results by 1000.

V_t = Volume of the concentrated extract (uL)

Using the units specified here for these terms will result in a concentration in units of mg/L ÷ 1000, which is equivalent to µg/L.

15.4.2 Soil and Nonaqueous samples

$$\text{Concentration } (\mu g/kg) = \frac{(A_s)(C_{is})(D)(V_t)}{(A_{is})(\overline{RF})(W_s)(V_i*)}$$

Where:

A_s, A_{is}, C_{is}, D, V_i, V_t, and $\overline{RF}$ are the same as for aqueous samples, and

W_s = Weight of sample extracted (g). Either a dry weight or wet weight may be used, depending upon specific application of the data. If units of kilograms are used for this term, multiply the results by 1000.

15.5 Linear Regression

If a linear calibration that does not pass through the origin has been employed, then the regression equation is rearranged and the concentration of the analyte is calculated from the area response (y), the slope (a), and the intercept (b). When using this form of linear calibration, it is the laboratory's responsibility to ensure that the calculations take into account the volume or weight of the original sample, the dilution factor (if any), and dry weight (as applicable). One approach to this calculation is to perform the original linear regression using the concentration of the analyte in the final extract volume or the volume purged. The concentration of the analyte in the sample may then be calculated as follows:

15.5.1 Aqueous samples

$$\text{Concentration } (\mu g/L) = \frac{(C_{ex})(D)(V_t)}{(V_s)}$$

where:

C = Concentration in the final extract (mg/L)

D = Dilution factor

V_t = Volume of the concentrated extract (uL)

V_s = Volume of the aqueous sample extracted (mL). If units of liters are used for this term, multiply the results by 1000.

15.5.2 Non-Aqueous samples

For solid samples, substitute the weight of the sample, W, for V_s.

15.6 Sample concentrations are reported when all QC criteria for the analysis have been met or the results are qualified with a footnote.

15.7 Data reporting and review is handled by a computerized LIMS System. Specifics pertaining to reporting and review are discussed in ADM-DREV. Method 8270 samples are reported to 2 significant figures. Method 625.1 samples are reported to 3 significant figures. Exceptions apply near the reporting limit – see ADM-Sigfig. Method 625.1 samples must be reported to the MDL.

16) Quality Control, Acceptance Criteria and Corrective Action

16.1 Frequency of QC Samples - Method blanks, laboratory control samples, and matrix spikes are prepared one per extraction batch of 20 or fewer samples. See ADM-BATCH. Client specific QC requirements shall always be considered for matrix-specific QC.

16.2 Acceptance Criteria and Corrective Action for QC Samples

16.2.1 LCS/LCSD – To establish accuracy and precision for all target compounds within the batch, the LCS is typically extracted in duplicate (LIMs limitation to report compounds not requested on client QC).

16.2.1.1 Limits – Recovery Acceptance criteria is listed in the Data Quality Objectives Table under the appropriate method. If LCSD is used to evaluate precision, use the limits for Duplicates (RPD). Both the LCS and the LCSD must meet recovery limits. Client –specific QAPP requirements and Program requirements (DOD QSM, MASS CAM, etc) supersede lab control limits listed in the DQO Table. The project manager must associate the job with the correct limits in LIMS. The associated limits for each Folder are available to the analyst through LIMS.

16.2.1.2 Results from both LCS and LCSD shall be reported. Do not report a combination of the two LCSs as a single LCS.

16.2.1.3 Corrective Action - if the acceptance criteria are not met for the control analytes, correct the problem, then reextract and reanalyze the batch or complete a Nonconformity Form (NCAR) to qualify these data in the case narrative. Non-detect sample results associated with a high recovery may be reported without qualification, except for DOD QSM5.4.

16.2.2 MS/MSD –

16.2.2.1 Limits - Acceptance criteria for precision and recovery is listed in the Data Quality Objectives Table under the appropriate method. Acceptance criteria for DOD is the same as LCS criteria.

16.2.2.2 Corrective Action - If the acceptance criteria for recovery is not met, but the LCS is in control, assume matrix interference, note the matrix interference in the case narrative and flag the specific analytes in the parent sample. RPD – If the RPD between MS/MSD is out of limits, repeat unless there is assignable matrix interference, historical failures, or lack of volume. If the pair is not repeated, note the reason on the data quality checklist. Examples may include product layers on aqueous samples that may result in non-homogenous subsampling, non-homogenous soil samples, chromatographic interferences resulting in poor peak resolution and inconsistent integrations, or poor purging efficiencies (indicated by surrogate recovery). The outlying RPD should be mentioned in the Case Narrative so that data may be flagged appropriately.

16.2.3 MB -

16.2.3.1 Limits - The method blank must demonstrate that interferences from the analytical and preparation steps are under control. No target analytes should be detected above the ½ MRL for 8270, 1/2 LOQ for DOD, 1/3 MRL for 625.1, with the exception of common laboratory contaminants, such as phthalates. Phthalates must not be present at a level greater than the MRL for 8270, >LOQ for DOD, >MRL for 625.1.

16.2.3.2 Corrective Action - If targets are detected greater than the acceptance criteria, re-extract the batch or flag the data appropriately. Flagging is only appropriate in cases where the samples cannot be reanalyzed. Non-detect samples associated with a contaminated MB may be reported without qualification. Samples with results greater than 10 times the contamination may be reported without qualification.

16.2.4 Surrogates

16.2.4.1 Frequency – Added to all client samples and QC samples.

16.2.4.2 Limits – see the Data Quality Objectives Table or client QAPP.

16.2.4.3 Corrective Action

- If surrogates are diluted more than 10 times, report as "D", diluted below calibration. For package reports, include initial and confirmation analysis results. High outlying recoveries associated with non-detect sample results need not be re-extracted. They need only be noted in the case narrative as high bias with non-detect results.
- If any of the surrogate compounds fail to meet the recovery acceptance criteria, check calculations, sample preparation logs, the surrogate compound spiking solutions, and the instrument operation. If the calculations were incorrect, correct the calculations and verify that the surrogate compound recoveries meet their acceptance criteria. If no surrogate spiking solution was added or if the surrogate spiking solution was improperly prepared, concentrated, or degraded, re-extract and reanalyze the samples. If the instrument malfunctioned, correct the instrument problem and reanalyze the sample extract. Sample results shall be reported from analysis in which both surrogates have acceptable recovery, unless matrix interferences are present.
- If the above actions do not correct the problem, then the problem may be due to a sample matrix effect. To determine if there was matrix effect, take the following corrective action steps.
    - Re-extract and reanalyze the sample. EXCEPTION: If surrogate compound recoveries in a sample used for a matrix spike and/or matrix spike duplicate were considered unacceptable, then it should be re-extracted/ re-analyzed only if surrogate compound recoveries met the surrogate acceptance criteria in both the matrix spike and matrix spike duplicate.
    - If the surrogate compound recoveries meet acceptance criteria in the re-extract/reanalyzed sample then the problem was within the

Laboratory's control. Therefore, submit only data from the re-extraction/reanalysis.

- If the surrogate recoveries fail to meet the acceptance criteria in the re-extracted/reanalyzed sample, then submit data from both analyses. Distinguish between the initial analysis and the re-extraction/ reanalysis on all.

16.2.5 Internal Standards Verification - The internal standard responses and retention times in every standard, sample, and QC sample must be evaluated against the most recent CCV (the internal standards in the CCV are evaluated against the midpoint of the ICAL). If the retention time for any internal standard changes by more than 10 seconds from the last CCV, the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (-50% to +100%) from the last CCV correct the problem – recalibration may be required. Once corrections have been made, reanalysis of associated samples is required unless a matrix interference can be clearly demonstrated by the first analysis and associated results from each outlying Internal Standard shall be flagged as estimated.

16.2.6 Ongoing verification of the LOD and LOQ are required. See ADM-MDL for requirements.

17) Data Records Management

The Internal Standards are added by the instrument analyst and the official record of the addition is the analytical Runlog. When the preparation benchsheet is finalized by the extraction analyst, it does not include the internal standard. Due to a limitation in LIMS, when the instrument analyst adds the internal standard in LIM, the internal standard will show on the preparation benchsheet report if repulled from LIMS. This should not be construed as being added at preparation.

Records are maintained according to ADM-ARCH.

18) Contingencies for Handling Out of Control Data

- If data is produced that is out of control and is not to be re-analyzed due to sample volume restrictions, holding times, or QC controls cannot be met, flag and narrate appropriately.

19) Method Performance

19.1 Detection and Quantitation limits are determined for each type of matrix commonly analyzed. Determine limits according to the requirements in ADM-MDL. The supporting information is filed with the QA office.

19.2 Demonstration of Capability is performed according to ADM-TRAINING.

19.3 Accuracy and Precision Data is available in the referenced method.

20) Summary of Changes

- Changed holding time of NAQ from none to 14/40
- 10.3 – updated preparations of tune standard, CCV, LCS/MS, as well as spiking amounts for surrogate. Added OLM additionals spike and updated LL LCS spike.
- 10.4 and 10.5 – Updated tables to current practice.
- 11.3.8.3 – Added that eval of RSD meets eval of RSE.
- Appendix – Added parameters for LL on 66.

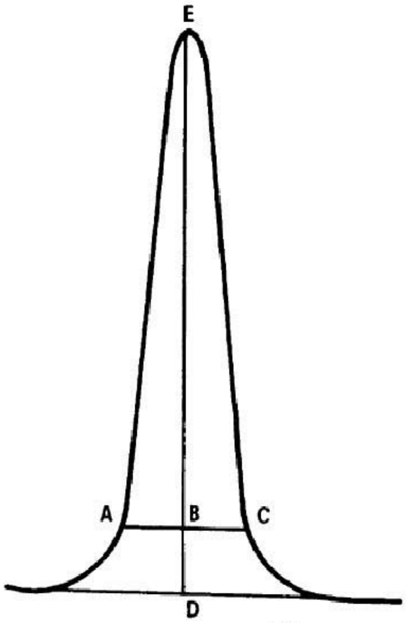
21) References and Related Documents

- Method 8270D Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA SW-846, February 2007.
- Method 8270E Rev. 6 Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA SW-846, June 2018.
- Method 8000C Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA SW-846, March 2003
- Method 625.1: Base/Neutrals and Acids by GC/MS, EPA 821-R-16-007 December 2016, 40 CFR Part 136 August 28, 2017.
- Department of Defense (DOD) Quality Systems Manual (QSM) for Environmental Laboratories. Version 5.4, 6.0 or most current.
- Massachusetts Compendium of Analytical Methods (CAM), Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup, July 1, 2010.
- Standard Operating Procedures for Chemical Analytical Programs Under the Hazardous Substance Cleanup Act, Delaware Department of Natural Resources and Environmental Control Site Investigation and Restoration Branch. January 2010.

22) Appendix

- Figure 1 Tailing Factor Calculation
- Table 1 DFTPP Key Ions and Abundance Criteria
- Table 2 Characteristic Ions for SemiVolatile Compounds
- Table 3 SemiVolatile Internal Standards with Corresponding Analytes Assigned for Quantitation
- Table 4 Minimum RFs
- Table 5 Quality Control Summary
- Appendix A – Instrument Operating Conditions

FIGURE 1
TAILING FACTOR CALCULATION



$$\text{TAILING FACTOR} = \frac{BC}{AB}$$

Example calculation: Peak Height = DE = 100 mm
10% Peak Height = BD = 10 mm
Peak Width at 10% Peak Height = AC = 23 mm
AB = 11 mm
BC = 12 mm

Therefore: Tailing Factor $= \frac{12}{11} = 1.1$

TABLE 1
DFTPP KEY IONS AND ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
68	< 2% of mass 69
69	Present (Base Peak)
70	< 2% of mass 69
197	< 2% of mass 198
198	Present (Base peak)
199	5-9% of mass 198
365	> 1% of mass 198
441	< 150% of mass 443
442	Present (Base peak)
443	15-24% of mass 442

TABLE 2
CHARACTERISTIC IONS FOR SEMIVOLATILE COMPOUNDS

Compound	Primary Ion	Secondary Ion(s)
2-Picoline	93	66,92
Aniline	93	66,65
Phenol	94	65,66
Bis(2-chloroethyl) ether	93	63,95
2-Chlorophenol	128	64,130
1,3-Dichlorobenzene	146	148,111
1,4-Dichlorobenzene-d_4 (IS)	152	150,115
1,4-Dichlorobenzene	146	148,111
Benzyl alcohol	108	79,77
1,2-Dichlorobenzene	146	148,111
N-Nitrosomethylethylamine	88	42,43,56
Bis(2-chloroisopropyl) ether	45	77,121
Ethyl carbamate	62	44,45,74
Thiophenol (Benzenethiol)	110	66,109,84
Methyl methanesulfonate	80	79,65,95
N-Nitrosodi-n-propylamine	70	42,101,130
Hexachloroethane	117	201,199
Maleic anhydride	54	98,53,44
Nitrobenzene	77	123,65
Isophorone	82	95,138
N-Nitrosodiethylamine	102	42,57,44,56
2-Nitrophenol	139	109,65
2,4-Dimethylphenol	122	107,121
p-Benzoquinone	108	54,82,80
Bis(2-chloroethoxy)methane	93	95,123
Benzoic acid	122	105,77
2,4-Dichlorophenol	162	164,98
Trimethyl phosphate	110	79,95,109,140
Ethyl methanesulfonate	79	109,97,45,65
1,2,4-Trichlorobenzene	180	182,145
Naphthalene-d_8 (IS)	136	68
Naphthalene	128	129,127
Hexachlorobutadiene	225	223,227
Tetraethyl pyrophosphate	99	155,127,81,109
Diethyl sulfate	139	45,59,99,111,125
4-Chloro-3-methylphenol	107	144,142
2-Methylnaphthalene	142	141
2-Methylphenol	107	108,77,79,90
Hexachloropropene	213	211,215,117,106,141
Hexachlorocyclopentadiene	237	235,272
N-Nitrosopyrrolidine	100	41,42,68,69
Acetophenone	105	71,51,120
3/4-Methylphenol[b]	107	108,77,79,90

TABLE 2 (cont.)
CHARACTERISTIC IONS FOR SEMIVOLATILE COMPOUNDS

Compound	Primary Ion	Secondary Ion(s)
2,4,6-Trichlorophenol	196	198,200
o-Toluidine	106	107,77,51,79
2-Chloronaphthalene	162	127,164
N-Nitrosopiperidine	114	42,55,56,41
1,4-Phenylenediamine	108	80,53,54,52
1-Chloronaphthalene	162	127,164
2-Nitroaniline	65	92,138
5-Chloro-2-methylaniline	106	141,140,77,89
Dimethyl phthalate	163	194,164
Acenaphthylene	152	151,153
2,6-Dinitrotoluene	165	63,89
Phthalic anhydride	104	76,50,148
o-Anisidine	108	80,123,52
3-Nitroaniline	138	108,92
Acenaphthene-d_{10} (IS)	164	162,160
Acenaphthene	154	153,152
2,4-Dinitrophenol	184	63,154
2,6-Dinitrophenol	162	164,126,98,63
4-Chloroaniline	127	129,65,92
Isosafrole	162	131,104,77,51
Dibenzofuran	168	139
2,4-Diaminotoluene	121	122,94,77,104
2,4-Dinitrotoluene	165	63,89
4-Nitrophenol	139	109,65
2-Naphthylamine	143	115,116
1,4-Naphthoquinone	158	104,102,76,50,130
p-Cresidine	122	94,137,77,93
Dichlorovos	109	185,79,145
Diethyl phthalate	149	177,150
Fluorene	166	165,167
2,4,5-Trimethylaniline	120	135,134,91,77
N-Nitrosodi-n-butylamine	84	57,41,116,158
4-Chlorophenyl phenyl ether	204	206,141
Hydroquinone	110	81,53,55
4,6-Dinitro-2-methylphenol	198	51,105
Resorcinol	110	81,82,53,69
N-Nitrosodiphenylamine	169	168,167
Safrole	162	104,77,103,135
Hexamethyl phosphoramide	135	44,179,92,42
3-(Chloromethyl)pyridine hydrochloride	92	127,129,65,39
Diphenylamine	169	168,167
1,2,4,5-Tetrachlorobenzene	216	214,179,108,143,218
1-Naphthylamine	143	115,89,63
1-Acetyl-2-thiourea	118	43,42,76
4-Bromophenyl phenyl ether	248	250,141

TABLE 2 (cont.)

CHARACTERISTIC IONS FOR SEMIVOLATILE COMPOUNDS

Compound	Primary Ion	Secondary Ion(s)
Toluene diisocyanate	174	145,173,146,132,91
2,4,5-Trichlorophenol	196	198,97,132,99
Hexachlorobenzene	284	142,249
Nicotine	84	133,161,162
Pentachlorophenol	266	264,268
5-Nitro-o-toluidine	152	77,79,106,94
Thionazine	107	96,97,143,79,68
4-Nitroaniline	138	65,108,92,80,39
Phenanthrene-d_{10} (IS)	188	94,80
Phenanthrene	178	179,176
Anthracene	178	176,179
1,4-Dinitrobenzene	168	75,50,76,92,122
Mevinphos	127	192,109,67,164
Naled	109	145,147,301,79,189
1,3-Dinitrobenzene	168	76,50,75,92,122
Diallate (cis or trans)	86	234,43,70
1,2-Dinitrobenzene	168	50,63,74
Diallate (trans or cis)	86	234,43,70
Pentachlorobenzene	250	252,108,248,215,254
5-Nitro-o-anisidine	168	79,52,138,153,77
Pentachloronitrobenzene	237	142,214,249,295,265
4-Nitroquinoline-1-oxide	174	101,128,75,116
Di-n-butyl phthalate	149	150,104
2,3,4,6-Tetrachlorophenol	232	131,230,166,234,168
Dihydrosaffrole	135	64,77
Demeton-O	88	89,60,61,115,171
Fluoranthene	202	101,203
1,3,5-Trinitrobenzene	75	74,213,120,91,63
Dicrotophos	127	67,72,109,193,237
Benzidine	184	92,185
Trifluralin	306	43,264,41,290
Bromoxynil	277	279,88,275,168
Pyrene	202	200,203
Monocrotophos	127	192,67,97,109
Phorate	75	121,97,93,260
Sulfallate	188	88,72,60,44
Demeton-S	88	60,81,89,114,115
Phenacetin	108	180,179,109,137,80
Dimethoate	87	93,125,143,229
Phenobarbital	204	117,232,146,161
Carbofuran	164	149,131,122
Octamethyl pyrophosphoramide	135	44,199,286,153,243
4-Aminobiphenyl	169	168,170,115
Dioxathion	97	125,270,153
Terbufos	231	57,97,153,103

TABLE 2 (cont.)
CHARACTERISTIC IONS FOR SEMIVOLATILE COMPOUNDS

Compound	Primary Ion	Secondary Ion(s)
α,α-Dimethylphenylamine	58	91,65,134,42
Pronamide	173	175,145,109,147
Aminoazobenzene	197	92,120,65,77
Dichlone	191	163,226,228,135,193
Dinoseb	211	163,147,117,240
Disulfoton	88	97,89,142,186
Fluchloralin	306	63,326,328,264,65
Mexacarbate	165	150,134,164,222
4,4'-Oxydianiline	200	108,171,80,65
Butyl benzyl phthalate	149	91,206
4-Nitrobiphenyl	199	152,141,169,151
Phosphamidon	127	264,72,109,138
2-Cyclohexyl-4,6-Dinitrophenol	231	185,41,193,266
Methyl parathion	109	125,263,79,93
Carbaryl	144	115,116,201
Dimethylaminoazobenzene	225	120,77,105,148,42
Propylthiouracil	170	142,114,83
Benz(a)anthracene	228	229,226
Chrysene-d_{12} (IS)	240	120,236
3,3'-Dichlorobenzidine	252	254,126
Chrysene	228	226,229
Malathion	173	125,127,93,158
Kepone	272	274,237,178,143,270
Fenthion	278	125,109,169,153
Parathion	109	97,291,139,155
Anilazine	239	241,143,178,89
Bis(2-ethylhexyl) phthalate	149	167,279
3,3'-Dimethylbenzidine	212	106,196,180
Carbophenothion	157	97,121,342,159,199
5-Nitroacenaphthene	199	152,169,141,115
Methapyrilene	97	50,191,71
Isodrin	193	66,195,263,265,147
Captan	79	149,77,119,117
Chlorfenvinphos	267	269,323,325,295
Crotoxyphos	127	105,193,166
Phosmet	160	77,93,317,76
EPN	157	169,185,141,323
Tetrachlorvinphos	329	109,331,79,333
Di-n-octyl phthalate	149	167,43
2-Aminoanthraquinone	223	167,195
Barban	222	51,87,224,257,153
Aramite	185	191,319,334,197,321
Benzo(b)fluoranthene	252	253,125
Nitrofen	283	285,202,139,253
Benzo(k)fluoranthene	252	253,125

TABLE 2 (cont.)
CHARACTERISTIC IONS FOR SEMIVOLATILE COMPOUNDS

Compound	Primary Ion	Secondary Ion(s)
Chlorobenzilate	251	139,253,111,141
Fensulfothion	293	97,308,125,292
Ethion	231	97,153,125,121
Diethylstilbestrol	268	145,107,239,121,159
Famphur	218	125,93,109,217
Tri-p-tolyl phosphate[c]	368	367,107,165,198
Benzo(a)pyrene	252	253,125
Perylene-d_{12} (IS)	264	260,265
7,12-Dimethylbenz(a)anthracene	256	241,239,120
5,5-Diphenylhydantoin	180	104,252,223,209
Captafol	79	77,80,107
Dinocap	69	41,39
Methoxychlor	227	228,152,114,274,212
2-Acetylaminofluorene	181	180,223,152
4,4'-Methylenebis(2-chloroaniline)	231	266,268,140,195
3,3'-Dimethoxybenzidine	244	201,229
3-Methylcholanthrene	268	252,253,126,134,113
Phosalone	182	184,367,121,379
Azinphos-methyl	160	132,93,104,105
Leptophos	171	377,375,77,155,379
Mirex	272	237,274,270,239,235
Tris(2,3-dibromopropyl) phosphate	201	137,119,217,219,199
Dibenz(a,j)acridine	279	280,277,250
Mestranol	277	310,174,147,242
Coumaphos	362	226,210,364,97,109
Indeno(1,2,3-cd)pyrene	276	138,277
Dibenz(a,h)anthracene	278	139,279
Benzo(g,h,i)perylene	276	138,277
1,2:4,5-Dibenzopyrene	302	151,150,300
Strychnine	334	334,335,333
Piperonyl sulfoxide	162	135,105,77
Hexachlorophene	196	198,209,211,406,408
Aldrin	66	263,220
Aroclor 1016	222	260,292
Aroclor 1221	190	224,260
Aroclor 1232	190	224,260
Aroclor 1242	222	256,292
Aroclor 1248	292	362,326
Aroclor 1254	292	362,326
Aroclor 1260	360	362,394
α-BHC	183	181,109
β-BHC	181	183,109
δ-BHC	183	181,109
γ-BHC (Lindane)	183	181,109
4,4'-DDD	235	237,165

TABLE 2 (cont.)
CHARACTERISTIC IONS FOR SEMIVOLATILE COMPOUNDS

Compound	Primary Ion	Secondary Ion(s)
4,4'-DDE	246	248,176
4,4'-DDT	235	237,165
Dieldrin	79	263,279
1,2-Diphenylhydrazine	77	105,182
Endosulfan I	195	339,341
Endosulfan II	337	339,341
Endosulfan sulfate	272	387,422
Endrin	263	82,81
Endrin aldehyde	67	345,250
Endrin ketone	317	67,319
2-Fluorobiphenyl (surr)	172	171
2-Fluorophenol (surr)	112	64
Heptachlor	100	272,274
Heptachlor epoxide	353	355,351
Nitrobenzene-d_5 (surr)	82	128,54
N-Nitrosodimethylamine	42	74,44
Phenol-d_6 (surr)	99	42,71
Terphenyl-d_{14} (surr)	244	122,212
2,4,6-Tribromophenol (surr)	330	332,141
Toxaphene	159	231,233

IS = internal standard
surr = surrogate
[a] The data presented are representative of DB-5 type analytical columns
[b] Compounds cannot be separated for quantitation
[c] Substitute for the non-specific mixture, tricresyl phosphate

Table 3
SemiVolatile Internal Standards with Corresponding Analytes Assigned for Quantitation

1,4-Dichlorobenzene-d4

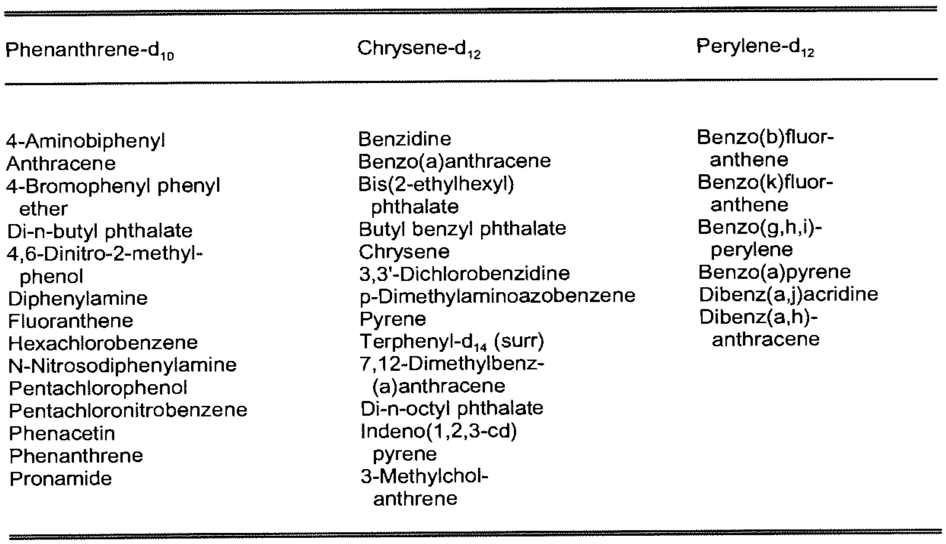
- Aniline
- Benzyl alcohol
- Bis(2-chloroethyl) ether
- Bis(2-chloroisopropyl) ether
- 2-Chlorophenol
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 1,2-Dichlorobenzene
- Ethyl methanesulfonate
- 2-Fluorophenol (surr)
- Hexachloroethane
- Methyl methanesulfonate
- 2-Methylphenol
- 4-Methylphenol
- N-Nitrosodimethylamine
- N-Nitroso-di-n-propylamine
- Phenol
- Phenol-d6 (surr)
- 2-Picoline
- 1,4-Dioxane

Naphthalene-d8

- Acetophenone
- Benzoic acid
- Bis(2-chloroethoxy)methane
- 4-Chloroaniline
- 4-Chloro-3-methylphenol
- 2,4-Dichlorophenol
- 2,6-Dichlorophenol
- α,α-Dimethylphenethylamine
- 2,4-Dimethylphenol
- Hexachlorobutadiene
- Isophorone
- 2-Methylnaphthalene
- Naphthalene
- Nitrobenzene
- Nitrobenzene-d8 (surr)
- 2-Nitrophenol
- N-Nitrosodi-n-butylamine
- N-Nitrosopiperidine
- 1,2,4-Trichlorobenzene

Acenaphthene-d10

- Acenaphthene
- Acenaphthylene
- 1-Chloronaphthalene
- 2-Chloronaphthalene
- 4-Chlorophenyl phenyl ether
- Dibenzofuran
- Diethyl phthalate
- Dimethyl phthalate
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Fluorene
- 2-Fluorobiphenyl (surr)
- Hexachlorocyclopentadiene
- 1-Naphthylamine
- 2-Naphthylamine
- 2-Nitroaniline
- 3-Nitroaniline
- 4-Nitroaniline
- 4-Nitrophenol
- Pentachlorobenzene
- 1,2,4,5-Tetrachlorobenzene
- 2,3,4,6-Tetrachlorophenol
- 2,4,6-Tribromophenol (surr)
- 2,4,6-Trichlorophenol
- 2,4,5-Trichlorophenol



Phenanthrene-d_{10}

- 4-Aminobiphenyl
- Anthracene
- 4-Bromophenyl phenyl ether
- Di-n-butyl phthalate
- 4,6-Dinitro-2-methylphenol
- Diphenylamine
- Fluoranthene
- Hexachlorobenzene
- N-Nitrosodiphenylamine
- Pentachlorophenol
- Pentachloronitrobenzene
- Phenacetin
- Phenanthrene
- Pronamide

Chrysene-d_{12}

- Benzidine
- Benzo(a)anthracene
- Bis(2-ethylhexyl) phthalate
- Butyl benzyl phthalate
- Chrysene
- 3,3'-Dichlorobenzidine
- p-Dimethylaminoazobenzene
- Pyrene
- Terphenyl-d_{14} (surr)
- 7,12-Dimethylbenz(a)anthracene
- Di-n-octyl phthalate
- Indeno(1,2,3-cd)pyrene
- 3-Methylcholanthrene

Perylene-d_{12}

- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Dibenz(a,j)acridine
- Dibenz(a,h)anthracene

TABLE 4

RECOMMENDED MINIMUM RESPONSE FACTOR CRITERIA FOR INITIAL AND CONTINUING CALIBRATION VERIFICATION USING THE SUGGESTED IONS FROM TABLE 1

Semivolatile Compounds	Minimum Response Factor (RF)
Benzaldehyde	0.010
Phenol	0.800
Bis(2-chloroethyl)ether	0.700
2-Chlorophenol	0.800
2-Methylphenol	0.700
2,2'-Oxybis-(1-chloropropane)	0.010
Acetophenone	0.010
4-Methylphenol	0.600
N-Nitroso-di-n-propylamine	0.500
Hexachloroethane	0.300
Nitrobenzene	0.200
Isophorone	0.400
2-Nitrophenol	0.100
2,4-Dimethylphenol	0.200
Bis(2-chloroethoxy)methane	0.300
2,4-Dichlorophenol	0.200
Naphthalene	0.700
4-Chloroaniline	0.010
Hexachlorobutadiene	0.010
Caprolactam	0.010
4-Chloro-3-methylphenol	0.200
2-Methylnaphthalene	0.400
Hexachlorocyclopentadiene	0.050
2,4,6-Trichlorophenol	0.200
2,4,5-Trichlorophenol	0.200
1,1'-Biphenyl	0.010
2-Chloronaphthalene	0.800

TABLE 4
(continued)

Semivolatile Compounds	Minimum Response Factor (RF)
2-Nitroaniline	0.010
Dimethyl phthalate	0.010
2,6-Dinitrotoluene	0.200
Acenaphthylene	0.900
3-Nitroaniline	0.010
Acenaphthene	0.900
2,4-Dinitrophenol	0.010
4-Nitrophenol	0.010
Dibenzofuran	0.800
2,4-Dinitrotoluene	0.200
Diethyl phthalate	0.010
1,2,4,5-Tetrachlorobenzene	0.010
4-Chlorophenyl-phenyl ether	0.400
Fluorene	0.900
4-Nitroaniline	0.010
4,6-Dinitro-2-methylphenol	0.010
4-Bromophenyl-phenyl ether	0.100
N-Nitrosodiphenylamine	0.010
Hexachlorobenzene	0.100
Atrazine	0.010
Pentachlorophenol	0.050
Phenanthrene	0.700
Anthracene	0.700
Carbazole	0.010
Di-n-butyl phthalate	0.010
Fluoranthene	0.600
Pyrene	0.600
Butyl benzyl phthalate	0.010
3,3'-Dichlorobenzidine	0.010
Benzo(a)anthracene	0.800

TABLE 4
(continued)

Semivolatile Compounds	Minimum Response Factor (RF)
Chrysene	0.700
Bis-(2-ethylhexyl)phthalate	0.010
Di-n-octyl phthalate	0.010
Benzo(b)fluoranthene	0.700
Benzo(k)fluoranthene	0.700
Benzo(a)pyrene	0.700
Indeno(1,2,3-cd)pyrene	0.500
Dibenz(a,h)anthracene	0.400
Benzo(g,h,i)perylene	0.500
2,3,4,6-Tetrachlorophenol	0.010

Table 5

8270D/8270E/625.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	DE HSCA
Reporting and Detection Limits	See ADM-MDL				Ongoing verification thru quarterly LOD/LOQ study	special reporting limits required!!!	No specific requirements
Breakdown Check	Prior to ICAL and at the beginning of each 12-hour period, prior to analysis of samples.	Degragation ≤20% for DDT	Correct problem. Retune instrument and verify. Rerun affected samples.	Problem must be corrected. No samples may be accepted without a valid tune.	same	same	same
Tuning	Prior to ICAL and at the beginning of each period (12 hour for 8270D, 15 hour for 625.1, only prior to ICAL for 8270E). Select scans as described in the SOP.	1. ion criteria in SOP 2. Benzidine and Pentachlorophenol normal response with tailing <2	Retune instrument and verify. If criteria cannot be met, maintenance may be required.	Problem must be corrected. No samples may be accepted without a valid tune.	Requirements met.	Requirements met	Requirements met
ICAL	Initially and when QC criteria cannot be maintained, after major maintenance. Instrument blank prior to 5 or more points with low point at or below reporting level. Point dropping policy and assignable causes defined in ADM-ICAL.	RSD for each ≤20% or another curve model such as linear regression r≥0.99, may force thru zero to improve low end accuracy, but not to include (0,0) as an extra point. For LR, refit low point within 50-150%recovery, all higher points at 70-130%. Minimum RF required for all compounds (8270D only). If >10% of compounds do not meet 20% or 0.99, curve is invalid. All outliers must be discussed in case narrative.	Correct problem then repeat ICAL	Problem must be corrected. No samples may be run until ICAL has passed. 5 or more points (6 if non-linear regression is used); Low standard ≤ to RL; must contain all analytes; performed under same conditions as samples.	QSM5.4:RSD <15% for each analyte and surrogate. or QSM5.4/6.0: LR or quad r2>0.99 Force through 0 OK. Must pass RF and refit method requirements. Flagging not appropriate. For 6.0, curving of surrogates is not required.	If <10% compounds exceed criteria, recalibration is not required as long as %RSD <40, r<0.98 Data rejected if RF<0.05 MUST meet 70-130% refit for linear or non-linear. If not met, report RL as estimated or raise RL to the next cal std that meets refit.	No linear regression nor quadratic. RRF>0.05 for all.

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8270D/8270E/625.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	DE HSCA
ICV	Immediately after each ICAL.	All target analytes within 70-130%	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat ICAL.	Second source containing all targets. Concentration near midpoint.	80-120% Recovery. Flagging not appropriate. Must correct problem - no samples run until ICAL verification passes.	70-130% except 40-160% for difficult compounds. Recalibrate if >10% compounds outside criteria.	No specific requirements
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. May use opening CCV on other days.	NA	NA	Same	No specific requirements	same
Analyte Identification and Evaluation of relative retention times (RRT)	With each sample.	RT of the IS in each sample within 10 seconds of the RT of the opening CCV. Relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the refernce spectrum. Isomers to be identified individually if height of the valley between isomer peaks is less than 25% of the sum of the two peak heights. Otherwise identify as isomeric pairs.	Correct problem, then rerun ICAL		RRT evaluation required for all GCMS methods	No Specific Requirements	No specific requirements

P:\QAQC\QA_DOCUM\QCLIMITS\SOP DQO Tables\8270D rev 15

8270D/8270E/625.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	DE HSCA
CCV	Daily, all targets, after tuning and before sample analysis and every 12 hours of analysis time.	1. Minimum RFs as per SOP (Table 4 of method 8270D). 2.%Difference/Drift for all target compounds and surrogates: ≤20%D. Up to 20% of compounds may fail 20%D up to 40%D and be reported with a note in the case narrative. 3.EICP area within -50% to +100% of ICAL midpoint standard. 4.Internal standards must have retention time ± 30 seconds from retention time of the midpoint standard in the ICAL. Non-detect samples may be reported with a high-bias CCV.	Correct problem, then rerun CCV. If that fails, the lab may make further corrective action, but must demonstrate acceptable performance with 2 consecutve CCVs. If this fails, repeat ICAL. Reanalyze all samples since last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Flag all results for the specific analytes in all samples since the last acceptable CCV.		END OF RUN CCV required with limits of ± 50%. If fails, reanalyze samples with acceptable CCVs. Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed. DOD must be notified PRIOR to reporting samples with an unacceptable CCV.	Conc near midpoint; %D≤20; Area counts for CCV must meet 50-200% of the mid level ICAL std.; If ≤20% of compounds exceed criteria recalibration is not requred as long as %D<40. Data rejected if RF<0.05.	Analysis Sequence: Tune, CCV, MB. End of Run CCV required within 1 hr of last sample with limits of <25% with up to 4 exceptions up to 50%. RRF>0.05

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	DE HSCA
Internal Standards verification	Every field sample, standard, and QC sample.	Retention time ± 10 seconds from retention time of the midpoint standard in the ICAL or opening CCV; EICP area within -50% to 100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Sample results are not acceptable without a valid IS verification.	same	Minimum of 6 required; RT +/-30 sec of CCV. if recovery is outside of the limits reanalyze or reanalyze at a dilution; lab must report both analyses; if second analysis is good report only second unless it is outside of HT. Then report both. If sample is not reanalyzed chromatogram must be included in report.	Same
MB	One per preparatory batch of 20 or fewer samples	No target analytes detected >1/2 MRL. Samples ND or >10 times contamination are acceptable to report.	Correct problem, then reprep and reanalyze all samples processed with contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Problem must be corrected. Results may not be reported without a valid MB. Flagging is only appropriate in cases where the samples cannot be reanalyzed. If reanalyzed out of HT, report both.	<1/2 LOQ. Samples >10x contamination are acceptable to report.	Targets must be <RL except for Phthalates that must be <5x the RL	<MDL, <5XMDL for phthalates.

8270D/8270E/625.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	DE HSCA
LCS/LCSD	One preparatory batch of 20 or fewer samples (pair is optional if MS/MSD not available). Contains all analytes to be reported, including surrogates.	QC acceptance criteria per client QAP or as listed in DQO Table. RPD ≤30%	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available and reanalysis can be completed within HT. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	DOD Limits	40-140% for BN, 30-130% for AE; difficult 15-140% (4-chloroanoline, 4-nitrophenol, phenol, 2,4-dinitrophenol); RPD<20 for water; <30 for solids. LCSD required. Recovery<10% affects NDs. If >10% are out, reanalyze. If >10% are above 130% reanalysis is not required if ND in samples.	No specific requirements
MS/MSD	One pair per preparatory batch.	Recovery acceptance criteria per client QAP or as listed in DQO Table. RPD ≤30%	Recovery - assume matrix interference if LCS is acceptable. Flag parent sample. RPD - Examine chromatogram for interferences. Examine sample for possible heterogeneity. Reanalyze pair if appropriate. Flag and narrate.	Outlying MS/MSD results with acceptable LCS results indicates matrix interferences are likely the cause.	LCS Limits	40-140% for BN, 30-130% for AE; RPD<20 for water ; <30 for solids; all target analytes	No specific requirements

8270D/8270E/625.1 Quality Control Summary

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Comments	DOD QSM 5.4/6.0	MA CAM	DE HSCA
Surrogate	Added to All field and QC samples	QC acceptance criteria per client QAP or as listed in DQO Table.	Correct problem then re-extract and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, or historical results verify interference, reanalysis may not be necessary. If surrogates are diluted more than 10 times, report with flag.		DOD Limits	3 AE, 3BN surrogates; solids: 30-130%; water: 30-130% for BN 15-110% for AE. Rev<10%affects NDs.	No specific requirements
Reporting	8270 reported to 2 sigfig. 625.1 reported to 3 sigfig except near RL.				J-flag all results between the MDL and LOQ.	TIC's- section 3.3, soils-dry weight basis, Appendix II B-1 for COC, temp sheet, HT's	Report TICs

APPENDIX A

INSTRUMENT OPERATING CONDITIONS

```
                                  TOPLEVEL PARAMETERS
                                  -------------------

Method Information For: I:\ACQUDATA\5973C\METHODS\LL8270.M

Method Sections To Run:

  ( ) Save Copy of Method With Data
  ( ) Pre-Run Cmd/Macro  =
  (X) Data Acquisition
  (X) Data Analysis
  ( ) Post-Run Cmd/Macro =

Method Comments:
  This is the method used for 8270D.LL  Running on MS 5973-C.

                                  END OF TOPLEVEL PARAMETERS
                                  --------------------------




                                  INSTRUMENT CONTROL PARAMETERS
                                  -----------------------------


Sample Inlet:       GC
Injection Source:   GC ALS
Mass Spectrometer:  Enabled

=========================================================================
====
                               6890 GC METHOD
=========================================================================
====

OVEN
   Initial temp:  40 'C (On)               Maximum temp:  350 'C
   Initial time:  1.00 min                 Equilibration time:  0.50 min
   Ramps:
      #  Rate  Final temp  Final time
      1 25.00      260        0.00
      2  6.00      295        0.00
      3 25.00      320        2.50
      4   0.0(Off)
   Post temp:  0 'C
   Post time:  0.00 min
   Run time:  19.13 min

FRONT INLET (HP PTV)                    BACK INLET (SPLIT/SPLITLESS)
```

```
   Mode:  Split                            Mode:  Pulsed Split
   Initial temp:  50 'C (Off)              Initial temp:  280 'C (Off)
   Cryo:  Off                              Pressure:  10.15 psi (On)
   Cryo use temp:  25 'C                   Split ratio:  2:1
   Cryo Timeout:  30.00 min (On)           Pulse pressure:  40.0 psi
   Cryo Fault:  On                         Pulse time:  0.50 min
   Pressure:  0.00 psi (Off)               Split flow:  2.6 mL/min
   Total flow:  45.0 mL/min                Total flow:  6.8 mL/min
   Gas saver:  Off                         Gas saver:  On
   Gas type:  Helium                       Saver flow:  15.0 mL/min
                                           Saver time:  5.00 min
                                           Gas type:  Helium

COLUMN 1                                COLUMN 2
   Capillary Column                        (not installed)
   Model Number:  PHENOMEN ZB-Semivola
   ZB-Semivolatile 30m .25mm .25um
   Max temperature:  340 'C
   Nominal length:  30.0 m
   Nominal diameter:  250.00 um
   Nominal film thickness:  0.25 um
   Mode:  constant flow
   Initial flow:  1.3 mL/min
   Nominal init pressure:  10.02 psi
   Average velocity:  41 cm/sec
   Inlet:  Back Inlet
   Outlet:  MSD
   Outlet pressure:  vacuum

FRONT DETECTOR (NO DET)                 BACK DETECTOR (NO DET)

SIGNAL 1                                SIGNAL 2
   Data rate:  20 Hz                       Data rate:  20 Hz
   Type:  test plot                        Type:  test plot
   Save Data:  Off                         Save Data:  Off
   Zero:  0.0 (Off)                        Zero:  0.0 (Off)
   Range:  0                               Range:  0
   Fast Peaks:  Off                        Fast Peaks:  Off
   Attenuation:  0                         Attenuation:  0

COLUMN COMP 1                           COLUMN COMP 2
   (No Detectors Installed)                (No Detectors Installed)

THERMAL AUX 2
   Use:  MSD Transfer Line Heater
   Description:
   Initial temp:  300 'C (On)
   Initial time:  0.00 min
      #  Rate  Final temp  Final time
      1   0.0(Off)

                                        POST RUN
                                           Post Time: 0.00 min
```

```
TIME TABLE
   Time       Specifier                     Parameter & Setpoint


                              7673 Injector


     Front Injector:
No parameters specified

     Back Injector:
        Sample Washes                 3
        Sample Pumps                  5
        Injection Volume            2.0 microliters
        Syringe Size               10.0 microliters
        PostInj Solvent A Washes      5
        PostInj Solvent B Washes      0
        Viscosity Delay               0 seconds
        Plunger Speed             Variable
        Injection Speed           6000.00 microliters/minutes
        Draw Speed                300.00 microliters/minutes
        Dispense Speed            1500.00 microliters/minutes
        PreInjection Dwell         0.00 minutes
        PostInjection Dwell        0.00 minutes
                                MS ACQUISITION PARAMETERS


General Information
------- -----------


Tune File                : LVIMSC.U
Acquistion Mode          : Scan


MS Information
-- -----------


Solvent Delay            : 2.10 min

EM Absolute              : False
EM Offset                : 0
Resulting EM Voltage     : 1411.8

[Scan Parameters]

Low Mass                 : 35.0
High Mass                : 500.0
Threshold                : 75
Sample #                 : 2       A/D Samples    4

[MSZones]

MS Quad                  : 150 C   maximum 200 C
MS Source                : 230 C   maximum 250 C
```

```
                                  END OF MS ACQUISITION PARAMETERS


                                END OF INSTRUMENT CONTROL PARAMETERS
                                ------------------------------------




                                DATA ANALYSIS PARAMETERS
                                ------------------------

Method Name: C:\MSDCHEM\1\METHODS\ENVDEF.M



Percent Report Settings
-----------------------

Sort By: Signal

Output Destination
    Screen:  No
    Printer: Yes
    File:    No

Integration Events: AutoIntegrate

Generate Report During Run Method:  Yes

Signal Correlation Window: 0.020



Quantitative Report Settings
----------------------------

Report Type: Summary

Output Destination
    Screen:  Yes
    Printer: No
    File:    No

Generate Report During Run Method:  No
```

```
Calibration Last Updated:


Reference Window: 10.00 Percent
Non-Reference Window: 5.00 Percent
Correlation Window: 0.02 minutes
Default Multiplier: 1.00
Default Sample Concentration: 0.00

Compound Information
--------------------

-------------------------------------------------------------------------
---
*** Empty Quantitation Database ***



                   END OF DATA ANALYSIS PARAMETERS
                   -------------------------------

                          Wed Jan 31 13:47:42 2024
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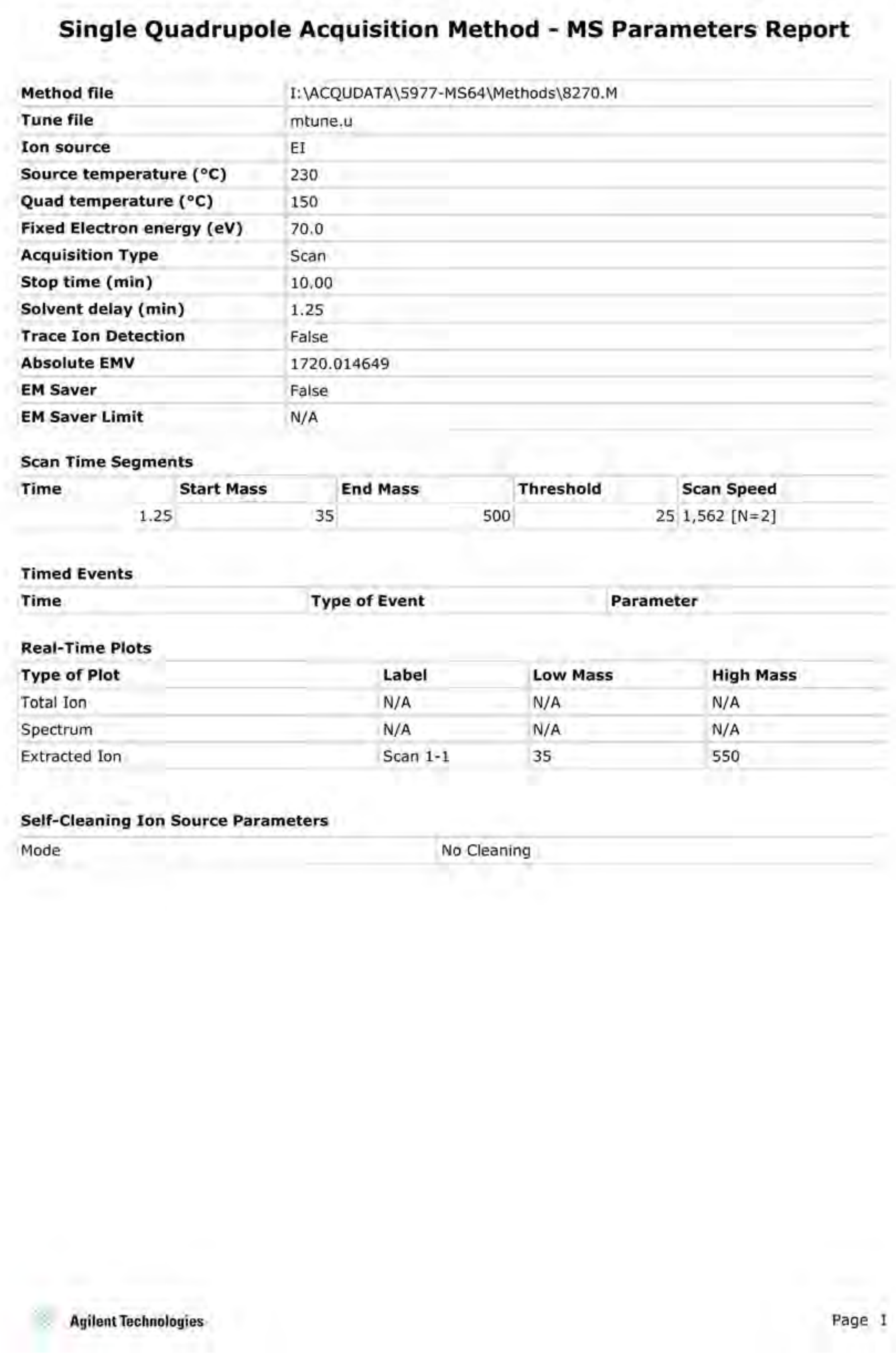

Single Quadrupole Acquisition Method - MS Parameters Report

Method file	I:\ACQUDATA\5977-MS64\Methods\8270.M
Tune file	mtune.u
Ion source	EI
Source temperature (°C)	230
Quad temperature (°C)	150
Fixed Electron energy (eV)	70.0
Acquisition Type	Scan
Stop time (min)	10.00
Solvent delay (min)	1.25
Trace Ion Detection	False
Absolute EMV	1720.014649
EM Saver	False
EM Saver Limit	N/A

Scan Time Segments

Time	Start Mass	End Mass	Threshold	Scan Speed
1.25	35	500	25	1,562 [N=2]

Timed Events

Time	Type of Event	Parameter

Real-Time Plots

Type of Plot	Label	Low Mass	High Mass
Total Ion	N/A	N/A	N/A
Spectrum	N/A	N/A	N/A
Extracted Ion	Scan 1-1	35	550

Self-Cleaning Ion Source Parameters

Mode	No Cleaning

Agilent Technologies

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```
                        INSTRUMENT CONTROL PARAMETERS:    GCMS
                        --------------------------------------

   I:\ACQUDATA\5977-MS64\Methods\8270.M
      Wed Jan 31 13:41:38 2024

Control Information
------- -----------

Sample Inlet             : GC
Injection Source         : GC ALS
Injection Location:  Rear
Mass Spectrometer        : Enabled


 No Sample Prep method has been assigned to this method.


GC
GC Summary
Run Time                                     19.053 min
Post Run Time                                0 min

Oven
Equilibration Time                           0.5 min
Max Temperature                              350 °C
Maximum Temperature Override                 Disabled
Slow Fan                                     Disabled
Temperature
Setpoint                                     On
(Initial)                                    42 °C
Hold Time                                    1 min
Post Run                                     50 °C
Program
#1 Rate                                      25 °C/min
#1 Value                                     260 °C
#1 Hold Time                                 0 min
#2 Rate                                      6 °C/min
#2 Value                                     295 °C
#2 Hold Time                                 0 min
#3 Rate                                      25 °C/min
#3 Value                                     320 °C
#3 Hold Time                                 2.5 min



ALS
ALS Errors                                   Pause for user interaction
Back Injector
Syringe Size                                 10 µL
Injection Volume                             2 µL
Injection Repetitions                        1
Injection Delay                              0 sec
Solvent A Washes (PreInj)                    0
Solvent A Washes (PostInj)                   5
Solvent A Volume                             8 µL
Solvent B Washes (PreInj)                    0
Solvent B Washes (PostInj)                   0
Solvent B Volume                             8 µL
Sample Washes                                2
Sample Wash Volume                           8 µL
Sample Pumps                                 5
Dwell Time (PreInj)                          0 min
Dwell Time (PostInj)                         0 min




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```

```
Solvent Wash Draw Speed                       300 µL/min
Solvent Wash Dispense Speed                   1500 µL/min
Sample Wash Draw Speed                        300 µL/min
Sample Wash Dispense Speed                    1500 µL/min
Injection Dispense Speed                      6000 µL/min
Viscosity Delay                               0 sec
Sample Depth                                  Disabled
Solvent Wash Mode                             A, B

Sample Overlap
Mode                                          Prepare sample after end of GC run 0.5 min


Front MM Inlet He
                                              ***Excluded from Affecting GC's Readiness State***
Mode                                          Solvent Vent
Pressure                                      Off
Total Flow                                    Off
Septum Purge Flow                             Off
Purge Flow to Split Vent                      15 mL/min at 0.35 min
Vent Flow                                     100 mL/min per min
Vent Pressure                                 5 psi Until 0.25 min
Cryo                                          Off
Cryo Type                                     CO2
Temperature
Setpoint                                      Off
(Initial)                                     250 °C


Back SS Inlet He
Mode                                          Pulsed Split
Heater                                        On     280 °C
Pressure                                      On     11.196 psi
Total Flow                                    On     22.6 mL/min
Septum Purge Flow                             On     3 mL/min
Gas Saver                                     On     15 After 5 min mL/min
Split Ratio                                   13 :1
Split Flow                                    18.2 mL/min
Injection Pulse Pressure                      40 psi Until 1 min

Thermal Aux 2 (MSD Transfer Line)
Temperature
Setpoint                                      On
(Initial)                                     300 °C
Post Run                                      0 °C


Column
Column Outlet Pressure                        0 psi
Column #1
Column Information                            Phenomen 7HG-G027-11-GGA: 1100528
ZB-Semivolatiles w/ 5m Guard Column
Temperature Range                             -60 °C—350 °C (350 °C)
Dimensions                                    30 m x 250 µm x 0.25 µm
In                                            Back SS Inlet He
Out                                           MSD
(Initial)                                     42 °C
Pressure                                      11.196 psi
Flow                                          1.4 mL/min
Average Velocity                              42.949 cm/sec
Holdup Time                                   1.1642 min
Flow
Setpoint                                      On
(Initial)                                     1.4 mL/min




8270.M Wed Jan 31 13:41:37 2024                                          Page:   2
```

```
Post Run                                     1.2211 mL/min



Aux EPC 4,5,6
Aux EPC 4 He
                                             ***Excluded from Affecting GC's Readiness State***
Pressure
Setpoint                                     Off
(Initial)                                    10 psi
Post Run                                     0 psi


Aux EPC 5 N2
                                             ***Excluded from Affecting GC's Readiness State***
Pressure
Setpoint                                     Off
(Initial)                                    10 psi
Post Run                                     0 psi


Aux EPC 6 N2
                                             ***Excluded from Affecting GC's Readiness State***
Pressure
Setpoint                                     Off
(Initial)                                    10 psi
Post Run                                     0 psi



Signals
Signal #1:  Test Plot
Description                                  Test Plot
Details
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Front Sample

Signal #2:  Test Plot
Description                                  Test Plot
Details
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Back Sample

Signal #3:  Test Plot
Description                                  Test Plot
Details
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Back Sample

Signal #4:  Test Plot
Description                                  Test Plot
Details
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Back Sample
```

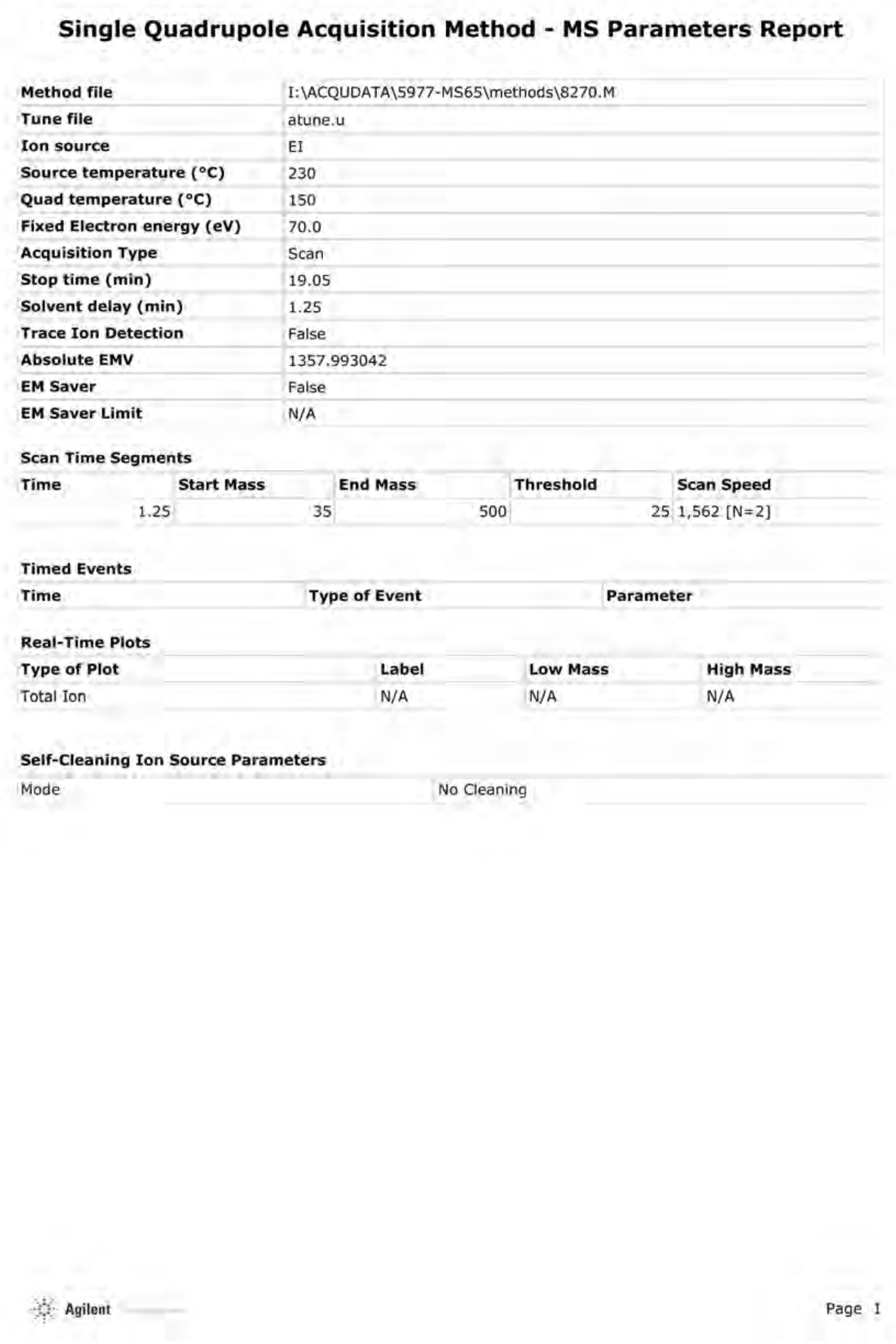
```
                         TUNE PARAMETERS for SN: US1352L201
                         ---------------------------------

 Trace Ion Detection is OFF.

    34.593   :   EMISSION
    70.007   :   ENERGY
    30.998   :   REPELLER
   120.002   :   IONFOCUS
   113.984   :   ENTRANCE_LENS
  1720.015   :   EMVOLTS
                               1720   : Actual EMV
                                2.70    : GAIN FACTOR
  1061.000   :   AMUGAIN
   129.063   :   AMUOFFSET
     1.000   :   FILAMENT
     1.000   :   DCPOLARITY
    12.746   :   ENTLENSOFFSET
     0.000   :   Ion_Body
     0.000   :   EXTLENS
  -633.000   :  MASSGAIN
   -35.000   :  MASSOFFSET

                         END OF TUNE PARAMETERS
                         ----------------------


                         END OF INSTRUMENT CONTROL PARAMETERS
                         ------------------------------------
```



Single Quadrupole Acquisition Method - MS Parameters Report

Method file	I:\ACQUDATA\5977-MS65\methods\8270.M
Tune file	atune.u
Ion source	EI
Source temperature (°C)	230
Quad temperature (°C)	150
Fixed Electron energy (eV)	70.0
Acquisition Type	Scan
Stop time (min)	19.05
Solvent delay (min)	1.25
Trace Ion Detection	False
Absolute EMV	1357.993042
EM Saver	False
EM Saver Limit	N/A

Scan Time Segments

Time	Start Mass	End Mass	Threshold	Scan Speed
1.25	35	500	25	1,562 [N=2]

Timed Events

Time	Type of Event	Parameter

Real-Time Plots

Type of Plot	Label	Low Mass	High Mass
Total Ion	N/A	N/A	N/A

Self-Cleaning Ion Source Parameters

Mode	No Cleaning

Agilent

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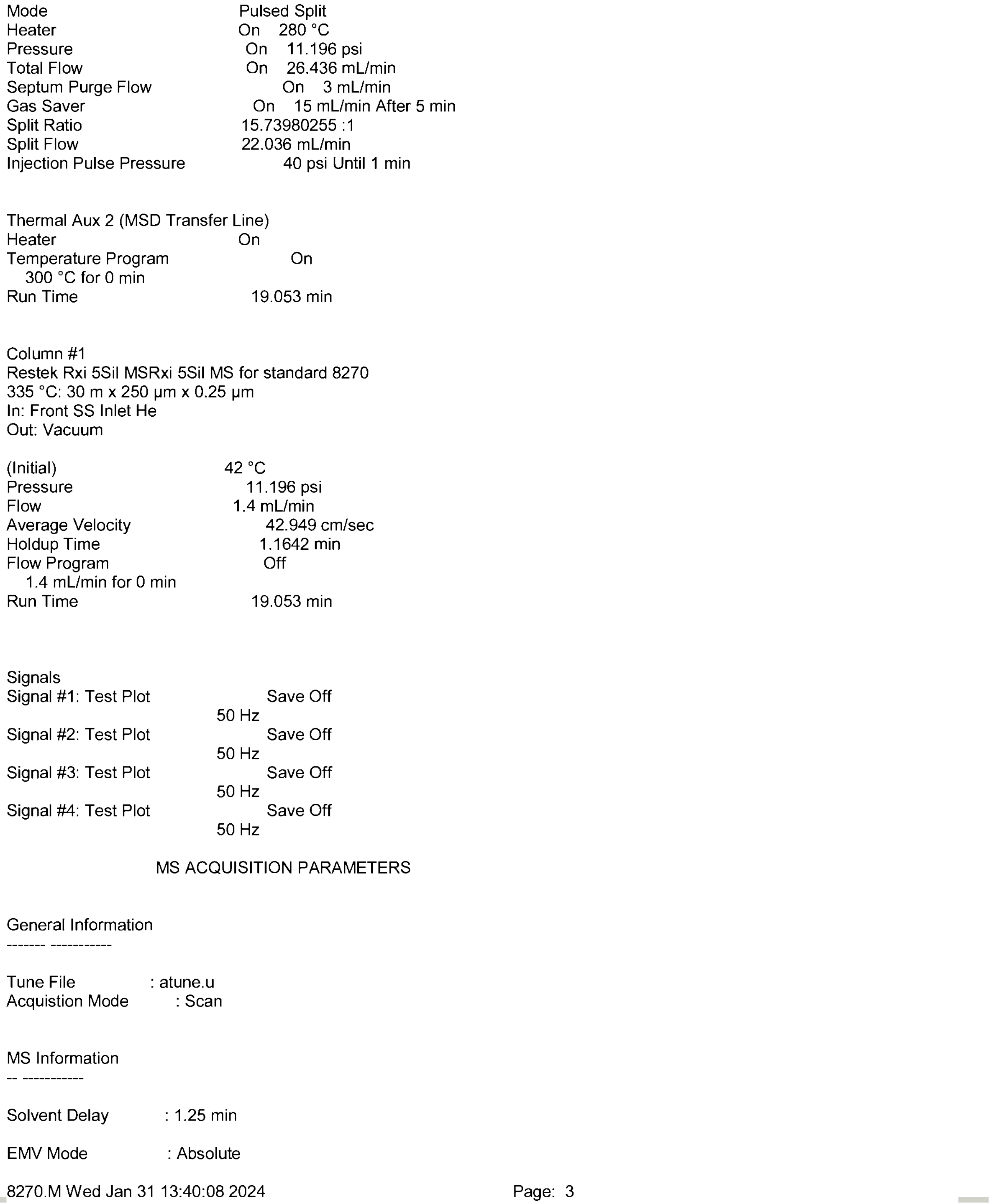
```
                         INSTRUMENT CONTROL PARAMETERS:    GCMS
                         --------------------------------------

   I:\ACQUDATA\5977-MS65\methods\8270.M
      Wed Jan 31 13:48:38 2024

Control Information
------- -----------

Sample Inlet            : GC
Injection Source        : GC ALS
Injection Location:  Front
Mass Spectrometer       : Enabled


 No Sample Prep method has been assigned to this method.


GC
GC Summary
Run Time                                     19.053 min
Post Run Time                                0 min

Oven
Temperature
Setpoint                                     On
(Initial)                                    42 °C
Hold Time                                    1 min
Post Run                                     42 °C
Program
#1 Rate                                      25 °C/min
#1 Value                                     260 °C
#1 Hold Time                                 0 min
#2 Rate                                      6 °C/min
#2 Value                                     295 °C
#2 Hold Time                                 0 min
#3 Rate                                      25 °C/min
#3 Value                                     320 °C
#3 Hold Time                                 2.5 min


Equilibration Time                           0.5 min
Max Temperature                              350 °C
Maximum Temperature Override                 Disabled
Slow Fan                                     Disabled

ALS
Front Injector
Syringe Size                                 10 µL
Injection Volume                             2 µL
Solvent A Washes (PreInj)                    2
Solvent A Washes (PostInj)                   3
Solvent A Volume                             4 µL
Solvent B Washes (PreInj)                    2
Solvent B Washes (PostInj)                   3
Solvent B Volume                             4 µL
Sample Washes                                1
Sample Wash Volume                           4 µL
Sample Pumps                                 4
Dwell Time (PreInj)                          0 min
Dwell Time (PostInj)                         0 min
Solvent Wash Draw Speed                      300 µL/min
Solvent Wash Dispense Speed                  1500 µL/min
Sample Wash Draw Speed                       300 µL/min




8270.M Wed Jan 31 13:48:37 2024                                           Page:  1
```

```
Sample Wash Dispense Speed             1500 µL/min
Injection Dispense Speed               6000 µL/min
Viscosity Delay                        1 sec
Sample Depth                           Disabled
Injection Type                         Standard
L1 Airgap                              0.2 µL
Solvent Wash Mode                      A, B

Sample Overlap
Mode                                   Prepare sample after end of GC run 0.5 min

ALS Errors                             Pause for user interaction

Front SS Inlet He
Mode                                   Pulsed Split
Heater                                 On     280 °C
Pressure                               On     11.196 psi
Total Flow                             On     15.6 mL/min
Septum Purge Flow                      On     3 mL/min
Pre-Run Flow Test                      Off
Gas Saver                              On     20 mL/min after 2 min
Split Ratio                            8 :1
Split Flow                             11.2 mL/min
Injection Pulse Pressure               40 psi Until 1 min
Liner                                  A Liner has not been selected.

Column
Column #1
Flow
Setpoint                               On
(Initial)                              1.4 mL/min
Post Run                               1 mL/min

Column Information                     Restek: 13623
Description                            Rxi-5Sil
Temperature Range                      -60 °C—325 °C (350 °C)
Dimensions                             30 m x 250 µm x 0.25 µm (Uncalibrated)
Heater                                 Oven
Column lock                            Unlocked
In                                     Front SS Inlet He
Out                                    MSD
(Initial)                              42 °C
Pressure                               11.196 psi
Flow                                   1.4 mL/min
Average Velocity                       42.949 cm/sec
Holdup Time                            1.1642 min
Control Mode                           Constant Flow

Column Outlet Pressure                 0 psi

Detector Evaluation
Perform Detector Evaluation Test       On
Signal Selected                        No Signal Selected
Checkout Sample                        No Checkout Sample Selected

MSD Transfer Line
Temperature
Setpoint                               On
(Initial)                              300 °C


Signals
Signal #1:
Description                            None




8270.M Wed Jan 31 13:48:37 2024                              Page:  2
```

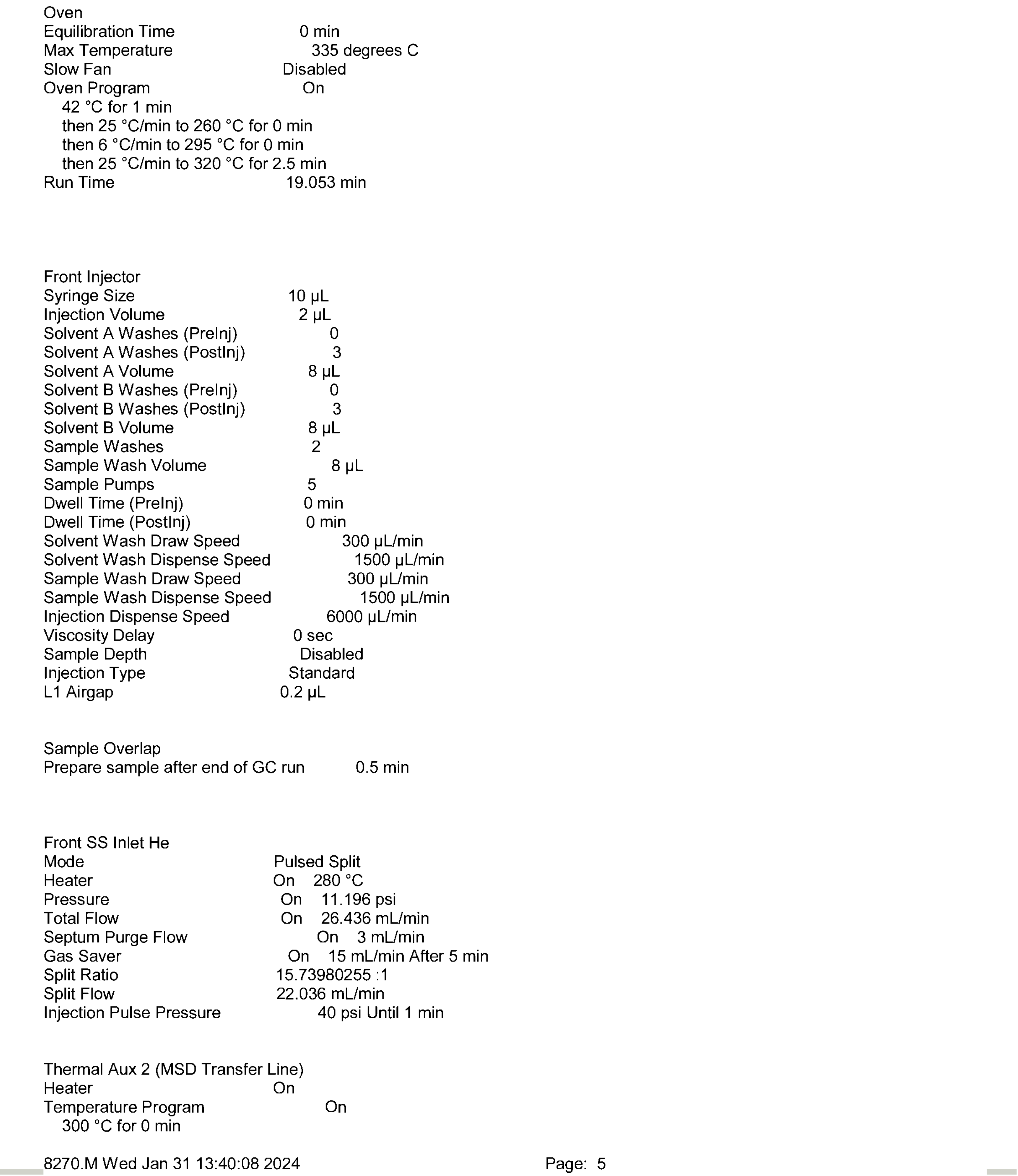
```
Signal #2:
Description                                  None

Signal #3:
Description                                  None

Signal #4:
Description                                  None

Signal #5:
Description                                  None

Signal #6:
Description                                  None

Signal #7:
Description                                  None

Signal #8:
Description                                  None




                        TUNE PARAMETERS for SN: US2151M037
                        ---------------------------------

 Trace Ion Detection is OFF.

    34.593   :   EMISSION
    70.007   :   ENERGY
    33.903   :   REPELLER
    55.305   :   IONFOCUS
    28.029   :   ENTRANCE_LENS
  1358.359   :   EMVOLTS
                              1294.1   : Actual EMV
                               1.00    : GAIN FACTOR
  2700.000   :   AMUGAIN
   144.063   :   AMUOFFSET
     2.000   :   FILAMENT
     1.000   :   DCPOLARITY
    10.311   :   ENTLENSOFFSET
     0.000   :   Ion_Body
     0.000   :   EXTLENS
    97.000   :  MASSGAIN
   -26.000   :  MASSOFFSET

                        END OF TUNE PARAMETERS
                        ----------------------



                        END OF INSTRUMENT CONTROL PARAMETERS
                        ------------------------------------







8270.M Wed Jan 31 13:48:37 2024                                          Page:   3
```

```
                          INSTRUMENT CONTROL PARAMETERS:    MS66
                          --------------------------------------

   C:\MSDCHEM\1\METHODS\8270.M
      Wed Jan 31 13:39:50 2024

Control Information
------- -----------

Sample Inlet       :  GC
Injection Source  :  GC ALS
Mass Spectrometer :  Enabled


 No Sample Prep method has been assigned to this method.

Oven
Equilibration Time                    0 min
Max Temperature                         335 degrees C
Slow Fan                            Disabled
Oven Program                          On
    42 °C for 1 min
    then 25 °C/min to 260 °C for 0 min
    then 6 °C/min to 295 °C for 0 min
    then 25 °C/min to 320 °C for 2.5 min
Run Time                             19.053 min




Front Injector
Syringe Size                         10 µL
Injection Volume                       2 µL
Solvent A Washes (PreInj)                  0
Solvent A Washes (PostInj)                  3
Solvent A Volume                         8 µL
Solvent B Washes (PreInj)                  0
Solvent B Washes (PostInj)                  3
Solvent B Volume                         8 µL
Sample Washes                            2
Sample Wash Volume                          8 µL
Sample Pumps                            5
Dwell Time (PreInj)                     0 min
Dwell Time (PostInj)                     0 min
Solvent Wash Draw Speed                     300 µL/min
Solvent Wash Dispense Speed                  1500 µL/min
Sample Wash Draw Speed                      300 µL/min
Sample Wash Dispense Speed                   1500 µL/min
Injection Dispense Speed                6000 µL/min
Viscosity Delay                       0 sec
Sample Depth                           Disabled
Injection Type                       Standard
L1 Airgap                           0.2 µL


Sample Overlap
Prepare sample after end of GC run          0.5 min


Front SS Inlet He
```



```
Mode                            Pulsed Split
Heater                          On    280 °C
Pressure                         On    11.196 psi
Total Flow                       On    26.436 mL/min
Septum Purge Flow                       On    3 mL/min
Gas Saver                         On    15 mL/min After 5 min
Split Ratio                     15.73980255 :1
Split Flow                      22.036 mL/min
Injection Pulse Pressure                40 psi Until 1 min


Thermal Aux 2 (MSD Transfer Line)
Heater                          On
Temperature Program                     On
    300 °C for 0 min
Run Time                          19.053 min


Column #1
Restek Rxi 5Sil MSRxi 5Sil MS for standard 8270
335 °C: 30 m x 250 µm x 0.25 µm
In: Front SS Inlet He
Out: Vacuum

(Initial)                     42 °C
Pressure                         11.196 psi
Flow                           1.4 mL/min
Average Velocity                    42.949 cm/sec
Holdup Time                        1.1642 min
Flow Program                        Off
    1.4 mL/min for 0 min
Run Time                          19.053 min



Signals
Signal #1: Test Plot                    Save Off
                             50 Hz
Signal #2: Test Plot                    Save Off
                             50 Hz
Signal #3: Test Plot                    Save Off
                             50 Hz
Signal #4: Test Plot                    Save Off
                             50 Hz

                    MS ACQUISITION PARAMETERS


General Information
------- -----------

Tune File             : atune.u
Acquistion Mode          : Scan


MS Information
-- -----------

Solvent Delay          : 1.25 min

EMV Mode              : Absolute

8270.M Wed Jan 31 13:40:08 2024                          Page:  3
```

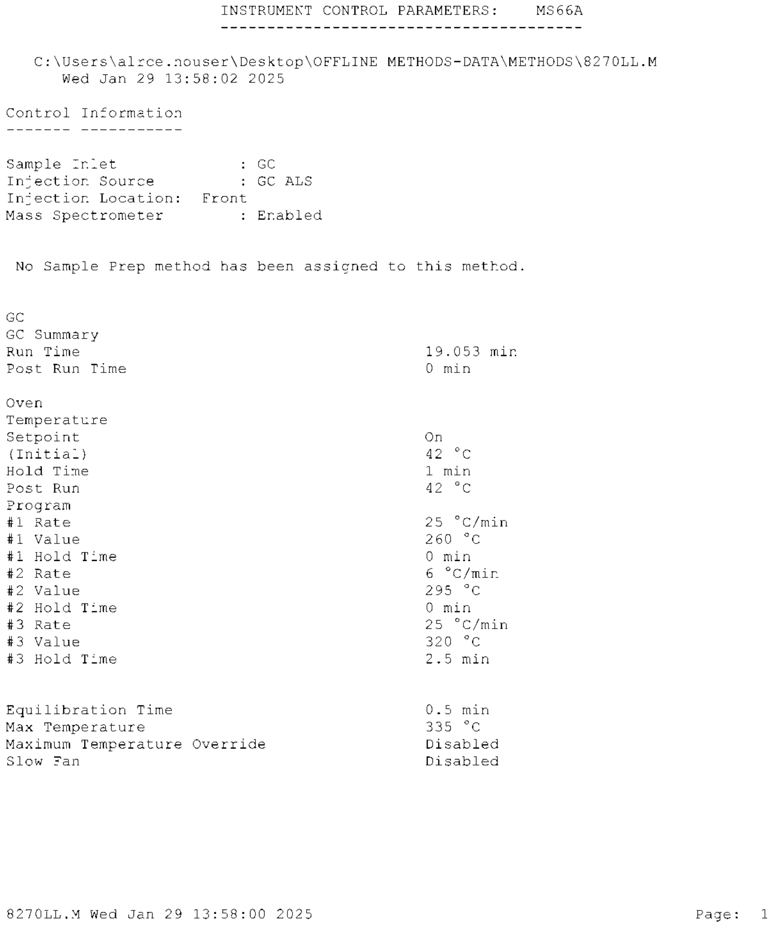
```
Resulting EM Voltage     : 1600

[Scan Parameters]

Low Mass                 : 35.0
High Mass                : 500.0
Threshold                : 25
Sample #                 : 2       A/D Samples    4

[MSZones]

MS Source                : 230 C   maximum 280 C
MS Quad                  : 150 C   maximum 200 C

                    END OF MS ACQUISITION PARAMETERS


                     TUNE PARAMETERS for SN: US11423931
                 -----------------------------

 Trace Ion Detection is OFF.

 EMISSION    :     34.610
 ENERGY      :     69.922
 REPELLER    :     29.620
 IONFOCUS    :    109.137
 ENTRANCE_LE :     59.000
 EMVOLTS     :   1600.000
                     Actual EMV  :    1600
                     GAIN FACTOR :       2.04
 AMUGAIN     :   1139.000
 AMUOFFSET   :    124.750
 FILAMENT    :      1.000
 DCPOLARITY  :      0.000
 ENTLENSOFFS :     22.839
 MASSGAIN    :  -1105.000
 MASSOFFSET  :    -41.000

                   END OF TUNE PARAMETERS
                ------------------------------------



                          END OF INSTRUMENT CONTROL PARAMETERS
                          ------------------------------------
                         INSTRUMENT CONTROL PARAMETERS:    MS66
                         --------------------------------------


  C:\MSDCHEM\1\METHODS\8270.M
     Wed Jan 31 13:40:13 2024

Control Information
------- -----------

Sample Inlet       :  GC
Injection Source  :  GC ALS
Mass Spectrometer :  Enabled


 No Sample Prep method has been assigned to this method.
```



```
Oven
Equilibration Time                0 min
Max Temperature                     335 degrees C
Slow Fan                         Disabled
Oven Program                      On
   42 °C for 1 min
   then 25 °C/min to 260 °C for 0 min
   then 6 °C/min to 295 °C for 0 min
   then 25 °C/min to 320 °C for 2.5 min
Run Time                          19.053 min



Front Injector
Syringe Size                      10 µL
Injection Volume                    2 µL
Solvent A Washes (PreInj)              0
Solvent A Washes (PostInj)              3
Solvent A Volume                     8 µL
Solvent B Washes (PreInj)              0
Solvent B Washes (PostInj)              3
Solvent B Volume                     8 µL
Sample Washes                         2
Sample Wash Volume                      8 µL
Sample Pumps                         5
Dwell Time (PreInj)                  0 min
Dwell Time (PostInj)                  0 min
Solvent Wash Draw Speed                   300 µL/min
Solvent Wash Dispense Speed                 1500 µL/min
Sample Wash Draw Speed                    300 µL/min
Sample Wash Dispense Speed                  1500 µL/min
Injection Dispense Speed               6000 µL/min
Viscosity Delay                     0 sec
Sample Depth                         Disabled
Injection Type                      Standard
L1 Airgap                          0.2 µL


Sample Overlap
Prepare sample after end of GC run          0.5 min



Front SS Inlet He
Mode                              Pulsed Split
Heater                            On    280 °C
Pressure                            On    11.196 psi
Total Flow                          On    26.436 mL/min
Septum Purge Flow                       On    3 mL/min
Gas Saver                            On    15 mL/min After 5 min
Split Ratio                        15.73980255 :1
Split Flow                         22.036 mL/min
Injection Pulse Pressure                 40 psi Until 1 min


Thermal Aux 2 (MSD Transfer Line)
Heater                            On
Temperature Program                       On
   300 °C for 0 min

8270.M Wed Jan 31 13:40:08 2024                       Page:  5
```

```
Run Time                          19.053 min


Column #1
Restek Rxi 5Sil MSRxi 5Sil MS for standard 8270
335 °C: 30 m x 250 µm x 0.25 µm
In: Front SS Inlet He
Out: Vacuum

(Initial)                      42 °C
Pressure                          11.196 psi
Flow                            1.4 mL/min
Average Velocity                     42.949 cm/sec
Holdup Time                        1.1642 min
Flow Program                        Off
    1.4 mL/min for 0 min
Run Time                          19.053 min



Signals
Signal #1: Test Plot                     Save Off
                              50 Hz
Signal #2: Test Plot                     Save Off
                              50 Hz
Signal #3: Test Plot                     Save Off
                              50 Hz
Signal #4: Test Plot                     Save Off
                              50 Hz

                 MS ACQUISITION PARAMETERS


General Information
------- -----------

Tune File            : atune.u
Acquistion Mode          : Scan


MS Information
-- -----------

Solvent Delay           : 1.25 min

EMV Mode                : Absolute
Resulting EM Voltage     : 1600

[Scan Parameters]

Low Mass                : 35.0
High Mass               : 500.0
Threshold               : 25
Sample #                : 2       A/D Samples     4

[MSZones]

MS Source               : 230 C   maximum 280 C
MS Quad                 : 150 C   maximum 200 C
```

```
                      END OF MS ACQUISITION PARAMETERS


                       TUNE PARAMETERS for SN: US11423931
                    -----------------------------

        Trace Ion Detection is OFF.

        EMISSION    :     34.610
        ENERGY      :    69.922
        REPELLER    :     29.620
        IONFOCUS    :    109.137
        ENTRANCE_LE :      59.000
        EMVOLTS     :   1600.000
                            Actual EMV  :    1600
                            GAIN FACTOR :       2.04
        AMUGAIN     :   1139.000
        AMUOFFSET   :     124.750
        FILAMENT    :      1.000
        DCPOLARITY  :       0.000
        ENTLENSOFFS :      22.839
        MASSGAIN    :  -1105.000
        MASSOFFSET  :      -41.000

                     END OF TUNE PARAMETERS
                   ------------------------------------



                              END OF INSTRUMENT CONTROL PARAMETERS
                              ------------------------------------
```



```
                        INSTRUMENT CONTROL PARAMETERS:    MS66A
                        ---------------------------------------

   C:\Users\alrce.nouser\Desktop\OFFLINE METHODS-DATA\METHODS\8270LL.M
      Wed Jan 29 13:58:02 2025

Control Information
------- -----------

Sample Inlet             : GC
Injection Source         : GC ALS
Injection Location:  Front
Mass Spectrometer        : Enabled


 No Sample Prep method has been assigned to this method.


GC
GC Summary
Run Time                                     19.053 min
Post Run Time                                0 min

Oven
Temperature
Setpoint                                     On
(Initial)                                    42 °C
Hold Time                                    1 min
Post Run                                     42 °C
Program
#1 Rate                                      25 °C/min
#1 Value                                     260 °C
#1 Hold Time                                 0 min
#2 Rate                                      6 °C/min
#2 Value                                     295 °C
#2 Hold Time                                 0 min
#3 Rate                                      25 °C/min
#3 Value                                     320 °C
#3 Hold Time                                 2.5 min


Equilibration Time                           0.5 min
Max Temperature                              335 °C
Maximum Temperature Override                 Disabled
Slow Fan                                     Disabled




8270LL.M Wed Jan 29 13:58:00 2025                             Page:   1
```

```
ALS
Front Injector
Syringe Size                                 10 µL
Injection Volume                             3 µL
Solvent A Washes (PreInj)                    2
Solvent A Washes (PostInj)                   2
Solvent A Volume                             4 µL
Solvent B Washes (PreInj)                    2
Solvent B Washes (PostInj)                   2
Solvent B Volume                             4 µL
Sample Washes                                2
Sample Wash Volume                           4 µL
Sample Pumps                                 5
Dwell Time (PreInj)                          0 min
Dwell Time (PostInj)                         0 min
Solvent Wash Draw Speed                      300 µL/min
Solvent Wash Dispense Speed                  1500 µL/min
Sample Wash Draw Speed                       300 µL/min
Sample Wash Dispense Speed                   1500 µL/min
Injection Dispense Speed                     6000 µL/min
Viscosity Delay                              0 sec
Sample Depth                                 Disabled
Injection Type                               Standard
L1 Airgap                                    0.2 µL
Solvent Wash Mode                            A, B

Sample Overlap
Mode                                         Prepare sample after end of GC run 0.5 min

ALS Errors                                   Pause for user interaction

Front SS Inlet He
Mode                                         Pulsed Split
Heater                                       On     280 °C
Pressure                                     On     11.196 psi
Total Flow                                   On     10 mL/min
Septum Purge Flow                            On     3 mL/min
Gas Saver                                    On     15 mL/min after 5 min
Split Ratio                                  4 :1
Split Flow                                   5.6 mL/min
Injection Pulse Pressure                     40 psi Until 1 min

Thermal Aux 2 (MSD Transfer Line)
Temperature
Setpoint                                     On
(Initial)                                    300 °C




8270LL.M Wed Jan 29 13:58:00 2025                                         Page:  2
```

```
Column
Column #1
Flow
Setpoint                                     On
(Initial)                                    1.4 mL/min
Post Run                                     1.3 mL/min

Column Information                           Restek Rxi 5Sil MS
Description                                  Rxi 5Sil MS for standard 8270
Temperature Range                            -60 °C—335 °C (335 °C)
Dimensions                                   30 m x 250 µm x 0.25 µm (Uncalibrated)
Heater                                       Oven
In                                           Front SS Inlet He
Out                                          MSD
(Initial)                                    42 °C
Pressure                                     11.196 psi
Flow                                         1.4 mL/min
Average Velocity                             42.949 cm/sec
Holdup Time                                  1.1642 min
Control Mode                                 Constant Flow

Column Outlet Pressure                       0 psi

Signals
Signal #1:  Test Plot
Description                                  Test Plot
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Front Sample

Signal #2:  Test Plot
Description                                  Test Plot
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Front Sample

Signal #3:  Test Plot
Description                                  Test Plot
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Back Sample

Signal #4:  Test Plot
Description                                  Test Plot




8270LL.M Wed Jan 29 13:58:00 2025                                         Page:  3
```

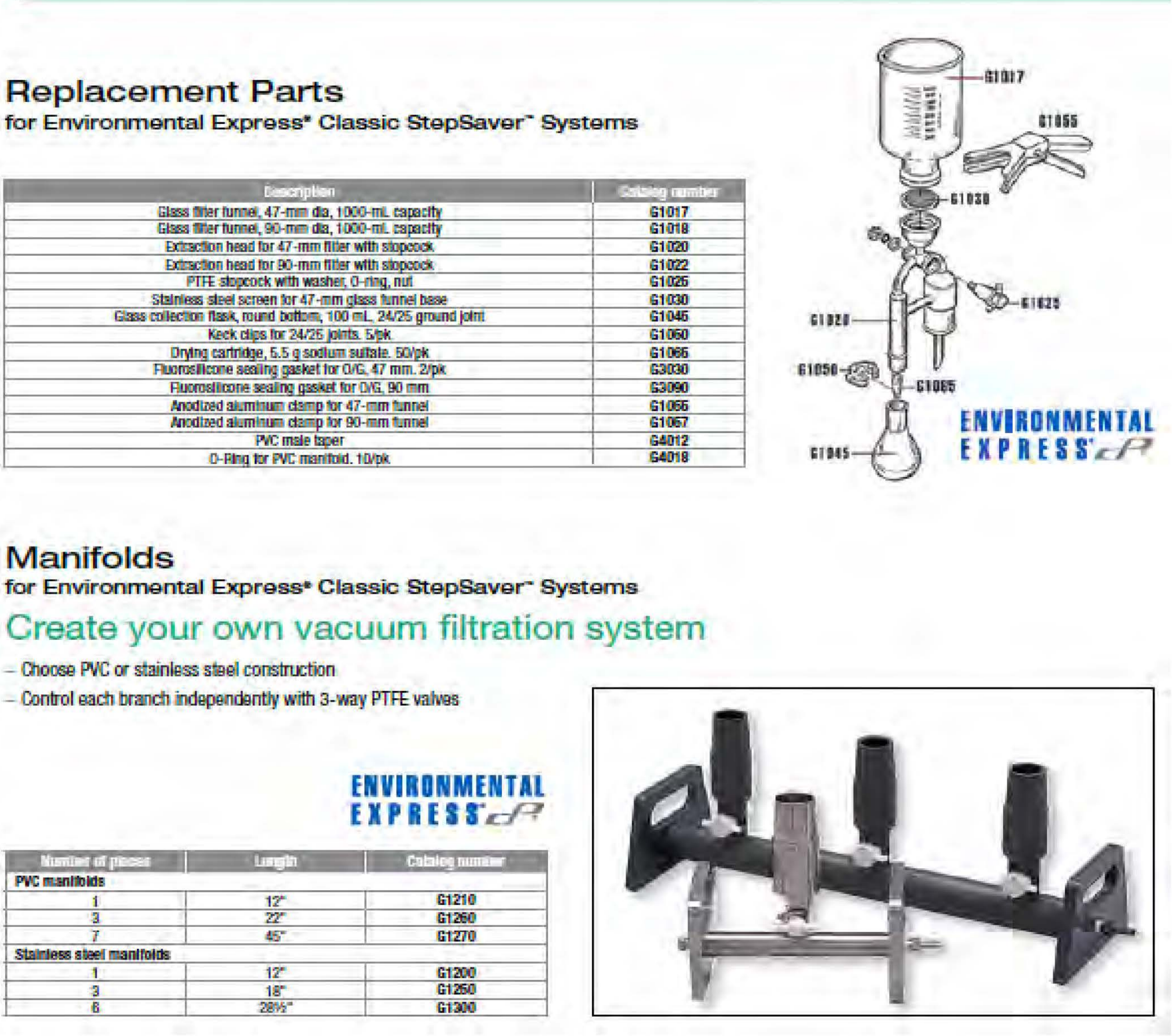
```
Save                                         Off
Data Rate                                    50 Hz
Dual Injection Assignment                    Back Sample



                        END OF INSTRUMENT CONTROL PARAMETERS
                        ------------------------------------
```

STANDARD OPERATING PROCEDURE
ALS | Environmental - Rochester, NY

SOP CHANGE FORM

SOP Title: OIL AND GREASE		
SOP Code: GEN-1664	Revision No: 11	SOP Date: 3/15/2021
SOP Section(s) Affected by Change: 8.2, 10.6 12.6.1		

Description of Change:
8.2 – When samples regularly won't filter all 250mL, request three 40mL vials in order to be able to rinse sample jar with hexane.
9 – Add parts list shown below.
10.6 – Silica Gel CAS Number: 112926-00-8
12.6.1 – The maximum difference between the tare weights cannot exceed 0.1mg.



Replacement Parts
for Environmental Express® Classic StepSaver™ Systems

Description	Catalog number
Glass filter funnel, 47-mm dia, 1000-mL capacity	G1017
Glass filter funnel, 90-mm dia, 1000-mL capacity	G1018
Extraction head for 47-mm filter with stopcock	G1020
Extraction head for 90-mm filter with stopcock	G1022
PTFE stopcock with washer, O-ring, nut	G1025
Stainless steel screen for 47-mm glass funnel base	G1030
Glass collection flask, round bottom, 100 mL, 24/25 ground joint	G1045
Keck clips for 24/25 joints. 5/pk	G1050
Drying cartridge, 5.5 g sodium sulfate. 50/pk	G1065
Fluorosilicone sealing gasket for O/G, 47 mm. 2/pk	G3030
Fluorosilicone sealing gasket for O/G, 90 mm	G3090
Anodized aluminum clamp for 47-mm funnel	G1055
Anodized aluminum clamp for 90-mm funnel	G1057
PVC male taper	G4012
O-Ring for PVC manifold. 10/pk	G4018

Manifolds
for Environmental Express® Classic StepSaver™ Systems

Create your own vacuum filtration system

- Choose PVC or stainless steel construction
- Control each branch independently with 3-way PTFE valves

Number of places	Length	Catalog number
PVC manifolds		
1	12"	G1210
3	22"	G1260
7	45"	G1270
Stainless steel manifolds		
1	12"	G1200
3	18"	G1250
6	28½"	G1300

Reason for Change: Current Practice

Change(s) Submitted by: Samantha Zogby	Date: 2/13/2025

Approvals:

Supervisor Signature: Christie Kutzer	Date: 2/14/25
QA Signature:	Date: 2/13/25
Laboratory Director Signature:	Date: 2/14/25

QA:

Does the approved change require further SOP user attestations? (If so, complete below. Note: Attestations may be kept separately on file and need not be scanned to the SOP)	N
If the change will have a future effective date, or past definitive date what is that date? If blank, the effective date is the date of this SOP change form and reflects current practice.	

Attestations: I, the undersigned, have read, understood, and agree to implement and follow the above referenced SOP. I agree to follow this procedure without modification unless otherwise approved and directed to do so in a client-specific quality assurance plan or by a client-specific communication requirement.

SOP CHANGE FORM

SOP Title: Oil and Grease		
SOP Code: GEN-1664	Revision No: ~~11~~ 10 4/21/23	SOP Date: ~~4/6/2023~~ 3/15/21 4/21/23
SOP Section(s) Affected by Change: 10.4, 12.5		

Description of Change:
Section 10.4: Addition of Sodium Sulfate drying cartridges. Purchased commercially from Environmental Express
Section 12.5: Between 12.5.1 and 12.5.2, attach drying cartridges to inner joint on manifold. Cartridges should connect easily without clip.

Reason for Change: Eliminates possibility of analyte removal during sample evaporation

Change(s) Submitted by: Samantha Talarico	Date: 4/6/2023

Approvals:

Supervisor Signature:	Date: 4/17/23
QA Signature:	Date: 4/17/23
Laboratory Director Signature:	Date: 4/20/23

QA:

Does the approved change require further SOP user attestations? (If so, complete below. Note: Attestations may be kept separately on file and need not be scanned to the SOP)	N
If the change will have a future effective date, or past definitive date what is that date? If blank, the effective date is the date of this SOP change form and reflects current practice.	

Attestations: I, the undersigned, have read, understood, and agree to implement and follow the above referenced SOP. I agree to follow this procedure without modification unless otherwise approved and directed to do so in a client-specific quality assurance plan or by a client-specific communication requirement.

SOP CHANGE FORM

SOP Title: Oil and Grease		
SOP Code: GEN-1664	Revision No: 10	SOP Date: 3/15/2021
SOP Section(s) Affected by Change: Secion 12.7		

Description of Change:
Add the following:
12.7.4.1 Alternatively to shaking, the analyst may utilize a shaker table for mixing during the silica gel treatment
12.7.4.2 Place ~~dishes~~ flasks on shaker table and set speed to an appropriate setting (~30% is a good starting speed setting)
12.7.4.3 Allow ~~dishes~~ flasks to swirl with protective door closed for five minutes. Once complete, allow table to fully complete its process. ~~The lid can be opened, and the dishes carefully moved to a desicator until weighing.~~ flasks JBC 5/16/22

Reason for Change: Improved efficiency and automation

Change(s) Submitted by: Christopher M. Woods	Date: 5/16/22

Approvals:

Supervisor Signature:	Date: 5/16/2022
QA Signature:	Date: 5/16/22
Laboratory Director Signature:	Date: 5/25/22

QA:

Does the approved change require further SOP user attestations? (If so, complete below. Note: Attestations may be kept separately on file and need not be scanned to the SOP)	Y
If the change will have a future effective date, or past definitive date what is that date? If blank, the effective date is the date of this SOP change form and reflects current practice.	

Attestations: I, the undersigned, have read, understood, and agree to implement and follow the above referenced SOP. I agree to follow this procedure without modification unless otherwise approved and directed to do so in a client-specific quality assurance plan or by a client-specific communication requirement.

Beverly Bruce

n-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-Polar Material) by Solid Phase Extraction

DOCUMENT ID: GEN-1664, REV 10

Approved By: ______________________ Date: 3/9/2021
Laboratory Director, Joe Ribar

Approved By: ______________________ Date: 3/9/21
Quality Manager, Vicky Collom

Approved By: ______________________ Date: 3/9/21
Technical Director, Christine Kutzer

Approved By: ______________________ Date: 3/9/2021
Department Supervisor, Chris Woods

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1) Scope and Applicability

This SOP uses EPA method 1664B for the determination of Oil and Grease (HEM) and SGT-HEM (non-polar material) in surface and saline waters and industrial and domestic aqueous wastes with Solid Phase Extraction. Extractable materials that may be determined are relatively non-volatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and other related materials. This method is not applicable to measurement of materials that volatilize below approximately 85˚C. Petroleum fuels from gasoline through #2 fuel oil may be partially lost in the solvent removal operation. Some crude oils and heavy fuel oils contain a significant percentage of materials that are not soluble in n-hexane and recoveries of these materials may be low.

The reporting limit is 5.0 mg/L. The range of the test is 5.0 - 1000 mg/L but will vary with smaller aliquots as should be taken if HEM is expected to be above 500 mg/L.

Non-Petroleum Fat may be determined by subtraction of the SGTHEM from the HEM.

This SOP may not be applicable to samples which are high in suspended solids. Samples which require a liquid-liquid extraction are not performed at ALS Rochester.

2) Summary of Procedure

2.1 SPE - Oil and Grease is extracted from the sample by moving the sample through an Oil and Grease Fiber SPE disk purchased commercially. The extraction procedure is preceded by a conditioning and activation of the disk which is critical to achieve constant target recoveries. The Oil and Grease is then eluted off of the disk using n-Hexane solvent and collected into a collection flask.

2.2 If SGT-HEM is to be evaluated, the sample is treated with silica gel.

2.3 The solvent is then transferred from the collection flask to a dish for evaporation and gravimetric analysis.

2.4 Method Options and Modifications – Section 1.7 of the EPA method states “The laboratory is permitted to modify the method to overcome interferences or lower the cost of measurements, provided that all performance criteria in this method are met. The laboratory is using the following modifications, some of which are specifically allowed in the method. This SOP and associated records satisfy the requirements of Section 9.1.2.2 for records of modifications.

Item	**Method and Method reference section**	**Lab Procedure**	**Allowable per 1.7.1**
Extraction	Liquid-Liquid Separatory Funnel (11.3, 6.4)	SPE	yes 1.7.1.1 and 1.7.1.9 and 1.7.1.14
Concentration	Solvent Distillation glassware, bath, vacuum, etc. (6.6 and 11.4)	Nitrogen evaporation in Glass Petri dish or Aluminum pans	yes 1.7.1.2 and 1.7.1.3
Sample Volume	1000 mL (2.1, 6.1, 8.1)	250 mL	yes 1.7.1.5
Balance Calibration Frequency	Before and after each analytical batch. (9.5, 10)	Before and after each day	yes 1.7.1.6
Sample mixing	Mix sample (11.2)	Use settled “as-is” sample	yes 1.7.1.8
Water removal from extract	sodium sulfate (7.5, 11.3.7)	microtip pipet	yes 1.7.12 (by “other equivalent means”)
Silica gel	Anhydrous, 75-150 um, 30A pore size (Davisil Grade 923) (7.7)	Equivalent, tested per method	yes 1.7.1.13
Optimized n-hexane volume	3x30 mL portions of n-hexane (Liq-Liq) (11.3.3)	2x25 mL portions (disk elution)	yes 1.7.1.14
Use of Polar Solvent	Not used	methanol sent to waste and disk air-dried before contact with sample or n-hexane	yes 1.7.1.16 and 1.7.2.1
Temperature of extraction, evaporation, analysis		Evap set temp 70	yes 1.7.1.17
Rinsing of pH dipper	collect the n-hexane rinseate in the funnel used for sample extraction (11.2.1.3)	n-hexane is only ever added to the reservoir after the sample has been sent to waste and the disc is ready to be eluted.	yes 1.7.1.1

Item	Method and Method reference section	Lab Procedure	Justification
Spiking Solution	Prepare at 4000mg/L. Spike 10 mL into 1000mL QC/Sample for final conc of 40 mg/L. (7.10, 7.11)	Prepare at 8000 mg/L. Spike 1.25mL into 250 mL QC/Sample for final concentration of 40 mg/L.	Same final concentration. Prepared solution lasts longer.
Mark spiking solution level	Add acetone to spiking solution to bring level back to mark. (7.10.3)	Verify concentration each day used per the 7.10.3 Note and 7.12.	Better evidence of concentration. Less room for error.
Adsorption with silica gel	use stirbar and stirplate to mix extract with silica gel (11.5.3.2)	Shake extract and silica gel vigorously by hand in the stoppered collection flask.	Less chance for contamination from stirbar, less chance of loss with fewer transfers.

3) Definitions

3.1 Analyte – the HEM or SGT-HEM determined by this method.

3.2 HEM – n-Hexane Extracted Materials - Any materials extractable by n-hexane will be measured in this test even if they are not normally considered oil and grease. HEM is a method-defined analyte and is dependent on the procedure used, including the specifications of the n-hexane. The nature of the oils and/or greases, and the presence of extractable non-oily matter in the sample will influence the material measured and interpretation of results.

3.3 SGT-HEM – Silica Gel Treated – n-Hexane Extractable Materials – the non-polar material extracted by n-hexane from the sample.

3.4 SPE - Solid Phase Extraction – technique in which the analytes of interest that may be present in a sample are selectively adsorbed onto a disk and subsequently desorbed by an eluting solvent.

3.5 QA/QC Samples: Samples added to a sample preparation batch, or an analytical batch to provide quality assurance checks on the analysis

3.6 Method Blank (MB) - An aliquot of laboratory deionized water, preserved as a sample, that is intended to monitor the introduction of contaminants into the procedure. The blank is carried through the entire analytical process.

3.7 Laboratory Control Sample (LCS) - A reference with a known value that is run periodically to ensure that the method is accurately determining the value of the samples. This sample is also known as the PAR (Precision and Recovery) and the OPR (Ongoing Precision and Recovery). The LCS is carried through the entire analytical procedure and is treated as a sample.

3.8 Matrix Spike (MS) - In the matrix spike analysis, a predetermined quantity of standard solution is added to a sample matrix prior to sample extraction and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Percent recovery is calculated for the analyte.

3.9 Matrix Spike Duplicate (MSD) – A duplicate of the Matrix Spike. The RPD between the MS and MSD are evaluated for precision.

3.10 Laboratory Control Sample Duplicate (LCSD) – A duplicate of the LCS. The RPD between the LCS and LCSD are evaluated for precision.

3.11 Relative Percent Difference (RPD) – The absolute value of the difference of two values divided by the average of the same two values. Used to compare the precision of the analysis. The result is always a positive number.

3.12 Batch –Up to 20 field samples processed together as a unit with accompanying QC, extracted in the same 12 hour shift with the same materials. See ADM-BATCH for further discussion.

4) Health and Safety Warnings

4.1 All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

4.2 Chemicals, reagents and standards must be handled as described in the company safety policies, approved methods and in MSDSs where available. Refer to the Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

4.3 Sulfuric and Hydrochloric Acids are extremely corrosive and should be handled with extreme care. Hydrochloric and sulfuric Acid are used in this method. These acids are extremely corrosive and care must be taken while handling them. A face shield should be used while pouring acids. And safety glasses should be worn while working with the solutions. Lab coat and gloves should always be worn while working with these solutions.

4.4 n-Hexane has been shown to have increased neurotoxic effects over other hexanes and solvents. Inhalation of n-Hexane should be minimized by performing all operations with n-Hexane under a hood.

4.5 n-Hexane has a flash point of -23°C (-9°F), has explosive limits in air in the range of 1-7%, and poses a serious fire risk when heated or exposed to flame. Ignitability should not be performed near the hood in which 1664 is being performed. Be sure the vapor trap is chilled with ice.

4.6 Unknown samples may contain high concentrations of volatile toxic compounds and should be opened under a hood and handled only with gloves to prevent unnecessary exposure.

4.7 Refer to the Safety Manual for further discussion of general safety procedures and information.

4.8 Waste Management and Pollution Prevention

- Hexane and Methanol which is collected in the Erlenmeyer flasks when the SPE disks are being conditioned is disposed of into a labeled volatile organic waste container for proper disposal.
- It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when disposed of properly.
- The lab must comply with all Federal, State, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the EH&S Manual.
- For additional information see SMO-SPLDIS.

5) Cautions

5.1 Thoroughly wash the glass sample reservoir with soap and hot water, then rinse once with 1:1 HCl and three (3) Deionized water rinses. Remove stainless steel disk plate and clean with brush with deionized water. This is to be done after every sample is completed.

5.2 Clean glass Petri dishes and 125 mL elution flasks according to GEN-GC. Flasks are and Petri dishes are further dried in a drying oven (approximately 50˚C). Store in a clean, dry location.

5.3 Monitor o-rings for wear and replace as needed. Indications that the o-ring needs replaced include movement of the o-ring during disk conditioning or filtering becomes slow.

6) Interferences

6.1 Be sure the glassware is scrupulously cleaned according to GEN-GC to avoid contamination from previous samples.

6.2 Interferences extracted from samples will vary considerable from source to source, depending upon the diversity of the site being sampled. For those instances in which samples are thought to consist of complex matrices containing substances (such as particulates or detergents) that may interfere with the extraction procedure, a smaller sample may need to be collected for analysis.

7) Personnel Qualifications and Responsibilities

- It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. Final review and sign-off of the data is performed by the department supervisor or designee.
- Training – see ADM-TRAINING. Each analyst must initially complete an acceptable IDC before beginning the analysis of samples. The precision of the IDC must be less than 11% for HEM and 28% for SGT-HEM. The Recovery of the IDC must be 83-101% for HEM and 83-116% for SGT-HEM. These IDC limits are tighter than the routine batch LCS limits.

8) Sample Collection, Containers, Preservations, and Storage

8.1 For most accurate analyses, sampling containers should be free of any organic contaminants.

8.2 Sampling and storage of samples should be done in purchased, pre-cleaned, certified 250 mL amber glass bottles following conventional sampling practices, except that the bottle must not be pre-rinsed with sample before collection. To allow for potential QC failures and Matrix QC requirements, it is recommended that additional sample aliquots be collected. The lab is currently sending out 250 mL bottles with new bottle requests. 1000 mL bottles are also acceptable.

8.3 Typically one extra bottle per analytical method is provided and should be filled by the sampler. The lab will use the extra bottle at its own discretion, and it may be used for batch MS/MSD, resulting in no extra volume to re-extract for QC failures. If the client desires matrix QC to be performed on a specific sample, or that there are volumes retained for re-extractions, the client must request additional bottleware or request “QC” on a sample at the time the bottle request is made.

8.4 Only grab samples are to be collected. In situations where composites are necessary, individual grab samples collected at prescribed time intervals must be analyzed separately and the concentrations averaged.

8.5 If samples are high in suspended solids or are historically difficult to pass through a SPE disk, consult with the laboratory to determine the volume, or volumes, to collect for best results.

8.6 Since sample analysis is to be delayed from collection by more than two hours (2 hours), the sample must be acidified (pH<2) and preserved with either HCl or H2SO4. The lab uses H2SO4 in lab-provided bottle sets. If the pH of the sample is not <2 during the check at analysis, the out of compliance preservation condition must be noted in the case narrative by the analyst or secondary reviewer (Code: 1664PH).

8.7 All samples must be stored refrigerated at 0 - 6°C from the time of collection until extraction.

8.8 All samples must be analyzed within 28 days from the date of collection.

8.9 Additional handling, storage, and custody procedures are discussed in SOP SMO-GEN and SMO-ICOC.

9) Equipment and Supplies

- SPE Manifold (CPI Inc., Accuprep 7000 - Manifold rack with six (6) 47mm Extraction Stations with 300 or 1000 ml Sample Reservoirs. P/N 4350-08) in Laboratory Fume Hood
- Oil and Grease Fiber SPE Disks (Biotage LLC 1664-47-HT or equivalent)
- 125 mL round bottom flasks with 24/40 ground glass joint
- 125 mL or 250 mL Erlenmeyer flasks with 24/40 ground glass joint
- 100 mL capacity Kimex Petri Dish Bottoms or Aluminum pans - 105mm in diameter, Environmental Express P/N F9314DSH-C (or equivalent).
- 25 mL Graduated Glass Pipettes
- 5 mL Volumetric Pipette
- Microtip glass Pasteur pipettes
- Latex bulb for small pipettes
- Syringe – Hamilton Co. GASTIGHT #1001 1mL syringe
- 8 L vacuum trap with insulated cooler
- 1/8 – 1/4 hp vacuum pump
- Semi-Micro Analytical balance capable of weighing 0.01mg – calibrated and used according to ADM-DALYCK.
- pH paper – wide range – examples: pHydrion by Mikro 1-12 or EMD colorpHast 0-14
- Plastic reducing locking clips
- Whatman 41 Filter paper, or equivalent
- 100 mL Volumetric Flask
- 2 and 1000 mg Class 1 weights.
- 50-80°C Incubator – temperature of the incubator is not critical.
- Dry Bath – Heating block with Nitrogen Evaporation – Thermo Drybath Cat#8887003
- Wash bottle – fluoropolymer for n-hexane
- Tongs
- Desiccator with color indicating desiccant

10) Standards and Reagents

10.1 All standards must be traceable using the laboratory lot system (CE-QA007).

10.2 Reagent water (laboratory deionized water)

10.3 All standards and reagents expire per the Expiration Policy (CE-QA012) unless otherwise noted in this SOP.

10.4 Reagents and Standards – Purchased Commercially. Store at room temperature unless otherwise indicated.

- Hydrochloric acid – concentrated
- Sulfuric acid – concentrated
- N-Hexane-85% purity, 99.0% minimum saturated C6 isomers, residue less than 1 mg/L. Store in a flammable cabinet.
- Methanol - Store in a flammable cabinet.
- Acetone-reagent grade, residue less than 1 mg/L - Store in a flammable cabinet.
- Hexadecane-98% purity
- Stearic Acid-98% purity

10.5 Hydrochloric or Sulfuric Acid, reagent grade – 1:1. Mix equal volumes of concentrated HCl or H_2SO_4 to reagent water. Store at room temperature.

10.6 Silica gel – Anhydrous, 75-150 um, 30A pore size. Store in a desiccator or tightly sealed container. The silica gel must contain less than 5 mg of n-hexane soluble material per 30 g (<0.17mg/g).

10.7 Hexadecane / Stearic Acid (1:1) spiking solution-Prepare in acetone at a concentration of 4 mg/ml each. The true value for SGT-HEM will be half that of HEM since the stearic acid is removed by silica gel treatment.

10.7.1 Clean and dry one (1) 100ml volumetric flask in the 50-80°C incubator (the temperature of the incubator is not critical) and allow to cool in a desiccator.

10.7.2 Add approximately 400 mg stearic acid and approximately 400 mg hexadecane to the 100 mL volumetric flask and dissolve to the mark with acetone. Record exact masses used. Calculate exact concentration.

10.7.3 After the hexadecane and stearic acid have completely dissolved, transfer the solution into 60 mL amber glass jars. Store spiking solution in the dark at room temperature. Remake every six months or sooner if the following check fails:

10.7.4 The concentration of the spike is verified each batch by adding 5 mL to a tared vessel, evaporating, and weighing. Compare to the calculated true value. If the experimental value is not within 1mg of the calculated value, remake the spike.

10.8 Laboratory Control Sample – (~40 mg/L) For 1000mL extraction, add 5.0 mL Hexadecane/ Stearic Acid spiking solution with a glass volumetric pipet to 950-1050 mL of acid preserved DI in a sample bottle. For the 250mL extraction, add 1.25 mL of Hexadecane/Stearic Acid spiking solution with a glass syringe to ~250 mL of acid preserved DI in a sample bottle. Prepare fresh before use.

10.9 Matrix Spike and Matrix Spike Duplicate – Add Hexadecane/ Stearic Acid spiking solution to the measured sample volume. Spike with the same volume and technique as described for the LCS.

10.10 Method Blank – ~1000 mL or ~250 mL of acid preserved DI in a sample bottle analyzed as a sample. For the SGT method blank, use the maximum amount of silica gel used in any sample.

11) Method Calibration

The semi-micro analytical balance is checked for calibration each day of use with a range of Class 1 weights. The balance is checked for calibration before and after the run with 2 and 1000 mg Class 1 weights. The balances are calibrated by an outside service according to ADM-DALYCK.

12) Sample Preparation and Analysis

12.1 Equipment preparation – add ice to the container surrounding the vapor trap.

12.2 Sample Preparation:

12.2.1 Remove the samples from the cooler. Samples must be at room temperature for extraction.

12.2.2 Check to see if any of the samples have extra bottles for matrix QC. If extra volumes are available, they must be used for batch matrix QC (up to the required frequency) and not retained for re-extraction. Prioritize as follows:

12.2.2.1 If 2 extra volumes for a single sample are available, analyze MS/MSD.

12.2.2.2 If 1 extra volume is available for each of 2 different samples, analyze a DUP on one, and a MS on the other.

12.2.2.3 If only 1 sample has 1 extra volume, analyze a MS and LCSD.

12.2.2.4 If no samples have extra volume, analyze LCSD.

12.2.3 Prepare the benchsheet (see attached) using the information from the QC section for QC frequency and from ADM-BATCH for batching and sequencing.

12.2.4 Weigh the full sample bottle (with lid) and record the weight on the benchsheet.

12.2.5 Check the pH of the sample by dipping the end of a glass disposable pipette or a glass stirring rod into the sample and allowing a drop of the sample to fall on or touch a piece of pH paper. Record this value on the analytical bench sheet. If needed, add a drop or two of 1:1 HCl until the pH is measured to be <2. Check the pH of the LCS and MB. Save the dipping device in a clean, labelled place (labelled with reservoir number) to be later rinsed with solvent into the empty sample bottle with the bottle rinse. If the pH of the sample is not <2 during the check at analysis, the out of compliance preservation condition must be noted in the case narrative by the analyst or secondary reviewer (Code: 1664PH)

12.3 SPE Disk Conditioning and Activation:

*NOTE: Proper conditioning of the SPE Disk is critical for a successful extraction. Failure to properly condition and activate the disk may result in low or erratic recoveries.

12.3.1 Record the lot number of the SPE Disks on the benchsheet.

12.3.2 Place a 24/40 ground glass jointed Erlenmeyer flask in the collection position on the SPE Manifold in order to collect solvent waste. Secure with plastic locking clips. Wipe any residue from the collar and place a clean screen on the manifold.

12.3.3 Place SPE Disk on manifold on top of the stainless steel screen with ripple side of the disk facing up. Set the glass sample reservoir on the manifold so that the disk is centered. Tighten the aluminum-locking ring so that the reservoir and disk form a tight seal. Be careful not to screw the aluminum-locking ring so tightly so that the reservoir cracks. Set all manifold controls so that they are in the closed position.

12.3.4 If the use of a SPE Prefilter is required for the sample, it should be placed in the neck of the reservoir prior to placement on the manifold. The bottom of the prefilter should not be flush with the bottom of the reservoir. Record which samples used a prefilter in the “Misc” column and record the lot number of the prefilter.

12.3.5 Wash the disk with 25 mL n-Hexane. Record the lot number of the n-hexane. Be sure to rinse the sides of the sample reservoir completely with the n-Hexane solvent in order to remove any possible contamination. Set the controls to elute and under light vacuum pressure pull 2 or 3 mL of n-hexane through the disk. Turn off the vacuum and set controls back to the closed position. Allow the disk to soak in the n-hexane for 2 minutes, then set the controls to elute and apply vacuum pressure slowly until the disk is completely dry. Repeat this step a second time. (2 rinse and soaks total.)

12.3.6 Add 25 mL Methanol to the reservoir. Record the lot number of the methanol. Apply a light vacuum and elute 2 or 3 mL of the methanol through the disk. Turn off the vacuum and set controls back to closed and allow the disk to soak for 1 minute. Apply a light vacuum and carefully elute the majority of the methanol, but be sure to leave ~2 mm of methanol on top of the disk. (Do not allow the disk to go dry!)

12.3.7 Add 10 – 15 mL DI water to the reservoir. Apply a light vacuum and elute the majority of the water through the disk, again leaving ~2 mm of water on top of the disk. Repeat this step a second time, making sure that the disk is not allowed to go dry.

12.4 SPE Sample Extraction:

12.4.1 Slowly decant the sample into the sample reservoir. Do not pour the majority of any suspended material into the reservoir at this point. However, be sure to add the remainder of the sample to the reservoir before the disk goes dry. For samples where less than the full volume provided is used (ie. There is too much suspended material to allow the sample to pass through the extraction disc), thoroughly shake the sample bottle to mix suspended material and note:"<Full Volume" on benchsheet and note in Case Narrative.

12.4.2 On the benchsheet, document the manifold position corresponding to the sample.

12.4.3 Apply full vacuum pressure and adjust the manifold controls to waste so that a constant extraction time is achieved. The extraction time should be no less than 10 minutes in duration so that maximum recoveries can be obtained. This can be accomplished by constant monitoring of the extraction for the first few minutes so that the manifold controls can be adjusted to extract more or less sample through the disk.

12.4.4 After sample extraction is complete, completely open the manifold controls to waste and continue to apply full vacuum pressure. This should be done for no less than 15 minutes to reduce the possibility of any water remaining on the disk.

12.5 SPE Sample Elution:

12.5.1 Remove the waste Erlenmeyer flask from the manifold.

12.5.2 Place clean, 125 mL round bottom flasks with 24/40 ground glass joints in the collection position on the manifold and secure with the plastic locking clips. Mark on the analytical bench sheet the collection flask with the sample that it corresponds with.

12.5.3 Rinse the sample jar with ~15 mL of n-hexane and pour this over the dipping device used for pH verification into the sample reservoir on the manifold. Rinse down the sides of the reservoir with ~10 mL of n-hexane.

12.5.4 Apply a light vacuum and elute 2 or 3 mL of n-hexane through the disk into the collection flask. Turn off the vacuum and let the disk soak for 2 minutes. After soaking for 2 minutes turn vacuum back on and open control completely in the elute position. Slowly increase vacuum pressure until all of the n-hexane has been eluted into the collection flask and the disk is dry. Repeat once from the previous step, including rinsing the sample jar.

12.5.5 Weigh the sample bottles (with lid) and record the weights on the benchsheet.

12.6 Sample Transfer and Evaporation:

12.6.1 On a tare weight sheet, record the ID and initial weight of the glass Kimex Petri dishes which will be used for evaporating the n-hexane. Be sure the balance is calibrated according to ADM-DALYCK and that the 2 and 1000 mg s-weight are used to verify the balance. Weigh each dish twice; the maximum difference between tare weights cannot exceed 0.5mg.

12.6.2 If the samples are to be analyzed for SGT-HEM only, treatment with silica gel is to occur at this time. If the samples are to be analyzed for both HEM and SGT-HEM, the silica gel treatment will occur after the analysis of HEM. If samples do not need analysis for SGT-HEM, skip the Silica gel treatment step.

12.6.3 Silica gel treatment – Add ~ 5 g silica gel to the collection flask. If the HEM is known to be high, use more silica gel (up to a max of 30 g) and/or divide the extracted solvent in half (be sure to account for the division in the calculation). Stopper and shake for 5 minutes. Proceed to the next step.

12.6.4 Place glass Petri dishes on the nitrogen evaporators in the hood. The evaporators are set to 70°C. Pour the extract from the collection flask into the Petri dish (pour through a filter if the extract includes silica gel). Rinse the collection flask twice with ~5 mL of n-hexane to ensure complete removal of any oil and grease residue. Add the rinses to the Petri dish. Record the Petri dish I.D. and the evaporator ID on the analytical bench sheet corresponding to the correct sample. Remove the dishes from the heat near the end of the evaporation. Remove before completely dry to minimize excessive heating and volatilization of the analyte.

12.6.5 After evaporation is complete, transfer the Petri dishes to a desiccator using a pair of tweezers or tongs. Let these sit in the desiccator for an hour before final weights are read.

12.6.6 Inspect the dishes for salt crystals. If crystals are observed, redissolve the extract in n-hexane, filter the extract, and evaporate. Process the MB and LCS in the same manner.

12.6.7 Read 2mg and 1000mg Class 1-verified weights before and after reading the batch of samples and record these weights on the bench sheet. Record gross weight of each sample on analytical bench sheet. Place the dishes back into a desiccator and allow the samples to continue to dry for 30 minutes. Reweigh to a constant weight until readings are within 0.5 mg or 4% of each other. If the initial gross weight is verified by the reweigh, use the lower gross weight in the sample calculation.

12.7 Analysis of SGT-HEM after analysis of HEM

After HEM analysis is complete, SGT-HEM may be determined by resuspending the HEM in n-hexane and treating with silica gel. Resuspension is not necessary if the HEM value was non-detect. SGT-HEM can be assumed to be non-detect also. If a sample undergoes this treatment, the MB and LCS are to undergo this treatment also.

12.7.1 Fill the Petri dish half full with n-hexane and allow to stand for 5 minutes

12.7.2 Pour the n-hexane into a boiling flask and rinse any remaining residue from the petri dish with n-hexane into the boiling flask. Use a large, glass, n-hexane rinsed funnel, to avoid loss of analyte.

12.7.3 Add an appropriate amount of silica gel to the flask. Determine this amount of silica gel from the result of the HEM analysis. It can generally be assumed that 3 grams of silica gel will adsorb 100 mg of all adsorbable material.

12.7.4 Stopper the flask and shake for 5 minutes.

12.7.5 Filter the solution through n-hexane moistened filter paper into a tared petri dish. Rinse the flask, silica gel, and filter with several small portions of n-hexane, collecting the rinse in the petri dish.

12.7.6 Proceed with evaporation and analysis as described for HEM.

13) Troubleshooting

13.1 If samples are high in suspended solids or are historically difficult to pass through a SPE disk, consult with the laboratory to determine the volume, or volumes, to collect for best results.

14) Data Acquisition

Data is entered manually to an electronic benchsheet. The benchsheet is electronically uploaded to LIMS.

15) Calculations and Data Reduction Requirements

15.1 HEM or SGT-HEM, mg/L = $\frac{(A-B) - (C-D) \times 1{,}000{,}000}{V}$

Where:
A = gross weight of dish, in grams
B = tare weight of dish, in grams
C = gross weight of dish for prep blank, in grams
D = tare weight of dish for prep blank, in grams
V = volume of sample extracted, in mL

15.2 If the entire sample volume in a single bottle is not used for analysis, the results may be biased low since the bottle is not rinsed with n-hexane and the analyte may cling to the sample bottle. Flag the data and explain in the case narrative.

15.3 Non-Petroleum Fat (mg/L) = HEM(mg/L) - SGTHEM(mg/L)

15.4 Data must be reviewed by the analyst and a peer (supervisor or qualified analyst) using a Data Quality Checklist before the results are validated and reported to the client. Further data review policies and procedures are discussed in ADM-DREV.

16) Quality Control, Acceptance Criteria and Corrective Action

16.1 A Method blank must be analyzed for every 20 or fewer samples. The result of the blank must be less than the MRL of 5 mg/L. If it is not, let the samples dry in the desiccator a bit longer and try again. If this does not bring the prep blank below the MRL, reextract samples associated with this blank. If reextraction is not possible, the sample results must be qualified and discussed in the case narrative. Samples with results greater than 10 times the blank contamination do not need to be reextracted nor qualified.

16.2 An LCS (OPR, PAR) must be analyzed for every 20 or fewer samples. The result of the LCS for HEM must be 78-114 % of the true value and for SGT-HEM must be 64-132% of the true value. If it is not, reextract samples associated with this non-compliant LCS whenever possible. Non-detect samples associated with a high LCS are acceptable and do not need to be reextracted nor qualified. If samples are to be reported with an out of control LCS (due to holding time or insufficient volume) flag the associated results.

16.3 MS/MSD must be analyzed for every 20 samples. See Sample Preparation section for priority of using extra volumes for matrix QC. The result of the MS (and MSD, if available) should be 78-114% of the true value for HEM and 64-132% of the true value for SGT-HEM. The precision limits are 18% RPD for HEM and 34% RPD for SGT-HEM. If limits are not met flag the associated data. If the LCS was acceptable, out of control matrix spikes are assumed to be matrix related and are not repeated.

16.4 Do not choose field blanks or rinse blanks as samples for analysis of MS/MSD.

16.5 If insufficient sample volume is received to perform a MSD, perform an LCSD to demonstrate precision for the run. The LCSD must meet the requirements for both precision and accuracy. If it does not, flag the associated samples.

16.6 Ongoing verification of the MDL is required. See ADM-MDL for requirements.

16.7 The limit for the 2 mg weight check is ± 0.2mg. The limit for the 1000 mg check is ± 0.5 mg. Read these weights before and after reading the batch of samples. If these weights are not in control, correct the balance problem and reweigh the samples.

17) Data Records Management

See ADM-ARCH.

18) Contingencies for Handling Out Of Control Data

If data is produced that is out of control and is not to be re-analyzed due to sample volume restrictions, holding times, or QC controls cannot be met, flag and narrate appropriately.

19) Method Performance

19.1 Detection and Quantitation limits are determined according to the requirements in the SOP ADM-MDL. The supporting information retained with the QA office.

19.2 Demonstration of Capability is performed upon instrument set-up, whenever a new analyst begins independent analysis, and whenever any changes are made to the method, including a new vendor of SPE filters. The precision of the IDC must be less than 11% for HEM and 28% for SGT-HEM. The Recovery of the IDC must be 83-101% for HEM and 83-116% for SGT-HEM.

19.3 This method was validated through single laboratory studies and an inter-laboratory method validation study conducted by the EPA. Combined data from these studies shows an average recovery of 93 percent for HEM and 89 percent for SGT-HEM and precision (as relative standards deviation) of 8.7 percent for HEM and 13 percent for SGT-HEM.

20) Summary of Changes

- Changed from 1664A to 1664B throughout.
- Incorporated 1/27/21 change form for method options and modifications and expanded upon the detailing of the options and modifications as compared to EPA 1664B.
- Changed the set temperature of the evaporator from 60 to 70˚C
- Changed temperature of oven/incubator used to dry glassware.
- Added details regarding the silica gel treatment
- Added procedure for removing salt crystals, if observed.
- Updated benchsheet and flowchart to reflect the updated method reference.

21) References and Related Documents

- Method 1664 Oil & Grease Using CPI nu•phase Fiber SPE Disks and Fastflo Prefilter, CPI, Revision F 1/21/98.
- Method 1664, Revision B: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry, USEPA. Feb. 2010.

22) Appendix

Attachments for Example Only. Controlled separately on the Controlled Forms section of the Rochester Intranet

Bench sheet

Flowchart for SPE

ALS ENVIRONMENTAL - ROCHESTER

Page 1

Analyte: Grease and Oil / Total Petroleum Hydrocarbons
Method: EPA 1664B
Solid Phase Extraction Manifold: CPI Accuprep 7000

Analyst: ____________
Date: ________
Pipet ID: Volumetric
Time: ________
Added ________ mls of ________ ppm lot # ________ to LCS/MS
LCS Volume ________
LCS True Value = ________
Hexane: ________
Methanol: ________ pH Paper: ________
SPE disks: ________ H2SO4: ________
Evap Set Temp(°C): ________ Silica Gel: ________
Top Loader Balance: R-Balance- ________ SGT filters: ________

Analytical Balance Verification: R-Balance- ________

	2 mg before	2 mg after	1 g before	1 g after
Gross 1:				
Gross 2:				
Gross 3:				

2mg Limits: 0.2mg 1g Limits: 0.5 mg

X1=Silica Gel Added

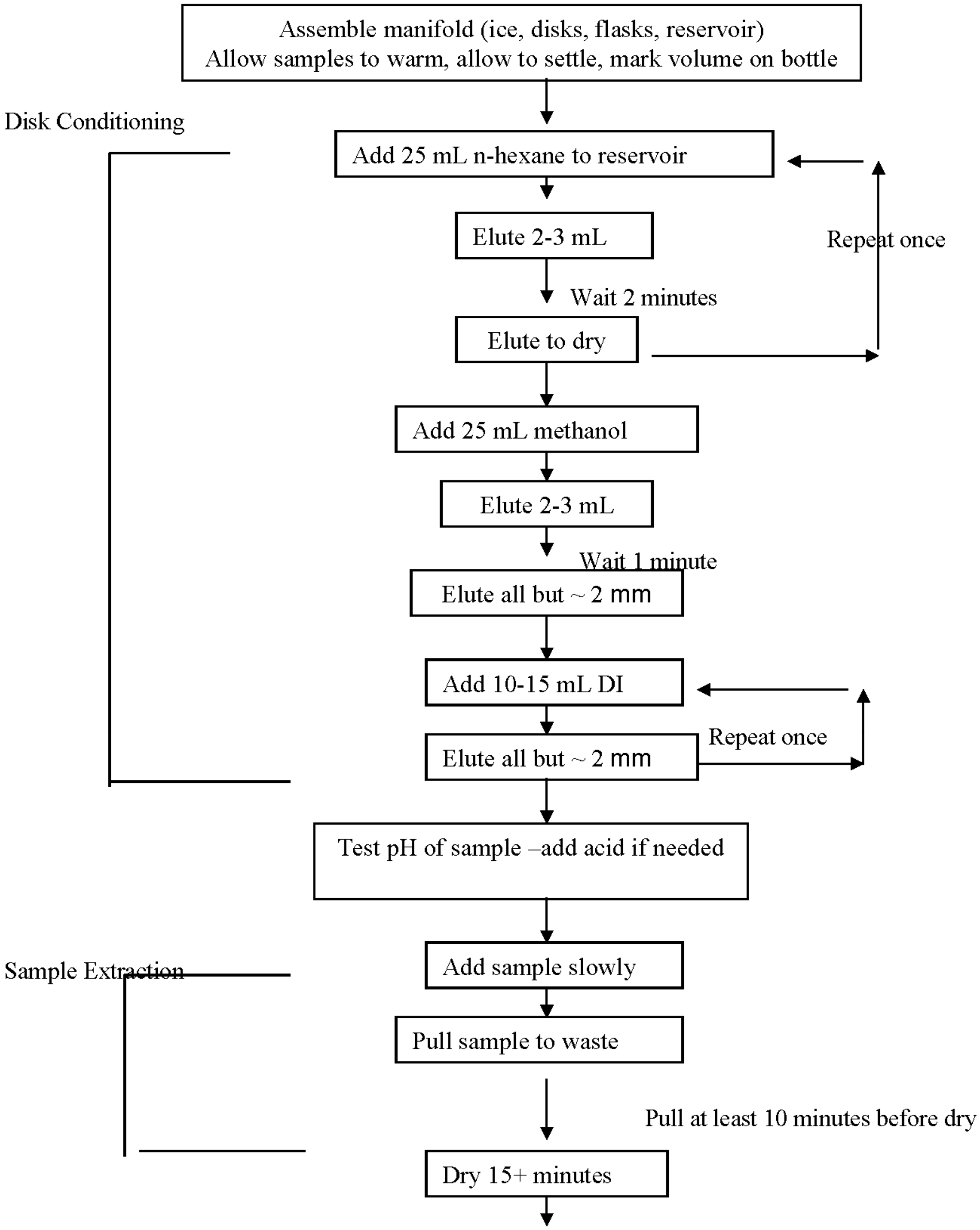
Spike Verification	
Dish ID	
Tare (g)	
mL added	5.0
Final (g)	
Diff (mg)	
within 1mg?	

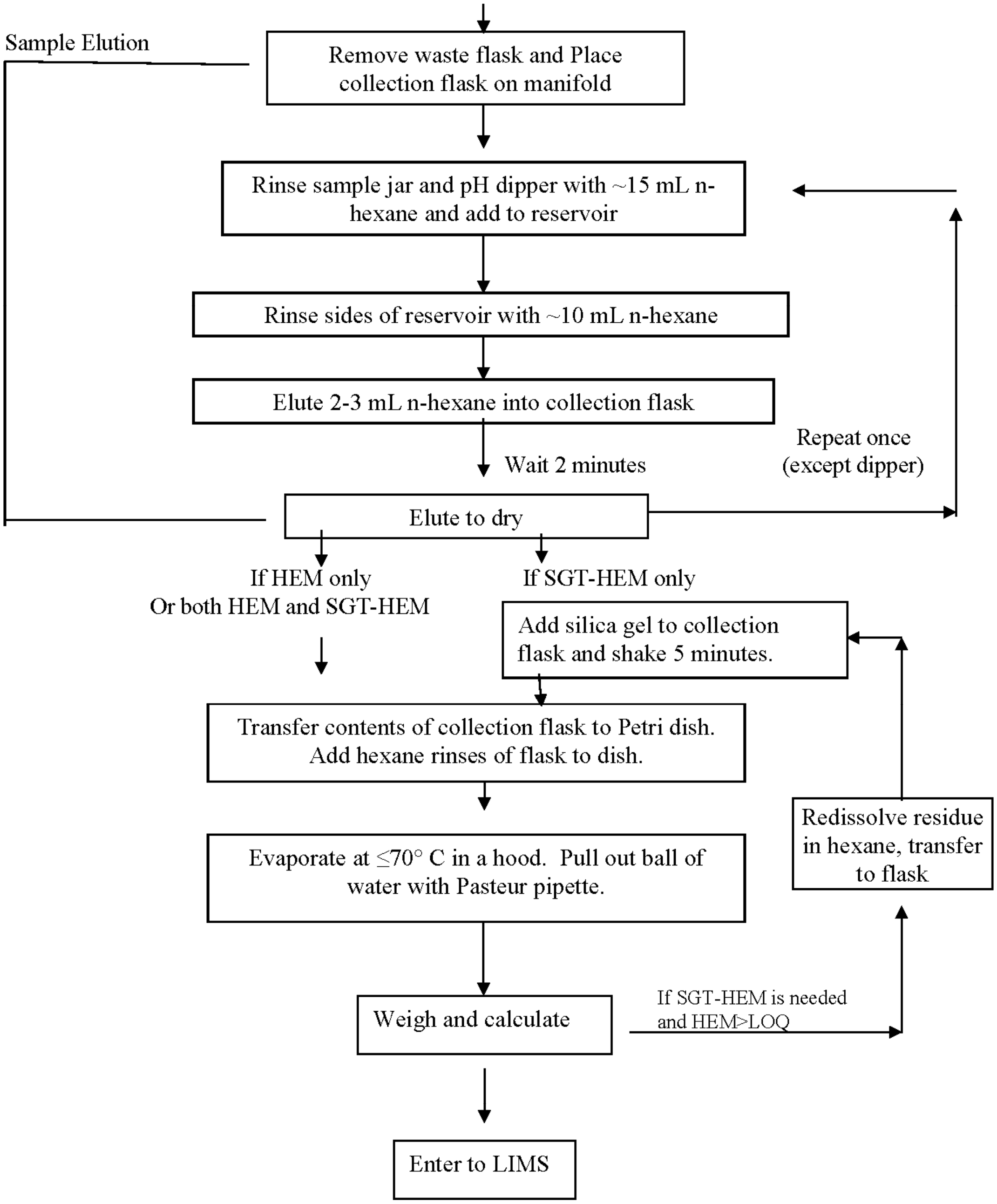
	Misc.	Order #	(X) if TPH	Flask IDs		Bottle (g) Before	Bottle (g) after	Sample Vol (mLs)	pH	Evap ID	Gross (g)			Tare	Difference (gross-tare)	Final Result (mg/L)
1				1								1				
				2								2				
				3								3				
2				1								1				
				2								2				
				3								3				
3				1								1				
				2								2				
				3								3				
4				1								1				
				2								2				
				3								3				
5				1								1				
				2								2				
				3								3				
6				1								1				
				2								2				
				3								3				
7				1								1				
				2								2				
				3								3				
8				1								1				
				2								2				
				3								3				
9				1								1				
				2								2				
				3								3				

mg/L G = [(gross-tare,g)-(blank, g (if nec.)) / vol. sample, mL] * 1,000,000

Template-1664-r4 3/15/2021

1664B Flowchart




Sample Elution
Remove waste flask and Place collection flask on manifold
Rinse sample jar and pH dipper with ~15 mL n-hexane and add to reservoir
Rinse sides of reservoir with ~10 mL n-hexane
Elute 2-3 mL n-hexane into collection flask
Wait 2 minutes
Repeat once (except dipper)
Elute to dry
If HEM only Or both HEM and SGT-HEM
If SGT-HEM only
Add silica gel to collection flask and shake 5 minutes.
Transfer contents of collection flask to Petri dish. Add hexane rinses of flask to dish.
Redissolve residue in hexane, transfer to flask
Evaporate at ≤70° C in a hood. Pull out ball of water with Pasteur pipette.
Weigh and calculate
If SGT-HEM is needed and HEM>LOQ
Enter to LIMS

SOP CHANGE FORM

SOP Title: Total Suspended Solids		
SOP Code: GEN-2540D	Revision No: 3	SOP Date: 1/22/24
SOP Section(s) Affected by Change: 10		

Description of Change: Now using Celite 545 to make TSS LCS.
- Weigh 100mg of Celite.
- Dilute to 1L in a volumetric flask w DI.
- Use stir bar to mix for at least 15 min.
- Once mixed, pour into TSS Reference bottle and store in fridge.
- True Value = 100 mg/L

Reason for Change: Had to change Standard from Kaolin to Celite.

Change(s) Submitted by: Hali Castrovinci	Date: 4/1/25

Approvals:

Supervisor Signature:	Date: 4/1/25
QA Signature:	Date: 4/4/25
Laboratory Director Signature:	Date: 4/4/25

QA:

Does the approved change require further SOP user attestations? (If so, complete below. Note: Attestations may be kept separately on file and need not be scanned to the SOP)	N
If the change will have a future effective date, or past definitive date what is that date? If blank, the effective date is the date of this SOP change form and reflects current practice.	

Attestations: I, the undersigned, have read, understood, and agree to implement and follow the above referenced SOP. I agree to follow this procedure without modification unless otherwise approved and directed to do so in a client-specific quality assurance plan or by a client-specific communication requirement.

Hali Castr

STANDARD OPERATING PROCEDURE
ALS | Environmental - Rochester, NY

SOP CHANGE FORM

SOP Title: Total Suspended Solids		
SOP Code: GEN-2540D	Revision No: 3	SOP Date: 1/22/24
SOP Section(s) Affected by Change: 12.3		

Description of Change:

Add that filters are to be placed on the filter holder with the wrinkle side up.

Reason for Change:
NY audit 2024

Change(s) Submitted by: Vicky Collom	Date: 5/13/24

Approvals:

Supervisor Signature:	Date: 5/14/24
QA Signature:	Date: 5/14/24
Laboratory Director Signature:	Date: 5/14/24

QA:

Does the approved change require further SOP user attestations? (If so, complete below. Note: Attestations may be kept separately on file and need not be scanned to the SOP)	Y
If the change will have a future effective date, or past definitive date what is that date? If blank, the effective date is the date of this SOP change form and reflects current practice.	

Attestations: I, the undersigned, have read, understood, and agree to implement and follow the above referenced SOP. I agree to follow this procedure without modification unless otherwise approved and directed to do so in a client-specific quality assurance plan or by a client-specific communication requirement.

Total Suspended Solids (TSS)

DOCUMENT ID: GEN-2540D, REV 3

Approved By: Operations Manager, Bill Allgeier Date: 1/9/24

Approved By: Quality Manager, Vicky Collom Date: 1/9/24

Approved By: Supervisor, Chris Woods Date: 1/9/24

Approved By: Christine Kutzer Technical Director, Christine Kutzer Date: 1/9/24

TABLE OF CONTENTS

1) Scope and Applicability

1.1 This SOP uses Standard Methods 2540D (2015) for the measurement of total suspended solids (non-filterable residue) in drinking, surface, and saline waters, domestic and industrial wastes.

1.2 Range of determination is 1 mg/L to 20,000 mg/L.

1.3 MRL is 1 mg/L when 1000 mL of sample are filtered.

2) Summary of Procedure

A well-mixed sample is filtered through a standard glass-fiber filter and the residue retained on the filter is dried to a constant weight at 103-105°C. The increased weight of the filter represents the total suspended solids.

3) Definitions

3.1 Duplicate Sample (DUP) - A laboratory duplicate. The duplicate sample is a separate sample aliquot that is processed in an identical manner as the sample proper. The relative percent difference between the samples is calculated and used to assess analytical precision.

3.2 Method Blank (MB)- The method blank is an artificial sample designed to monitor introduction of artifacts into the process. The method blank is carried through the entire analytical procedure.

3.3 Laboratory Control Sample (LCS) – A solution with a known value is prepared and analyzed as a sample. Percent recoveries are calculated for the analyte detected.

3.4 Batch – a group of no more than 20 samples analyzed together. See ADM-BATCH for more detail.

3.5 Relative Percent Difference (RPD) – The absolute value of the difference of two values divided by the average of the same two values. Used to compare the precision of the analysis. The result is always a positive number.

4) Health and Safety Warnings

4.1 All appropriate safety precautions for handling samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

4.2 Refer to the Environmental, Health and Safety Manual for other general safety information.

4.3 A fume vent is available on the 104 oven #7. Use this oven if drying samples are likely to need ventilation.

4.4 Waste Management and Pollution Prevention

The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the EH&S Manual. Samples and sample residue may be washed down the drain. See SMO-SPLDIS for further discussion on waste management.

5) Cautions

5.1 Replace desiccant in desiccators as needed (when desiccant is no longer blue).

5.2 Keep balance clean and dry. See ADM-DALYCK for balance information.

5.3 Add oil to the vacuum pump as needed.

5.4 Be sure dishes are cleaned according to GEN-GC.

5.5 If the filtration apparatus starts to look foggy or dirty, use a soft glassware brush to scrub the apparatus.

6) Interferences

6.1 Nonrepresentative particulates such as leaves, sticks, fish and lumps of fecal matter should be excluded if it is determined that their inclusion is not desired in the final result.

6.2 Excessive residue on the filter may form a water-entrapping crust. Limit the sample size to that yielding no more than 200 mg residue.

6.3 For samples high in total dissolved solids, thoroughly wash the filter to ensure removal of dissolved material.

6.4 Prolonged filtration times resulting from filter clogging may produce high results because of increased colloidal materials captured on the clogged filter.

6.5 Filtration apparatus, filter material, pre-washing, post-washing, and drying temperature are specified because they can affect the results.

7) Personnel Qualifications and Responsibilities

7.1 It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. Final review and sign-off of the data is performed by the department supervisor or designee.

7.2 Training – see ADM-Training.

8) Sample Collection, Containers, and Storage

8.1 Samples should be collected in purchased, certified clean plastic or glass bottles or jars. Volumes collected should be sufficient to insure a representative sample, allow for replicate analysis (if necessary), and minimize waste disposal. Typically, a 1000 mL HDPE bottle is provided with bottle sets.

8.2 Samples are to have no chemical preservation and are kept at 0-6°C until analysis to minimize decomposition of solids.

8.3 Holding time is 7 days.

8.4 Sample handling, storage, and custody procedures are discussed in SOP SMO-GEN and SMO-ICOC.

9) Equipment and Supplies

- Glass fiber filter discs, 4.7cm, Whatman GF/C or
- Preweighed 47mm glass fiber filter discs – SSI Products, LLC.
- Filtration Apparatus
- Aluminum Drying Dishes
- Drying Oven capable of maintaining 103-105 °C.
- Desiccators with color indicating desiccant mixed with uncolored (white) desiccant. The color indicating desiccant changes from blue to purple to pink as it loses its ability to absorb water from the air. When the desiccant is no longer blue (when it becomes purple), the desiccant is discarded and replaced with new mixed desiccant.
- Analytical Balance, capable of weigh to 0.1 mg. with U-Electrode Ionizer- calibrated according to ADM-DALYCK.
- Forceps
- Graduated Cylinder – Class A.

10) Standards and Reagents

10.1 Kaolin powder – purchased commercially. Dry at 104 °C for at least 1 hour and cool to room temperature prior to being weighed. Dried Kaolin powder is stored at room temperature in a glass beaker covered with aluminum foil in a desiccator. Expires per Expiration Policy (ADM-PUR).

10.2 Reference/LCS: To a tared plastic bottle, add 0.20 -0.30 g of dried Kaolin powder. Record actual weight used. Add DI water to 1000 g. The true value will be between 200 and 300 mg/L. Use as if it were a client sample. Store at 0-6 °C for up to one year.

10.3 MB – Use DI as if it were a client sample.

11) Method Calibration

Balance Calibration – The balance calibration is checked daily prior to use according to ADM-DALYCK. ADM-DALYCK also addresses balance use, limits, corrective action, documentation, and annual check of weights.

12) Sample Preparation and Analysis

Note: Handle filter with forceps at all times.

12.1 If using Environmental Express Proweigh Filters, skip the following filter preparation steps.

12.1.1 Place the disc on filter apparatus. While vacuum is on, wash the disc with three successive 20 ml volumes of distilled water. Remove all traces of water by continuing to apply vacuum after water has passed through. Discard washings. Remove filter from the apparatus and place in a numbered crucible. Record the lot number of the filters on the benchsheet. Dry the filters at 550°C for at least 20 minutes. Remove to a desiccator and cool for at least 30 minutes.

12.1.2 Weighing of filters – Weigh the 1.0000g Class 1 weight and record on the tare sheet. Transfer filter to the analytical balance and record the weight of the filter with the ID number. Weigh filter twice; successive weights must be within 0.5 mg of each other. Record the balance ID.

12.2 Prepare a sequence of samples and QC in compliance with the frequency requirements in ADM-BATCH and the QC section of this SOP. Prioritize samples according to holding times and rush dates. Use the benchsheet appropriate to the test (TSS or VSS). An example TSS benchsheet is attached to this SOP. An example VSS benchsheet is attached to GEN-160.4.

12.3 Transfer the tared filter to the filtering apparatus and begin suction. Wet the filter with a small volume of distilled water to fit it to fritted support.

12.4 Selection of sample volume - The target residue on the filter is 2.5-200 mg.

12.4.1 For clean samples, choose a sample volume up to 1000 mL. The first measured volume must be <1/2 the total volume received, unless historical data for this sample indicates that the entire volume will pass. If the entire first measured volume does not pass the filter (the filter clogs), discard the filter. Cap and shake the bottle and add a smaller measured volume to a new filter. Do not add any volume remaining in the graduated cylinder back to the sample bottle. Do not add portions of the measured volume and calculate the volume that passed by difference.

12.4.2 If the first measured volume passed the filter and it appears that more volume needs to be added to meet the reporting limit, estimate the volume expected to pass, cap and shake the sample bottle, measure and filter the aliquot through the same filter. Use small enough aliquots that it is unlikely they will clog the filter. If, however, the estimation was incorrect, and there will be insufficient sample to repeat with a new filter, measure by difference and note the problem on the benchsheet.

12.4.3 Smaller sample volumes will be needed for dirty samples. If filtration time exceeds 10 minutes, discard the clogged filter and repeat with a new filter set and a smaller sample volume.

12.5 Shake the sample vigorously and transfer the predetermined sample volume selected to the filter using a graduated cylinder. Type the volume into the spreadsheet with the corresponding sample and dish ID. Verify the volume and mark the verification on the spreadsheet.

12.6 With suction on, wash the graduated cylinder, filter, non-filterable residue and filter funnel wall with three portions of distilled water allowing complete drainage between washing. Remove all traces of water by continuing to apply vacuum after all the water has passed through. A 3 minutes dry time is mentioned in the method, but less time is typically used because the vacuum will start to pull the filter through the apparatus before 3 minutes.

12.7 Carefully remove the filter and place into the aluminum dish or crucible. Dry at least one hour at 103-105°C. In the oven In/Out log, record the time and temperature. Record the ID of the oven used. When dishes are removed from the oven, place hot dishes in a desiccator with the lid on, leaving a 1-2 cm gap. Start a timer for 10 minutes. Close the desiccator completely when the timer alarms. Cool dishes in the desiccator. For TSS, remove the filter from the dish and weigh the filter. For VSS, weigh the entire filter and crucible. Record the balance ID.

12.8 Repeat cycles of igniting, cooling, desiccating, and weighing until weight change is <0.5 mg.

12.9 If the samples are to undergo volatile solids analysis, retain the dish and filter in a desiccator and proceed with GEN-160.4.

13) Troubleshooting

Maintenance log - All Preventive maintenance, as well as instrument repair, should be documented in the appropriate instrument maintenance log. Most routine maintenance and troubleshooting are performed by laboratory staff. Other maintenance or repairs may, or may not require factory service, depending upon the nature of the task. Any maintenance performed by outside services must also be documented – either through notes in the log or through documents provided by the service. The log entries will include the date maintenance was performed, symptoms of the problem, serial numbers of major equipment upgrades or replacements. This applies to the oven log used for temperature checks and balance log used for calibration and daily checks.

14) Data Acquisition

Data is recorded manually into a controlled Excel spreadsheet. Tare weights from the pre-weighed filters are downloaded from the manufacturer website and applied to the Excel benchsheet electronically. Data is uploaded from the spreadsheet to LIMS.

15) Calculation and Data Reduction Requirements

$$mg\ total\ suspended\ solids / L = \frac{(A - B) \times 1000{,}000}{sample\ volume,\ mL}$$

Where:
A= weight of dried residue + dish (g)
B= weight of dish (g)

Data must be reviewed by the analyst and a peer (supervisor or qualified analyst) using a Data Quality Checklist before the results are validated and reported to the client. Further data review policies and procedures are discussed in ADM-DREV. Run creation, data uploading, and run approval procedures are discussed in ADM-DREV.

16) Quality Control, Acceptance Criteria, and Corrective Action

16.1 Run one duplicate per batch of 20 samples. The DUP should have an RPD < 10%. If the sample is low level (≤5 times the PQL), the RPD may exceed 10%, but the difference between results must be less than ≤ the PQL. If the RPD of the duplicates is >20%, repeat the sample and duplicate unless there is assignable matrix interference, historical failures, or lack of volume. If an out of control duplicate is not repeated, note the reason on the data quality checklist. If, at the time when the problem is discovered, the sample exceeds twice the holding time, discuss with supervisor or Project Manager prior to repeating the samples. Report all of the replicates and explain in the checklist for the case narrative.

16.2 Run a Laboratory Control Sample per batch of 20 samples. The LCS recovery should be within the limits set in the Wetchem QC table in Appendix C of the Quality Assurance Manual. If it is not, determine the cause, fix the problem, and repeat the samples if volume and holding time permits. If not, flag the samples. If the LCS recovery is greater than its upper limit, associated non-detect samples may be reported. The ND sample with high bias LCS exception does not apply to DOD samples unless this SOP is superseded by a client specific QAP.

16.3 Analyze a Method Blank for every 20 or fewer samples. The result of the blank must be less than the PQL (Final weights of blanks must vary no more than 1.0 mg from the tare) or <1/2 LOQ for DOD and NC. If it is not, the associated sample results may be used if they are less than the PQL or greater than 10 times the blank value. If this criteria is not met, repeat the samples if volume and holding time permits, or flag the data.

17) Data Records Management

See ADM-ARCH

18) Contingencies for Handling Out of Control Data

If data is produced that is out of control and is not to be re-analyzed due to sample volume restrictions, holding times, or QC controls cannot be met, flag and narrate appropriately.

19) Method Performance

19.1 Demonstration of Capability is performed according to ADM-TRAINING.

19.2 Precision Data is available in the referenced method SM 2540D.

20) Summary of Changes

- Incorporated change forms for adding DOD, placing filter on balance instead of filter and tin, dessicant expiration and use, using measured volumes instead of by difference, removed twice daily temps,
- Updated format and SOP references and attachments
- Updated to SM2540-2015 version throughout.
- Removed 4% as a limit for constant weight per SM 2540-2015
- Removed ASP holding time.
- Removed need to assign expiration to desiccant since using color indicator.
- 12.1.2 Changed the Class 1 weight used during the taring process from 20g to 1g.
- 4.3 – modified since only Oven 7 has a ventilation drop.
- 5.5 – Added the need to use a brush on the filtration apparatus if it begins to look foggy/dirty.

21) References and Related Documents

- APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association, Washington, D.C. Method 2540D. 2015.
- DOD QSM version 5.4 or most current version

22) Attachments

For example only – forms are controlled on the Controlled Forms section of the Rochester Intranet.

ALS Environmental

Page 1

Analyte: Total Suspended Solids (TSS)
Method: SM 2540D-2011, -2015
Analyte: Total Dissolved Solids (TDS)
Method: SM 2540C-2011, -2015
Analyte: Total Solids (TS)
Method SM 2540B-2011, -2015

Analyst: ____________________
Date: ____________
Pipet: ____________________
Time: ____________
TS _____
TDS _________
TSS _________
LCS Lot: ____________________
TV: _____
Balance ID: **R-BALANCE-**
Bag Lot: ______________
Filter: __________
Oven ID: _________
*Lower tare weight used unless marked: _____

	Misc.	**Order #**	**Dish ID**	**Sample Vol. (mLs)**	**Used all**	**Vol. Conf.**	**Raw Data**				**Total Solids (mg/L)**
1							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
2							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
3							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
4							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
5							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
6							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
7							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
8							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
9							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
10							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
11							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
12							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		
13							Gross (A) 1:		Gross (A) 3:		
							Gross (A) 2:				
							B)		A-B=		

TS, TDS, TSS mg/L = (A-B)*1,000,000 /Sample Vol. (mls)
Where: A = wgt (g) of dried residue + dish
B = wgt (g) of tared dish

I:\ACQUDATA\WetChem\Solids\Solids\Template-Solids-r8
Template-Solids-r8 9/15/2021

Appendix C

Sampling and Analysis Plan for Supplemental Site Stormwater Characterization at the GE Pittsfield Site

November 2024
General Electric Company – Pittsfield, Massachusetts

Sampling and Analysis Plan: Supplemental GE-Pittsfield Site Stormwater Characterization

Prepared for General Electric Company

November 2024
General Electric Company – Pittsfield, Massachusetts

Sampling and Analysis Plan: Supplemental GE-Pittsfield Site Stormwater Characterization

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APPENDICES

ABBREVIATIONS

AES	Adirondack Environmental Services
BMP	best management practice
City	City of Pittsfield
EPA	U.S. Environmental Protection Agency
ESA2	East Street Area 2
FSP/QAPP	*GE-Pittsfield/Housatonic River Site, Second Revised Field Sampling Plan/Quality Assurance Project Plan*
GE	General Electric Company
HASP	*Site Health and Safety Plan*
MassDOT	Massachusetts Department of Transportation
NPDES	National Pollutant Discharge Elimination System
OWS	oil/water separator
PCB	polychlorinated biphenyl
PEDA	Pittsfield Economic Development Authority
SAP	*Sampling and Analysis Plan: Supplemental GE-Pittsfield Site Stormwater Characterization*
TSS	total suspended solids
WQBEL	Water Quality Based Effluent Limitation

1 Introduction

This *Sampling and Analysis Plan: Supplemental GE-Pittsfield Site Stormwater Characterization* (SAP) has been prepared for the former General Electric Company (GE) facility located in Pittsfield, Massachusetts (Figure 1). The former GE facility has an administratively continued National Pollutant Discharge Elimination System (NPDES) permit that was issued on September 30, 2008, and modified on August 10, 2009. GE's activities at the former GE facility no longer involve manufacturing or any other industrial operations, but consist only of environmental remediation and some office-based activities.

In February 2020, the U.S. Environmental Protection Agency (EPA), GE, and others executed a Settlement Agreement regarding the appropriate response under the 2000 Consent Decree covering the GE facility (EPA 2000) to the polychlorinated biphenyl (PCB) contamination in the portion of the Housatonic River known as the Rest of River. One of the provisions of that Settlement Agreement stated that GE and EPA would engage in good-faith discussions regarding a renewal of the NPDES permit for the former GE facility based on implementation of best management practices (BMPs) to improve stormwater management.

In 2023, a draft renewed NPDES permit (No. MA0003891) was issued by EPA for public comment. The draft permit included new numeric and non-numeric limitations for PCBs, total suspended solids (TSS), and other parameters, as well as certain additional prohibitions. The additional proposed prohibitions included the elimination of designed treatment overflow allowances (i.e., bypasses) for oil/water separators (OWSs) and the identification and elimination of dry-weather flows.

GE submitted comments on the draft NPDES permit to EPA on December 2023 (GE 2023). GE's comments explained the following, among other things: (1) the proposed PCB and TSS effluent limits are not currently achievable; (2) a reasonable potential analysis has not been conducted to demonstrate that the proposed Water Quality Based Effluent Limitations (WQBELs) for PCBs are necessary and/or feasible to meet; (3) the proposed elimination of OWSs and prohibition on dry-weather flows are also infeasible to achieve at this time; and (4) in any event, schedules have not been proposed for meeting the permit requirements through the implementation of specified BMPs.

More specifically, as described in GE's comments, EPA has determined that the PCB Performance Standards specified in the Consent Decree for soil and groundwater at the former GE facility are protective of human health and the environment and that no further response actions are necessary there. The elimination of PCBs from stormwater discharges from the former GE facility is impossible given the PCBs remaining in soil and groundwater consistent with the Consent Decree's Performance Standards. Also, the proposed TSS numeric limitation of 30 milligrams per liter is currently not achieved at nearly all outfalls.

Additional data are needed to determine what effluent limitations and/or other requirements might be achievable at the former GE facility and through what BMPs. These data needs include the relative contributions of TSS (in terms of both concentrations and particle size) from off-site areas—namely, properties owned by the City of Pittsfield (City) and by the Massachusetts Department of Transportation (MassDOT)—and from on-site areas. Additional Investigations are also needed to determine where dry-weather flow may be occurring. Finally, a hydrologic and hydraulic model of the former GE facility is needed to understand and predict stormwater flows, including contributions originating from off-site (i.e., non-GE) areas. Such a model will allow for the development of concepts for site improvements and modifications that will aid in the management and treatment of stormwater. To develop this model, continuous flow data are needed.

This SAP was prepared to identify sampling locations, specify monitoring equipment, and describe schedules and methods for conducting stormwater sample collection and flow monitoring necessary to further characterize stormwater and dry-weather discharges from the former GE facility so as to address the above data needs.

Along with this SAP, the revised *GE-Pittsfield/Housatonic River Site, Second Revised Field Sampling Plan/Quality Assurance Project Plan* (FSP/QAPP; Arcadis 2023a), which was submitted in December 2023 and has been approved by EPA, provides procedures to support the sampling, analytical, and other data collection and quality assurance procedures that will be followed during stormwater characterization.

All work presented in this SAP will be performed in accordance with GE's July 2023 *Site Health and Safety Plan* (HASP; Arcadis 2023b).

1.1 Site Description

The former GE facility is an approximately 254-acre parcel of land adjacent to the Housatonic River and Unkamet Brook (Figure 1). Although the former GE facility historically housed multiple manufacturing operations that produced many products, including transformers, ordnance, and plastics, the last of those operations ceased in 2003, and GE has eliminated all process wastewater and industrial-related discharges. As noted above, GE's current activities at its former facility consist only of environmental remediation activities and some office-based activities.

The former GE facility consists of the following areas (designated as Removal Action Areas in the Consent Decree): the 20s Complex, the 30s Complex, the 40s Complex, East Street Area 2 (ESA2)-South, ESA2 -North, East Street Area 1-North, Hill 78 Consolidation Area, Building 71 Consolidation Area, Hill 78-Remainder, and the Unkamet Brook Area. Portions of the GE facility (primarily portions of the former 19s, 20s, 30s, and 40s Complexes) were transferred to the Pittsfield Economic Development Authority (PEDA) in 2005 and 2011. This transfer included some separation and isolation of the stormwater collection system located on PEDA's property from GE's stormwater collection system and transfer of NPDES permit coverage for certain outfalls from GE's NPDES permit to a PEDA NPDES permit. Drainage areas remaining under the GE permit include 005N, 005S, 006, 009, and four yard drain areas (YD10, YD12, YD13, and YD16). The stormwater at the former GE facility is managed using a dedicated stormwater treatment facility (the Building 64T water treatment plant), as well as OWSs. In addition to the stormwater conveyance system, GE operates a Groundwater Treatment Facility at Building 64G.

1.2 Plan Organization

The SAP provides describes sample locations, rationale, and schedules and methods for conducting sample collection and flow monitoring necessary to further characterize stormwater at the site. Following this Introduction (Section 1), the remainder of this SAP is divided into the following sections:

- **Section 2:** Overview and Approach
- **Section 3:** Equipment Needs and Installation
- **Section 4:** Sample Collection
- **Section 5:** Field Equipment Decontamination Procedure
- **Section 6:** Investigation-Derived Waste
- **Section 7:** References

2 Overview and Approach

2.1 Objectives

The data quality objectives for the supplemental sampling described in this SAP are presented in Tables 1 and 2 and are discussed further in Sections 2.2 through 2.5 below. Sampling will be performed to characterize stormwater and dry-weather discharges to OWS systems, dry-weather inflow/infiltration and stormwater contributions from the City and MassDOT areas, and stormwater system flow rates. Details on sampling methods and procedures are discussed further in Sections 3 to 6.

2.2 Oil-Water Separator Sampling

As described in Table 1 as Data Needs No. 1 and No. 2, stormwater samples will be collected at three OWSs (64W, 64X, and 64Z) to meet two objectives: (1) characterization of influent to the OWSs to inform possible pre-treatment/additional treatment options; and (2) characterization of stormwater that is flowing through the OWSs to evaluate the effectiveness of that current treatment system. All three of these OWSs have similar construction, as depicted on Figure 2. The site orientation and locations of the OWSs are shown on Figures 3 through 5. As documented in the *Oil/Water Separator 64Z Pilot Study Report* (Arcadis 2010), each OWS consists of an influent building, which contains an influent chamber, trash rack, drum screen, gate valves that direct the incoming flow into two separate settling bays, and a set of baffles. The OWSs have settling bays about 20 feet wide, 64 feet long, and five feet deep, with a capacity of approximately 48,000 gallons (6,420 cubic feet). As shown on Figure 2, samples will be collected from each OWS system at the influent discharge pipe and analyzed for turbidity, TSS, and particle size distribution.

Samples will also be collected within the OWS chamber as shown on Figure 2 for analysis of those same parameters (i.e., turbidity, TSS, and particle size distribution), as well as chlorophyll-a.

From the OWS chambers, jar samples will be collected for visual assessment, and velocity measurements will be made to evaluate flow through the OWS. This information will be compiled to inform the performance of the OWSs.

2.3 Characterization of Dry-Weather Inflow/Infiltration

As outlined in Data Need No. 3 on Table 1, additional monitoring will be performed to determine whether any groundwater inflow originating from the former GE facility is occurring during periods of high groundwater and no rain. If any inflow is occurring, that inflow will subsequently be characterized to determine the relative volume of flow and whether contaminants are present. To assess this, a phased approach will be used. The first phase is to determine whether there is any dry-weather flow contribution originating from the former GE facility. Flow rates will be measured at the nearest location to where off-site groundwater infiltration/inflow into stormwater lines occurs from City/MassDOT properties, and at corresponding downgradient locations on the former GE facility.

If the flow rates measured at the off-site monitoring locations (e.g., Newell Street, Tyler Street, and East Street) are lower than the flows observed at the downgradient monitoring locations at the former GE facility (e.g., OWS influent locations), it can be concluded that additional dry-weather inflow is occurring within the former GE facility. Flow measurements from these locations will be collected when groundwater is high (to capture potential groundwater infiltration) and during a period of no precipitation (to ensure no stormwater runoff contribution). To achieve this objective, flows will be monitored at the following locations:

- Manhole 6A-2A influent (Newell and East streets) to 6A-1 effluent (GE and non-GE flows; Figure 5)
- OWS-64Z valve box influent (Railroad, PEDA, and East Street; Figures 4)
- Manhole 6A-1A4 (East Street) to Manhole 6A-1 influent (GE and non-GE flows; Figure 5)
- Manhole 5NC-6D alternate/unnamed manhole to Diversion Structure (Tyler Street: Figures 5 and 6)
- Manhole 5NC-6 influent East (Figure 6)
- Manhole 5NA-3 influent (Figure 6)

If Phase I indicates that there are dry-weather flow contributions from the former GE facility, additional reconnaissance will be performed to determine where stormwater sample collection and analysis may be performed as part of Phase II. The goal of any Phase II sampling and analysis would be to determine whether any dry-weather flow inputs from the former GE facility are contaminated and with what constituents. Phase II analytes and sampling methods will be determined prior to further field mobilization.

2.4 City of Pittsfield/MassDOT Solids Input Characterization

To assess potential solids contributions from the City of Pittsfield/MassDOT properties, samples will be collected during both wet and dry weather as summarized on Table 1 (Data Need No. 4). Sampling of City/MassDOT inputs will be used to evaluate solids contribution from those areas, including those related to snow management operations performed by the City and MassDOT that include the use of salt, sand, and other materials. Samples will be collected from the following locations:

- Catch basin 6A-2A influent (East and Newell streets; Figure 5)
- Manhole 6A-1A4 influent (East Street; Figure 5)
- Manhole 5NC-6D alternate/unnamed manhole influent (Tyler Street; Figure 6)

Samples collected from these locations will be submitted for analysis of turbidity, TSS, and particle size distribution.

2.5 Continuous Flow Monitoring

Flow monitoring is currently performed by GE on a continuous basis at various outfall locations. However, as part of this SAP, additional continuous flow monitoring will be performed at a number of locations further up in the system to support several objectives, including development and calibration of a site hydrologic and hydraulic model and to characterize GE and City/MassDOT flow contributions to the system under a variety of flow conditions. To support these objectives, flow monitoring will be performed at the following locations:

- Diversion structure influent (contribution from ESA2-North to OWS 64Z; Figure 5)
- Diversion structure bypass effluent (contribution from ESA2-North to OWS-64X; Figure 5)
- Valve box effluent to OWS 64Z (Figure 4)
- Valve box bypass effluent to OWS 64W (Figure 4)
- Manhole 5SC-3A1 influent (Figure 4)
- Manhole 6A-2A influent (Figure 5)
- OWS 64Z influent (Figure 4)
- Manhole 5NC-6 influent East (Figure 6)
- Manhole 5NC-6D alternate/unnamed manhole influent (Figure 6)
- Manhole 5NA-3 influent (Figure 6)

3 Equipment Needs and Installation

Composite samplers and flow meters will be installed in manholes, OWSs, and vaults prior to the work discussed in this SAP (as described further in Section 4). This section discusses the types of sampling equipment that will be utilized and considerations for equipment installation and sample collection and retrieval.

3.1 Equipment

Composite Sampler. Composite samples will be collected using a programmable flow-weighted Teledyne ISCO 6712 autosampler or similar. Samplers will be installed in each OWS manhole. The composite sampler is outfitted with sample containers that hold up to 5.5 gallons of sample material. The autosampler uses a contained peristaltic pump and tubing and can be programmed with a combination of 16 inputs from up to 10 sensors to trigger sampling. The composite autosampler will be mounted in each manhole in a location above the high-water level. Composite sample aliquots will be programmed to be collected during the duration of the storm event or for three hours.

Grab Sampler. Grab samples, including those for jar tests, will be collected using a telescopic pole that can secure a stainless-steel vessel for water collection. Contents will be transferred from the stainless-steel vessel to the sample containers.

Flow Meter. A Pulsar MantaRay water flow logger will be used to collect flow data from each location. This meter is suitable for data collection for various applications, such as inflow and infiltration studies, stormwater and wastewater collection systems, open channels, and other gravity flow systems. The flow meter will measure and log depth, temperature, water flow, and velocity and can operate in water depths as low as 1.0 inch. The flow meter will be installed and anchored at the base of the desired stormwater flow channel. Flow measurements will be collected and logged every five minutes.

3.2 Confined-Space Entry

A confined space is defined as an area that has limited means of entry and/or exit, is large enough for a worker to enter the space, and is not intended for regular or continuous occupancy. Only workers who have been assigned and trained to work in a permit-required confined space may do so. Additionally, before workers can enter a permit-required confined space, a permit must be developed that specifies what safety measures must to be taken and who is allowed to go in. Deployment of sample collection equipment and flow meters pursuant to this SAP will likely require access to confined spaces. If any GE contractor needs to enter a permit-required confined space, the project HASP and specific confined-space entry training requirements must be followed.

4 Sample Collection

This section describes sample locations, sampling criteria, sampling procedures, sample identification, and sample analysis. Table 2 provides additional sampling information, including sample locations and descriptions, sample identification, analytical testing methods, and required sample media and equipment. To the extent not described in this SAP, sampling, analytical, and quality assurance procedures will follow those described in the December 2023 FSP/QAPP.

4.1 Sample Locations

As discussed in Section 2, various samples will be collected to better characterize site stormwater. Sampling locations are listed in Table 2 and are shown on Figures 4 through 6.

4.2 Sampling Event Conditions

4.2.1 Dry- and Wet-Weather Event Criteria

Sampling events included in this SAP include wet- and dry-weather events. For purposes of sampling, dry weather is defined as a period after at least 72 hours have passed with no precipitation. For purposes of reporting flow, dry weather is any day on which less than 0.1 inch of total precipitation falls and on which no snow melt occurs. Wet weather is defined as a storm event with at least 0.1 inch of precipitation, provided the interval from the preceding measurable rainfall event is at least 72 hours. The 72-hour storm interval criterion is waived when the preceding measurable storm did not yield a measurable discharge or if it can be documented that less than a 72-hour interval is representative for local storm events during the sampling period.

4.2.2 Sampling Events Targeted

A few different storm sizes (e.g., 50% of a 2-year storm, 2-year storm, and 25-year event) will be targeted for characterization.

4.3 Sampling Procedures

The following sections describe the composite and grab sampling approaches. Sampling procedures have been developed using the Massachusetts Department of Environmental Protection *Massachusetts Stormwater Handbook*, Volume 1, Chapter 1, “Stormwater Management Standards” (MassDEP 1997).

4.3.1 Composite Sampling

Composite samples will be collected at each sample location where samples are being collected for analytical testing. Sample aliquots will be collected using a programmable portable sampler deployed at each sample location. Wet-weather composite sampling will be done on a wet-weather day. Composite samples will be collected over the duration of the storm or for three hours, whichever is less, and will be collected as flow-proportioned samples (or collected at equal time intervals and combined proportional to flow). The first aliquot will be collected within the first 30 minutes of the discharge. If it is not practicable to take the sample during the first 30 minutes, the sample will be collected during the first hour of discharge.

4.3.2 Grab Sampling

A grab sample will also be collected during first flush at each sample location. First-flush grab samples will be taken during the first 30 minutes of the discharge. If it is not practicable to take the sample during the first 30 minutes, the sample will be collected the first 90 minutes of discharge. Grab samples will also be collected in the OWS chambers as specified in Table 2. Grab samples will be collected using a telescopic pole that can secure a stainless-steel vessel for water collection. Contents will be transferred from the stainless-steel vessel to the sample containers.

4.3.3 Jar Testing

As shown on Figure 2, jar samples will be collected by grab sampling from various locations within each OWS chamber. Jar test samples will undergo visual observations to document the gravity-settling capabilities of the suspended solids within the system. The visual observations will be performed at predetermined time intervals, which include every five minutes for the first 30 minutes and every half hour for the following two hours and hourly thereafter for the next three hours. Visual observations will then be taken at a decreased frequency of twice daily over the following five days. If a visible interface (i.e., line) between the water and sediment developed during the observations, water/sediment interface measurements will be made. Jar samples will be placed side by side to assist in the recognition of interface development. Observations will be documented by photographs and recorded in field logs.

4.3.4 Velocity and Flow-Rate Measurements

A water flow logger will be used to collect flow data from each OWS and the selected manhole locations listed in Table 2 for flow-rate monitoring. The flow meter will measure and record depth, temperature, water flow, and velocity and can operate in water depths as low as 1.0 inch. For flow-rate data collection, the flow meter will be installed and anchored at the base of the desired stormwater flow channel. Flow measurements will be collected and logged every five minutes. For velocity measurements in the OWS, the probe will be placed into the OWS chamber, and velocity readings will be recorded in real time.

4.4 Sample Identification

Sample and velocity measurement locations and identifications for wet and dry sampling events are included in Table 2 and are shown on Figures 3 through 6.

4.5 Sample Analysis

Adirondack Environmental Services (AES) and Pace Analytical will perform analytical testing of samples collected during this work. AES and Pace Analytical maintain EPA National Lead Laboratory Accreditation, which defines the minimum requirements and abilities that a laboratory must meet to attain EPA recognition as an accredited testing laboratory. AES, located at 314 North Pearl Street, Albany, New York, will perform the particle size distribution testing. Pace Analytical, located at 8 Walkup Drive, Westborough, Massachusetts, will perform the chlorophyll-a and TSS testing. Table 2 lists the parameters for each sample location. Field quality control will consist of a field duplicate for TSS analysis. Turbidity will be performed in the field. Additional information on sample analyses and laboratory quality control is presented in Table 4 of the December 2023 FSP/QAPP.

5 Field Equipment Decontamination Procedure

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with water quality sample material must meet high standards of cleanliness. Equipment and instruments in contact with the water samples will be cleaned prior to each day’s use and will be rinsed with deionized water between sample stations. Decontamination of field equipment will follow the Standard Operating Procedure for Equipment Cleaning provided in Appendix EE to the December 2013 FSP/QAPP.

6 Investigative-Derived Waste

Excess sample material, equipment decontamination fluids, disposable sampling materials, and personal protective equipment used in sample processing will be stored on site in drums (not exceeding 55 gallons in size) until final disposal is arranged. The drums will be located in a secure area selected by GE. After receipt of required disposal analytical data, the drums will be transported for appropriate disposal. Disposable supplies that do not come into contact with contaminated sediment, groundwater, or stormwater will be placed in a normal refuse container for disposal as solid waste.

7 References

Arcadis, 2010. *Oil/Water Separator 64Z Pilots Study Report*. Prepared for the General Electric Company, Pittsfield, Massachusetts. September 2010.

Arcadis, 2023a. *General Electric Company, Field Sampling Plan/Quality Assurance Project Plan, GE-Pittsfield/Housatonic River Site*. Revised December 2023.

Arcadis 2023b. *Site Health and Safety Plan, GE-Pittsfield/Housatonic River Site*. Revised July 2023.

EPA (U.S. Environmental Protection Agency), 2000. Consent Decree in *United States et al. v. General Electric Company*, United States District Court District of Massachusetts Western Division, Civil Action No 99-30225, 99-30226, 99-30227-MAP. October 27, 2000.

GE (General Electric Company), 2023. Comments of the General Electric Company on Draft NPDES and Massachusetts Surface Water Discharge Permit No. MA0003891 for Discharges from the General Electric Facility to the Housatonic River, Unkamet Brook, and Housatonic River Watershed, Pittsfield, Massachusetts. December 20, 2023.

MassDEP (Massachusetts Department of Environmental Protection), 1997. "Stormwater Management Standards." *Massachusetts Stormwater Handbook*. Volume 1, Chapter 1.

Tables

Table 1

Characterization and Flow-Rate Sampling Locations

Data Need	Discharge Characterization	DQO	Locations	Sampling Point	Parameters
1	OWS influent characterization	Characterization of influent to the OWSs to inform possible pre-treatment/additional treatment options. This DQO is meant to inform possible BMPs to reduce TSS and PCBs.	• OWS-64W • OWS-64X • OWS-64Z	• OWS Influent – Pipe that discharges into each OWS	• Particle size distribution • Turbidity and TSS
2	OWS in-treatment	Characterization of stormwater that is flowing through the OWSs to evaluate effectiveness of treatment. This DQO is meant to inform possible BMPs to reduce TSS and PCBs.	• OWS-64W • OWS-64X • OWS-64Z	• OWS Chambers	• Chlorophyll-a list • Particle size distribution • Turbidity and TSS • Velocity measurements • Jar tests for visual assessment
3	GE groundwater infiltration/inflow into stormwater lines	Determine whether GW inflow is occurring during periods of high GW and no rain. Characterization of inflow to determine whether contamination is present.	Phased approach: Phase I monitor dry-weather City/MassDOT contribution from Newell and East streets (east), East Street (west), and Tyler Street and corresponding downpipe flows at GE • OWS-64Z valve box • Manhole 6A-2A • Manhole 6A-1 • Manhole 6A-1A4 • Manhole 5NA-3 • Manhole 5NC-6 • Manhole 5NC-6D alternate/unnamed manhole	• OWS-64Z valve box influent (railroad, PEDA, and East Street) • Manhole 6A-2A influent to Manhole 6A-1 effluent (East and Newell streets) • Manhole 6A-1 effluent • Manhole 6A-1A4 effluent to Manhole 6A-1 influent (East Street) • Manhole 5NA-3 influent • Manhole 5NC-6 influent west and east • Manhole 5NC-6D alternate/unnamed manhole to diversion structure (Tyler Street)	Phase I – Monitor dry-weather flow Phase II – If delta exists between City/MassDOT and GE flow contribution, then identify GE flow contribution and collect representative samples (analysis to be determined)
4	City dry- and wet-weather characterization	Characterize Newell Street, Tyler Street, and East Street dry- and wet-weather inputs for solids contribution from City areas to inform pre-treatment needs.	Newell, Tyler, and East Streets • Catch basin 6A-2A • Manhole 6A-1A4 • Manhole 5NC-6D alternate/unnamed manhole	• Catch basin 6A-2A influent (East and Newell streets) • Manhole 6A-1A4 influent (East Street) • Manhole 5NC-6D alternate/unnamed manhole influent (Tyler Street)	• Turbidity and TSS • Particle size distribution
Flow Rate	Flow-rate monitoring (wet weather)	Measure flow rates in the system to support hydrologic and hydraulic model development and calibration. Includes City/MassDOT contribution.	Newell, Tyler, and East streets • OWS-64W • OWS 64X • OWS-64Z • 5SC-3A1 • 6A-1A4 • 6A-2A • 5NC-6 • 5NC-6D alternate/unnamed manhole • 5NA-3	• Diversion structure influent (contribution from ESA2-North to OWS 64Z) • Diversion structure bypass effluent (contribution from ESA2-North to OWS 64X) • Valve box effluent to OWS 64Z • Valve box bypass effluent to OWS 64W • Manhole 5SC-3A1 influent • Manhole 6A-1A4 influent (East Street) • Manhole 6A-2A influent (East and Newell streets) • OWS 64Z influent • Manhole 5NC-6 influent west and east • Manhole 5NC-6D alternate/unnamed manhole influent • Manhole 5NA-3 influent	Wet weather flow

Notes:
BMP: best management practice
City: City of Pittsfield
DQO: data quality objective
ESA2: East Street Area 2
GE: General Electric Company
GW: groundwater
MassDOT: Massachusetts Department of Transportation
OWS: oil/water separator
PEDA: Pittsfield Economic Development Authority
PCB: polychlorinated biphenyl
TSS: total suspended solids

Table 2
Summary of Sample Locations and Identifications

Data Need	Discharge Characterization/ Description	Wet/Dry[1]	Sample Location	Sample ID[2]	Analytical Testing and Velocity/Flow Rate Measurements	Sample Media and Equipment
1	OWS Influent / Characterization of influent to the OWSs to inform possible pre-treatment/additional treatment options	Wet	OWS-64W – Influent (Composite)	OWS-64W-INF-C-1	Particle distribution by ASTM F-312 Turbidity and TSS by SM 2540D	Flow-weighted autosampler (composite)
			OWS-64X – Influent (Composite)	OWS-64X-INF-C-1		
			OWS-64Z – Influent (Composite)	OWS-64Z-INF-C-1		
			OWS-64W – Influent (Grab)	OWS-64W-INF-G-1		Telescopic sampler (grab)
			OWS-64X – Influent (Grab)	OWS-64X-INF-G-1		
			OWS-64Z – Influent (Grab)	OWS-64Z-INF-G-1		
2	OWS In-Treatment / Characterization of stormwater that is flowing through the OWSs to evaluate effectiveness of treatment	Wet	OWS-64W Chambers (probe)	N/A - Velocity measurements	Velocity measurements	YSI flow meter
			OWS-64X Chambers (probe)			
			OWS-64Z Chambers (probe)			
			OWS-64W – In-Treatment (Grab)	OWS-64W-A-G-1[3]	Particle distribution by ASTM F-312 Turbidity and TSS by SM 2540D Chlorophyll-a list by EPA 446 or SM 1020 Jar tests for visual assessment	Telescopic sampler (grab), sterilized jars
			OWS-64X – In-Treatment (Grab)	OWS-64X-A-G-1[3]		
			OWS-64Z – In-Treatment (Grab)	OWS-64Z-A-G-1[3]		
3	GE groundwater infiltration and inflow into stormwater lines / Determine whether GW inflow is occurring during periods of high GW and no rain	Dry[4]	OWS-64Z valve box influent (Railroad, PEDA, and East Street)	N/A – Flow-rate measurements	Flow rate measurements	YSI flow meter
			Manhole 6A-2A influent to Manhole 6A-1 effluent (East and Newell Streets)			
			Manhole 6A-1 effluent			
			Manhole 6A-1A4 effluent to Manhole 6A-1 influent (East Street)			
			Manhole 5NA-3 influent			
			Manhole 5NC-6 influent West and East			
			Manhole 5NC-6D to Diversion Structure (Tyler Street)			
4	City dry- and wet-weather characterization / Characterize Newell Street, Tyler Street, and East Street dry- and wet-weather inputs for solids contribution from City areas to inform pre-treatment needs	Wet	Catch basin 6A-2A influent (East and Newell Streets) (Composite)	COP-Wet-CB-INF-C-6A-2A-1	Particle distribution by ASTM F-312 Turbidity and TSS by SM 2540D	Flow-weighted autosampler (composite)
			Manhole 6A-1A4 influent (East Street) (Composite)	COP-Wet-MH-INF-C-6A-1A4-1		
			Manhole 5NC-6D alternate/unnamed manhole influent (Tyler Street) (Composite)	COP-Wet-MH-INF-C-5NC-6D alt-1		
			Catch basin 6A-2A influent (East and Newell Streets) (Grab)	COP-Wet-CB-INF-G-6A-2A-1		Telescopic sampler (grab)
			Manhole 6A-1A4 influent (East Street) (Grab)	COP-Wet-MH-INF-G-6A-1A4-1		
			Manhole 5NC-6D alternate/unnamed manhole influent (Tyler Street) (Grab)	COP-Wet-MH-INF-G-5NC-6D alt-1		
		Dry	Catch basin 6A-2A influent (East and Newell Streets) (Composite)	COP-Dry-CB-INF-C-6A-2A-1		Flow-weighted autosampler (composite)
			Manhole 6A-1A4 influent (East Street) (Composite)	COP-Dry-MH-INF-C-6A-1A4-1		
			Manhole 5NC-6D alternate/unnamed manhole influent (Tyler Street) (Composite)	COP-Dry-MH-INF-C-5NC-6D alt-1		
			Catch basin 6A-2A influent (East and Newell Streets) (Grab)	COP-Dry-CB-INF-G-6A-2A-1		Telescopic sampler (grab)
			Manhole 6A-1A4 influent (East Street) (Grab)	COP-Dry-MH-INF-G-6A-1A4-1		
			Manhole 5NC-6D alternate/unnamed manhole influent (Tyler Street) (Grab)	COP-Dry-MH-INF-G-5NC-6D alt-1		

Table 2
Summary of Sample Locations and Identifications

Data Need	Discharge Characterization/ Description	Wet/Dry[1]	Sample Location	Sample ID[2]	Analytical Testing and Velocity/Flow Rate Measurements	Sample Media and Equipment
Flow Rate	Flow-rate monitoring (wet weather) / Measure flow rates in the system to support hydrologic and hydraulic model development and calibration. Includes City/MassDOT contribution	Wet	Diversion structure influent (contribution from ESA2-North to OWS 64Z)	N/A – Flow rate measurements	Flow rate measurements	Pulsar MantaRay flow meter
			Diversion structure bypass effluent (contribution from ESA2-North to OWS 64X)			
			Valve box effluent to OWS 64Z			
			Valve box bypass effluent to OWS 64W			
			Manhole 5SC-3A1 influent			
			Manhole 6A-1A4 influent (East Street)			
			Manhole 6A-2A influent (East and Newell Streets)			
			OWS 64Z influent			
			Manhole 5NC-6 influent West and East			
			Manhole 5NC-6D alternate/unnamed manhole influent			
			Manhole 5NA-3 influent			

Notes:

1. "Wet" is wet-weather sampling event and "Dry" is dry-weather sampling event.
2. For multiple sampling events, change sample ID suffix from "-1" to number corresponding to sample event.
3. Add "-A,-B,and -C" in sample identification for additional locations.
4. Characterization of inflow should be performed during periods of high groundwater and no precipitation.

ASTM: ASTM International

City: City of Pittsfield

EPA: U.S. Environmental Protection Agency

GE: General Electric Company

MassDOT: Massachusetts Department of Transportation

N/A: not applicable

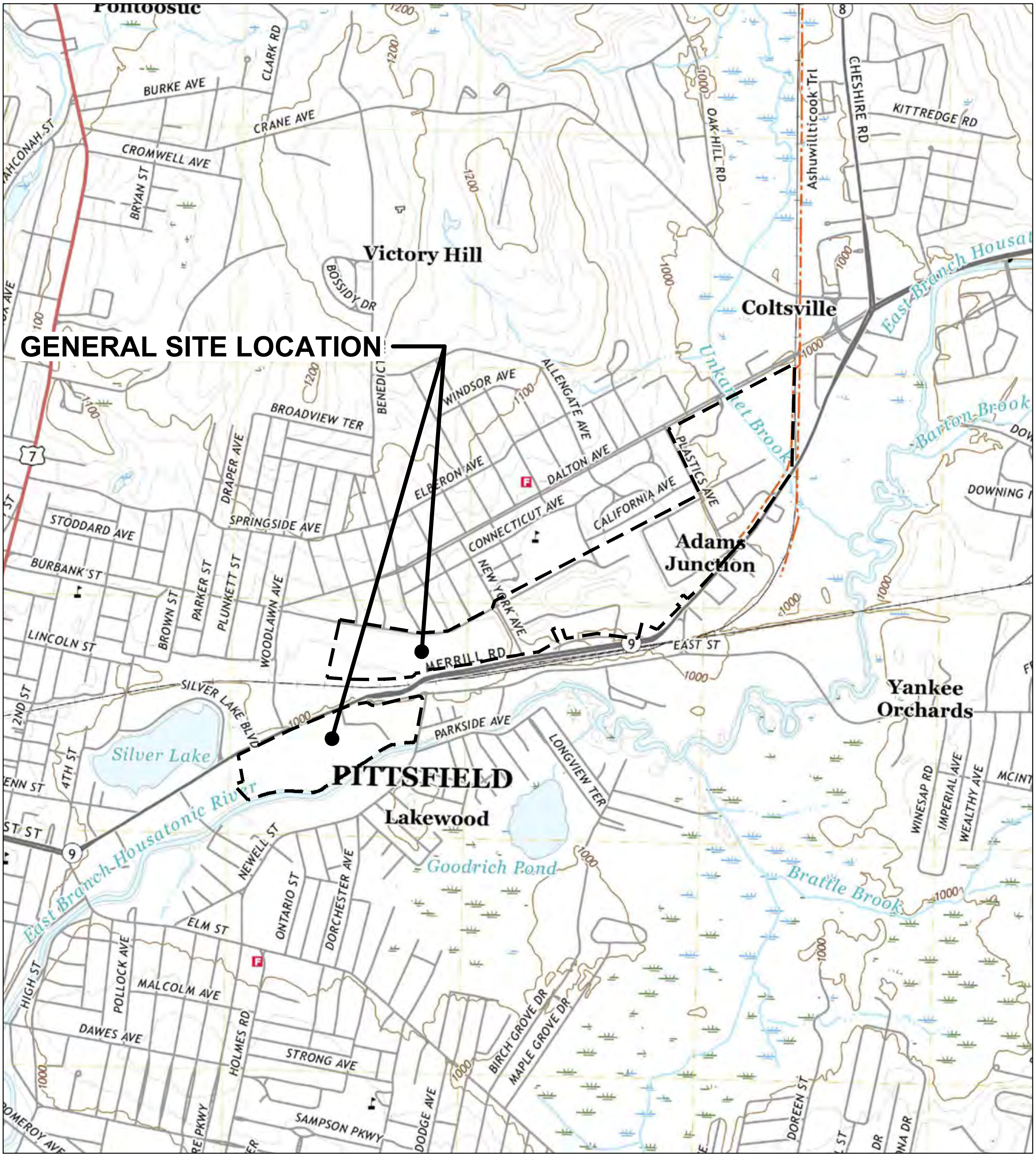
OWS: oil/water separator

SM: Standard Method

SPME: solid-phase microextraction

TSS: total suspended solids

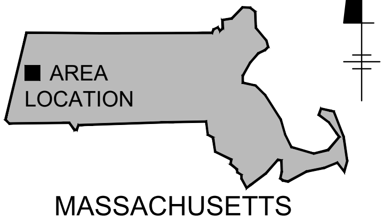
Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., PITTSFIELD EAST, MASSACHUSETTS, 2021.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

SUPPLEMENTAL GE-PITTSFIELD SITE
STORMWATER CHARACTERIZATION

SITE LOCATION MAP

ARCADIS

FIGURE
1

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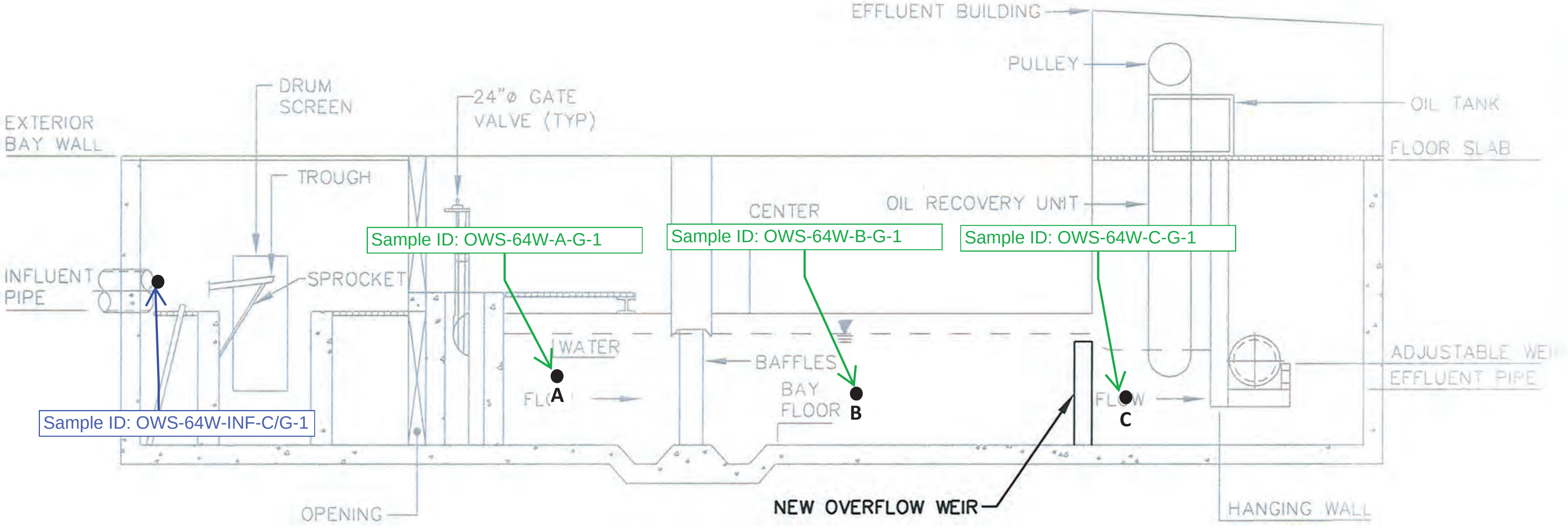


A ● Sample Location

Sample ID: OWS-64W-INF-C/G-1	Sample Location for Particle Distribution, Turbidity, and Total Suspended Solids (Grab and Composite Samples)
Sample ID: OWS-64W-A-G-1	Sample Location for Particle Distribution, Turbidity, Total Suspended Solids, Chlorophyll, Jar Sample (Grab Sample), and Velocity Measurement

Note: Since OWS 64W, OWS 64X, and OWS 64Z have similar construction, samples will be collected at these locations at each OWS. Include "C" or "G" in sample ID as appropriate.

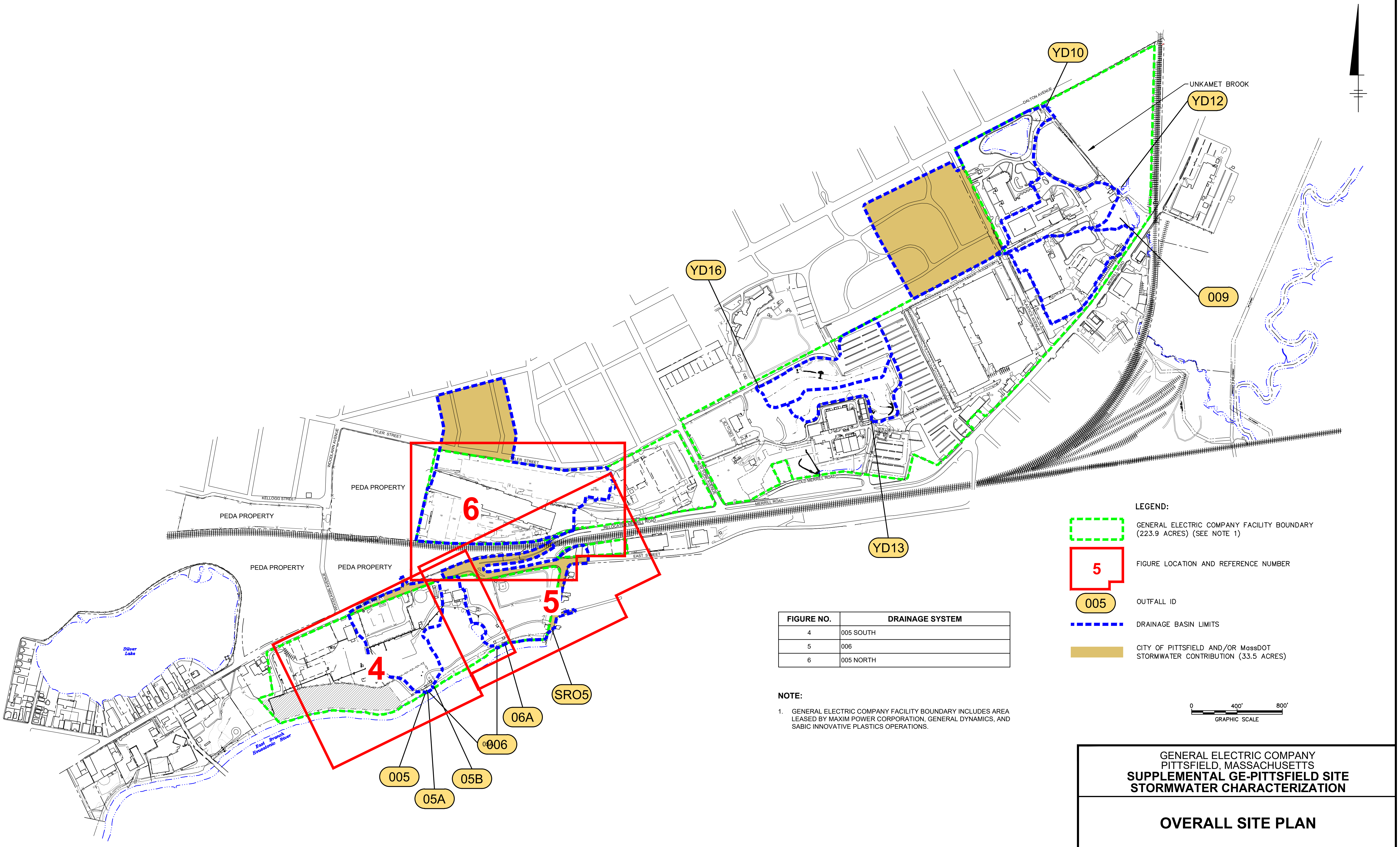
NOT TO SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
OIL/WATER SEPARATOR CLEANING AND OVERFLOW WEIR INSTALLATION ACTIVITIES SUMMARY REPORT

TYPICAL OIL/WATER SEPARATOR PROFILE

ARCADIS

FIGURE
2



LEGEND:

🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY (223.9 ACRES) (SEE NOTE 1)
5	FIGURE LOCATION AND REFERENCE NUMBER
005	OUTFALL ID
- - -	DRAINAGE BASIN LIMITS
▬	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION (33.5 ACRES)

FIGURE NO.	DRAINAGE SYSTEM
4	005 SOUTH
5	006
6	005 NORTH

NOTE:

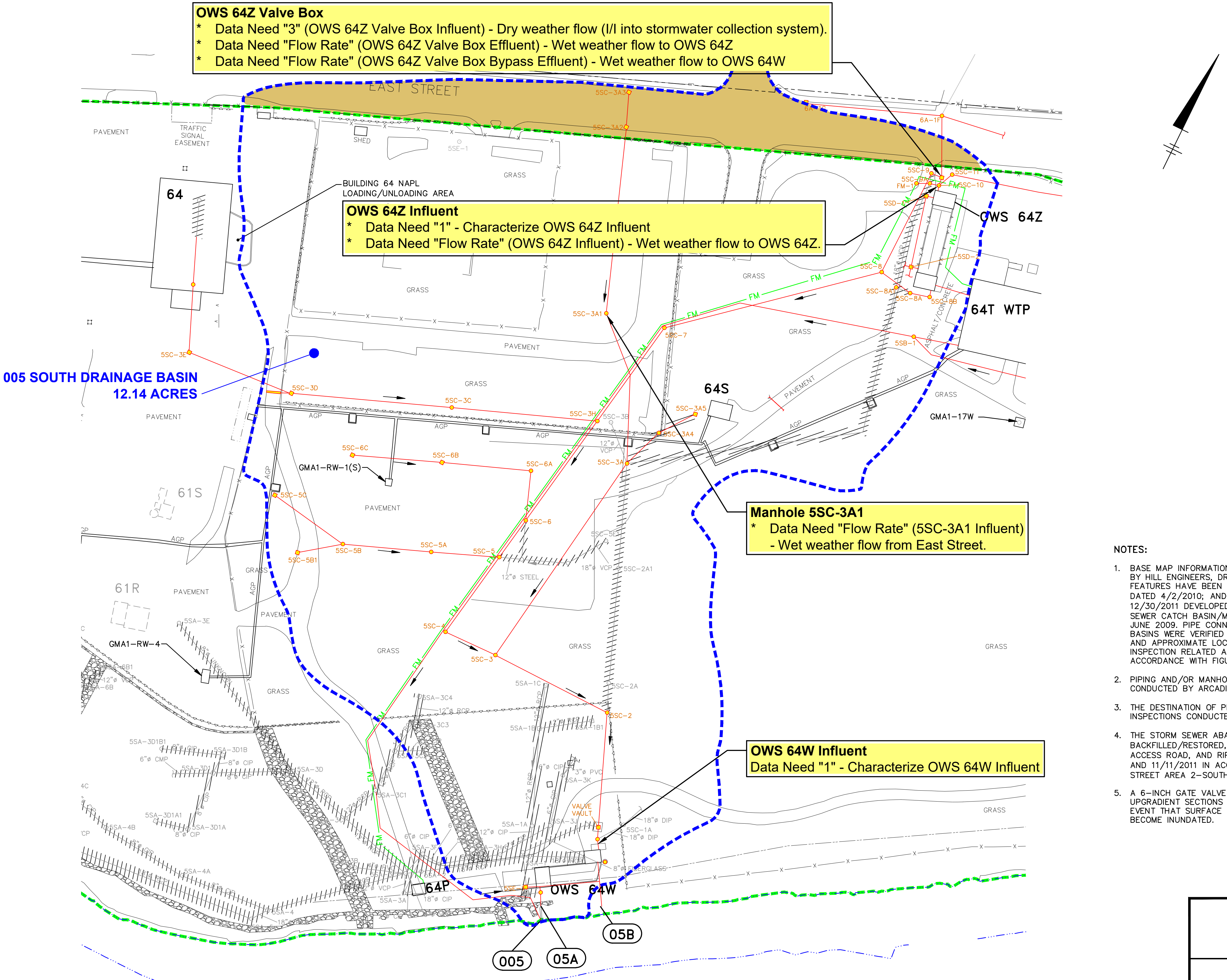
1. GENERAL ELECTRIC COMPANY FACILITY BOUNDARY INCLUDES AREA LEASED BY MAXIM POWER CORPORATION, GENERAL DYNAMICS, AND SABIC INNOVATIVE PLASTICS OPERATIONS.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
SUPPLEMENTAL GE-PITTSFIELD SITE
STORMWATER CHARACTERIZATION

OVERALL SITE PLAN

ARCADIS

FIGURE
3



OWS 64Z Valve Box
* Data Need "3" (OWS 64Z Valve Box Influent) - Dry weather flow (I/I into stormwater collection system).
* Data Need "Flow Rate" (OWS 64Z Valve Box Effluent) - Wet weather flow to OWS 64Z
* Data Need "Flow Rate" (OWS 64Z Valve Box Bypass Effluent) - Wet weather flow to OWS 64W

OWS 64Z Influent
* Data Need "1" - Characterize OWS 64Z Influent
* Data Need "Flow Rate" (OWS 64Z Influent) - Wet weather flow to OWS 64Z.

Manhole 5SC-3A1
* Data Need "Flow Rate" (5SC-3A1 Influent)
- Wet weather flow from East Street.

OWS 64W Influent
Data Need "1" - Characterize OWS 64W Influent

LEGEND:

005	NPDES OUTFALL LOCATION
🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
	GUARDRAIL
//////////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
5SC-3B	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
5SC-8A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
FM	FORCE MAIN
←	STORMWATER FLOW DIRECTION
	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
65	BUILDING LOCATION AND ID
66	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
▨	RIPRAP DRAINAGE SWALE
▨	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION (0.96 ACRES)
■■■■■	DRAINAGE BASIN LIMITS

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1081-1, DATED MARCH 24, 2004. TOPOGRAPHIC FEATURES HAVE BEEN UPDATED BASED ON FINAL GRADING PLAN FOR AVERAGING AREA 4E DATED 4/2/2010; AND SURFACE FEATURES AND ITEMS SUBJECT TO INSPECTION FIGURE DATED 12/30/2011 DEVELOPED BY ARCADIS. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE INSPECTED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. THE STORM SEWER ABANDONMENT AND REMEDIATION/RESTORATION ACTIVITIES (I.E., BACKFILLED/RESTORED, ENGINEERED BARRIER, ENHANCED PAVEMENT, ENGINEERED BARRIER ACCESS ROAD, AND RIPRAP DRAINAGE SWALE AREAS) WERE PERFORMED BETWEEN 6/28/2010 AND 11/11/2011 IN ACCORDANCE WITH GE'S REVISED FINAL RD/RA WORK PLAN FOR EAST STREET AREA 2-SOUTH (APRIL, 2010), AS CONDITIONALLY APPROVED BY EPA ON 5/3/2010.
5. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
SUPPLEMENTAL GE-PITTSFIELD SITE
STORMWATER CHARACTERIZATION

005 SOUTH DRAINAGE SYSTEM

ARCADIS

FIGURE
4

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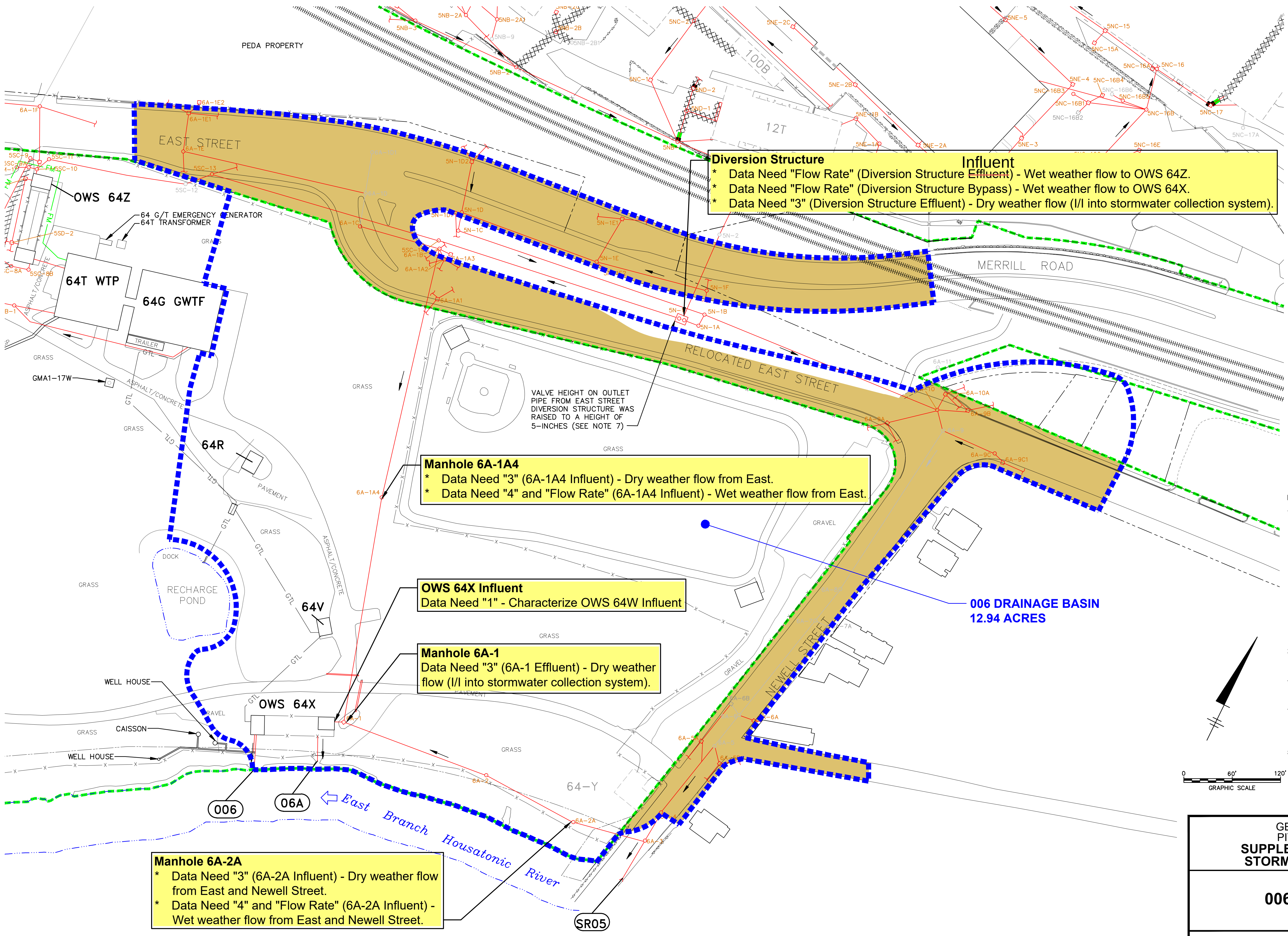


Diversion Structure
- * Data Need "Flow Rate" (Diversion Structure ~~Effluent~~ Influent) - Wet weather flow to OWS 64Z.
- * Data Need "Flow Rate" (Diversion Structure Bypass) - Wet weather flow to OWS 64X.
- * Data Need "3" (Diversion Structure Effluent) - Dry weather flow (I/I into stormwater collection system).

Manhole 6A-1A4
- * Data Need "3" (6A-1A4 Influent) - Dry weather flow from East.
- * Data Need "4" and "Flow Rate" (6A-1A4 Influent) - Wet weather flow from East.

OWS 64X Influent
Data Need "1" - Characterize OWS 64W Influent

Manhole 6A-1
Data Need "3" (6A-1 Effluent) - Dry weather flow (I/I into stormwater collection system).

Manhole 6A-2A
- * Data Need "3" (6A-2A Influent) - Dry weather flow from East and Newell Street.
- * Data Need "4" and "Flow Rate" (6A-2A Influent) - Wet weather flow from East and Newell Street.

LEGEND:

006	NPDES OUTFALL LOCATION
🟩 🟩 🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
▽▽▽	GUARDRAIL
/////	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
/////	EXISTING STORM SEWER PIPING ABANDONED WITH 6" DRAIN VALVE
5NC-17A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
5NC-16C	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
FM	FORCE MAIN
←	STORMWATER FLOW DIRECTION
GTL	GROUNDWATER TRANSFER LINE
⊢	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
🟩	6-INCH GATE VALVE (SEE NOTE 6)
64R	BUILDING LOCATION AND ID
64Y	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
🟫	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION (4.0 ACRES)
🟦 🟦 🟦	DRAINAGE BASIN LIMITS

NOTES:

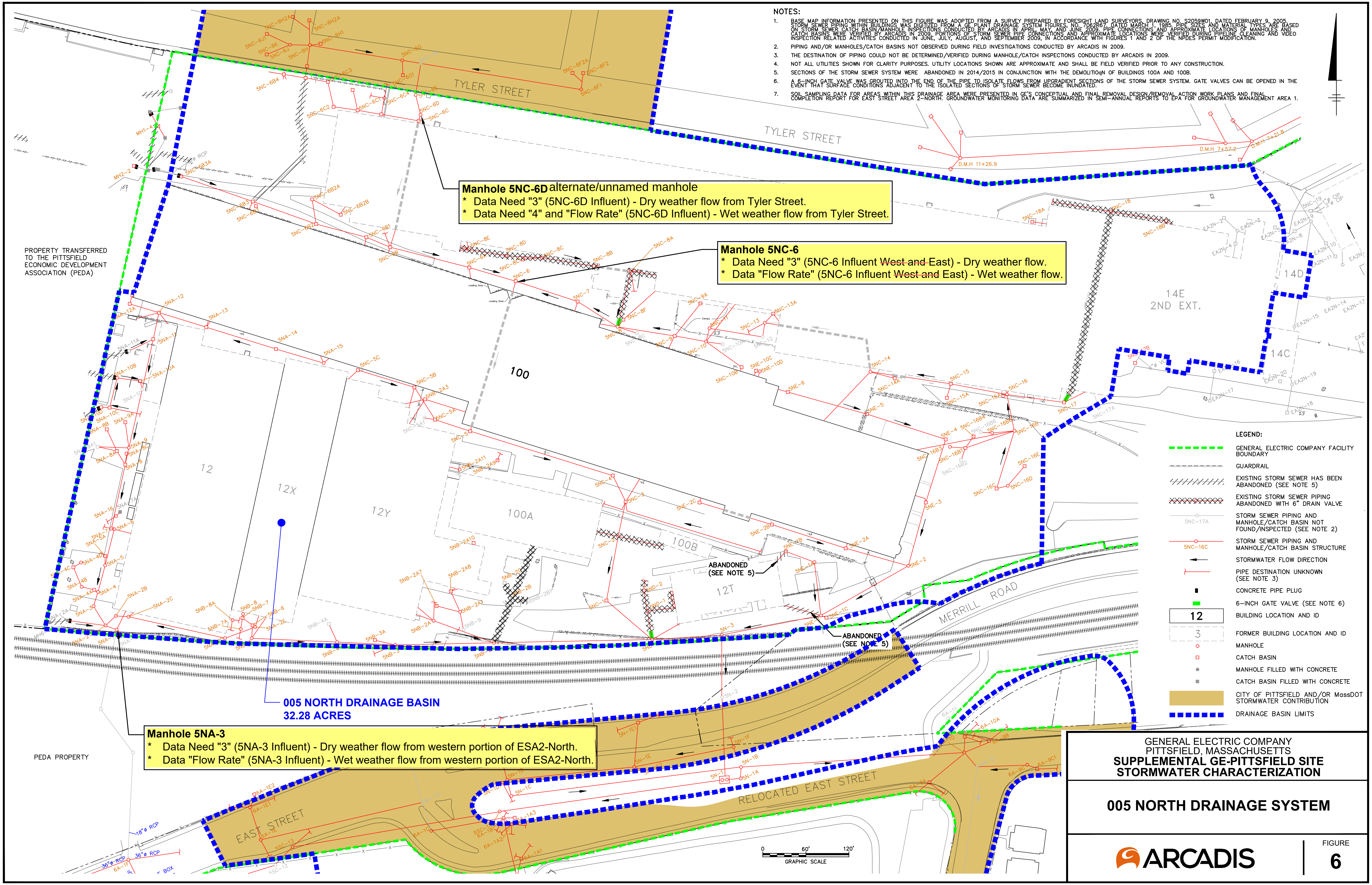
1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY HILL ENGINEERS, DRAWING NO. GE-1081-1, DATED MARCH 24, 2004. TOPOGRAPHIC FEATURES HAVE BEEN UPDATED BASED ON FINAL GRADING PLAN FOR AVERAGING AREA 4E DATED 4/2/2010; AND SURFACE FEATURES AND ITEMS SUBJECT TO INSPECTION FIGURE DATED 12/30/2011 DEVELOPED BY ARCADIS. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.
5. ON 1/26/2012 THE OPENING OF THE VALVE WAS MODIFIED FROM ITS HISTORICAL SETTING OF A HEIGHT OF 4-INCHES AND WAS RAISED ONE INCH TO DIVERT ADDITIONAL FLOW TO OWS 64Z AND REDUCE FLOW TO OUTFALL SR05. THE OPENING OF THE VALVE WAS MEASURED FROM THE CENTER OF THE VALVE BLADE TO THE SEAT.

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
SUPPLEMENTAL GE-PITTSFIELD SITE
STORMWATER CHARACTERIZATION

006 DRAINAGE SYSTEM

ARCADIS

FIGURE
5



Manhole 5NC-6D alternate/unnamed manhole
- Data Need "3" (5NC-6D Influent) - Dry weather flow from Tyler Street.
- Data Need "4" and "Flow Rate" (5NC-6D Influent) - Wet weather flow from Tyler Street.

Manhole 5NC-6
- Data Need "3" (5NC-6 Influent ~~West and~~ East) - Dry weather flow.
- Data "Flow Rate" (5NC-6 Influent ~~West and~~ East) - Wet weather flow.

Manhole 5NA-3
- Data Need "3" (5NA-3 Influent) - Dry weather flow from western portion of ESA2-North.
- Data "Flow Rate" (5NA-3 Influent) - Wet weather flow from western portion of ESA2-North.

005 NORTH DRAINAGE BASIN
32.28 ACRES

NOTES:

1. BASE MAP INFORMATION PRESENTED ON THIS FIGURE WAS ADOPTED FROM A SURVEY PREPARED BY FORESIGHT LAND SURVEYORS, DRAWING NO. S2059W01, DATED FEBRUARY 9, 2005. STORM SEWER PIPING WITHIN BUILDINGS WAS DIGITIZED FROM A GE PLANT DRAINAGE SYSTEM FIGURES, NO. 7062R67, DATED MARCH 1, 1985. PIPE SIZES AND MATERIAL TYPES ARE BASED ON STORM SEWER CATCH BASIN/MANHOLE INSPECTIONS CONDUCTED BY ARCADIS IN APRIL, MAY, AND JUNE 2009. PIPE CONNECTIONS AND APPROXIMATE LOCATIONS OF MANHOLES AND CATCH BASINS WERE VERIFIED BY ARCADIS IN 2009. PORTIONS OF STORM SEWER PIPE CONNECTIONS AND APPROXIMATE LOCATIONS WERE VERIFIED DURING PIPELINE CLEANING AND VIDEO INSPECTION RELATED ACTIVITIES CONDUCTED IN JUNE, JULY, AUGUST, AND SEPTEMBER 2009, IN ACCORDANCE WITH FIGURES 1 AND 2 OF THE NPDES PERMIT MODIFICATION.
2. PIPING AND/OR MANHOLES/CATCH BASINS NOT OBSERVED DURING FIELD INVESTIGATIONS CONDUCTED BY ARCADIS IN 2009.
3. THE DESTINATION OF PIPING COULD NOT BE DETERMINED/VERIFIED DURING MANHOLE/CATCH INSPECTIONS CONDUCTED BY ARCADIS IN 2009.
4. NOT ALL UTILITIES SHOWN FOR CLARITY PURPOSES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION.
5. SECTIONS OF THE STORM SEWER SYSTEM WERE ABANDONED IN 2014/2015 IN CONJUNCTION WITH THE DEMOLITIOqN OF BUILDINGS 100A AND 100B.
6. A 6-INCH GATE VALVE WAS GROUTED INTO THE END OF THE PIPE TO ISOLATE FLOWS FROM UPGRADIENT SECTIONS OF THE STORM SEWER SYSTEM. GATE VALVES CAN BE OPENED IN THE EVENT THAT SURFACE CONDITIONS ADJACENT TO THE ISOLATED SECTIONS OF STORM SEWER BECOME INUNDATED.
7. SOIL SAMPLING DATA FOR AREAS WITHIN THIS DRAINAGE AREA WERE PRESENTED IN GE'S CONCEPTUAL AND FINAL REMOVAL DESIGN/REMOVAL ACTION WORK PLANS AND FINAL COMPLETION REPORT FOR EAST STREET AREA 2-NORTH. GROUNDWATER MONITORING DATA ARE SUMMARIZED IN SEMI-ANNUAL REPORTS TO EPA FOR GROUNDWATER MANAGEMENT AREA 1.

LEGEND:

🟩	GENERAL ELECTRIC COMPANY FACILITY BOUNDARY
	GUARDRAIL
	EXISTING STORM SEWER HAS BEEN ABANDONED (SEE NOTE 5)
	EXISTING STORM SEWER PIPING ABANDONED WITH 6" DRAIN VALVE
5NC-17A	STORM SEWER PIPING AND MANHOLE/CATCH BASIN NOT FOUND/INSPECTED (SEE NOTE 2)
5NC-16C	STORM SEWER PIPING AND MANHOLE/CATCH BASIN STRUCTURE
←	STORMWATER FLOW DIRECTION
	PIPE DESTINATION UNKNOWN (SEE NOTE 3)
■	CONCRETE PIPE PLUG
🟩	6-INCH GATE VALVE (SEE NOTE 6)
12	BUILDING LOCATION AND ID
3	FORMER BUILDING LOCATION AND ID
○	MANHOLE
□	CATCH BASIN
●	MANHOLE FILLED WITH CONCRETE
■	CATCH BASIN FILLED WITH CONCRETE
🟨	CITY OF PITTSFIELD AND/OR MassDOT STORMWATER CONTRIBUTION
🟦	DRAINAGE BASIN LIMITS

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
SUPPLEMENTAL GE-PITTSFIELD SITE
STORMWATER CHARACTERIZATION

005 NORTH DRAINAGE SYSTEM

ARCADIS

FIGURE
6

Appendix A

Field Forms