GEI Consultants

Consulting
Engineers and
Scientists

August 17, 2018

VIA EMAIL

Consolidated Edison Company
Mr. Kenneth Kaiser
31-01 20th Avenue
Astoria, NY 11105

Orange & Rockland Utilities
Ms. Maribeth McCormick
3 Old Chester Rd.
Goshen, NY 10924-5220

Dear Mr. Kaiser and Ms. McCormick:

Re: Emerging Contaminant Sampling Work Plan
Con Edison and O&R MGP Sites

GEI Consultants, Inc., (GEI) prepared this Emerging Contaminant Sampling Work Plan (Work Plan) on behalf of Consolidated Edison Company of New York, Inc. (Con Edison) and Orange and Rockland Utilities, Inc. (O&R) for certain Con Edison's and O&R's former Manufactured Gas Plant (MGP) sites as required by the New York State Department of Environmental Conservation (NYSDEC) in letters to the above companies dated May 30, 2018. This Work Plan was revised based on comments provided by NYSDEC on August 14, 2018. Both of the NYSDEC letters are provided in Attachment D.

This Work Plan provides the means and methods for sampling groundwater and analyzing for 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS) and reporting in accordance with the requirements provided in the NYSDEC May 30, 2018 letters. The rationale for selecting monitoring wells for sampling, the locations of the wells proposed for sampling at each of the sites and the sampling schedule are also provided.

1.0 Introduction

PFAS have historically not been evaluated at remediation sites, and 1,4-dioxane has not been evaluated at the levels greater than now thought to represent a health concern. This sampling initiative is being undertaken as a result of these "emerging contaminants" having been found in a number of drinking water supplies in New York. Accordingly, the NYSDEC is requiring that site groundwater is tested for these chemicals. An overview of emerging contaminants is provided in Section 2 and the scope of work is provided in Section 3.

2.0 Overview

PFAS are emerging contaminants that have recently become a target of concern due to their ubiquitous presence in the environment, persistence, and bio accumulative properties. PFAS are a large group of highly soluble man-made chemicals that have been widely used since the 1940s to make everyday products more resistant to stains, grease, and water (EPA, 2018a and 2018b). PFAS are used to keep food from sticking to cookware, to make sofas and carpets resistant to stains, or to make clothes more waterproof. They are also used in food packaging, fire-fighting materials and in a variety of other industries to reduce friction including aerospace, automotive, building and construction, and electronics (EPA, 2018a and 2018b). Since PFAS were not manufactured prior to the 1940s, it is unlikely that these chemicals were used at MGP sites.

PFAS are highly soluble, stable, and have low volatility. They are dispersed by air emissions into the atmosphere or deposited directly to surface water or the land surface. PFAS present in unsaturated soils leach downward through the subsurface with precipitation and are transported via groundwater flow.

1,4-Dioxane is used primarily as a solvent in paints, varnishes, lacquers, cosmetics, deodorants, cleaning and detergent preparations, and in scintillating fluids. 1,4-Dioxane often has been used with chlorinated solvents, particularly 1,1,1-trichloroethane (TCA), as a stabilizer and corrosion inhibitor (EPA, 2018c). Commercial production of 1,4-dioxane in the United States was first reported in 1951 (NCI, 1985). Since 1,4-dioxane was not manufactured prior to 1951, it is unlikely that this chemical was used at MGP sites.

3.0 Scope of Work

This Work Plan provides the means and methods for sample location selection, sample collection, and reporting. Activities performed under this work plan will follow the:

- Quality Assurance Project Plan (QAPP) – Attachment A
- Field Sampling Plan (FSP) – Attachment B

3.1 Sample Locations

As described in Section 2, if present, emerging contaminants will be dissolved and traveling with groundwater. Thus, a review of groundwater conditions at each site has been completed, including the vertical and lateral groundwater flow gradients and distribution of existing wells at each site. Depending on site conditions, representative on-site monitoring wells were selected for sampling using the following rationale:

- An upgradient well located closest to the upgradient site boundary was selected for sampling.
- A well located at a central location in an area of lowest MGP impacts was selected for sampling.
- A downgradient well located closest to the downgradient site boundary and downgradient of the central well was selected for sampling.

- Additional wells were selected at some of the larger, more hydraulically complex sites as required to ensure groundwater samples representative of site conditions could be attained.
- No monitoring wells will be sampled in areas of the site that contain MGP source material due to the low detection limits required for the emerging contaminant analysis and the emerging contaminants are not associated with MGP impacts.
- For the majority of sites, wells screened across the intermediate aquifer zone have been selected for sampling. However, if a strong vertically upward or downward groundwater flow gradient is present at a site, then wells screened across the respective shallow or deep aquifer zones were selected for sampling.

A list of monitoring wells to be sampled at each of the sites and figures showing the monitoring well locations is provided as Attachment C.

3.2 Sample Collection

Groundwater samples will be collected from selected wells at each of the sites using low flow methods according to the FSP (Attachment B). A peristaltic pump will be used with high density polyethylene (HDPE) and silicone tubing to collect each groundwater sample. Sampling equipment components and sample containers will not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Each groundwater sample will be placed in laboratory-provided, pre-cleaned 500-ml HDPE or polypropylene bottles for PFAS and 500-ml amber glass bottles for 1,4-dioxane.

Equipment will be decontaminated using detergent and a clean water rinse. All clothing worn by sampling personnel must have been laundered multiple times and must not contain waterproofed material. The sampler must wear nitrile gloves while filling and sealing the sample bottles. Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory. No waterproof notebooks, food, drinks, or plumbers thread seal tape will be used during sample collection.

3.3 Laboratory Procedures

Each groundwater sample will be analyzed for the full PFAS Target Analyte List provided in the NYSDEC March 30, 2018 letter by Modified United States Environmental Protection Agency (EPA) Method 537 and 1,4-dioxane by EPA Method SIM 8270D. As required by NYSDEC, the reporting limit for PFAS will not exceed 2 ng/l (ppt) and the method detection limit (MDL) for 1,4-dioxane will not exceed 0.35 µg/l (ppb).

QA/QC samples will include one blind duplicate sample, one matrix spike/matrix spike duplicate (MS/MSD) sample, and one equipment blank sample per 20 samples collected. At a minimum, one equipment blank sample will be collected each day.

The samples will be analyzed by a NYSDOH environmental lab approval program (ELAP) laboratory certified for PFOA and PFOS in drinking water by Modified EPA Method 537 selected from the list presented in the NYSDEC March 30, 2018 letter. Analytical results will be provided in a full New York State Category B data deliverable format. The data will be validated in accordance with New York State Analytical Service Protocols, and a data usability summary report (DUSR) will be prepared documenting the adequacy of the analytical data obtained from the laboratory and discussing any quality control non-compliance issues or limitations on the use of the data.

3.4 Waste Management

Investigation derived waste (IDW) generated during the field program will be managed in accordance with all applicable regulations. If on-site storage of IDW is feasible, it will be temporarily stored on-site in new, New York State Department of Transportation (NYSDOT)-approved 55-gallon steel drums. IDW will be removed from each site following waste characterization sampling and analyses and disposed of at a properly licensed facility. Con Edison and O&R will be the listed generators of their respective waste.

3.5 Data Interpretation and Reporting

Con Edison and O&R will submit the emerging contaminant data to NYSDEC within 90 days of completing the sampling. The following information will be provided:

- Description of groundwater sampling activities;
- Validated analytical data;
- Category B laboratory reports;
- DUSRs; and
- Observations and interpretation of the analytical results.

Con Edison and O&R will also submit electronic data as described at:
https://www.dec.ny.gov/chemical/62440.html.

3.6 Schedule

Sampling will be conducted following NYSDEC approval of the work plan. The schedule for each site will depend on property access and pre-scheduled sampling events. Specific sampling schedules for each site are provided in Attachment C.

Sincerely,

Melissa J Felter

Melissa Felter, P.G.
Project Manager

Kathleen A Slimon

Kathleen Slimon, P.E.
Senior Project Manager

Enclosures
cc: Yelena Skorobogatov, Con Edison
MF/KS:amm H:\WPROC\Project\CON-ED\PFAS Sampling Work Plan\August 2018\Work Plan\Emerging Contaminant Sampling WP.docx

References

Consolidated Edison Company of New York, Inc., December 30, 2002, Handling of Investigation Derived Waste at Manufactured Gas Plants, EH&S Remediation Program.

EPA 2018a Contaminated Site Clean-Up Information, Per- and Polyfluoroalkly Substances (PFASs) retrieved from https://clu-in.org/contaminantfocus/default.focus/sec/Per-_and_Polyfluoroalkyl_Substances_(PFASs)/cat/Overview/

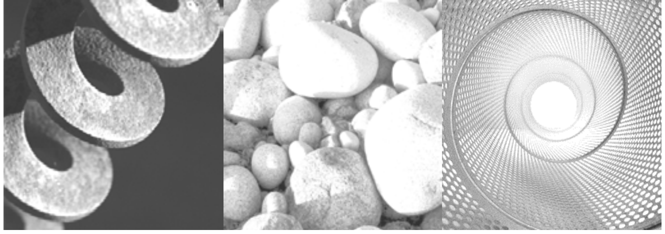
EPA 2018b Research on Per- and Polyfluoroalkly Substances (PFAS) retrieved from https://www.epa.gov/chemical-research/research-and-polyfluoroalkyl-substances-pfas

EPA 2018c Contaminated Site Clean-Up Information, 1,4-Dioxane retrieved from https://clu-in.org/contaminantfocus/default.focus/sec/1,4-Dioxane/cat/Overview/

NCI. 1985. Monograph on Human Exposure to Chemicals in the Workplace: 1,4-Dioxane. Technical Report No. 86-131414. Bethesda, MD: Department of Health and Human Services. 31 pp

ATTACHMENT A

Quality Assurance Project Plan
Emerging Contaminant Sampling



Consulting
Engineers and
Scientists

Quality Assurance Project Plan
Emerging Contaminant Sampling

Manufactured Gas Plant Sites
New York

Prepared For:
Consolidated Edison Company of New York
31-01 20th Avenue
Astoria, NY 11105

And

Orange & Rockland Utilities
3 Old Chester Rd.
Goshen, NY 10924-5220

Submitted by:
GEI Consultants, Inc., P.C.
455 Winding Brook Drive
Glastonbury, CT 06033
860.368.5300

August 2018
Project 1802631

Table of Contents

Tables

MO:ammH:\WPROC\Project\CON-ED\PFAS Sampling Work Plan\August 2018\QAPP\2018-08.QAPP.DOCX

Abbreviations and Acronyms

%R	Percent Recovery
ASP	Analytical Service Protocol
CAS	Chemical Abstract Service
CLP	Contract Laboratory Protocol
COC	Chain Of Custody
Con Edison	Consolitated Edison
DQO	Data Quality Objective
DO	Dissolved Oxygen
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
GC/MS	Gas Chromatography/Mass Spectroscopy
GEI	GEI Consultants, Inc., P.C.
LCS	Laboratory Control Sample
MDL	Method Detection Limit
MGP	Manufactured Gas Plant
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NAPL	Non-Aqueous Phase Liquids
NYSDEC	New York State Department of Environmental Conservation
O&R	Orange & Rockland Utilities, Inc.
PAH	Polycyclic Aromatic Hydrocarbon
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanessulfonic acid
PM	Project Manager
PQL	Practical Quantification Limit
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SD	Standard Deviation
SOP	Standard Operating Procedures
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TIC	Tentatively Identified Compounds
USDOT	United States Department of Transporation
VOC	Volatile Organic Compound

MEASUREMENTS

µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter

Quality Assurance Glossary

"Alteration" means altering a sample collected for analysis in any way other than by adding a preservative, such as nitric acid to lower pH. Examples of alteration include, but are not limited to: filtering, settling and decanting, centrifuging and decanting and acid extracting.

"Analytical Services Protocol" or "ASP" means the New York State Department of Environmental Conservation (NYSDEC's) compendium of approved United States Environmental Protection Agency (EPA) and NYSDEC laboratory methods for sample preparation and analysis and data handling procedures.

"Correlation Sample" means a sample taken, when using a field-testing technology, to be analyzed by an ELAP-certified laboratory to determine the correlation between the laboratory and field analytical results.

"Confirmatory Sample" means a sample taken after remedial action is expected to be complete to verify that the cleanup requirements have been met. This term has the same meaning as "post remediation sample."

"Contract laboratory program" or "CLP" means a program of chemical analytical services developed by the EPA to support CERCLA.

"Data Usability Summary Report, (DUSR)" is a document that provides a thorough evaluation of the analytical data to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and use.

"Effective solubility" means the theoretical aqueous solubility of an organic constituent in groundwater that is in chemical equilibrium with a separate phase mixed product (product containing several organic chemicals). The effective solubility of a particular organic chemical can be estimated by multiplying its mole fraction in the product mixture by its pure phase solubility.

"Environmental Laboratory Accreditation Program" or "ELAP" means a program conducted by the New York State Department of Health, which certifies environmental laboratories through on-site inspections and evaluation of principles of credentials and proficiency testing.

"Filtration" means the filtering of a groundwater or surface water sample, collected for metals analysis, at the time of collection and prior to preservation. Filtering includes, but is not limited to, the use of any membrane, fabric, paper or other filter medium, irrespective of pore size, to remove particulates from suspension.

"**Final delineation sample**" means a sample taken as an endpoint sample, used to make a decision regarding the extent of contamination at a site, which is to be analyzed by an ELAP-certified laboratory.

"Intermediate Sample" means a sample taken during the investigation process that will be followed by another sampling event to confirm that remediation was successful or to confirm that the extent of contamination has been defined to below a level of concern.

"Method detection limit" or "MDL" means the minimum concentration of a substance that can be measured and reported with a 99-percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

"Minimum reporting limit" means the lowest concentration at which an analyte can be detected and which can be reported with a reasonable degree of accuracy. It is the lowest concentration that can be measured, a lab-specific number, developed from minimum detection limits, and is also referred to as the practical quantitation limit (PQL).

"Non-targeted compound" means a compound detected in a sample using a specific analytical method that is not a targeted compound, a surrogate compound, a system monitoring compound or an internal standard compound.

"Nephelometric Turbidity Unit" or "NTU" is the unit by which turbidity in a sample is measured.

"Practical quantitation level" or "PQL" means the lowest quantitation level of a given analyte that can be reliably achieved among laboratories within the specified limits of precision and accuracy of a given analytical method during routine laboratory operating conditions.

"Preservation" means preventing the degradation of a sample due to precipitation, biological action, or other physical/chemical processes between the time of sample collection and analysis. The most common examples involve refrigeration at 4 degrees Celsius and lowering sample pH by the addition of acid to keep dissolved metals in solution or to reduce the biodegradation of dissolved organic analytes.

“PAH” means polycyclic aromatic hydrocarbon as defined by EPA Method 8270.

“Quality assurance” or “QA” means the total integrated program for assuring the reliability of monitoring and measurement data, which includes a system for integrating the quality planning, quality assessment and quality improvement efforts to meet data end-use requirements.

“Quality assurance project plan” or “QAPP” means a document, which presents in specific terms the policies, organization, objectives, functional activities, and specific quality assurance/quality control activities designed to achieve the data quality goals or objectives of a specific project or operation.

“Quality control” or “QC” means the routine application of procedures for attaining prescribed standards of performance in the monitoring and measurement process.

“Semivolatile organic compound” or “SVOC” means compounds amenable to analysis by extraction of the sample with an organic solvent. For the purposes of this section, semivolatiles are those target compound list compounds identified in the statement of work in the current version of the 2005 ASP.

“Target analyte list” or “TAL” means the list of inorganic compounds/elements designated for analysis as contained in the version of the EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. For the purpose of this chapter, a Target Analyte List scan means the analysis of a sample for Target Analyte List compounds/elements.

“Targeted compound” means a hazardous substance, hazardous waste, or pollutant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively.

“Target compound list plus 30” or “TCL+30” means the list of organic compounds designated for analysis (TCL) as contained in the version of the EPA “Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration” in effect as of the date on which the laboratory is performing the analysis, and up to 30 non-targeted organic compounds (plus 30) as detected by gas chromatography/mass spectroscopy (GC/MS) analysis. For the purposes of this chapter, a TCL+30 scan means the analysis of a sample for TCL compounds and up to 10 non-targeted volatile organic compounds and up to 20 non-targeted SVOCs using GC/MS analytical methods. Non-targeted compound criteria should be pursuant to the version of the EPA “Contract Laboratory Program

Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

"Tentatively identified compound or TIC" means a chemical compound that is not on the target compound list but is detected in a sample analyzed by a GC/MS analytical method. TICs are only possible with methods using mass spectrometry as the detection technique. The compound is tentatively identified using a mass spectral instrumental electronic library search and the concentration of the compound estimated.

"Unknown compound" means a non-targeted compound which cannot be tentatively identified. Based on the analytical method used, the estimated concentration of the unknown compound may or may not be determined.

"Volatile organics" or "VOC" means organic compounds amenable to analysis by the purge and trap technique. For the purposes of this chapter, analysis of VOCs means the analysis of a sample for either those priority pollutants listed as amenable for analysis using EPA method 8260B or those target compounds identified as volatiles in the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

"**Waste oil"** means used and/or reprocessed engine lubricating oil and/or any other used oil, including but not limited to: fuel oil, engine oil, gear oil, cutting oil, transmission fluid, oil storage tank residue, animal oil, and vegetable oil, which has not subsequently been refined.

"Well development" means the application of energy to a newly installed well to establish a good hydraulic connection between the well and the surrounding formation. During development, fine-grained formation material that may have infiltrated the sand pack and/or well during installation is removed, allowing water from the formation to enter the well without becoming turbid and unrepresentative of groundwater in the formation.

1. Purpose

GEI Consultants, Inc., P.C. (GEI) has prepared this Quality Assurance Project Plan (QAPP) to address sampling for emerging contaminants at Consolidated Edison (Con Edison's) and Orange & Rockland, Inc.'s (O&R's) manufactured gas plant (MGP) sites. The QAPP is a companion document to the *Emerging Contaminant Sampling Work Plan* dated August 2018 (Work Plan). The QAPP presents the project scope and goals, organization, objectives, sample handling procedures and quality assurance/quality control (QA/QC) procedures.

Furthermore, this QAPP identifies project responsibilities, prescribes guidance and specifications to make certain that:

- Samples are identified and controlled through sample tracking systems and chain-of-custody (COC) protocols
- Field and laboratory analytical results are valid and usable by adherence to established protocols and procedures
- Laboratory data are validated, as necessary, so they can be applied to developing a conceptual understanding of the nature and extent of contamination of groundwater
- All aspects of investigation, from field to laboratory, are documented to provide data that are technically sound and legally defensible

The requirements of this QAPP apply to all contractor activities as appropriate for their respective tasks.

This QAPP was prepared based upon guidance provided by the United States Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC) including:

- *DER-10, Technical Guidance for Site Investigation and Remediation.* NYSDEC. *May 3, 2010;*
- *Analytical Service Protocol,* NYSDEC. *July 2005;*
- *US EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5, March 2001); and*
- *Guidance for Quality Assurance Project Plans (EPA QA/G-5, December 2002).*

2. Project Goals and Objectives

Per- and polyfluoroalkyl substances (PFAS) have historically not been evaluated at remediation sites, and 1,4-dioxane has not been evaluated at the levels that are now thought to represent a health concern. This initiative is being undertaken as a result of these "emerging contaminants" having been found in a number of drinking water supplies in New York. Accordingly, the NYSDEC is requiring that site groundwater is tested for these chemicals.

3. Project Organization and Responsibility

The consultant is responsible for the implementation of the scope of work, and associated performance monitoring tasks including the supervision of contractors, field activities, and the evaluation and interpretation of data. The consultant will perform the sampling activities and coordinate submittal of samples to testing laboratories.

The primary responsibilities of each of these personnel are described in the following table.

Key Project Personnel and Responsibilities	
Position	**Areas of Responsibilities**
In-House Consultant	• Provide strategic guidance of project activities • Client contact regarding strategic issues • Review of project deliverables
Program Manager	• Overall program oversight • Project management • Project schedule • Client contact regarding project-related issues • Personnel and resource management • Review of project submittals • Budgeting
Project Manager	• Client contact regarding project related issues • Coordination of contractors • Technical development and implementation of Work Plan and Field Sampling Plan • Personnel and resource management • Preparation and review of project submittals • Preparation of project submittals • Budgeting
Field Team Leader	• Client contact regarding project related issues on day to day basis as part of field operations • Coordination of contractors • Implementation of Site Management Plan, Work Plan and Field Sampling • Plan Personnel and resource management • Preparation of project submittals
Data Validators	• Perform data validation activities • Prepare data usability summary reports • Evaluate data with regards to quality objectives
Quality Assurance Officer/Data Manager	• Manage raw data from the laboratory • Maintain copies of COCs in the project file • QA/QC for sampling, validation and laboratory performance

The selected laboratory will be Environmental Laboratory Approval Program (ELAP)-certified in New York State for Perfluorooctanoic acid (PFOA) and Perfluorooctanessulfonic acid (PFOS) in drinking water by Modified EPA Method 537. Analytical chemistry parameters for groundwater samples include:

- 1,4-Dioxane according to EPA Method 8270D SIM
- Target Analyte List (TAL) PFAS according to Modified EPA Method 537

Table 1 provides a summary of quality assurance samples, holding times and analysis for each media. The PFAS Target Analyte List is shown below.

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

4. Quality Assurance Objectives

This section establishes the QA objectives for measurements that are critical to the project. The QA objectives are developed for relevant data quality indicators. These indicators include the method detection limit (MDL), reporting limit (RL), precision, accuracy, completeness, representativeness, and comparability. The data quality objectives (DQOs) are based on project requirements and ensure: (1) that the data generated during the project are of known quality, and (2) that the quality is acceptable to achieve the project's technical objectives.

Quantitation Limits are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. However, in order to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, and completeness. The analytical methods to be used at this site will provide a level of data quality and can be used to evaluate potential impacts to groundwater at the former MGP site, compared to New York State Standards, Criteria and Guidance values, and for purposes of risk assessment.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting, which will provide results that are scientifically valid and the levels of which are sufficient to meet DQOs. Specific procedures for sampling, chain of custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, and corrective action are described in other sections of the QAPP and the Field Sampling Plan (FSP).

The data quality indicators are presented in subsections 4.1 through 4.6. Procedures to assess the data quality indicators are given below in Section 13.

Table 2 provides the RLs, MDLs and the DQOs for groundwater samples. The DQOs for groundwater samples for this project include minimum RLs and MDLs specified within the NYSDECs May 30, 2018 and August 14, 2018 letters.

Table 3 provides the precision and accuracy DQOs for water samples.

4.1 Required Quantification Limit

The required quantification limit is the quantitative analytical level for individual analytes needed to make decisions relative to the objectives of the project. Quantitative limits may be expressed as the MDL or some quantitative level defined in terms relative to the program. It should be noted that there is some ambiguity in the definitions and use of terms that define quantification limits. The MDL presented herein is a well-defined and accepted entity, although attainable only under ideal laboratory conditions.

Method Detection Limit: The MDL is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the analyte concentration is greater than zero. The MDL is determined from analysis of a sample in a given matrix-type containing the analyte.

Practical Quantitation Limit: The practical quantitation limit (PQL) [also referred to as the reporting limit (RL)] is the concentration in the sample that corresponds to the lowest concentration standard of the calibration curve.

Table 2 provides the reporting limits and the DQOs for groundwater samples as specified in NYSDEC’s May 30, 2018 letter.

4.2 Accuracy

Accuracy is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being used (e.g., sample liners, drilling shoe, or stainless–steel sampling implements).

The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of “standards,” materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic analyses, or %R of spiked compounds in matrix spikes (MSs), matrix spike duplicates (MSDs) and/or laboratory control samples (LCSs). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds. The laboratory accuracy will be evaluated in accordance with laboratory quality assurance plan and standard operating procedures.

4.3 Precision

Precision is the agreement among a set of replicate measurements without consideration of the “true” or accurate value: i.e., variability between measurements of the same material for the same analyte. In environmental sampling, precision is the result of field sampling and analytical factors. Precision in the laboratory is easier to measure and control than precision in the field. Replicate laboratory analyses of the same sample provide information on analytical precision; replicate field samples provide data on overall measurement precision. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision.

Precision in the field is assessed through the collection and measurement of field duplicates. Field duplicates will be collected at a frequency of one per twenty samples per matrix per analytical parameter, with the exception of the waste characterization parameters. Precision will be measured through the calculation of relative percent differences (RPDs) as described below in subsection 13.2. The resulting information will be used to assess sampling and analytical variability. Duplicate samples are described below in subsection 5.1.2. **Table 1** summarizes the number of duplicates per media sampled.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic analyses, laboratory precision will be assessed through the analysis of MS/MSD samples and field duplicates. MS/MSD samples or matrix duplicate pairs will be performed at a frequency of one per twenty primary samples per matrix. Duplicate samples are described below in subsection 5.1.2. **Table 1** summarizes the number of duplicates per media sampled.

4.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. “Normal conditions” are defined as the conditions expected if the sampling plan was implemented as planned. The objective for completeness is a sufficient amount of valid data to achieve a predetermined statistical level of confidence. Critical samples must be identified and plans must be formulated to secure requisite valid data for these samples.

Field completeness is a measure of the amount of (1) valid measurements obtained from all the measurements taken in the project, and (2) valid samples collected. The field completeness objective is greater than 90-percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95-percent.

4.5 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which data accurately and precisely represents either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that work plans are followed and that proper sampling, sample handling, and sample preservation techniques are used.

Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample-holding times.

4.6 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the work plan is followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

Comparability is dependent on the use of recognized EPA or equivalent analytical methods and the reporting of data in standardized units. To facilitate data comparison, the data-reporting format as presented below will be used:

- Conventions (units reported as): for liquids (weight/unit volume [i.e., micrograms per liter (µg/L)]); for air (weight/unit volume [i.e., micrograms per cubic meter (µg/m^3)]);
- Use common chemical name with corresponding chemical abstract system (Chemical Abstracts Service [CAS]) code.

5. Sampling Plan

Environmental sampling will include groundwater sampling. Groundwater samples will be collected utilizing low-flow sampling methods with peristaltic pumps. Sampling methods and procedures are presented in the FSP.

5.1 Sample Type, Location, and Frequency

5.1.1 Groundwater samples

Groundwater samples will be collected and submitted for laboratory analysis in accordance with the Work Plan. Water quality parameters including temperature, pH, turbidity, salinity, dissolved oxygen (DO) oxidation reduction potential, and specific conductance, will be collected prior to laboratory analysis. Groundwater samples will be analyzed for 1,4-Dioxane according to EPA Method 8270D SIM and TAL PFAS according to Modified EPA Method 537.

5.1.2 Field QC Sample Collection

Field QC samples are used to monitor the reproducibility and representativeness of field sampling activities. The field QC samples are handled, transported and analyzed in the same manner as the associated field samples. Field QC samples will include equipment blanks, field duplicates, and MS/MSDs. The quantity, field QC sample type, and analysis is detailed in **Table 1**.

Equipment Blank Samples are used to monitor the adequacy of decontamination procedures and possible sources of contamination such as potential laboratory methodologies. Equipment blanks will consist of laboratory-supplied, distilled or de-ionized water and will be used to check for potential contamination of the equipment which may cause sample contamination. Equipment blanks will be collected by routing the distilled water through a decontaminated piece of sampling equipment or disposable sampling equipment into laboratory supplied bottles. Non-dedicated field equipment will be decontaminated as specified below in subsection 4.3. Equipment blanks will be submitted to the laboratory at a frequency of one per day per parameter.

Field Duplicate Samples, also referred to as blind duplicate samples, are two samples that are submitted from the same interval using the same sample procedures. Field duplicates will be used to assess the sampling and analytical reproducibility. Both samples are collected utilizing the same methods and are submitted for the same laboratory analysis; however, different sample identification numbers are used. Field duplicates will be submitted at a frequency of one-per-20 samples for all matrices and all parameters.

MS/MSD Samples are two additional aliquots of the same sample submitted for the same parameters as the original sample. However, the additional aliquots are spiked with the compounds of concern. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. MS/MSDs will be submitted at a frequency of one-per-20 investigative samples per matrix for organic parameters.

Refer to **Table 1** for a summary of QC sample preservation and container requirements.

5.2 Sample Preservation and Containerization

The analytical laboratory will supply the sample containers for the chemical samples. These containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest EPA’s Specifications and Guidance for Contaminant-Free Sample Containers. Certificates of analysis are provided with each bottle lot and maintained on file to document conformance to EPA specifications. The containers will be pre-preserved, where appropriate. Sample preservation and containerization details are outlined in **Table 1**.

5.3 Equipment Decontamination

All non-dedicated sampling equipment shall be cleaned between each use in the following manner:

- Wash and scrub with Alconox (or non-phosphate soap) and water mixture
- Tap water rinse
- Decontamination fluids will be containerized into United States Department of Transportation (USDOT)/UN-approved 55-gallon drums or containment vessels and will be characterized and disposed of by Con Edison and O&R at an approved disposal facility.

6. Documentation and COC

6.1 Sample Collection Documentation

6.1.1 Field Notes

Field notes documenting field activities will be maintained daily field sampling sheets in general accordance with the FSP. No erasures or obliterations of field notes will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field sampling sheets will be reviewed at regular intervals by the field team leader, site manager and project manager for completeness and representativeness. When necessary, field sampling sheets will be supported by daily activity reports.

6.1.2 COC Records

Sample custody is discussed in detail below in subsection 6.2. COC records are initiated by the samplers in the field. The field portion of the custody documentation should include:

- The project name
- The project number
- Signature(s) of sampler (s) responsible for sample custody
- Sample Name/ID number
- Date and time of collection
- Whether the sample is grab or composite
- Names of individuals involved in sampling
- Required analytical methods
- Air bill or other shipping number (if applicable)

On a regular basis (daily or on such a basis that all holding times will be met), samples will be transferred to the custody of the respective laboratories, via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures, and field COC procedures are described below in subsection 6.2.1 of this Plan. Sample receipt and log-in procedures at the laboratory are described below in subsection 6.2.2 of this Plan.

6.1.3 Sample Labeling

Each sample will be labeled with an adhesive label using indelible ink. The label should include the date and time of collection, sampler's initials, tests to be performed, preservative (if applicable), and a unique identification. The following identification scheme will be used:

PRIMARY SAMPLE TYPES	QA/QC SAMPLE TYPES
GROUNDWATER SAMPLES Monitoring Well-ID	**EQUIPMENT BLANKS** SAMPLE-ID – [DATE] **MATRIX SPIKE/DUP** SAMPLE [ID] [DEPTH] [EITHER MS OR MSD] **BLIND DUPLICATES** SAMPLE-ID[XX][DATE]

This sample label contains the authoritative information for the sample. Inconsistencies with other documents will be settled in favor of the vial or container label unless otherwise corrected in writing from the field personnel collecting samples or the Data Manager and/or the Project QA Officer.

6.1.4 Sample Handling

Samples will be handled in general accordance with the FSP.

6.2 Sample Custody

The COC provides a record of the custody of any environmental field sample from the time of collection to the delivery to the laboratory. Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample is considered to be under a person's custody if:

- The item is in the actual possession of a person
- The item is in the view of the person after being in actual possession of the person
- The item was in the actual physical possession of the person but is locked up to prevent tampering
- The item is in a designated and identified secure area

6.2.1 Field Custody Procedures

Samples will be collected following the sampling procedures indicated in the FSP. A summary of samples and collection methods are provided above in Section 5 of this QAPP. Documentation of sample collection is described above in subsection 6.1. Sample COC and packaging procedures are summarized below. These procedures will ensure that the samples will arrive at the laboratory with the COC intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.
- All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample naming system is presented above in subsection 6.1.3.
- Sample labels will be completed for each sample using waterproof ink.
- Samples will be accompanied by a completed COC form. The sample numbers and locations will be listed on the COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, and to the laboratory facility.
- All shipments will be accompanied by the COC record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and provided to the data manager and placed in the project files.
- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the cooler and covered with clear plastic tape after being signed by field personnel.
- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.
- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on COC document as receiving the samples and signature of sampler as relinquishing samples.

6.2.2 Laboratory Custody Procedures

After accepting custody of the shipping containers, the laboratory will document the receipt of the shipping containers by signing the COC record. The laboratory will:

- Examine the shipping containers to verify that the custody tape is intact
- Examine all sample containers for damage
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the COC records
- Compare samples received against those listed on the COC
- Verify that sample holding times have not been exceeded
- Examine all shipping records for accuracy and completeness
- Determine sample pH (if applicable) and record on COC forms
- Sign and date the COC immediately (if shipment is accepted) and attach the air bill
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the laboratory project manager, who will be responsible for contacting the GEI data manager
- Attach laboratory sample container labels with unique laboratory identification and test
- Place the samples in the proper laboratory storage

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.
- The completed COC, air bills, and any additional documentation will be placed in the project file.

7. Calibration Procedure

7.1 Field Instruments

Field instruments will be calibrated according to the manufacturer’s specifications. Water quality meters will be calibrated with known reference solutions. All calibration procedures performed will be documented on the field sampling sheets and will include the date/time of calibration, name of person performing the calibration, reference standard used, and the readings.

7.2 Laboratory Instruments

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and/or continuing calibration verification. Detailed descriptions of the calibration procedures for a specific laboratory instrument are included in the laboratory’s quality assurance plan, which describe the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration.

8. Sample Preparation and Procedures

Analytical samples will be collected in general accordance with the FSP and as specified in a job-specific Work Plan. Groundwater samples will be analyzed for 1,4-Dioxane according to EPA Method 8270D SIM and TAL PFAS according to Modified EPA Method 537. Analytical samples will be collected into laboratory-preserved sample containers and will be preserved as indicated in **Table 1**.

9. Data Reduction, Validation, and Reporting

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project. Complete data packages suitable for data validation to support the generation of a Data Usability Summary Report (DUSR) according to NYSDEC requirements will be provided by the analytical laboratory. Complete data packages suitable for data validation to support the generation of a DUSR according to NYSDEC requirements will be provided by the project data validator.

9.1 Field Data Evaluation

Measurements and sample collection information will be transcribed directly onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Reviews of the field records by the field team leader, site manager, and project manager will ensure that:

- Standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the FSP and Work Plan, and that any deviations were documented and approved by the appropriate personnel.

9.2 Analytical Data Validation

An independent validation of the analytical data will be completed. Project-specific procedures will be used to validate analytical laboratory data. The basis for the validation will be the USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review (January 2005) and the USEPA CLP National Functional Guidelines for Inorganic Data Review (October 2004), modified to accommodate the criteria in the analytical methods used in this program, and Region II Standard Operating Procedures (SOPs) for CLP Organic Data review (Revision 11, June 1996) and Evaluation of Metals for the CLP Program (Revision 11, January 1992). Critical functions for determining the validity of generated data are: (1) strict adherence to the analytical methods, (2) assurance that the instrumentation employed was operated in accordance with defined operating procedures, (3) assurance that quality parameters built into the analytical procedures have been adhered to, and (4) confirmation that the DQOs have been met.

Table 2 highlights the QC criteria and holding time requirements for all analyses conducted under this program. These criteria will be used to evaluate and qualify the data during validation.

Laboratory deliverables will consist of an original hard copy data package that is in general accordance with NYSDEC Analytical Service Protocol (ASP) Category B data deliverable requirements. Data validation is required for all data.

Data validation will be completed by the consultants' data validators or qualified contracted personnel. Validation will include all technical holding times, as well as QC sample results (blanks, surrogate spikes, laboratory duplicates, MS/MSDs, and LCSs), tunes, internal standards, calibrations, target compound identification, and results calculations.

For all analyses, the laboratory will report results which are between the laboratory's RL and the MDL; these results will be qualified as estimated (J) by the laboratory.

The overall completeness of the data package will also be evaluated by the data validator. Completeness checks will be administered on all data to determine whether full data deliverables were provided. The reviewer will determine whether all required items are present and request copies of missing deliverables.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any nonconformance with the established criteria, and validation actions. Data qualifiers will be consistent with EPA National Functional Guidelines. This report will be in a format consistent with NYSDEC's DUSR.

9.3 Analytical Data Deliverable

Laboratory deliverables will consist of an original hard copy data package that is in general accordance with NYSDEC ASP Category B data deliverable requirements.

10. Internal Quality Control

Laboratory and field quality internal control checks will be used to ensure the data quality objectives are achieved. At a minimum, this will include:

- MS and/or MS/MSDs samples
- Matrix duplicate analyses
- Laboratory control spike samples
- Instrument calibrations
- Instrument tunes for semivolatile organic compound (SVOC) 8270D analyses
- Method and/or instrument blanks
- Surrogate spikes for organic analyses
- Internal standard spikes for SVOC 8270D analyses
- Detection limit determination and confirmation by analysis of low-level calibration standard

Field quality control samples will include:

- Equipment blanks as outlined in **Table 1**
- Field duplicate samples as outlined in **Table 1**
- MS/MSDs as outlined in **Table 1**

11. Performance and System Audits

Audits are an independent means of: 1) evaluating the operation or capability of a measurement system, and 2) documenting the use of QC procedures designed to generate data of know and acceptable quality.

Field audits may be completed to assess sample collection protocols, determine the integrity of COC procedures, and evaluate sample documentation and data handling procedures. Field audits may be scheduled by the QA officer, Project Manager (PM), site manager or in-house consultant, at their discretion. Written records of audits and any recommendations for corrective action will be submitted to the PM.

The QA officer is the interface between management and project activities in matters of project quality. The QA officer will review the implementation of the QAPP. Reviews will be conducted at the completion of field activities and will include the results of any audits and an evaluation of the data quality.

12. Preventative Maintenance

Preventative maintenance will be performed on field equipment in accordance with the manufacturer’s recommendations. Preventative maintenance to field equipment will be provided by equipment vendors.

Laboratory equipment calibration and maintenance procedures are specified in Test America’s laboratory quality manual.

13. Specific Procedures to Assess Data Quality Indicators

QC analyses conducted as a part of the testing program will provide a quantitative quality assessment of the data generated and their adherence to the data quality indicators. The data quality indicators ensure that the quality assurance objectives for the project are met.

13.1 Detection Limits

13.1.1 Method Detection Limit

The MDL is defined as follows for all measurements:

MDL = (t[n-1,1-a=0.99]) x (s)

where: s = standard deviation of the replicate analysis,
t(n-1, 1-a=0.99) = student's t-value for a one-sided, 99-percent confidence level and a standard deviation estimate with n-1 degrees of freedom

The MDLs calculated by the laboratory are determined under ideal conditions. MDLs for environmental samples are dependent on the sample aliquot, the matrix, the concentration of analyte, and interference present in the matrix, the percent of moisture, dilution factor, etc. The MDL for each sample analysis will be adjusted accordingly.

13.1.2 *Reporting Limit*

The RL is the concentration of an analyte in the sample that corresponds to the lowest concentration standard of the calibration curve. As with the MDLs, the RLs are dependent on the sample aliquot, the final sample volume, the percent of moisture, dilution factor, etc.

The RL is determined as follows:

$$PQL = \frac{Lowest\ conc.\ std\ (ng)}{Volume\ injected\ (uL)}\ x\ \frac{Sample\ aliquot\ (mL\ or\ g)}{Final\ volume\ (mL)}\ x\ DF\ \ x\ \frac{100}{(100\ \text{-}\ PM)}$$

where: DF = dilution factor, including all dilutions or lost samples not accounted for in a sample aliquot/final volume ratio
%M = percent moisture for solid samples

13.2 Precision

Variability will be expressed in terms of the RPD when only two data points exist. The RPD is calculated as:

$$RPD = \frac{(Larger\ Value\ \text{-}\ Smaller\ Value)}{[(Larger\ Value + Smaller\ Value)/2]}\ x\ 100\%$$

For data sets greater than two points, the percent relative standard deviation (percent Relative Standard Deviation [RSD]) is used as the precision measurement. It is defined by the equation:

$$Percent\ RSD = \frac{Standard\ \ Deviation}{Mean}\ x\ 100\%$$

Standard deviation (SD) is calculated as follows:

$$SD = \sqrt{\sum_{i=1}^{n} \frac{(\ y_i\ \text{-}\ y\ )^2}{n\ \text{-}\ 1}}$$

where: SD = standard deviation
yi = measured value of the ith replicate
y = mean of replicate measurements
n = number of replicates

For measurements such as pH, where the absolute variation is more appropriate, precision is usually reported as the absolute range (D) of duplicate measurements:

$$D = \left| \text{first measurement - second measurement} \right|$$

or as the absolute standard deviation previously given. RPD, %RSD, and D are independent of the error of the analyses and reflect only the degree to which the measurements agree with each other, not the degree to which they agree with the true value for the parameter measured.

13.3 Accuracy

Accuracy is related to the bias in a measurement system. Accuracy describes the degree of agreement of a measurement with a true value. Accuracy will be expressed as percent recovery for each matrix spike analyte by using the following equation:

$$\%\ Recovery = \frac{Css - Cus}{Csa}\ X\ 100\%$$

where: Css = measured concentration in spiked sample
Cus = measured concentration in unspiked sample
Csa = known concentration added to the sample

Accuracy for a measurement such as pH is expressed as bias in the analysis of a standard reference sample according to the equation:

$$\text{Bias} = pH_m - pH_t$$

where: pH_m = measured pH
pH_t = the true pH of the standard reference sample

13.4 Completeness

Data completeness is a measure of the amount of usable data resulting from a measurement effort. For this program, completeness will be defined as the percentage of valid data obtained compared to the total number of measurements necessary to achieve our required statistical level of confidence for each test. The confidence level is based on the total number of samples.

Data completeness is calculated as:

$$Completeness = \frac{Number\ of\ valid\ data\ points}{Number\ of\ data\ points\ necessary\ for\ confidence\ level}\ x\ 100\%$$

The completeness goal is to generate a sufficient amount of valid data. It is anticipated that 95-percent of the data will be complete. Data validation criteria discussed in Section 10 of this QAPP will be used to determine data completeness. Any data deficiencies and their effect on project goals will be evaluated in the DUSR.

13.5 Representativeness

Representativeness is a qualitative statement that expresses the extent to which the sample accurately and precisely represents the characteristics of interest of the study. Representativeness is primarily concerned with the proper design of the sampling program and is best ensured by proper selection of sampling locations and the taking of a sufficient number of samples. It is addressed by describing the sampling techniques, the matrices sampled, and the rationale for the selection of sampling locations, which are discussed in the FSP and job-specific Work Plan.

13.6 Comparability

Comparability is a qualitative parameter expressing the confidence that one set of data can be compared to another. Comparability is possible only when standardized sampling and analytical procedures are used.

14. Corrective Action

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the PM, Field Team Leader, and QA officer will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

The entire sampling program will be under the direction of the PM and QA officer. The emphasis in this program is on preventing problems by identifying potential errors, discrepancies, and gaps in the data collection and the laboratory analysis and interpretation process. Any problems identified will be promptly resolved. Likewise, follow-up corrective action is always an option in the event that preventative corrective actions are not effective.

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by other means in the Work Plan and FSP. Corrective actions are likely to be immediate in nature and most often will be implemented by the contracted laboratory analyst or the PM. The corrective action will usually involve recalculation, reanalysis, or repeating a sample run.

14.1 Immediate Corrective Action

Corrective action in the field may be needed when the sample requirements are changed (i.e., more/less samples, sampling locations other than those specified in the Work Plan), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The Field Team Leader, Site Manager, and PM will approve the corrective action and notify the QA officer. The PM and QA officer will approve the corrective measure. The Field Team Leader and Project Manager will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action
- The action taken in response
- The final resolution
- Any necessary approvals

Corrective action in the laboratory will be completed in accordance with the quality assurance procedures. Any corrective actions completed by the laboratory will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to the PM. If the corrective action does not rectify the situation, the laboratory will contact the PM, who will determine the action to be taken and inform the appropriate personnel.

If potential problems are not solved as an immediate corrective action, the contractor will apply formalized long-term corrective action if necessary.

Tables

Table 1. Analytical Methods/Quality Assurance Summary Table
MGP Sites
New York

Media	Number of Primary Samples	QA/QC Samples			Total Number of Samples	Analytical Parameters	Method	Preservative	Holding Time	Container
		Equipment Blank	Duplicate	MS/MSD						
Ground Water	TBD	1/20, at least daily	1/20	1/20	TBD	1,4-Dioxane	8270D SIM	Cool to 4°C	7 days	(1) 500 mL amber glass bottle
	TBD	1/20, at least daily	1/20	1/20	TBD	PFAS	Modified 537	Cool to 4°C	14 days	(2) 500 mL HDPE or polypropylene bottles, no bottle cap liners

Notes:

Waste Characterization disposal sample analysis will meet the requirements of the selected disposal facility.

TBD - To Be Determined

PFAS - Per- and Polyfluoroalkyl Substances

SIM - Selective Ion Monitoring

TAL - Target Analyte List

°C- Degrees Celsius

oz. - ounce

mL - Milliliter

Table 2. Chemical Parameters, Reporting Limits and Data Quality Objectives for Groundwater Samples
MGP Sites
New York

CAS Number	Analyte	DQO's	RL[2]	MDL[2]
Per- and Polyfluoroalkyl Substances Method Modified 537 (ng/L)				
375-73-5	Perfluorobutanesulfonic acid	2	≤ 2	TBD
355-46-4	Perfluorohexanesulfonic acid	2	≤ 2	TBD
375-92-8	Perfluoroheptanesulfonic acid	2	≤ 2	TBD
1763-23-1	Perfluorooctanessulfonic acid	2	≤ 2	TBD
335-77-3	Perfluorodecanesulfonic acid	2	≤ 2	TBD
375-22-4	Perfluorobutanoic acid	2	≤ 2	TBD
2706-90-3	Perfluoropentanoic acid	2	≤ 2	TBD
307-24-4	Perfluorohexanoic acid	2	≤ 2	TBD
375-85-9	Perfluoroheptanoic acid	2	≤ 2	TBD
335-67-1	Perfluorooctanoic acid	2	≤ 2	TBD
375-95-1	Perfluorononanoic acid	2	≤ 2	TBD
335-76-2	Perfluorodecanoic acid	2	≤ 2	TBD
2058-94-8	Perfluoroundecanoic acid	2	≤ 2	TBD
307-55-1	Perfluorododecanoic acid	2	≤ 2	TBD
72629-94-8	Perfluorotridecanoic acid	2	≤ 2	TBD
376-06-7	Perfluorotetradecanoic acid	2	≤ 2	TBD
27619-97-2	6:2 Fluorotelomer sulfonate	2	≤ 2	TBD
39108-34-4	8:2 Fluorotelomer sulfonate	2	≤ 2	TBD
754-91-6	Perfluroroctanesulfonamide	2	≤ 2	TBD
2355-31-9	N-methyl perfluorooctanesulfonamidoacetic acid	2	≤ 2	TBD
2991-50-6	N-ethyl perfluorooctanesulfonamidoacetic acid	2	≤ 2	TBD
Semivolatile Organic Compounds (ug/L) via Method 8270D SIM				
123-91-1	1,4-Dioxane	0.35	TBD	≤ 0.35

Notes:

ug/L - milligrams per Liter
ng/L - nanograms per Liter
RL - Reporting Limit
MDL - Method Detection Limit
DQO - Data Quality Objectives
1 - DQOs are based on NYSDECs letter dated August 14, 2018.
2 - Where not specified, RLs and MDLs will be based on the selected laboratory's Reporting Limits and Method Detection limits.

Table 3. Quality Control Limits Precision and Accuracy for Groundwater Samples
MGP Sites
New York

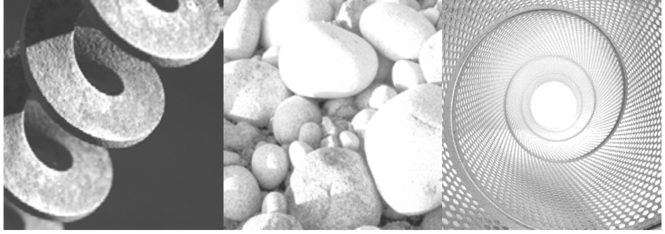
Analytical	Analytical Method	MS/MSD Compound	MS/MSD % Recovery			LCS % Recovery		Surrogate	Surrogate % Recovery	
			Low	High	RPD	Low	High		Low	High
SVOCs	8270D SIM	1,4-Dioxane	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
PFAS	Modified 537	Perfluorobutanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorohexanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluoroheptanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorooctanessulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorodecanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorobutanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluoropentanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorohexanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluoroheptanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorooctanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorononanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorodecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluoroundecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorododecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorotridecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perfluorotetradecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	6:2 Fluorotelomer sulfonate	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	8:2 Fluorotelomer sulfonate	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	Perflurooctanesulfonamide	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	N-methyl perfluorooctanesulfonamidoacetic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 537	N-ethyl perfluorooctanesulfonamidoacetic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Notes:

TBD - To Be Determined
MS - Matrix Spike
MSD - Matrix Spike Duplicate
LCS - Laboratory Control Sample
(a) Matrix spike only
(b) Laboratory duplicate RPD
NA - Not Applicable
SVOCs - semivolatile organic compounds
RPD - Relative Percent Difference

ATTACHMENT B

Field Sampling Plan
Emerging Contaminant Sampling



Consulting
Engineers and
Scientists

Field Sampling Plan
Emerging Contaminant Sampling

Manufactured Gas Plant Sites
New York

Prepared For:
Consolidated Edison Company of New York
31-01 20th Avenue
Astoria, NY 11105

And

Orange & Rockland Utilities
3 Old Chester Rd.
Goshen, NY 10924-5220

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive
Glastonbury, CT 06033
860.368.5300

August 2018
Project 1802631

Table of Contents

Section 1 – Groundwater Sampling Activities (GW)

GW-015 Groundwater Sampling for PFAS (June 2018)

H:\WPROC\Project\CON-ED\PFAS Sampling Work Plan\August 2018\FSP\Emerging Contaminant Sampling FSP.doc

STANDARD OPERATING PROCEDURE

GW-015 Groundwater Sampling for PFAS

1. Objective

This Standard Operating Procedure (SOP) was developed to describe the methods for screening for poly and perfluoroalkyl substances (PFAS) in groundwater. Given the extremely low detection limits associated with PFAS analysis and the many potential sources of trace levels of PFAS, field personnel will follow the protocols described in this SOP to avoid the potential for false detections of PFAS. Specific precautions to be taken during field sampling are discussed in detail below.

2. Execution

- Materials acceptable for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. Grundfos pumps and bladder pumps are known to contain PFAS materials and will not be used to collect groundwater samples.
- Decontamination will include two steps; detergent and a clean water rinse.
- Place plastic sheeting adjacent to the monitoring well for use as a clean work area. Prevent sampling equipment from contacting the ground or other surface that could compromise sample integrity.
- Collect the groundwater sample (up to the brim leaving no head-space) from the tubing into the pre-labelled 500 mL HDPE bottles and tightly screw on the HDPE lined cap (snug, but not too tight).
- Samples should be collected from the sample tubing directly into pre-labelled water sample containers – HDPE bottles fitted with an HDPE lined screw cap only.
- Do not filter samples.
- Container labels will be completed using pen/pencil (i.e. NO MARKERS) after the caps have been placed back on each bottle.
- Prior to collection of samples, field personnel must wash their hands and don a new set of nitrile gloves. Gloved hands must not be used to subsequently handle papers, pens, clothes, etc., prior to the collection of PFAS samples.
- The PFAS samples bottle caps must remain on the bottle until immediately prior to sample collection and the bottle immediately sealed after sample collection. This will minimize potential loss of PFAS, through volatilization. The bottle cap must remain in the other hand of the sampler, until replaced on the bottle. PFAS sample bottles will not be rinsed during sampling.
- During PFAS sampling, water turbulence should be minimized to avoid potential volatilization from aqueous solution; this could include: adjusting discharge rates prior to sampling and inclining the sample bottle neck,

during filling of the bottle. Ensure the rim of the bottle does not come into direct contact with the equipment or tubing.

- Groundwater samples will be collected in pre-labelled, laboratory-supplied "PFAS free" HDPE sample bottles.
- Labelling information and time of sampling should be recorded on the Field Reports. Avoid using markers. All sampling materials should be treated as single use and disposed following completion of sampling at each monitoring well.
- Keep samples as dry as possible. Ensure that sample bottles are securely closed.
- Samples should be placed in coolers and kept at a cool temperature until transportation to the lab. Samples must be kept at between 0–4 ºC in an insulated, durable transport container.

3. Limitations

- Packaged food:
    - Field personnel should avoid the use of paper bags and should not bring food onsite in any paper packaging (i.e., do not bring any fast food to the site that uses any form of paper wrapping such as sandwiches, coffee in paper cups, etc.).
    - Avoid products such as aluminum foil, coated papers, and coated textiles onsite.
    - Avoid foods that have been fried on a frying pan onsite as the Teflon coating on most frying surfaces is made of a fluorinated coating and could represent a potential source of PFAS.
    - Snacks and meals (lunch) are not to be eaten in the field vehicle or in the immediate vicinity of sampling activities (i.e., within 30 feet). When field personnel require a break to eat or drink, they should remove their gloves and coveralls and move to an appropriate location (preferably downwind). When finished, field personnel should then tidy up and put their coveralls and gloves back on prior to returning to the work area.
- Field Gear:
    - Water resistant, water proof or stain-treated clothing will not be worn during the field program.
    - Field clothing to be worn on site should be restricted to natural fibers (preferably cotton) and not synthetic.
    - Field clothing should be laundered with minimal use of soap (multiple washings since purchase), no fabric softener or scented products and after they have been cleaned, the clothing should be rinsed again with water only before drying (no fabric softener, etc.).
    - Preferably, field gear should be cotton construction, old and well laundered. New cotton clothing may contain PFAS related treatments. The use of new clothing while sampling or sample

    handling shall be avoided. Gore-Tex™ consists of a PFAS membrane. Gore-Tex™ clothing shall not be worn during the sampling program.
  - Avoid plastic coating or glue materials. Waterproof field books are not to be used. Field reports should be on loose paper on masonite or aluminum clip boards (i.e. plastic clip boards, binders or spiral hard cover notebooks are not acceptable) using a pencil. Sharpies should not be used.
  - Most safety footwear are made from leather and synthetic fibers that have been treated to provide some degree of waterproofing/increased durability and represent a source of trace PFAS. For the health and safety of field personnel, the protection for footwear must be maintained. As such, contact with safety footwear will take place after field personnel remove themselves from immediate vicinity of the sample port (i.e. 30 feet).
  - Disposable nitrile gloves must be worn at all times. Further, a new pair of nitrile gloves shall be donned prior to the following activities at each sample location:
    - Decontamination of re-usable sampling equipment;
    - Prior to contact with sample bottles;
    - Insertion of anything into the monitoring well (e.g. HDPE tubing);
    - Handling of any QA/QC samples including equipment blanks; and
    - After the handling of any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel.
- Field vehicle:
  - The field vehicle seats may be treated with stain resistant products by the manufacturer. The seats of the vehicle shall be covered with a well laundered cotton blanket for the duration of the field program in order to avoid direct contact between field clothing and the seats of the vehicle.
- Personnel Hygiene:
  - Field personnel will not use shampoo, conditioner, body gel, cosmetic or hand cream as part of their personal cleaning/showering routine on the day of a sampling event, as these products may contain surfactants and represent a potential source of PFAS. It is strongly recommended that field personnel shower as per normal routine the night before and then rinse with water only on the morning of sampling event. Use of bar soap is considered acceptable, although soap containing moisturizing lotions should be avoided.

    - Moisturizers, cosmetics and dental floss may contain PFAS and shall not be used throughout the duration of the field program, either on or off-site. Sunscreen and insect repellent also cannot be used.
    - For washroom breaks, field personnel will remove themselves from the immediate vicinity of the sampling location (i.e., 30 feet) and then remove gloves and overalls. Field personnel should wash as normal with extra time for rinsing with water after soap use. When finished washing, the use of air dryer is preferred and the use of paper towel for drying is to be avoided (if possible).
- Visitors:
    - Visitors to the site are asked to remain at least 30 feet from sampling areas.

4. Contacts

Melissa Felter

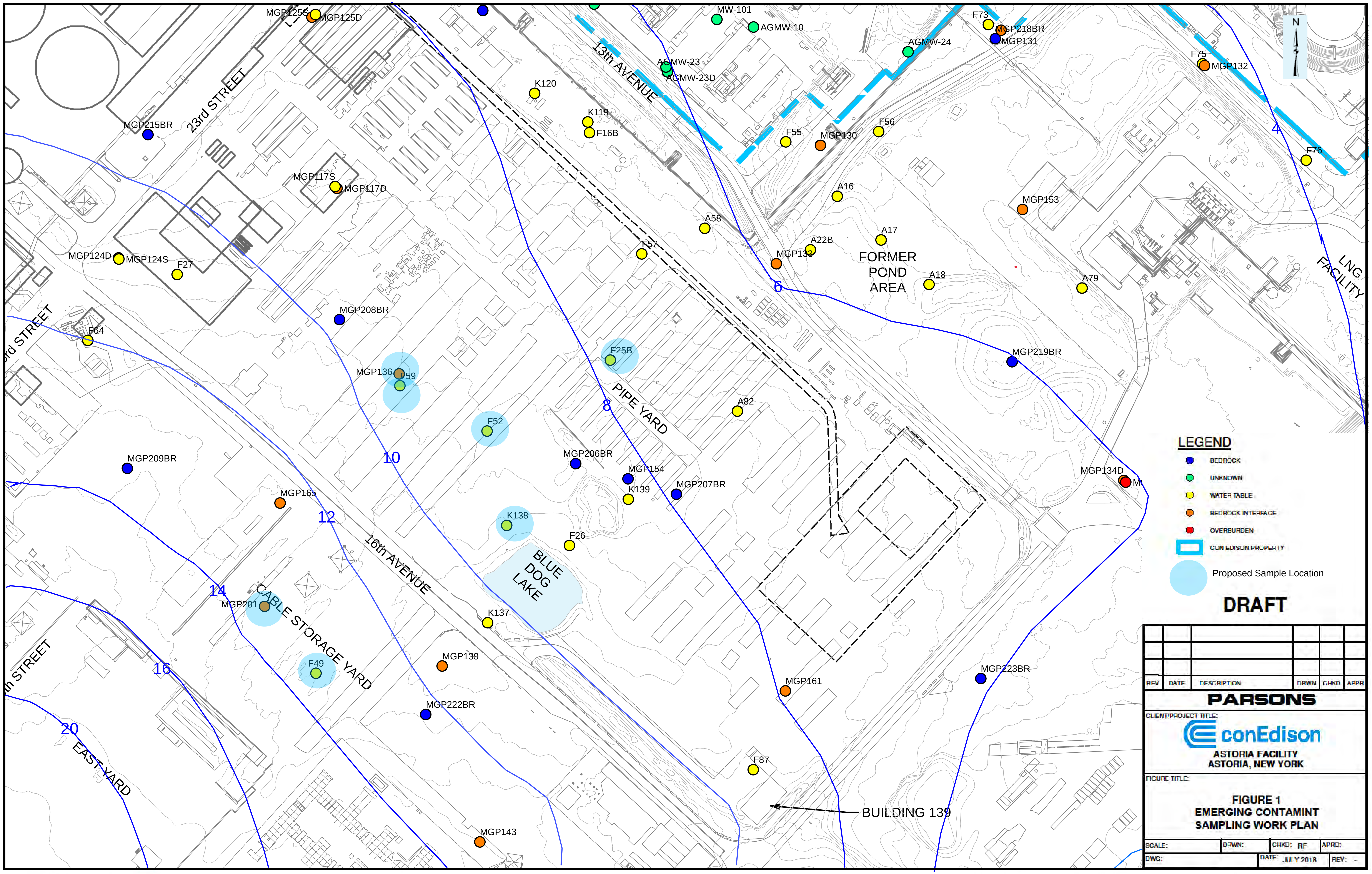
ATTACHMENT C

Proposed Sampling Locations/Schedule
Emerging Contaminant Sampling

Table 1. Proposed Groundwater Sampling Locations and Schedule

Site Name	*Site Name*	*Well Selection Rational*	*Sampling Schedule*
Astoria MGP	MGP201, MGP136, F25B, F49, F52, F59 and K138	Wells F49 and MGP201 are upgradient; wells MGP136, F52, F59 and K138 are mid-gradient; well F25B is downgradient	4thQtr 2019 (coincides with field investigation in Astoria Pipe yard, where the work plan is currently under NYSDEC review)
Cedar St. MGP New Rochelle	MW-09; MW-08A; MW-10	Wells MW-08A and MW-10 are updgradient and well MW-09 is downgradient. No MGP impacts have been observed in these wells	4th Qtr 2019 (coincides with field work associated with the Site's approved remedial action)
Central Ave- Peekskill MGP	MW-02, MW-08	Well MW-01 is upgradient and well MW-08 is downgradient (it is a very smal area of concern)	4th Qtr 2018
E11th St. MGP - Jacob Riis NYCHA Housing	MW-122A; MW-128A	Well MW-122A is an upgradient and well MW-128A is a downgradient well	4th Qtr 2019 (associated with pending SMP monitoring event)
E14th St. Works (East River Generating Station)/Ballfield	MW-17; MW-18	Well MW-17 is upgradient and well MW-18 is downgradient. They are the only 2 wlls onsite	4th Qtr 2019
E99th St. Works	MW-11; MW-03	Well MW-11 is upgradient and well MW-03 is downgradient. No MGP impacts have been observed in these wells	2nd Qtr 2019 (associated with next round of groundwater sampling after new wells are installed)
E108th St Gasholder	MW-107; MW-108	Wells MW-107 and MW-108 are both updgradient. No MGP impacts have been observed in these wells	4th Qtr 2018 (associated with pending groundwater monitoring event)
E111th St. MGP	MW-101;MW-102; MW-104	Wells MW-101 and MW-102 are downgradient and well MW-104 is upgradient. No MGP impacts have been observed in these wells.	4th Qtr 2018 (associated with pending groundwater monitoring event)
E138th St. - Bronx Works	MW-02; MW-06	Well MW-02 is upgradient and well MW6 is downgradient	4th Qtr 2019 (associated with pending SMP monitoring event)
Farrington St. Holder	CMW-36, MW-14, MW-17	CMW-36: upgradient well; no MGP-related impacts were observed during installation of this monitoring well. MW-14: centrally located well; no MGP-related impacts were observed during installation of this monitoring well. MW-17: downgradient well; no MGP-related impacts were observed during installation of this monitoring well.	4th Qtr 2018 (associated with pending groundwater monitoring event)
Farrington St. MGP	MW-CSB-60, MW-21, MW-27	MW-CSB-60: upgradient well; no MGP-related impacts were observed during installation of this monitoring well. MW-21: centrally located well; no MGP-related impacts were observed during installation of this monitoring well. MW-27: downgradient well; no MGP-related impacts were observed during installation.	4th Qtr 2018, (associated with PDI field work, pending NYSDEC approval of PDI Work Plan)
Hastings Gas Works	MW-02, MW-06, PZ-109	MW-02: upgradient well not impacted by MGP source material. MW-06: centrally located well not impacted by MGP source material. PZ-109: downgradient well not impacted by MGP source material.	4th Qtr 2018 (associated with pending annual site groundwater monitoring event)
Hester Street MGP	MW-12, MW-1, MW-7	MW-01: down gradient well not impacted by MGP source material. MW-07: upgradient well not impacted by MGP source material. MW-12: upgradient well not impacted by MGP source material	4th Qtr 2018
Ossining MGP	MW-06, MW-13, MW-09	MW-06: upgradient well; MW-13: centrally located well; MW-09: upgradient well	4th Qtr 2018 (associated with pending quarterly NAPL monitoring event)
Pelham MGP Offsite	MW-07; MW-09B	MW-07: upgradient; MW-09B: downgradient	4th Qtr 2019 (pending off-site RI completion)
Peemart Ave-Peekskill MGP	MW-04, MW-20, MW-27	MW-04: upgradient well; MW-20 and MW-27: downgradient wells	4th Qtr 2019 (pending remediation of OU1)
Rye MGP	MGP-MW-112S; MGP-MW-104	MGP-MW-112S: upgradient well; MGP-MW-104: downgradient well; possible NAPL presence	4th Qtr 2019 (associated with pending SMP monitoring event)
W45th St.Gas Works	MW-10; MW-16	MW-10: upgradient well; MW16: downgradient well	4th Qtr 2019 (associated with pending SMP monitoring event)
York Ave. Station	MW-03	MW-03 is a downgradient well. No MGP impacts have been observed in this well.	4th Qtr 2018 (associated with pending soil sampling activities)
Zerega Ave. Station	MW-01; MW-03; MW-05	MW-01 is an upgradient well; MW-03 is a centrally located well; MW-05 is a downgradient well	4th Qtr 2019 (associated with pending SMP monitoring event)

* - See attached site maps for proposed sampling well locations



LEGEND

- ● BEDROCK
- ● UNKNOWN
- ● WATER TABLE
- ● BEDROCK INTERFACE
- ● OVERBURDEN
- ▭ CON EDISON PROPERTY
- ● Proposed Sample Location

DRAFT

REV	DATE	DESCRIPTION	DRWN	CHKD	APPR

PARSONS

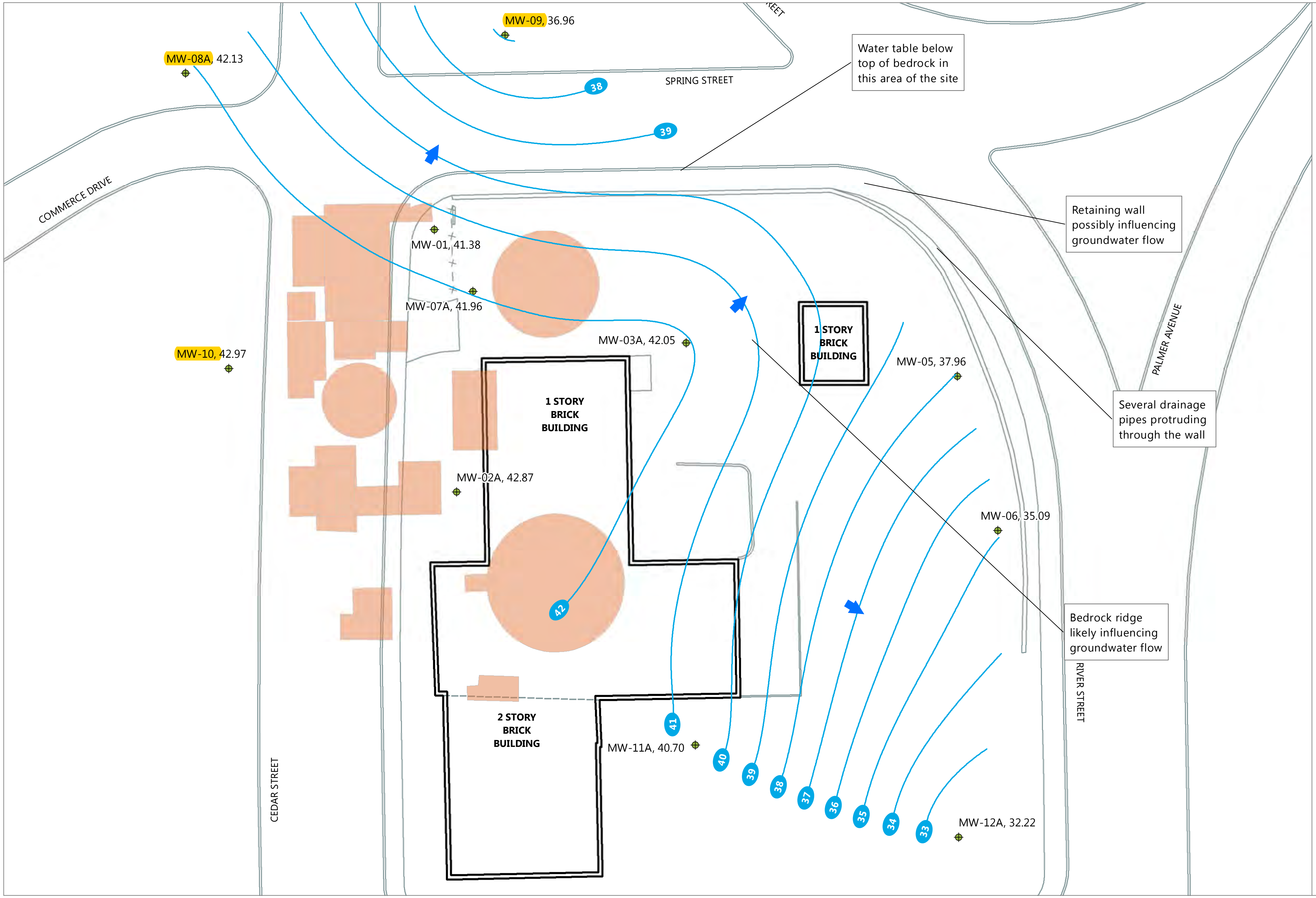
CLIENT/PROJECT TITLE:

conEdison
ASTORIA FACILITY
ASTORIA, NEW YORK

FIGURE TITLE:

FIGURE 1
EMERGING CONTAMINT
SAMPLING WORK PLAN

SCALE:	DRWN:	CHKD: RF	APRD:
DWG:		DATE: JULY 2018	REV: -



Water table below top of bedrock in this area of the site

Retaining wall possibly influencing groundwater flow

Several drainage pipes protruding through the wall

Bedrock ridge likely influencing groundwater flow

LEGEND:

➡ Inferred Groundwater Flow Direction

— Groundwater Elevation Contour (ft amsl)

⊕ Overburden Monitoring Well

═ Toyota Dealership Structure

▨ Historical MGP Structure

Highlighted Monitoring Wells (MW-08A, MW-09, and MW-10): Proposed monitoring wells for Emerging Contaminants Testing.

NOTES:

1. Depth to groundwater is generally 5 to 15 feet below ground surface.
2. Groundwater elevations were calculated from depth-to-water measurements in April 2014.
3. Base map information based on a survey provided by Chazen Engineering, Land Surveying & Landscape Architecture, CO., P.C. dated 1/20/2009.
4. Historical MGP structure locations are approximate and based on information presented in the *Cedar Street Works Remedial Investigation Report*, prepared by URS and dated July 2017.
5. Elevations based on North American Vertical Datum, 1988.

0 100

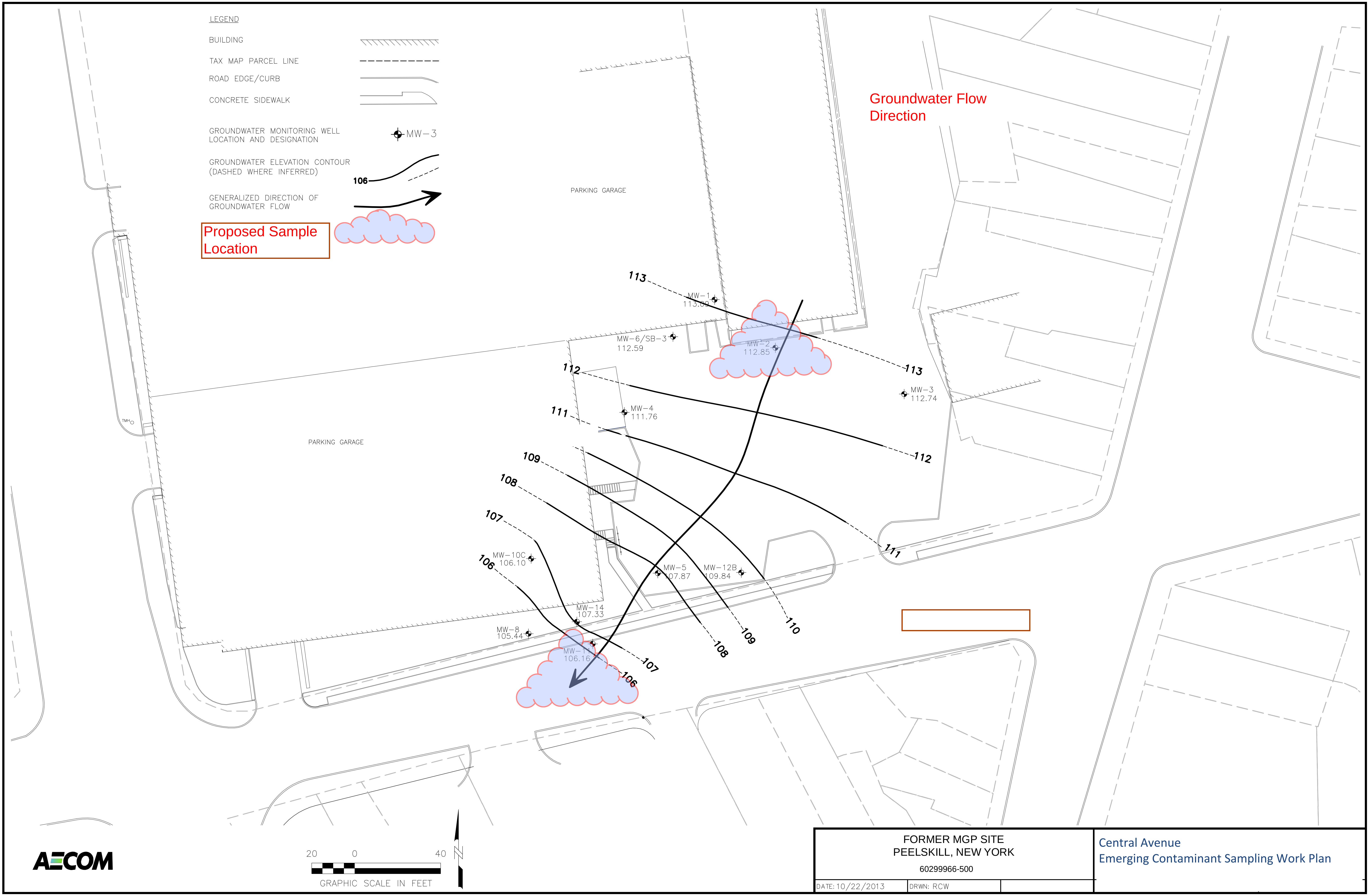
Feet

Publish Date: 2018/06/19, 1:47 PM | User: alesueur
Filepath: \\orcas\GIS\Jobs\Con_Edison_0921\CedarStreetWorksSite\Maps\RI\AQ_ConEd_Fig1_6_OverburdenGW_Potentiometric.mxd

ANCHOR QEA

Proposed Sampling Locations

Emerging Contaminants Sampling Plan
Cedar Street Works Site, New Rochelle, New York
Consolidated Edison Company of New York, Inc.

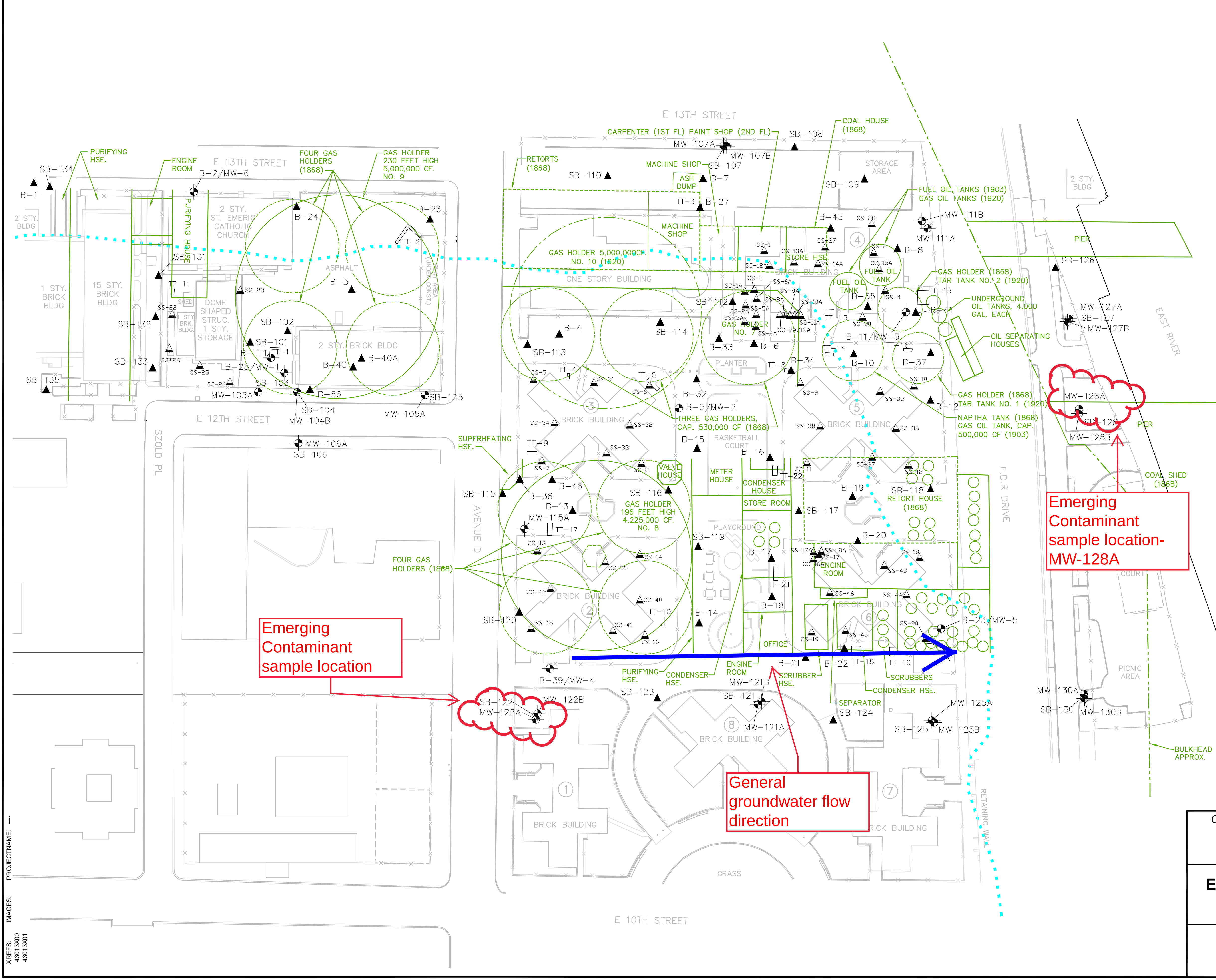


FORMER MGP SITE
PEELSKILL, NEW YORK
60299966-500

DATE: 10/22/2013
DRWN: RCW

Central Avenue
Emerging Contaminant Sampling Work Plan

File: J:\Indl_Service\Project Files\ConEd 1869\Peekskill - MGP Central AVE\11.0 CADD\2013-SMP\60299966-500-C01.dwg Layout: FIG 1-9 User: warrenr Plotted: Oct 22, 2013 - 3:35pm Xref's:



LEGEND:

SS-4 △	SURFACE SOIL SAMPLE
B-35 ▲	SOIL BORING
TT-16 ▭	TEST TRENCH
B-25/MW-1 ⊕	MONITORING WELL
······	APPROXIMATE HISTORICAL SHORELINE
- - - -	FORMER SITE FEATURES (FIRST OCCURENCE-1868)
——	FORMER SITE FEATURES (FIRST OCCURENCE-1903)
- · - ·	FORMER SITE FEATURES (FIRST OCCURENCE-1920)
④	JACOB RIIS BUILDING NUMBER

NOTES:

1. BASE MAP AND SURVEY CONTROL WAS TAKEN FROM ORIGINAL SURVEY DATED 9/3/2004; SUBMITTED BY B.B.L. ON 8/25/2006 AND SATELLITE IMAGERY OBTAINED FROM GOOGLE EARTH ON SEPTEMBER 16, 2009.
2. ALL ELEVATIONS SHOWN ARE IN BOROUGH PRESIDENT OF MANHATTAN VERTICAL DATUM, WHICH IS 2.75 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK (NGVD29); REFERENCE CITY BENCH MARKS #399 AND #419.
3. ALL PLANIMETRIC FEATURES SHOWN ARE IN NAD 83 NY STATE PLANE COORDINATE SYSTEM.
4. THE ORIGINAL SURVEY WAS CONVERTED INTO NEW COORDINATE AND VERTICAL SYSTEM BASED ON 7 TRAVERSE POINTS, RECOVERED IN THE FIELD (#2,3,4,6,7,12, AND 18).

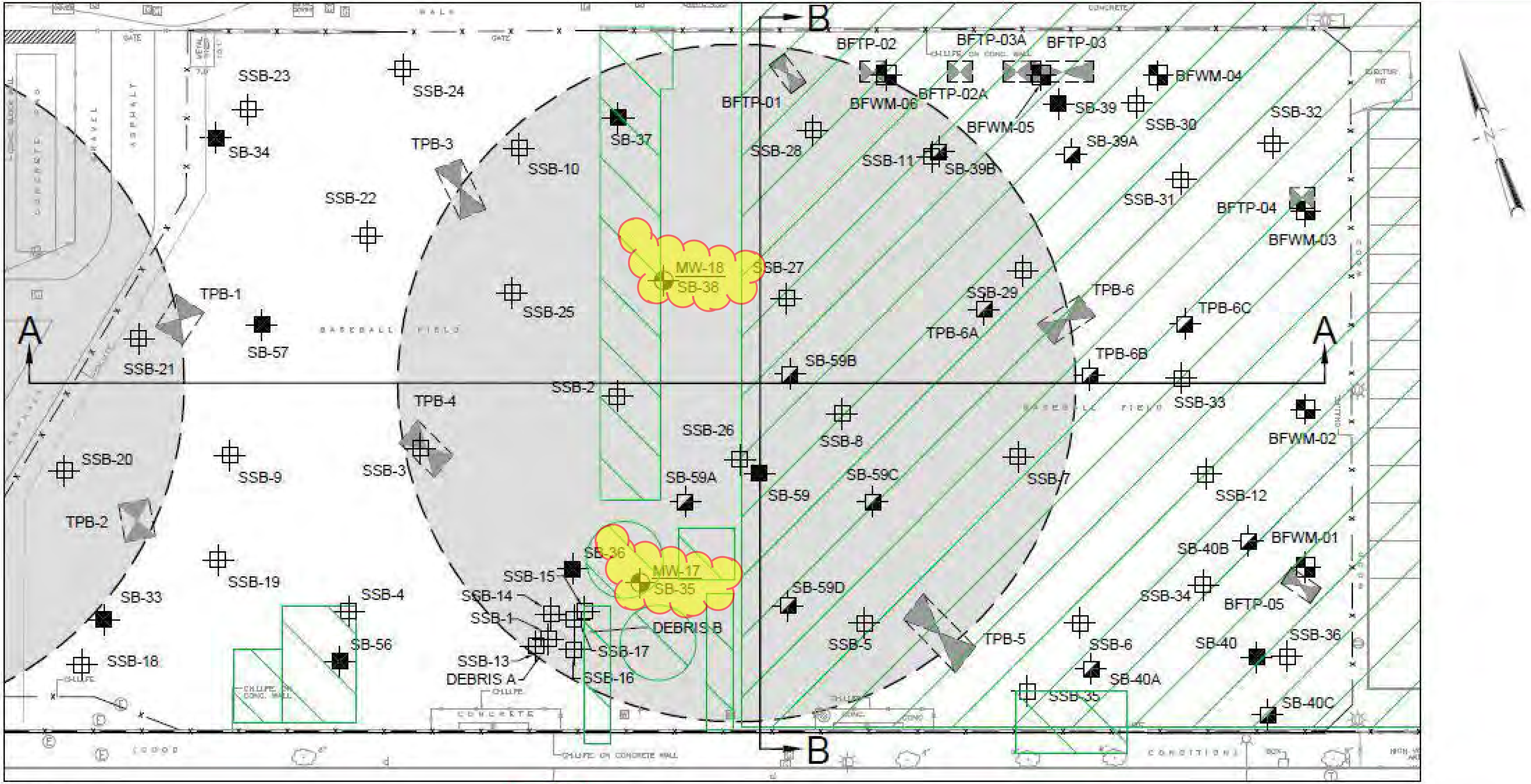
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER EAST 11TH STREET WORKS SITE
MANHATTAN, NEW YORK

Emerging Contaminant Sampling Work Plan

ARCADIS

FIGURE
1-3

CITY:Syracuse DIV/GROUP:Env-141 DB:A.Schilling R.Allen A.Schilling R. BASSETT LD:(Opt) PIC:(Opt) PM:M.Carrillo-Sheridan TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0043013\0001\00010\DWG\43013B04.dwg LAYOUT: 1-3 SAVED: 10/23/2009 3:18 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/23/2009 3:18 PM BY: BASSETT, RICHARD
XREFS: 43013X00 43013X01 IMAGES: PROJECTNAME: ----



LEGEND:

⌖ SSB-30 SURFACE SOIL SAMPLE LOCATION

■ SB-57 SITE CHARACTERIZATION SOIL BORING LOCATION

MW-18 SB-38 COMBINED MONITORING WELL AND SOIL BORING LOCATION

WM04 WATER MAIN SOIL SAMPLE LOCATION

SB-57 DELINEATION SOIL BORING LOCATION

TP01 TEST PIT

— — — BOUNDARY OF FORMER GAS HOLDERS

▨ FORMER MGP STRUCTURES (REFER TO FIGURE 2 FOR DETAILS)

A A REFER TO FIGURES 5 AND 6 FOR SUBSURFACE PROFILE SECTIONS

Proposed Sample Location

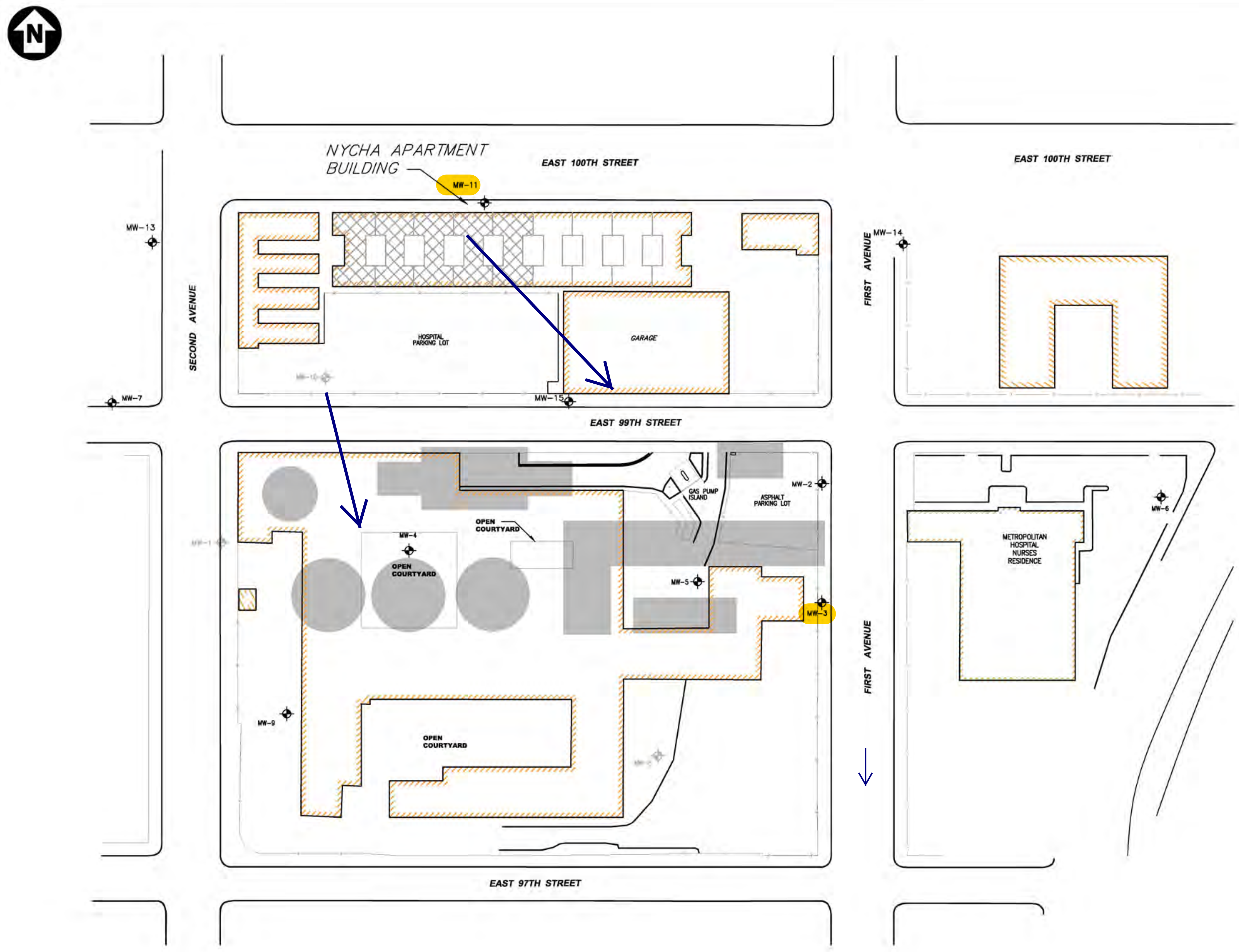
NOTES:
1.) BASE PLAN FEATURES AND LOCATIONS OF MONITORING WELLS, SOIL BORINGS AND TEST PITS SHOWN ON PLAN WERE BASED ON THE SURVEY CONDUCTED ON 9 FEBRUARY 2004 BY LEONARD J. STRANDBERG AND ASSOCIATES, INC.

0 30 60
SCALE IN FEET

14tth Street Ballfields
Emerging Contaminant Sampling Work Plan

29724-014 B05

FIGURE 4



LEGEND:

▬ FORMER MGP STRUCTURES
—x— CHAIN LINK FENCE
⌖ EXISTING MONITORING WELL
⌖ MONITORING WELL DESTROYED
→ Groundwater Flow Direction

NOTES:

1. INSETS NOT TO SCALE. IMAGE TAKEN FROM SEPTEMBER 16, 2011 REPORT BY ECOSYSTEMS STRATEGIES, INC.

Highlighted Monitoring Wells (MW-3 and MW-11): Proposed monitoring wells for Emerging Contaminant Testing.

120 60 0 120 240

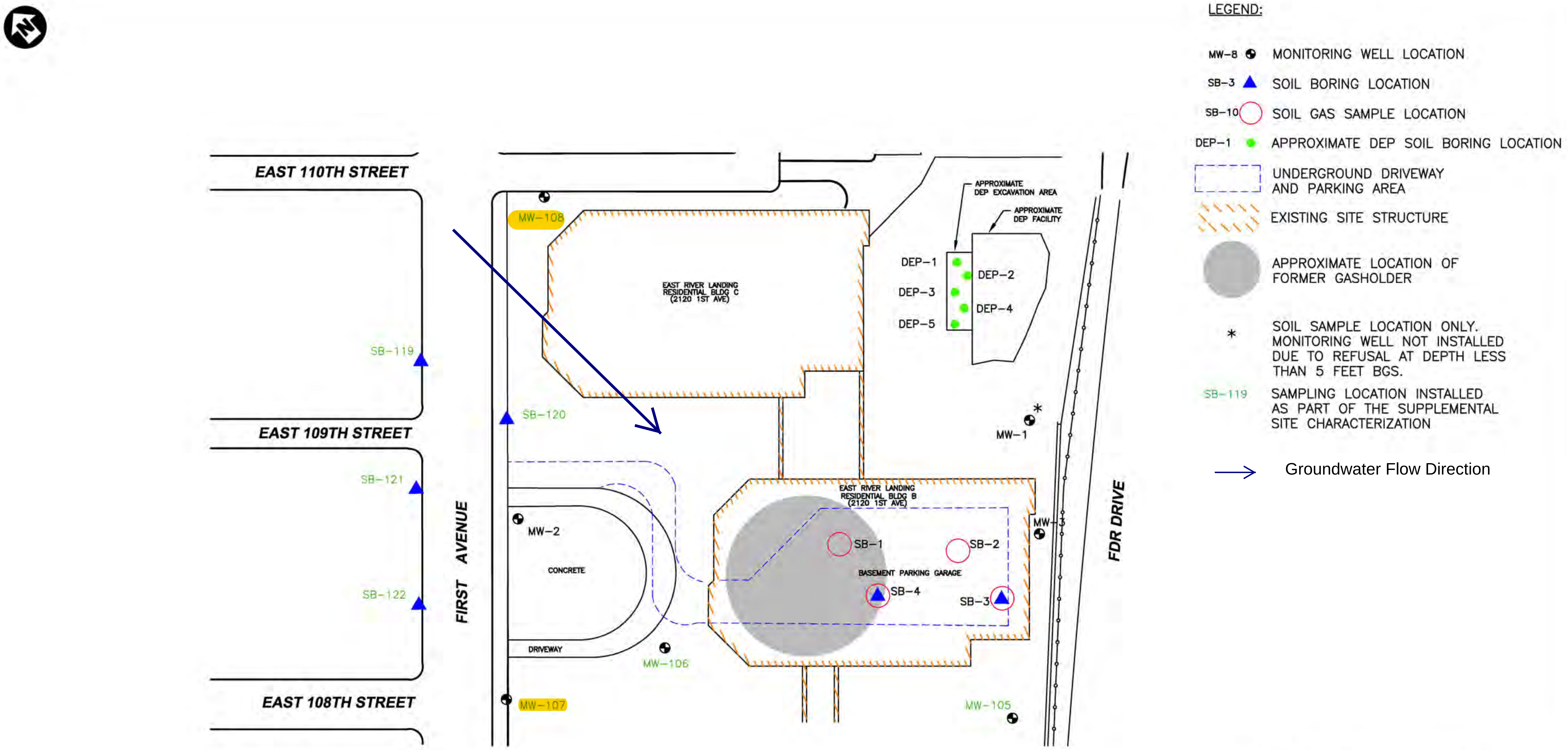
SCALE: 1"=120'

Proposed Sampling Locations

Emerging Contaminants Sampling Plan
Former East 99th Street Works
New York, NY
Consolidated Edison Company of New York, Inc.

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

FILE NAME: S:\PROJECTS\CONEDISON\E. 99TH STREET\2018 LETTER WORK PLAN TO NYSDEC\CAD\FIGURE 1 - WP - 442290C002.DWG
PLOT DATE: 6/5/2018 2:55 PM PLOTTED BY: RUSSO, JILL



100 50 0 100 200

SCALE: 1"=100'

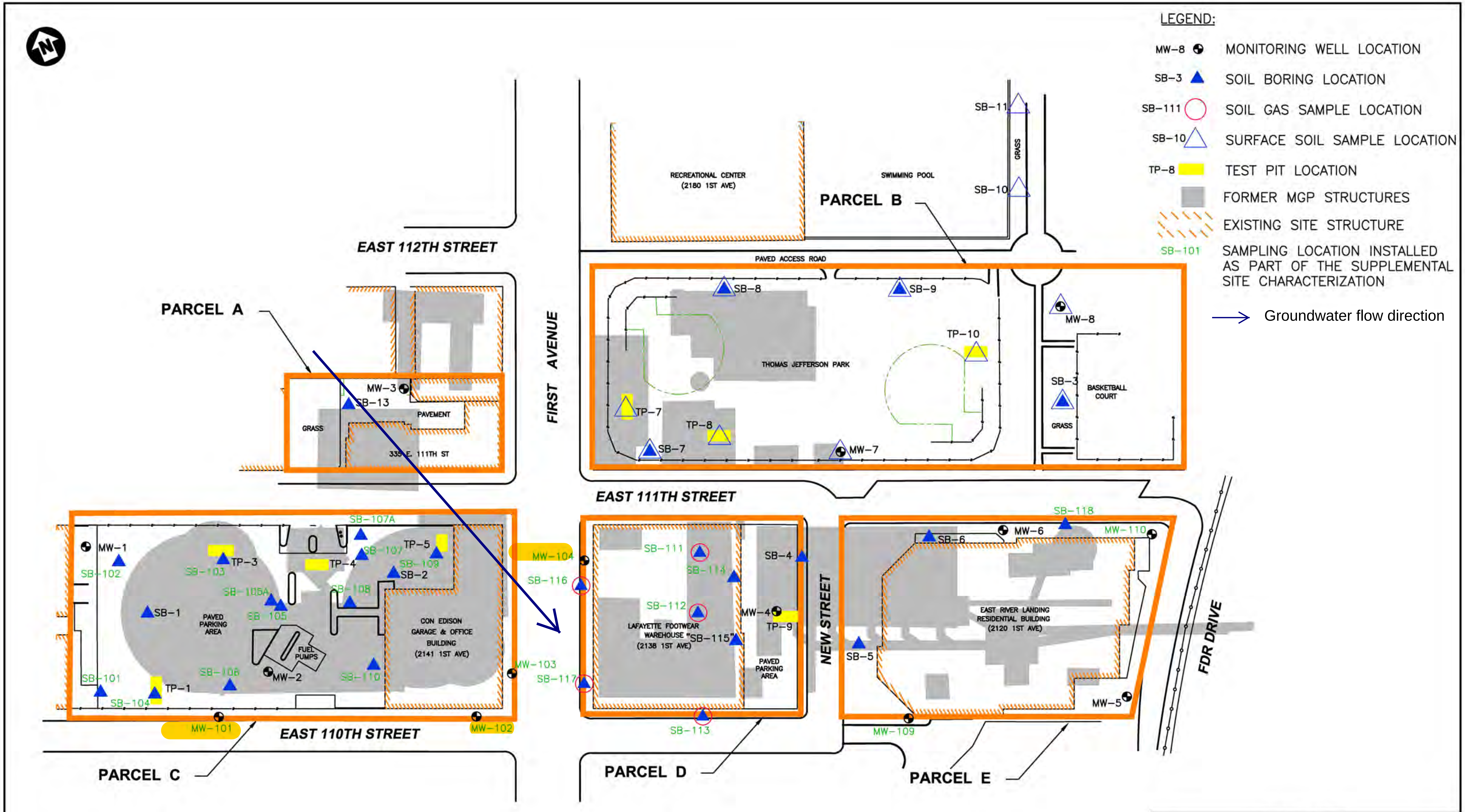
NOTE: Highlighted Monitoring Wells (MW-107 and MW-108): Proposed monitoring wells for Emerging Contaminants Testing.

Proposed Sampling Locations

Emerging Contaminants Sampling Plan
East 108th St Former Gasholder Station
New York, New York
Consolidated Edison Company of New York, Inc.

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

No XREFs
P:\CONED\440242\CAD\440242C008.DWG, 6/14/05, CLW



NOTE: Highlighted Monitoring Wells (MW-101, MW-102, and MW-103): Proposed monitoring wells for Emerging Contaminants Testing.

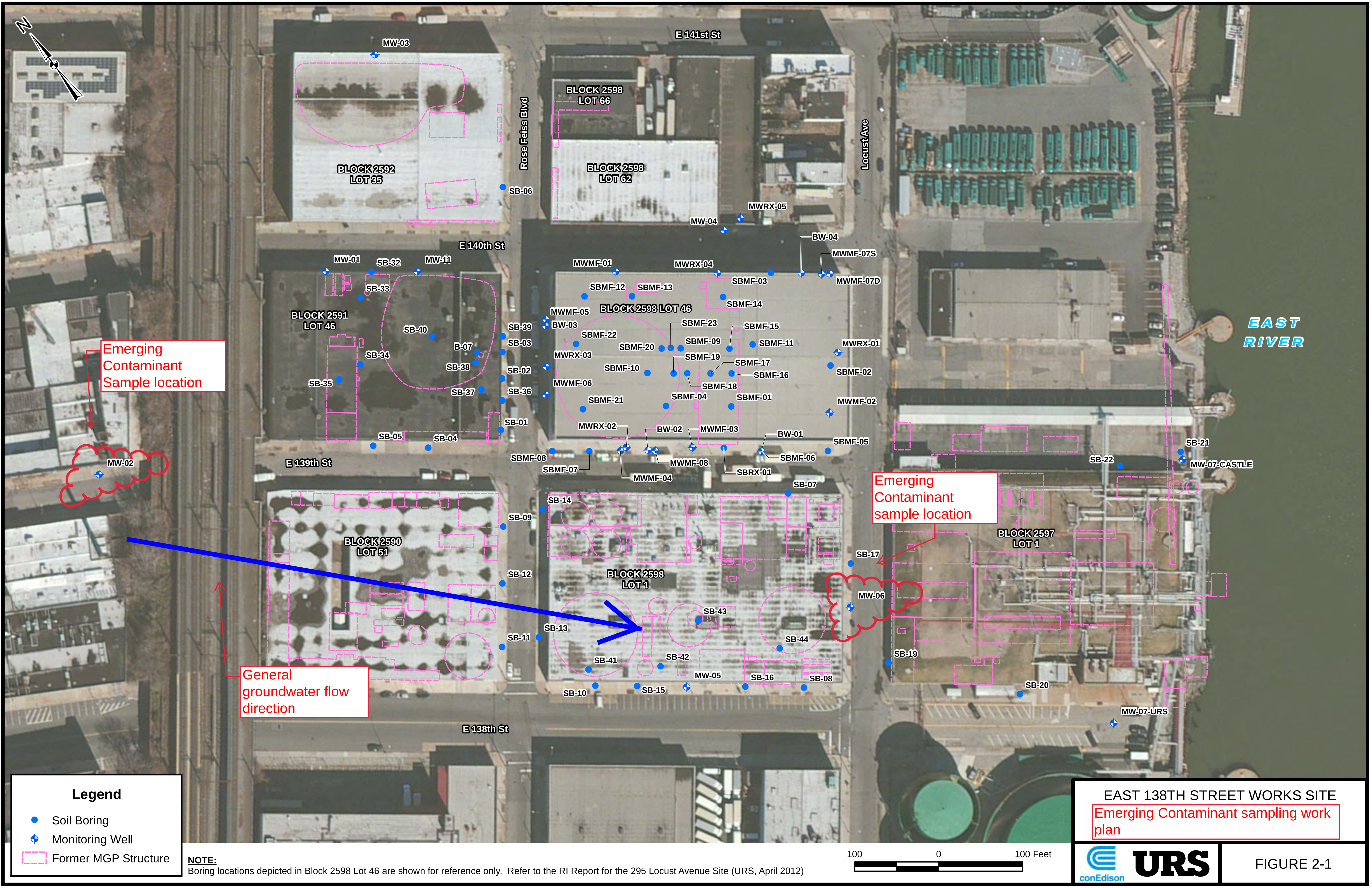
100 50 0 100 200

SCALE: 1"=100'

Proposed Sampling Locations
Emerging Contaminants Sampling Plan
East 111th Street Former Gas Works
New York, New York
Consolidated Edison Company of New York, Inc.

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

No XREFs
P:\CONED\440241\CAD\440241C002.DWG, 6/1/05, 10:20, CLW



J:\Projects\11175538.00000\DB\GIS\Maps\138th RI Report\SB AND MW.mxd 1/5/2016

NOTE:
Boring locations depicted in Block 2598 Lot 46 are shown for reference only. Refer to the RI Report for the 295 Locust Avenue Site (URS, April 2012)

EAST 138TH STREET WORKS SITE
Emerging Contaminant sampling work plan

conEdison URS

FIGURE 2-1

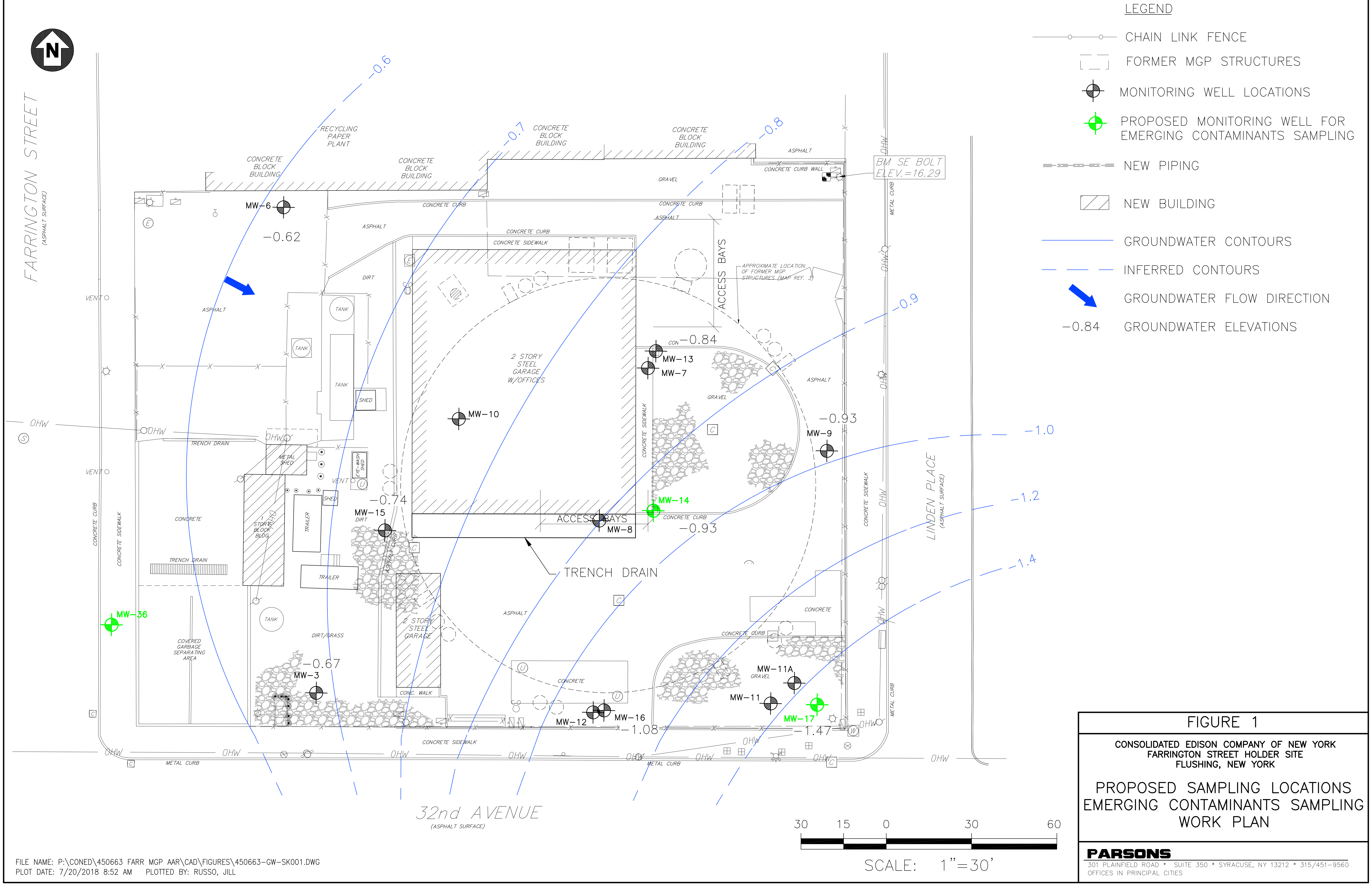


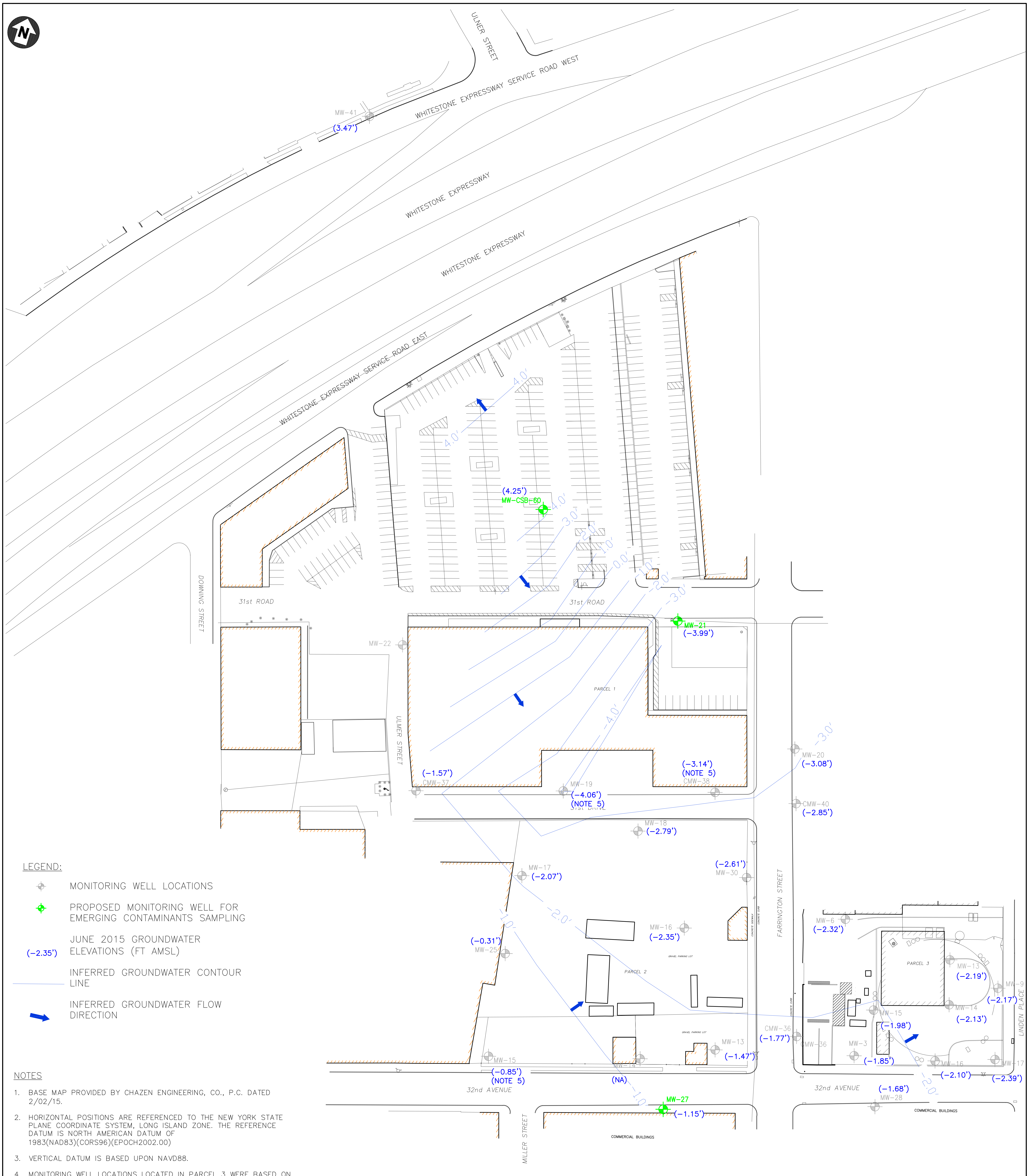
FIGURE 1

CONSOLIDATED EDISON COMPANY OF NEW YORK
FARRINGTON STREET HOLDER SITE
FLUSHING, NEW YORK

PROPOSED SAMPLING LOCATIONS
EMERGING CONTAMINANTS SAMPLING
WORK PLAN

PARSONS
301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315/451-9560
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\CONED\450663 FARR MGP AAR\CAD\FIGURES\450663-GW-SK001.DWG
PLOT DATE: 7/20/2018 8:52 AM PLOTTED BY: RUSSO, JILL



LEGEND:

⌖	MONITORING WELL LOCATIONS
⌖	PROPOSED MONITORING WELL FOR EMERGING CONTAMINANTS SAMPLING
(−2.35')	JUNE 2015 GROUNDWATER ELEVATIONS (FT AMSL)
—	INFERRED GROUNDWATER CONTOUR LINE
➡	INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP PROVIDED BY CHAZEN ENGINEERING, CO., P.C. DATED 2/02/15.
2. HORIZONTAL POSITIONS ARE REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE. THE REFERENCE DATUM IS NORTH AMERICAN DATUM OF 1983(NAD83)(CORS96)(EPOCH2002.00)
3. VERTICAL DATUM IS BASED UPON NAVD88.
4. MONITORING WELL LOCATIONS LOCATED IN PARCEL 3 WERE BASED ON A FIELD SURVEY CONDUCTED ON MAY 1, 2014 AND ARE PART OF A POST-IRM GROUNDWATER MONITORING PROGRAM.
5. LNAPL WAS MEASURED IN MONITORING WELLS MW-15, MW-19, AND CMW-38 DURING THE JUNE 2015 GAUGING EVENT. A SPECIFIC GRAVITY OF 0.93 WAS ASSUMED FOR THE LNAPL TO CALCULATE A CORRECTION FACTOR THAT WAS THEN USED TO ADJUST THE GROUNDWATER ELEVATIONS IN THESE WELLS.
6. THE FOLLOWING MONITORING WELLS COULD NOT BE LOCATED OR WERE DAMAGED AT THE TIME OF THE JUNE 2015 GAUGING EVENT: MW-14, MW-22, AND CMW-39.

80 40 0 80 160

SCALE: 1"=80'

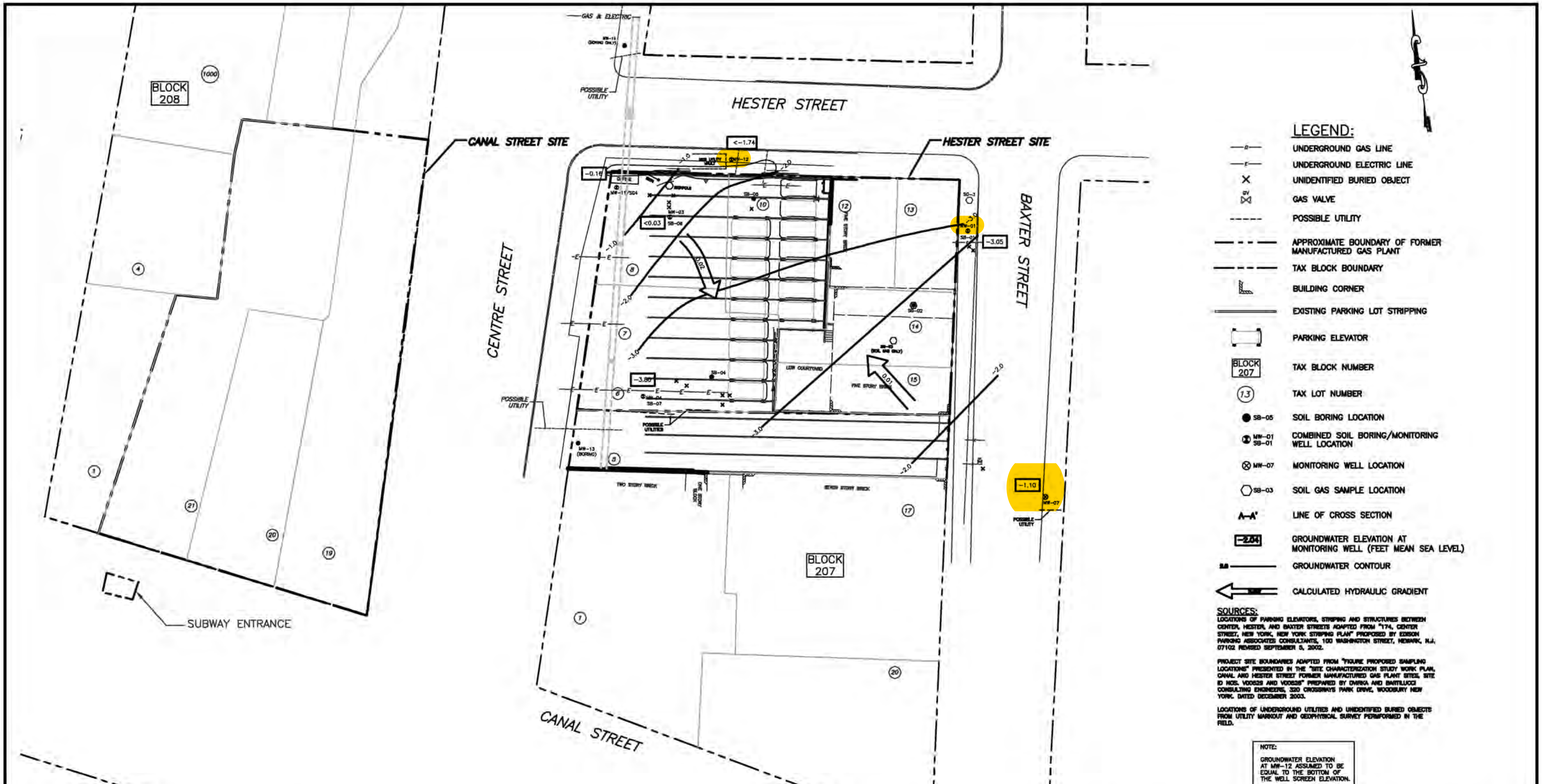
FILE NAME: P:\CONED\450663 FARR MGP AAR\CAD\FIGURES\450663-GW-SK002.DWG
PLOT DATE: 7/20/2018 8:48 AM PLOTTED BY: RUSSO, JILL

FIGURE 1

CONSOLIDATED EDISON COMPANY OF NEW YORK
FARRINGTON STREET FORMER MGP SITE
FLUSHING, NEW YORK

PROPOSED SAMPLING LOCATIONS
EMERGING CONTAMINANTS SAMPLING
WORK PLAN

PARSONS
301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315/451-9560
OFFICES IN PRINCIPAL CITIES



SOURCES:

LOCATIONS OF PARKING ELEVATORS, STRIPING AND STRUCTURES BETWEEN CENTER, HESTER, AND BAXTER STREETS ADAPTED FROM "174, CENTER STREET, NEW YORK, NEW YORK STRIPING PLAN" PROPOSED BY EDISON PARKING ASSOCIATES CONSULTANTS, 100 WASHINGTON STREET, NEWARK, N.J. 07102 REVISED SEPTEMBER 5, 2002.

PROJECT SITE BOUNDARIES ADAPTED FROM "FIGURE PROPOSED SAMPLING LOCATIONS" PRESENTED IN THE "SITE CHARACTERIZATION STUDY WORK PLAN, CANAL AND HESTER STREET FORMER MANUFACTURED GAS PLANT SITES, SITE ID NOS. V00529 AND V00528" PREPARED BY DVIRKA AND BARTILUCCI CONSULTING ENGINEERS, 320 CROSSWAYS PARK DRIVE, WOODBURY NEW YORK. DATED DECEMBER 2003.

LOCATIONS OF UNDERGROUND UTILITIES AND UNIDENTIFIED BURIED OBJECTS FROM UTILITY MARKOUT AND GEOPHYSICAL SURVEY PERMFORMED IN THE FIELD.

NOTE:

GROUNDWATER ELEVATION AT MW-12 ASSUMED TO BE EQUAL TO THE BOTTOM OF THE WELL SCREEN ELEVATION.

NOTE: Highlighted Monitoring Wells (MW-1, MW-7, and MW-12):
Proposed monitoring wells for Emerging Contaminants Testing.

–NOTICE–

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED.

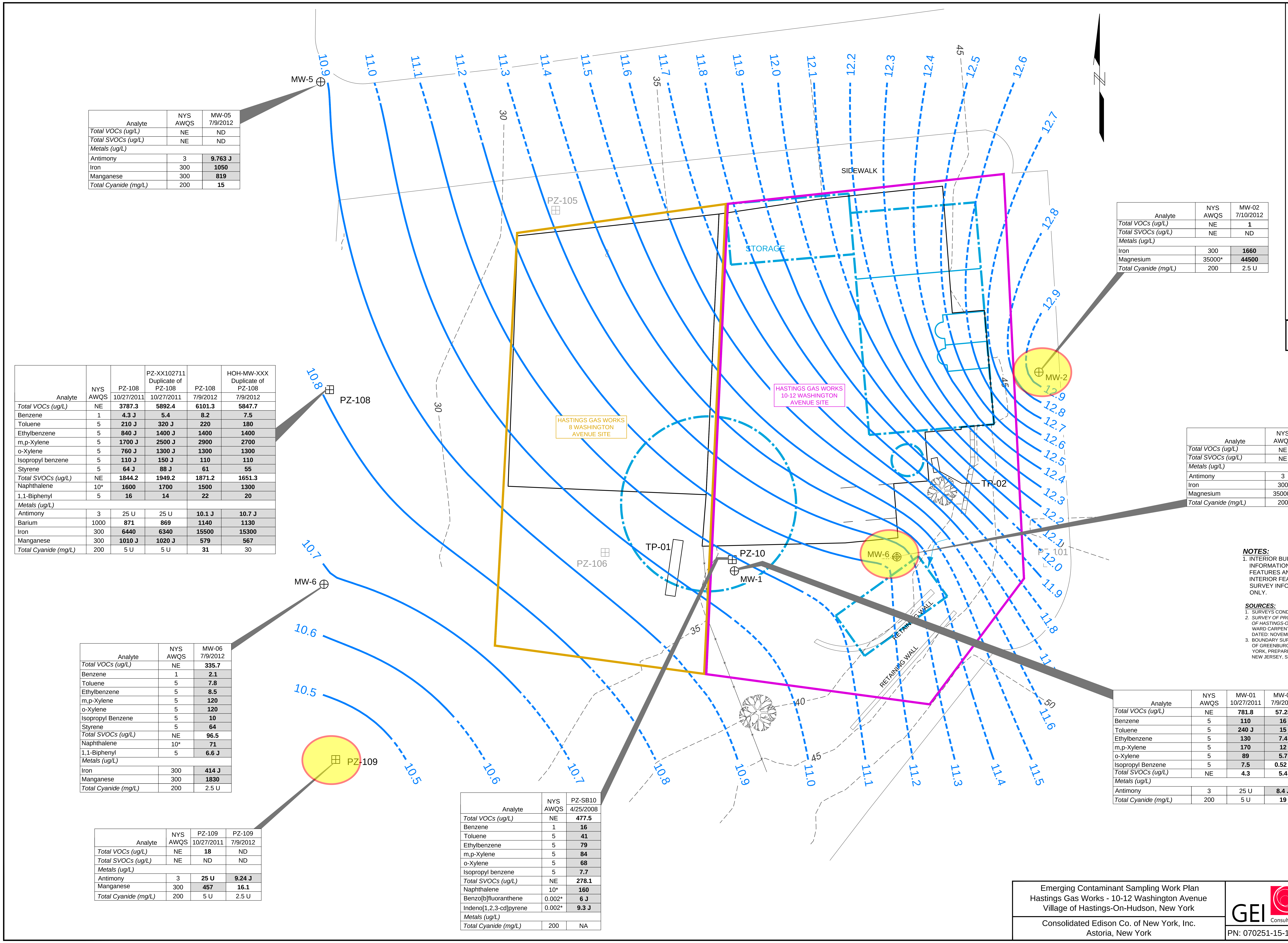
THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF CMX.

40 0 40 80

GRAPHIC SCALE IN FEET
1"=40'

Proposed Sampling Locations
Emerging Contaminants Sampling Plan

Consolidated Edison Company of New York, Inc.
Hester Street Former Manufacturing Gas Plant Site
New York, New York



Analyte	NYS AWQS	MW-05 7/9/2012
Total VOCs (ug/L)	NE	ND
Total SVOCs (ug/L)	NE	ND
Metals (ug/L)		
Antimony	3	**9.763 J**
Iron	300	**1050**
Manganese	300	**819**
Total Cyanide (mg/L)	200	**15**

Analyte	NYS AWQS	PZ-108	PZ-XX102711 Duplicate of PZ-108	PZ-108	HOH-MW-XXX Duplicate of PZ-108
		10/27/2011	10/27/2011	7/9/2012	7/9/2012
Total VOCs (ug/L)	NE	**3787.3**	**5892.4**	**6101.3**	**5847.7**
Benzene	1	**4.3 J**	**5.4**	**8.2**	**7.5**
Toluene	5	**210 J**	**320 J**	**220**	**180**
Ethylbenzene	5	**840 J**	**1400 J**	**1400**	**1400**
m,p-Xylene	5	**1700 J**	**2500 J**	**2900**	**2700**
o-Xylene	5	**760 J**	**1300 J**	**1300**	**1300**
Isopropyl benzene	5	**110 J**	**150 J**	**110**	**110**
Styrene	5	**64 J**	**88 J**	**61**	**55**
Total SVOCs (ug/L)	NE	**1844.2**	**1949.2**	**1871.2**	**1651.3**
Naphthalene	10*	**1600**	**1700**	**1500**	**1300**
1,1-Biphenyl	5	**16**	**14**	**22**	**20**
Metals (ug/L)					
Antimony	3	25 U	25 U	**10.1 J**	**10.7 J**
Barium	1000	**871**	**869**	**1140**	**1130**
Iron	300	**6440**	**6340**	**15500**	**15300**
Manganese	300	**1010 J**	**1020 J**	**579**	**567**
Total Cyanide (mg/L)	200	5 U	5 U	**31**	30

Analyte	NYS AWQS	MW-06 7/9/2012
Total VOCs (ug/L)	NE	**335.7**
Benzene	1	**2.1**
Toluene	5	**7.8**
Ethylbenzene	5	**8.5**
m,p-Xylene	5	**120**
o-Xylene	5	**120**
Isopropyl Benzene	5	**10**
Styrene	5	**64**
Total SVOCs (ug/L)	NE	**96.5**
Naphthalene	10*	**71**
1,1-Biphenyl	5	**6.6 J**
Metals (ug/L)		
Iron	300	**414 J**
Manganese	300	**1830**
Total Cyanide (mg/L)	200	2.5 U

Analyte	NYS AWQS	PZ-109	PZ-109
		10/27/2011	7/9/2012
Total VOCs (ug/L)	NE	**18**	ND
Total SVOCs (ug/L)	NE	ND	ND
Metals (ug/L)			
Antimony	3	**25 U**	**9.24 J**
Manganese	300	**457**	**16.1**
Total Cyanide (mg/L)	200	5 U	2.5 U

Analyte	NYS AWQS	PZ-SB10
		4/25/2008
Total VOCs (ug/L)	NE	**477.5**
Benzene	1	**16**
Toluene	5	**41**
Ethylbenzene	5	**79**
m,p-Xylene	5	**84**
o-Xylene	5	**68**
Isopropyl benzene	5	**7.7**
Total SVOCs (ug/L)	NE	**278.1**
Naphthalene	10*	**160**
Benzo[b]fluoranthene	0.002*	**6 J**
Indeno[1,2,3-cd]pyrene	0.002*	**9.3 J**
Metals (ug/L)		
Total Cyanide (mg/L)	200	NA

Analyte	NYS AWQS	MW-02 7/10/2012
Total VOCs (ug/L)	NE	**1**
Total SVOCs (ug/L)	NE	ND
Metals (ug/L)		
Iron	300	**1660**
Magnesium	35000*	**44500**
Total Cyanide (mg/L)	200	2.5 U

Analyte	NYS AWQS	MW-03 7/10/2012
Total VOCs (ug/L)	NE	**0.88**
Total SVOCs (ug/L)	NE	ND
Metals (ug/L)		
Antimony	3	**8.31**
Iron	300	**308 J**
Magnesium	35000*	**43200**
Total Cyanide (mg/L)	200	2.5 U

Analyte	NYS AWQS	MW-01 10/27/2011	MW-01 7/9/2012
Total VOCs (ug/L)	NE	**781.8**	**57.28**
Benzene	5	**110**	**16**
Toluene	5	**240 J**	**15**
Ethylbenzene	5	**130**	**7.4**
m,p-Xylene	5	**170**	**12**
o-Xylene	5	**89**	**5.7**
Isopropyl Benzene	5	**7.5**	**0.52 J**
Total SVOCs (ug/L)	NE	**4.3**	**5.4**
Metals (ug/L)			
Antimony	3	25 U	**8.4 J**
Total Cyanide (mg/L)	200	5 U	**19**

LEGEND:

▨	CURRENT STRUCTURE
▭	HISTORICAL STRUCTURE
▬	HASTINGS GAS WORKS - 10-12 WASHINGTON AVENUE SITE BOUNDARY
▬	HASTINGS GAS WORKS - 8 WASHINGTON AVENUE SITE BOUNDARY
— - - —	CURRENT PROPERTY BOUNDARY
⊕	MONITORING WELL
⊞	PIEZOMETER PIEZOMETER NOT ANALYZED
NYS AWQS	NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES FOR GA GROUNDWATER
ND	NOT DETECTED; TOTAL CONCENTRATION IS LISTED AS ND BECAUSE NO COMPOUNDS WERE DETECTED IN THE GROUP
NE	NOT ESTABLISHED
NA	NOT ANALYZED
J	ESTIMATED VALUE
U	INDICATES NOT DETECTED TO THE REPORTING LIMIT
mg/L	MILLIGRAMS/LITER OR PARTS PER MILLION (PPM)
ug/L	MICROGRAMS/LITER OR PARTS PER BILLION (PPB)
*	INDICATES THE VALUE IS A GUIDANCE VALUE AND NOT A STANDARD
VOCs	VOLATILE ORGANIC COMPOUNDS
SVOCs	SEMIVOLATILE ORGANIC COMPOUNDS
BOLDING	INDICATES A DETECTED CONCENTRATION
BOLDING	GREY SHADING AND BOLDING INDICATES THAT THE DETECTED RESULT VALUE EXCEEDS ESTABLISHED NY AWQS
18 ——	GROUNDWATER CONTOUR (FEET)
18 — —	INFERRED GROUNDWATER CONTOUR (FEET)
●	MONITORING WELL SELECTED FOR EMERGING CONTAMINANT SAMPLING

NOTES:

1. INTERIOR BUILDING LAYOUT IS APPROXIMATE; SURVEY INFORMATION WAS OBTAINED FOR EXTERIOR BUILDING FEATURES AND SAMPLING LOCATIONS, AND SELECT INTERIOR FEATURES FOR SAMPLE LOCATION PURPOSES. SURVEY INFORMATION FOR ENVIRONMENTAL PURPOSES ONLY.

SOURCES:

1. SURVEYS CONDUCTED BY GEI ON 5/30/08, 9/28/11, AND 6/25/12.
2. *SURVEY OF PROPERTY PREPARED FOR JOHN WAZETER IN THE VILLAGE OF HASTINGS-ON-HUDSON, WESTCHESTER CO., NY.,* PREPARED BY WARD CARPENTER ENGINEERS, WHITE PLAINS, NY, SCALE: 1" = 20', DATED: NOVEMBER 17, 1994.
3. BOUNDARY SURVEY, SECTION 004.070, BLOCK 52 LOTS 48, 49, & 50, TOWN OF GREENBURGH, VILLAGE OF HASTINGS, WESTCHESTER COUNTY, NEW YORK, PREPARED BY KENNON SURVETING SERVICES, INC., WARREN, NEW JERSEY, SCALE 1"=20', DATED: OCTOBER 30, 2017.

Emerging Contaminant Sampling Work Plan
Hastings Gas Works - 10-12 Washington Avenue
Village of Hastings-On-Hudson, New York

Consolidated Edison Co. of New York, Inc.
Astoria, New York

GEI Consultants

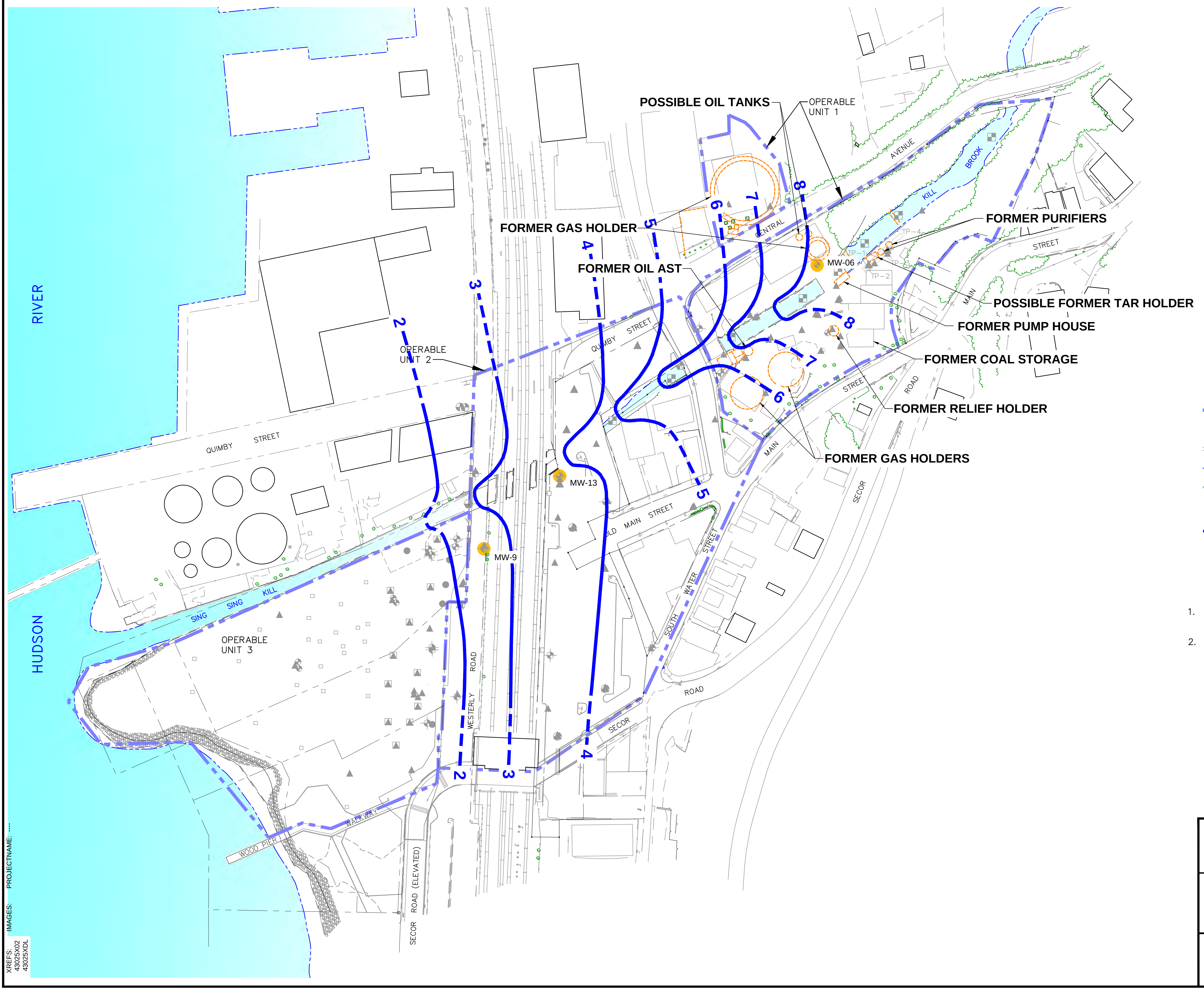
PN: 070251-15-1501

PROPOSED
SAMPLING
LOCATIONS

July 2018

Fig. 1

---- \\gtb1v-fs01\CAD\Project\CON_ED\HASTINGS-ON-HUDSON\070251\CAD\Figures\SMP\070251-SMP-F3.dwg - 3/30/2018



LEGEND:

- MONITORING WELL
- SOIL BORING
- SOIL CORE
- VARIOUS BORINGS
- RECOVERY WELL
- SEDIMENT SAMPLE
- TP-3 TEST PIT
- STAFF GAUGE
- ABANDONED MONITORING WELL
- BORING BY OTHERS
- OPERABLE UNIT OUTLINE
- HISTORICAL MGP STRUCTURE
- RAILROAD
- WATER
- TREE
- ● WELL TO SAMPLE (MW-06, MW-9, MW-13)
- 4 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

NOTES:

1. BASE MAP IS A COMPOSITE OF DIGITAL MAPS RECEIVED FROM THE CLIENT AND CREATED BY CMX, MANALPAN, NJ. DATED 2009.
2. GROUNDWATER ELEVATIONS COLLECTED ON APRIL 13, 2012.

0 80' 160'
GRAPHIC SCALE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER OSSINING WORKS MANUFACTURED GAS PLANT SITE
OSSINING, NEW YORK
EMERGING CONTAMINANT SAMPLING WORK PLAN

PROPOSED SAMPLING LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

NOTES:
1) Tax parcel boundaries represent approximate property line location and should NOT be interpreted as or used in lieu of a survey or property boundary description. Property descriptions must be obtained from surveys or deeds. As this data was compiled from many different sources, discrepancies will exist along some municipal boundaries.

0 50 100 200
Feet

LEGEND:
- ⊕ Existing ConEd Offsite Monitoring Wells
- ‐ · ‐ Pelham Former MGP Property Boundary
- ▭ Approximate Off-Site RI Properties

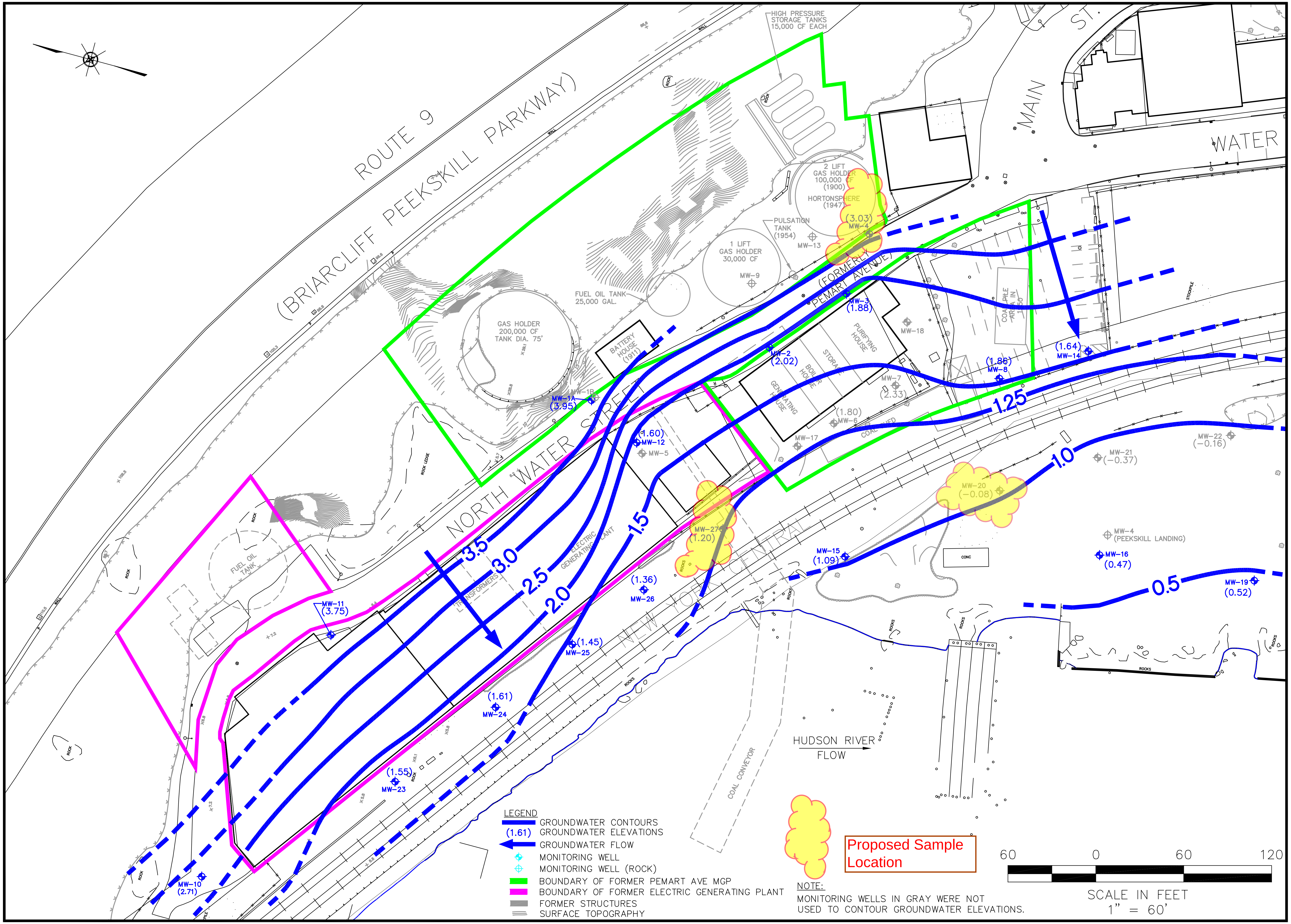
PARSONS

PELHAM FORMER MGP SITE
OFF-SITE Emerging Contaminant
Sampling Work Plan

EXISTING CONED OFFSITE
MONITORING WELL LOCATIONS

SCALE: 1 " = 80 '	DATE: 10 Jul 2018	REV: 1

P:\PIT\Projects\ConEd\Pelham Plaza\Off-Site Investigation\GIS\Pelham_Offsite_ExistingWells_v1.mxd



NOTE:
MONITORING WELLS IN GRAY WERE NOT USED TO CONTOUR GROUNDWATER ELEVATIONS.

FILENAME: 01869-116-06B.DWG

REVISIONS		
NO.:	DESCRIPTION:	DATE:	BY:

DESIGNED BY:
DRAWN BY: J.E.B.
CHECKED BY: D.S.
APPROVED BY: D.S.

ENSR | AECOM

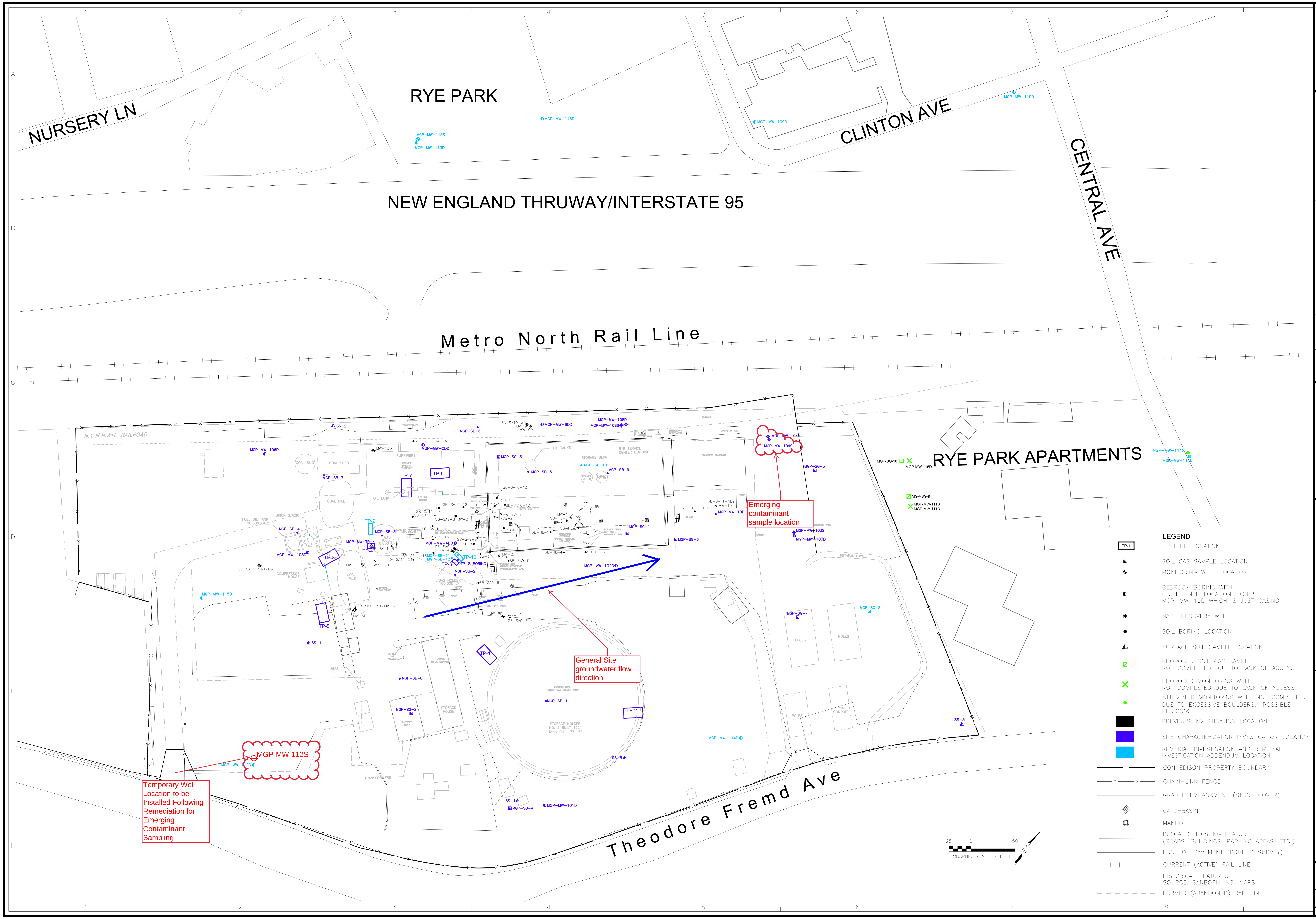
ENSR CORPORATION
2 TECHNOLOGY PARK DRIVE
WESTFORD, MASSACHUSETTS 01886
PHONE: (978) 589-3000
FAX: (978) 589-3100
WEB: HTTP://WWW.ENSR.AECOM.COM

Emerging Contaminant Work Plan

PROJECT NUMBER: 01869-116
DATE: 12/06
SCALE: 1" = 60'

FIGURE NUMBER: 3-5

SHEET NUMBER: 1



Emerging contaminant sample location

General Site groundwater flow direction

Temporary Well Location to be Installed Following Remediation for Emerging Contaminant Sampling

File: J:\Rem_Eng\Project Files\Con Edison\Rye CADD\2015\Rye Figures 2015\Rye 2015 (Basemap Insert)\2015-01-15 Figure 2-4_2 (Basemap Insert).dwg Layout: Fig 3-1 - Sample Locations User: Lambertt Plotted: Mar 26, 2015 - 6:08pm Xref's:

NO	DRWN	DATE	REVISION	CHK'D	DATE	APPV'D	DATE
0							
1							
2							
3							
4							
5							
6							
7							

AECOM
www.aecom.com

CONSOLIDATED EDISON
RYE GAS WORKS SITE
178 THEODORE FREMD AVE. RYE, NY

PROJ. NO.: 60321717.810
DATE: 03/2015

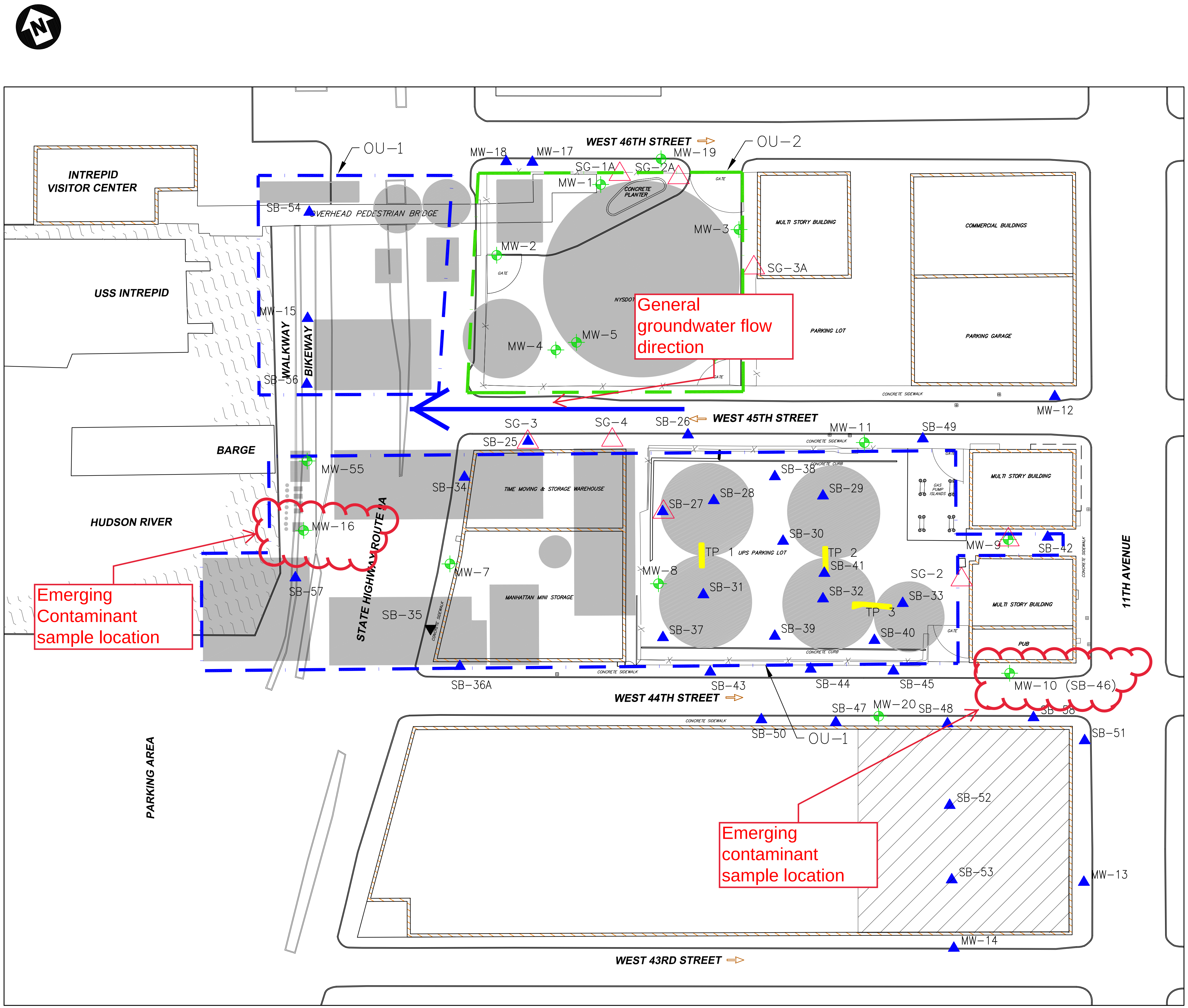
Emerging Contaminant Sampling Work Plan
SAMPLE LOCATIONS

REMEDIAL INVESTIGATION

DRAWING NUMBER:
3-1

SHEET NUMBER:

REVISION 0



LEGEND:

───	CURRENT FEATURES
▨	HISTORICAL FEATURES (LOCATIONS ARE APPROXIMATE)
▭	EXISTING BUILDING
—x—	CHAIN LINK FENCE
MW−1 ⊕	MONITORING WELL
SB−5 ▲	SOIL BORING
SB−35 ▼	SOIL BORING WAS NOT ADVANCED DUE TO THE PRESENCE OF A SUBSURFACE OBSTRUCTION.
SG−1A △	SOIL GAS
▬	TEST PIT
━ ━ ━	LIMITS OF OU−1
━ ━ ━	LIMITS OF OU−2
▨	APPROXIMATE EXTENT OF UPS PARKING GARAGE

NOTE:

MONITORING WELLS WERE NOT INSTALLED AT MW−12, MW−13, MW−14, MW−15, MW−17 AND MW−18. GROUNDWATER WAS NOT OBSERVED IN THE BORINGS AT THESE LOCATIONS.

100 50 0 100 200

SCALE: 1"=100'

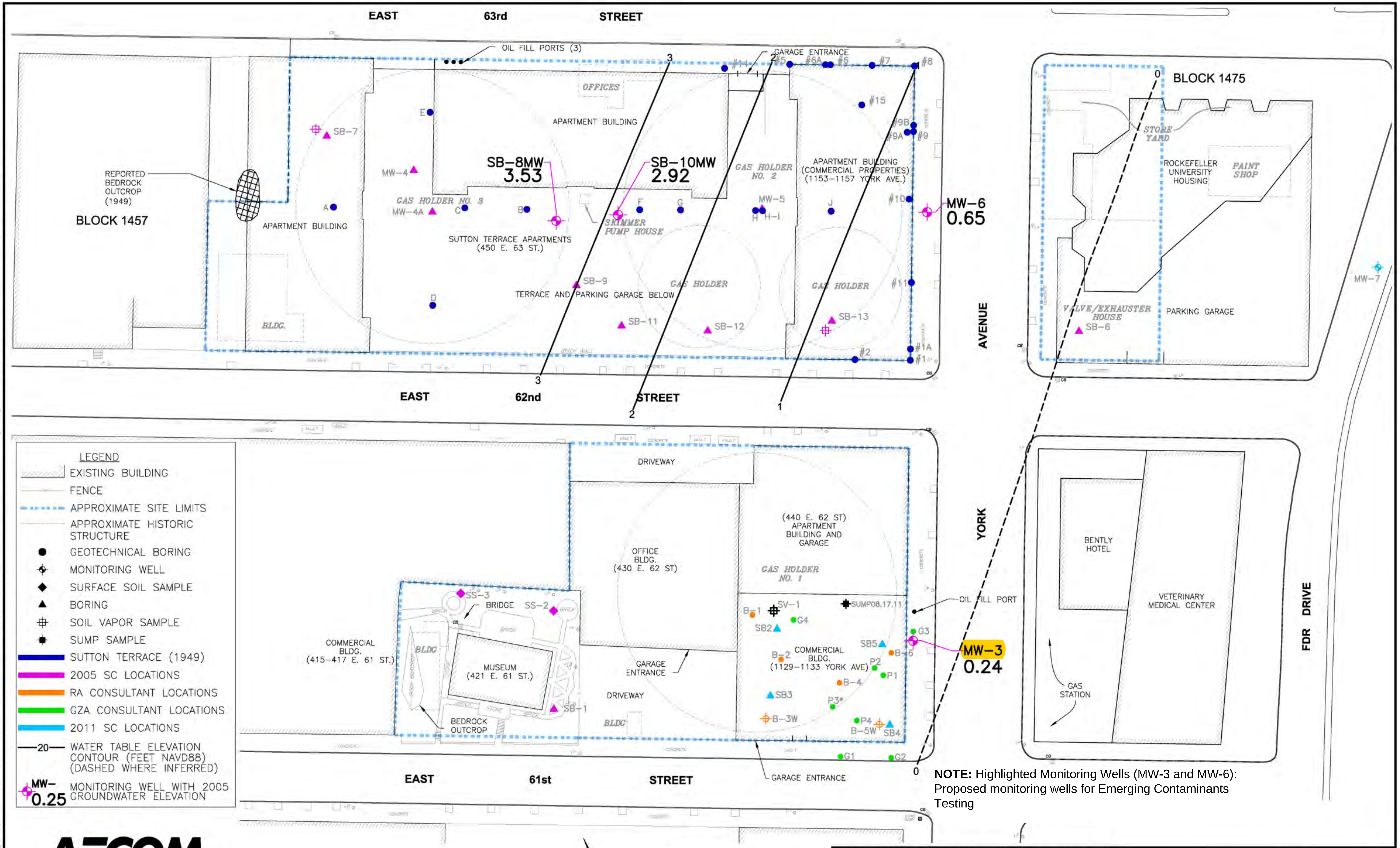
FIGURE 3

CONSOLIDATED EDISON OF NEW YORK
WEST 45th STREET
NEW YORK, NEW YORK

Emerging Contaminant Sampling Work Plan

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, N.Y. 13212, PHONE: 315−451−9560

FILE NAME: P:\CONED\446340 − W45TH ST\CAD\446340−C002.DWG
PLOT DATE: 1/5/2011 12:39 PM PLOTTED BY: RUSSO, JILL



NOTE: Highlighted Monitoring Wells (MW-3 and MW-6): Proposed monitoring wells for Emerging Contaminants Testing

AECOM

NOTE: P3 LOCATION NOT SURVEYED

MAP SOURCE: 1907/1995 SANBORN MAPs AND 2011 SAMPLE LOCATION SURVEY

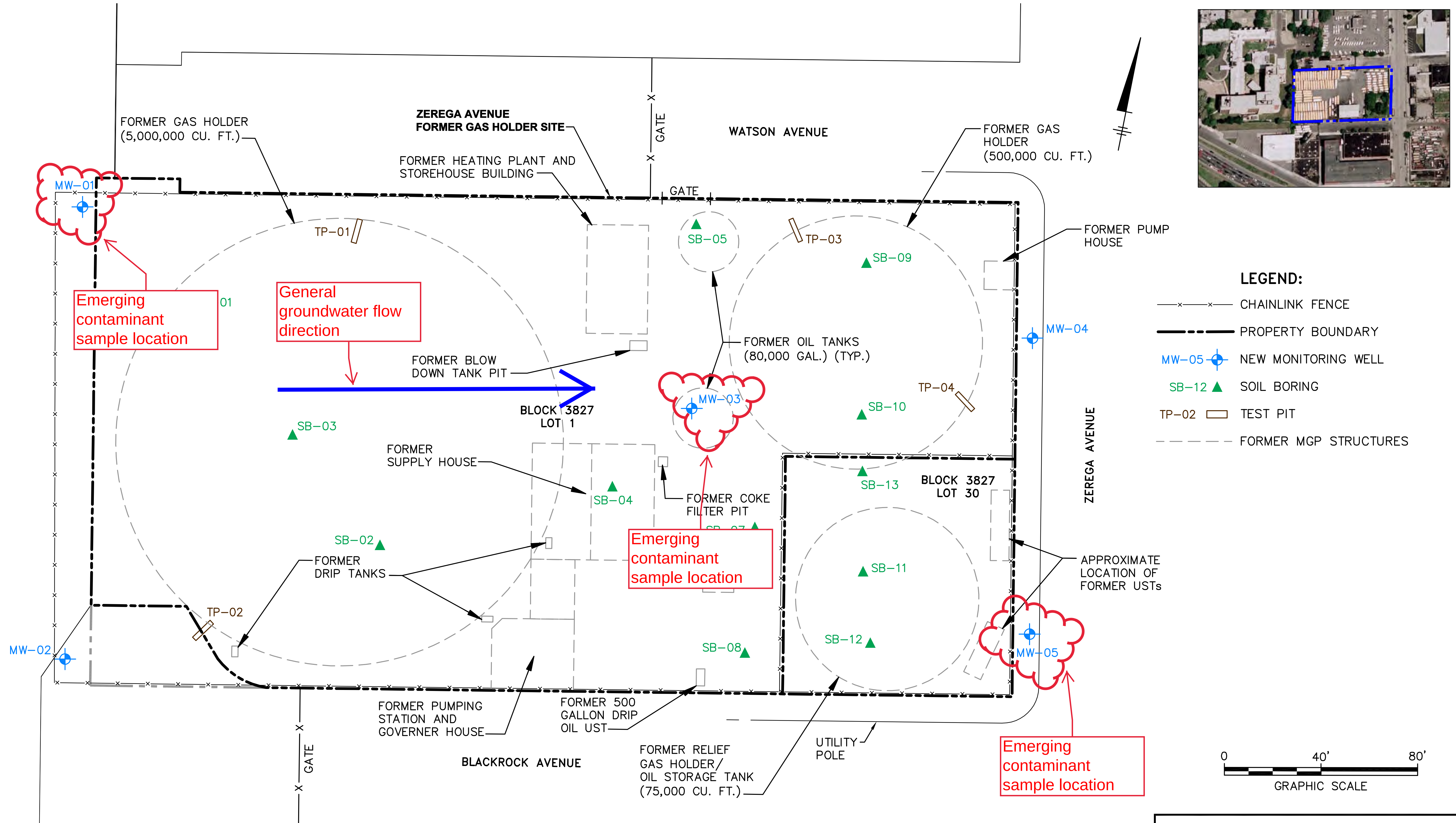
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
YORK AVENUE FORMER GAS HOLDER SITE
60155845-700

DATE: 11/2011 | DRWN: BcV/C-MA

Proposed Sampling Locations
Emerging Contaminants Sampling Plan

File: J:\Rem_Eng\Project Files\Con Edison\60155845 – York Ave SC\CADD\2011\60155845-700-SC-RPT-01.dwg Layout: 4-3 User: vershomo Plotted: Nov. 29, 2011 – 9:58am Xref's:

CITY: SYRACUSE, NY GROUP: ENVCAD DB: R. ALLEN, E. KRAHMER LD: A. SCHILLING PM/TM: M. JONES TR: C.CAMPBELL LYR:ON=*;OFF=REF, (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0043014\0002\00011\DWG\43014B02.dwg LAYOUT: 3 SAVED: 11/19/2010 1:57 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/19/2010 1:58 PM BY: KRAHMER, ERIC
XREFS: 43014X00 IMAGES: 43014X04small.jpg PROJECTNAME: ----



NOTES:

1. BASEMAP PREPARED FROM SURVEY BY MUÑOZ ENGINEERING P.C., 2008. AERIAL PHOTO FROM GOOGLE – IMAGERY, 2008.
2. ALL HORIZONTAL COORDINATES ARE BASED ON NAD 1983-96, STATE PLANE COORDINATE SYSTEM – NEW YORK EAST ZONE (3101).
3. ALL ELEVATIONS REFER TO NAVD 1988 VERTICAL DATUM.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE

Emerging Contaminant Sampling Work Plan

ARCADIS

FIGURE
3

ATTACHMENT D

NYSDEC Request for Emerging Contaminant Sampling and Comments on Con Edison's July 26, 2018 Work Plan

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Office of the Director
625 Broadway, 12th Floor, Albany, New York 12233-7011
P: (518) 402-9706 | F: (518) 402-9020
www.dec.ny.gov

May 30, 2018

Kenneth J. Kaiser, P.E.
Manager, EH&S, Remediation
Consolidated Edison Company of NY, Inc.
3101 20th Avenue – Bldg. 136, 2nd Floor
Long Island City, NY 11105

RE: Request for Sampling of Emerging Contaminants
Con Edison MGP Sites

Dear Mr. Kaiser:

The New York State Department of Environmental Conservation (DEC) is undertaking a Statewide evaluation of remediation sites to better understand the risk posed to New Yorkers by 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS). PFAS have historically not been evaluated at remediation sites, and 1,4-dioxane has not been evaluated at the levels that are now thought to represent a health concern. This initiative is being undertaken as a result of these “emerging contaminants” having been found in a number of drinking water supplies in New York. Accordingly, the DEC is requiring that you test site groundwater for these chemicals. To accommodate this requirement a select number of existing monitoring wells, representative of the potential of the attached list of sites to be a source of these emerging contaminants, must be sampled. DEC recommends that at least one of these wells should be upgradient of the site.

The enclosed guidance provides information on the analytical methods and reporting requirements. A second guidance document describes special precautions that need to be considered when sampling for PFAS.

Please prepare a draft letter work plan that identifies the wells proposed for sampling at each of the sites, a brief description of the sampling methods, and anticipated sampling dates within the next 60 days. If you wish to discuss the scope of the requested water testing, please contact me at 518-402-9682 or george.heitzman@dec.ny.gov.

Sincerely,

George W Heitzman

George W. Heitzman, P.E.
Director, Remedial Bureau C
Division of Environmental Remediation

Enclosures

Groundwater Sampling for Emerging Contaminants

April 2018

Issue: NYSDEC has committed to analyzing representative groundwater samples at remediation sites for emerging contaminants (1,4-dioxane and PFAS) as described in the below guidance.

Implementation

NYSDEC project managers will be contacting site owners to schedule sampling for these chemicals. Only groundwater sampling is required. The number of samples required will be similar to the number of samples where "full TAL/TCL sampling" would typically be required in a remedial investigation. If sampling is not feasible (e.g., the site no longer has any monitoring wells in place), sampling may be waived on a site-specific basis after first considering potential sources of these chemicals and whether there are water supplies nearby.

Upon a new site being brought into any program (i.e., SSF, BCP), PFAS and 1,4-dioxane will be incorporated into the investigation of groundwater as part of the standard "full TAL/TCL" sampling. Until an SCO is established for PFAS, soil samples do not need to be analyzed for PFAS unless groundwater contamination is detected. Separate guidance will be developed to address sites where emerging contaminants are found in the groundwater. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane, which already has an established SCO.

Analysis and Reporting

Labs should provide a full category B deliverable, and a DUSR should be prepared by a data validator, and the electronic data submission should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html ,

The work plan should explicitly describe analysis and reporting requirements.

PFAS sample analysis: Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. However, laboratories analyzing environmental samples (ex. soil, sediments, and groundwater) are required, by DER, to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537 or ISO 25101.

Modified EPA Method 537 is the preferred method to use for groundwater samples due to the ability to achieve 2 ng/L (ppt) detection limits. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve similar reporting limits, the project manager should discuss this with a DER chemist. Note: Reporting limits for PFOA and PFOS should not exceed 2 ng/L.

PFAS sample reporting: DER has developed a PFAS target analyte list (below) with the intent of achieving reporting consistency between labs for commonly reportable analytes. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. This list may be updated in the future as new information is learned and as labs develop new capabilities. If lab and/or matrix specific issues are encountered for any particular compounds, the NYSDEC project manager will make case-by-case decisions as to whether particular analytes may be temporarily or permanently discontinued from analysis for each site. Any technical lab issues should be brought to the attention of a NYSDEC chemist.

Some sampling using this full PFAS target analyte list is needed to understand the nature of contamination. It may also be critical to differentiate PFAS compounds associated with a site from other sources of these chemicals. Like routine refinements to parameter lists based on investigative findings, the full PFAS target analyte list may not be needed for all sampling intended to define the extent of contamination. Project managers may approve a shorter analyte list (e.g., just the UCMR3 list) for some reporting on a case by case basis.

1,4-Dioxane Analysis and Reporting: The method detection limit (MDL) for 1,4-dioxane should be no higher than 0.28 µg/l (ppb). ELAP offers certification for both EPA Methods 8260 and 8270. In order to get the appropriate detection limits, the lab would need to run either of these methods in “selective ion monitoring” (SIM) mode. DER is advising the use of method 8270, since this method provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents (we acknowledge that 8260 has been shown to have a higher recovery in some studies).

Full PFAS Target Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	**Perfluorobutanesulfonic acid**	**PFBS**	**375-73-5**
	Perfluorohexanesulfonic acid	**PFHxS**	**355-46-4**
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	**PFOS**	**1763-23-1**
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	**PFHpA**	**375-85-9**
	Perfluorooctanoic acid	**PFOA**	**335-67-1**
	Perfluorononanoic acid	**PFNA**	**375-95-1**
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Bold entries depict the 6 original UCMR3 chemicals

Labs Certified for PFOA and PFOS in Drinking Water

LAB ID	NAME	CITY	STATE	METHOD
10311	SUFFOLK	HAUPPAUGE	NY	EPA 537
10391	TESTAMERICA	SOUTH BURLINGTON	VT	ISO 25101
10670	EUROFINS	LANCASTER	PA	EPA 537
10730	AMERICAN	BELLEVILLE	IL	EPA 537
10756	MAXXAM	MISSISSAUGA	ON	EPA 537
10763	NYSDOH ORG	ALBANY	NY	EPA 537
10763	NYSDOH ORG	ALBANY	NY	ISO 25101
10899	CON-TEST	EAST LONGMEADOW	MA	EPA 537
10899	CON-TEST	EAST LONGMEADOW	MA	ISO 25101
11320	EUROFINS	MONROVIA	CA	EPA 537
11398	EUROFINS	SOUTH BEND	IN	EPA 537
11411	VISTA	EL DORADO HILLS	CA	EPA 537
11411	VISTA	EL DORADO HILLS	CA	ISO 25101
11501	GEL	CHARLESTON	SC	EPA 537
11608	PACE	ORMOND BEACH	FL	EPA 537
11627	ALPHA	WESTBOROUGH	MA	EPA 537
11666	TESTAMERICA	WEST SACRAMENTO	CA	EPA 537
11666	TESTAMERICA	WEST SACRAMENTO	CA	ISO 25101
11685	SGS NORTH	WILMINGTON	NC	EPA 537
11867	REGIONAL	NEW HAVEN	CT	EPA 537
12022	SGS NORTH	ORLANDO	FL	EPA 537
12060	ALS	KELSO	WA	EPA 537
12073	BSK ASSOCIATES	FRESNO	CA	EPA 537

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The procedure used must be consistent with the NYSDEC March 1991 Sampling Guidelines and Protocols http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. Equipment blanks should be generated at least daily. Additional materials may be acceptable if pre-approved by NYSDEC. Requests to use alternate equipment should include clean equipment blanks. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse will be performed for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and “plumbers thread seal tape” contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2° Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

ConEd Sites

241012	CE - Astoria MGP
360167	CE - Central Ave-Peekskill MGP
231118	CE - E. 108th St. Station
231114	CE - E. 111th St. Works
231110	CE - E. 11th St. MGP
C231105	CE - E. 11th Street MGP - OU-3
203108	CE - E. 138th St. - Bronx Works
231111	CE - E. 14th St. (StuyTown) Works
231115	CE - E. 17th St. Station
231116	CE - E. 19th St. Station
231112	CE - E. 21st St. Works
231113	CE - E. 99th St. Works
241034	CE - Farrington St. Holder
241208	CE - Farrington St. MGP
360170	CE - Hastings Gas Works
360165	CE - Pelham MGP Offsite
360166	CE - Pemart Ave-Peekskill MGP
360168	CE - Rye (V) MGP
360169	~~CE - Saw Mill River HS -Yonkers~~
203109	CE - Unionport Works
231109	CE - W. 45th St. Gas Works
231117	CE - York Ave Station
203110	CE - Zerega Ave. Station
231007	CE E.14th Street Works (East River Generating Sta)
360171	CE- Ludlow St-Yonkers MGP
360172	CE- Ossining MGP
360173	CE-Cedar St MGP New Rochelle

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Office of the Director
625 Broadway, 12th Floor, Albany, New York 12233-7011
P: (518) 402-9706 | F: (518) 402-9020
www.dec.ny.gov

August 14, 2018

Mr. Kenneth J. Kaiser, PE, BCEE, PMP
Department Manager
EH&S, Remediation
Consolidated Edison Company of NY, Inc.
3101 20th Avenue - Bldg 136, 2nd Floor
Long Island City, NY 11105

Re: Sampling for Emerging Contaminants
Con Edison MGP Sites

Dear Ken:

Thank you for your assistance in evaluating the presence of emerging contaminants at sites that Con Edison is managing under the Department's Manufactured Gas Plant program. The Department has the following general and site-specific comments concerning July 26, 2018 work plan submitted by Con Edison:

General Comments Re: Emerging Contaminants Sampling Work Plan and QAPP:

1. NYSDEC Guidance recommends "Modified EPA Method 537" as the preferred method to use for groundwater samples due to the ability to achieve 2 ng/L (ppt) reporting limits. The analytical method specified in the work plan and QAPP is "EPA Method 537".

2. The most recent NYSDEC guidance (July 2018) stipulates the method detection limit (MDL) for 1,4-dioxane should be no higher than 0.35 µg/l (ppb); however, previous guidance (April 2018) stipulated MDL ≤ 0.28 µg/l.

3. Reporting limits for PFOA and PFOS should not exceed 2 ng/L. Table 2 in QAPP lists RL (reporting limits) for PFAS as TBD (To Be Determined), but should indicate RL ≤ 2 ng/L.

4. Table 2 in QAPP lists MDL (method detection limits) for 1,4-dioxane as TBD (To Be Determined), but should indicate MDL ≤ 0.35 µg/L (July 2018 guidance), or MDL ≤ 0.28 µg/L (if we are sticking with the April 2018 guidance).

Site-specific Comments:

Hester Street MGP is missing from the plan.

Pemart MGP: Add MW–20 to the EC sampling plan

Zerega Holder Site: Add MW–3 to the EC sampling plan

E. 11th Street – The proposed downgradient well is somewhat sidegradient to the groundwater flow direction. Instead the downgradient sample should be collected from MW-127 or MW-128.

The proposed sampling plans for following sites are acceptable:

Cedar Street
Astoria
Rye MGP (as modified by Richard Rienzo's July 30th email to John Spellman)
E. 111th
E 108th
E99th
E 138th Street
Hastings Gas Works
York Ave.
Farrington Street Holder

This is also to confirm that the following sites are exempt from the emerging contaminant sampling requirement:

Ludlow Street Yonkers MGP
Unionport MGP

For the acceptable sampling plans listed above, sampling may be performed at any time, provided that the Department's project manager is provided with at least a one-week advance notification. For the others, please provide a revised multisite work plan.

Thanks again for your assistance with this effort. Please let me or the appropriate project manager know if you have any questions about these items.

Sincerely,

George W Heitzman

George W. Heitzman, P.E.
Assistant Director
Division of Environmental Remediation

ec: Remedial Bureau C staff