DESIGN ANALYSIS REPORT

WORK ASSIGNMENT D007622-12

COLD SPRING FORMER MGP SITE
VILLAGE OF COLD SPRING

SITE NO. 340026
PUTNAM (C), NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway, Albany, New York

Joseph Martens, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION
REMEDIAL BUREAU E

URS Corporation
257 West Genesee Street, Suite 400
Buffalo, New York 14202

G4667M

April 2015

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TABLE OF CONTENTS

			Page No.
1.0	INTRODUCTION		1-1
	1.1	Scope of Services	1-1
	1.2	Site History and Background	1-1
	1.3	Purpose and Scope of Report	1-2
2.0	SUMMARY REMEDIAL INVESTIGATIONS		2-1
	2.1	Soil Cleanup Objectives	2-1
	2.2	Extent of Contamination	2-2
	2.3	Location of Buried MGP Structures	2-2
	2.4	Site Stratigraphy	2-2
	2.5	Site Hydrogeology	2-4
	2.6	Existing Utilities	2-4
3.0	DESIGN SCOPE		3-1
	3.1	Summary of the Revised Selected Remedy	3-1
	3.2	Remedial Components	3-1
	3.3	Remedial Design	3-2
		3.3.1 Boat House Demolition	3-2
		3.3.2 Relocation of Existing Utilities	3-3
		3.3.3 Excavation Support System	3-3
		3.3.4 Initial Excavation and Backfill	3-6
		3.3.5 Temporary Containment Structure	3-7
		3.3.6 Vapor Management System	3-7
		3.3.7 Excavation	3-8
		3.3.8 Dewatering	3-9
		3.3.9 Remedial Excavation and Post-Excavation Sampling	3-10
		3.3.10 Removal of Buried MGP Structures	3-11
		3.3.11 Transportation	3-11
		3.3.12 Disposal	3-12
		3.3.13 Backfill and Restoration	3-12

TABLE OF CONTENTS

(continued)

		Page No.
4.0	PERMITS	4-1
5.0	SCHEDULE	5-1
6.0	POST-CONSTRUCTION PLANS	6-1

TABLES

Table 1	2010 Record of Decision Remedy Expansion	1-3

FIGURES
(Following Text)

Figure 1 Site Location Map

Figure 2 URS Site Investigation Plan

Figure 3 Boring Locations with Top of Clay

Figure 4 Boring Locations with Top of Bedrock

Figure 5 Cross-Sections

Figure 6 Bottom of Excavation Plan

1.0 INTRODUCTION

1.1 Scope of Services

This report has been prepared for the New York State Department of Environmental Conservation (NYSDEC) under Task 2 of Work Assignment D007622-12. Under this contract, URS was tasked to design a remediation to address soil contamination at the Cold Spring MGP site (Figure 1) in accordance with the February 2010 Record of Decision (ROD), as expanded. The design includes preparation of a Design Analysis Report (DAR) and Contract Specifications and Drawings for soil excavation and disposal. Drawings and specifications will be prepared and issued as part of a bid package to remedial Contractors after this DAR is submitted and approved by the NYSDEC.

1.2 Site History and Background

The Cold Spring Former Manufactured Gas Plant (MGP) site is located at 5 New Street in the Village of Cold Spring, Putnam County, New York. The parcel on which the site is located is owned by the Village of Cold Spring. The site is a 0.977 portion of the parcel on which, in 2010, the NYSDEC established an environmental easement. The western portion of the parcel is leased to the Cold Spring Boat Club. The Boat Club building is the only structure on the parcel. A parking lot serving the Hudson House River Inn is also located on that parcel, just east of the Boat Club building. The former MGP itself (approximately 0.2 acres) occupied a portion of that parking lot and the grass-covered area directly to the east. The site is bounded on the south by a rock outcrop.

The MGP used a “coal carbonization” process which involved heating of coal in a closed vessel with minimal air contact, converting the coal to coke and releasing a combustible gas which was piped into the surrounding community for lighting, heating, and cooking purposes. The principal waste product was coal tar, which is a dark brown to black liquid with an objectionable odor similar to driveway sealer. Coal tar condensed from the hot gas produced by the plant as it cooled.

Coal tar is a dense non-aqueous phase liquid (DNAPL), slightly heavier than, and with low solubility in, water. When released into a pervious material, it will sink downward through

any groundwater until it reaches a stratum that it cannot penetrate. It can, under certain conditions, move laterally.

Coal tar contains high levels of volatile and semi-volatile organic compounds (VOCs and SVOCs). The principal VOCs in coal tar are benzene, toluene, ethylbenzene, and xylenes (BTEX), which are slightly soluble in water. The principal SVOCs in coal tar are polycyclic aromatic hydrocarbons (PAHs), which are generally less soluble than BTEX.

Tar was found as a discrete substance - as visible droplets or pools of liquid - in the vicinity of the subsurface remains of the former MGP structures. From the structures, tar has migrated downward to the underlying clay, and tar is still seen throughout this interval near the structures.

Site soil is contaminated with PAHs and BTEX compounds. Total PAH concentrations ranged from not-detected to 1,896 ppm. The highest PAH levels were in the area of the subsurface coal tar deposits. Total BTEX concentrations ranged from not-detected to 833 ppm. The highest BTEX levels were in the area of the subsurface coal tar deposits.

1.3 Purpose and Scope of Report

The scope and components of the site remediation were identified in the February 2010 ROD. They comprise 1) active construction to remediate the site and 2) engineering and institutional controls to protect the public and the environment after construction is completed.

This DAR presents a detailed description of the design of the construction component of the remedial action and the component remedial technology(ies). This DAR presents the supporting data, design rationale, and criteria, for the remedial design.

In October 2013, the NYSDEC agreed to the request by the Village of Cold Spring that the selected remedy presented in the ROD be expanded to also include demolition of the boat house building and removal of contamination beneath the boat house. The design presented in this DAR includes the revisions that resulted from that additional scope, referred to herein as the "expanded selected remedy." The selected remedy was expanded as summarized in the following table:

Table 1

2010 Record of Decision Remedy Expansion

Remedial Component Added	Remedial Component Removed
Demolition of the boat house	Vertical low permeability barrier between the excavation wall and the boat house.
Excavation of soil below and east of the boat house	Horizontal barrier above unexcavated contaminated soil near the boat house

2.0 SUMMARY OF REMEDIAL INVESTIGATIONS

Several investigations have been conducted at the site for the purposes of site classification and to develop the basis of the remedial design. The results of those investigations are contained in the following reports:

- Site Characterization Report, NYSDEC, July 2005.
- Site Investigation/Remedial Alternatives Report, Dvirka and Bartilucci, 2009
- Site Characterization Report, Groundwater and Environmental Services, Inc. (GES), 2013
- Pre-Design Investigation Soil Boring Program Report, URS, February, 2014
- Pre-Design Investigation Report, URS, September, 2014
- Pre-Design Geotechnical Summary Report, URS, September 2014. (URS performed an initial pre-design site investigation in April 2013, followed by a subsequent investigation in April 2014 to collect additional data specifically related to the design of an excavation support system.)

The location of URS's investigation points from 2013 and 2014 are shown on Figure 2. The following section presents a summary of the site characteristics, as determined in those investigations, that are relevant to the remedial design.

2.1 Soil Clean-up Objectives

The soil clean-up objectives (SCOs) identified in the expanded selected remedy include the removal and off-site disposal of the following materials:

- Remaining buried MGP structures
- All soil under and east of the boat club building and south of New Street that
  - contains visible coal tar, or
  - is contaminated with 500 ppm or more total polycyclic aromatic hydrocarbons (PAHs).

The SCOs include also, to the extent practicable, the removal of all soil that exceeds the restricted residential clean-up criteria of 6 NYCRR Part 375-6.

2.2 Extent of Contamination

The location of the specific soil samples that exceeded SCOs is shown in the Pre-Design Investigation Report (URS, 2014). The resultant extent of remedial excavation developed from that report is shown on Figures 2, 3, and 5.

2.3 Location of Buried MGP Structures

In September 2008, Hager Geoscience, Inc. performed a geophysical survey of the site using terrain conductivity and electromagnetic methods, and ground penetrating radar. The completed geophysical survey identified two below grade structures in the area of the excavation that were staked and surveyed. The structures include an approximately 35-foot diameter circular structure believed to be the foundation for a former gas holder tank and a rectangular structure (approximately 20 feet by 30 feet), believed to be the remains of the former MGP generator house foundation. The rectangular structure is shown on the attached figures and Design Drawings.

On April 14, 2014, Radar Solutions Incorporated (RSI) of Waltham, Mass., as a subcontractor to URS, performed an additional geophysical survey of the site. The investigation was performed using ground-penetrating radar and electro-magnetic induction (EMI). The most significant result of this second survey is that the large ring foundation, determined in the 2008 investigation to be in the northeast corner of the parking lot and partially below the adjacent residential property, was determined to be actually located approximately 35 feet south of that location. This second estimated location is more probable than the first since it does not lie partially below the raised grades of the adjacent residential property. The design is based on the second location of the ring foundation. That location of the ring foundation is shown on the attached figures and Design Drawings.

2.4 Site Stratigraphy

Borings performed during the various investigations have identified 3 geologic strata below the site: the surficial fill layer, which is underlain in the northern portion of the site by a clay unit of variable thickness, and bedrock that underlies those strata. Figures 3 and 4 show the top of clay and the top of bedrock respectively. Geologic cross sections of the site area are

presented on Figure 5. These three geologic units are discussed below. (See also the discussion of the geotechnical properties of the units in Section 3.3.3.1.)

Fill Unit: The fill unit, the surface unit at the site and surrounding areas, typically consists of fine to coarse sand with significant amounts of gravel and anthropogenic materials such as brick, ash and coal. The fill unit also contains the subsurface remnants of MGP structures. Some silt and clay has been observed in the fill at some boring locations, especially those on the site. The color of the fill ranges from (typically) brown to gray and olive.

Clay Unit: In the northern portion of the site, the fill is underlain by a clay unit, which varies from 0 thickness in the middle of the site to greater than 10 feet thick along New Street. The clay unit generally consists of a soft gray to olive organic, silty clay and containing peat and wood in some areas. In addition, numerous samples of the clay unit contained shell fragments typical of aquatic environments. Note that the unit is sometimes reported as brown in color, especially in probes completed on the former MGP site. In general, the clay unit increases in thickness in the direction of the Hudson River (west to southwest) following the contour of the bedrock.

Where present, the clay unit serves as an effective confining unit. However, it is not present in the southern portion of the former MGP site where bedrock is shallowest. In those areas, the fill unit transitions directly to the bedrock with the clay unit being completely absent at depths generally less than 10 feet.

Bedrock: Bedrock underlies the fill and clay units discussed above. Core samples of the bedrock were collected during the most recent site investigation and are described in the Pre-Design Geotechnical Summary Report (URS, September 2014).

As indicated on the cross-sections and boring logs, the bedrock surface is relatively shallow on the southern portion of the site, approximately 3 feet below grade. Directly south of the former MGP site, bedrock rises to 40 feet above the area of the former MGP. This outcrop and associated hillside trends in a roughly east-west direction along the southern property line of the Cold Spring Boat Club.

The bedrock appears to dip steeply in the direction of the Hudson River (west to southwest) and dips to the northwest under the remainder of the former MGP site.

2.5 Site Hydrogeology

Water level measurements from November 19, 2008 showed that groundwater is encountered from less than 2 to more than 4 feet below ground surface (bgs) at and downgradient of the site. The water levels are impacted by a tidal fluctuations in the Hudson River. Shallow groundwater flow is generally to the southwest toward the Hudson River.

The permeability of the fill unit was measured during the most recent pre-design investigation from 5.46×10^{-4} cm/sec to 6.03×10^{-3} cm/sec.

2.6 Existing Utilities

Poles along the south side of New Street in the vicinity of the site carry lines of Central Hudson Electric and Gas (CHE&G), Cablevision, and Verizon. The poles are owned by CHE&G.

There are currently no known buried utilities along the south side of New Street. However, the Village of Cold Spring will soon relocate the control panels to its existing stormwater pump station from their current location on West Street to a new location just east of the project site. This will require that the Village bury power and control wires along the south side of New Street in front of the remedial excavation area. The location of these new buried utilities has been coordinated with the Village's design engineer to ensure that they do not interfere with the remediation. They will be shown on the design drawings so that the Contractor can avoid them during construction.

3.0 DESIGN SCOPE

3.1 Summary of the Expanded Selected Remedy

The schedule of the remedial action will be coordinated with the Village of Cold Spring and with the boat club.

The contamination source area and the contamination below the boat house will now be excavated as part of the ROD remedy. The contamination source area, located east of the boat house, includes soil contaminated by coal tar as well as subsurface MGP structures and piping. The boat house must be demolished to allow excavation of the contaminated soil from below it. The demolition debris will be disposed of off-site.

To the degree possible, the excavation will be carried out under a temporary structure with a vapor management system in order to control odors and vapors. Areas that cannot be covered by the temporary structure will be excavated using odor suppressant foam.

The material removed will be transported offsite for disposal at an appropriately permitted treatment and/or disposal facility to be identified by the Contractor.

Following excavation, the site will be backfilled with clean, granular backfill that will be structurally suitable for potential future site development.

3.2 Remediation Components

The following are the basic remedial components, presented in generally sequential order:

- Boat house demolition
- Relocation of existing utilities
- Installation of excavation support system

- Installation of groundwater storage tanks
- Installation of groundwater pre-treatment system if discharge to surface water is proposed.
- Initial excavation of contaminated soil using odor suppressant foam
- Backfill of the Initial Excavation area with stabilized backfill
- Installation of temporary containment structure (TCS) and vapor management system
- Excavation of remaining contaminated soil and below-grade MGP structures
- Disposal of contaminated materials
- Collection of post-excavation documentation and confirmation samples
- Backfill with clean fill
- Removal of temporary containment system, air handling unit, and soil bracing system.
- Final restoration

3.3 Remedial Design

3.3.1 Boat House Demolition

The boat house must be demolished to grade before initial excavation can begin. The building has slab-on-grade construction. The slab may be at least partially asphalt, based on borings conducted in 2013.

The above-grade portions of the boat house will be demolished initially, to allow erection of the temporary containment structure. Subsequently, the floor slab will be excavated (and disposed of) with the underlying soil.

In February, 2015, URS surveyed the boat club building for asbestos-containing material (ACM). None was found. A copy of the asbestos survey report will be included in the limited site data document.

The specifications will allow the Contractor to salvage from the demolition whatever materials it can or desires to, and to dispose of the remainder of the demolition debris at an

appropriately licensed disposal facility. Contents of the Boat House will need to be removed by the owners/tenants prior to demolition.

3.3.2 Relocation of Existing Utilities

The ¾-inch water and 4-inch sanitary service lines into the boat house from mains along the north side of the street will be stubbed off outside of the limits of intrusive work.

As a result of the relocation of the existing electrical service, once the Boat House is demolished only cable (Cablevision) and telephone (Verizon) lines will remain on the poles adjacent to the site. URS has notified those utlities of the need to bury (or allow to be buried) their lines as part of the remedial construction, though no permits or plans for the work have yet been obtained from the utlities. The poles are shown to be removed and the lines buried within New Street during remedial construction.

3.3.3 Excavation Support System

The excavation along New Street and down the east and west sides will be supported. The Excavation Support System (ESS) will serve two purposes. It will allow the maximum amount of soil to be removed from the northern portion of the site without requiring the excavation into New Street. It will also minimize the degree to which the clay layer dewaters during excavation.

Subsurface conditions at the site consist of, from highest to lowest elevation: a layer of variable but typically medium dense granular fill (primarily sands); very soft lean to fat clay; medium dense to dense native granular materials (primarily sands); granite bedrock. The depth to bedrock was highly variable across the site, ranging from 6 to 35 ft. below existing grade. In general, bedrock is shallowest along the south edge of the proposed excavation and deepest along the north edge. The groundwater table is generally located within 8 feet of the ground surface (or shallower) across the site. Based on laboratory testing, the clay deposit which is intermediate to the profile has very low shear strength (undrained strengths less than 500 pounds per square foot).

The following observations/conclusions can be made, based on the results of the subsurface investigation:

- In areas where the thickness of clay soils after excavation is 8 ft. or greater, the soil is considered sufficient for support of an anchored sheet pile system consisting of two rows of tiebacks supporting vertical sheet piles driven to refusal on the top of rock. Although the clay deposit is soft, design calculations show that it is suitable for providing sufficient passive resistance to retaining wall elements. Furthermore, tiebacks anchored in the granite bedrock will provide adequate bond strengths to resist active pressures developed in the granular fill and soft clay soils present behind the sheet piles. Two rows of tiebacks along the entire length of sheet pile wall are required to resist these active pressures.

- The high groundwater table and tidal fluctuations, combined with the presence of relatively pervious overburden materials (such as the fill deposits and native granular soils) makes seepage into the excavation a significant concern. A relatively watertight support system will be required in order to suitably control groundwater during excavation and backfill activities. A wall system consisting of hot-rolled sheet piling is thus recommended.

- In order to stay within the right of way at New Street, the tiebacks should be installed at an angle of 45 degrees from the horizontal. This angle provides adequate unbonded and bonded length for each tieback while staying within the public right of way.

- Bedrock is shallow (less than 8 ft. below existing grade) along the southern and a portion of eastern and western perimeter of the proposed excavation. These sides further coincide with areas of the project site where permanent structures are not located within close proximity to the excavation proper. In these areas, it should be possible to open cut the excavation with properly inclined sideslopes.

Given these considerations, the recommended temporary ESS is an anchored sheet pile wall system extending over the north and a portion of the east and west faces of the proposed excavation perimeter. Based on current design analysis, the ESS will consist of steel PZ -22 interlocking sheet piles driven to refusal within bedrock (refusal is expected within a few inches below the soil-bedrock interface) and anchored with two rows of 1- ¾ inch diameter grade 50 steel threadbar tiebacks. The tiebacks will be braced against the sheet piling using steel walers. The walers at the upper tieback will consist of two grade 50 steel C10 x 20 channel sections. At the lower tieback the walers will be two grade 50 steel C15 x 20 channel sections. Each threadbar will be anchored within the granite bedrock with a minimum bond length of 10 ft.

The ESS would be constructed by driving the PZ-22 sheet piles to the top of bedrock and then excavating down to the depth of the upper tieback. Once the upper tieback has been installed and proof tested along the entire length of sheet pile wall, excavation may continue down to the depth of the second tieback. The second tieback shall be installed and proof tested prior to extending the excavation down to the termination depth. Each tieback will be installed by drilling a minimum 3 – ½ inch diameter hole through soil and rock at an angle of 45 degrees with the horizontal. The threadbar will be installed within the drill-hole and grouted in place from the lowest point of the tieback up to the point it intersects the sheeting using 4,000 psi fine-grout. Each tieback will be welded to the walers and proof tested prior to lock-off. Installation of the tiebacks will occur within the vapor containment structure. During back-filling operations, the tieback will be de-tensioned when backfill reaches within 1 ft. below the waler. To maintain safety at the site, the sheet piles may be extended a minimum of 1 ft. above the ground surface and barricaded.

After completion of the excavation and during/after backfilll, the tops of the sheets will be cut off approximately 4 feet below grade, with the portions below that to remain. The record survey information will include the locations of all such materials.

Along the south and a portion of the east and west perimeter faces, the excavation will be advanced by open-cut methods. Open cut excavations should have maximum (steepest) side slopes of 1.5H: 1.0V.

3.3.4 Initial Excavation and Backfill

The bedrock outcrops and property lines immediately to the south and east of the excavation area will prevent the temprary containment structure (TCS) from being able to cover the entire excavation area. Even if the TCS is moved, as is shown on the Contract Drawings, it will not be able to cover the south-most and east-most edge of the excavation area. Excavation of those areas, therefore, will have to be performed under odor-suppresant foam.

Excavation in this area is further hampered by the fact that there is no clay layer underlying it; the excavation will proceed to bedrock. This prevents the installation of the anchored sheet pile wall system there.

As a result of these considerations, this perimeter will be excavated as follows:

- Initial excavation will be performed prior to erection of the TCS so that the TCS can be constructed on clean, competent soil.
- Excavation of the inner edge of the initial excavation area will be performed through a trench box to create a vertical edge to the backfill.
- The backfill will be stabilized to accomplish the following objectives:
    - It must hold the vertical face to allow excavation of contaminated soil (under TCS) up to it without significant backslope.
    - It must be able to support the weight of the TCS without supporting fill on the side below the TCS.
    - It must restrict groundwater inflow into the excavation area from the unsheeted portion of the perimeter of the excavation area.
- After excavation of the inner edge, the remaining portion of the Initial Excavation area can be excavated and backfill by open cut methods without trench boxes, etc. Odor-suppresant foam will, however, still be required.

Minimum structural requirements for the stabilized backfill will be included in the Contract Documents.

3.3.5 Temporary Containment Structure (TCS)

Once the initial excavation is completed, a TCS will be erected to cover the majority of the remaining excavation area. Since, as can be seen on Drawing C-005, that remaining area is still not rectangular, the structure will have to be relocated at least once to fully cover the excavation area. The TCS shown is approximately 71 feet wide by 148 feet long. The ridge height of such a structure is just over 34 feet.

The following traffic flow and work patterns within the TCS are anticipated:

- All vehicular access will be through a fabric door at the south end.
- Excavation will proceed from the back of the structure to the front, and from the outside edges inwards toward the center.
- Backfilling may start after a significant portion of the entire area has been fully excavated (and satisfactory post-excavation sample results have been obtained from any confirmatory samples).

The TCS will be removed after the completion of excavation. It will not be removed prior to the placement of the majority of the backfill, so as to minimize the potential for the escape of any residual odors. The Contractor will be allowed to propose an alternative size and layout of the TCS, provided that all ancillary measures (vapor management system, excavation equipment, etc.) are adjusted accordingly.

3.3.6 Vapor Management System

The TCS will be equipped with a Vapor Management System (VMS) to process air collected in the building to remove dust, odors, and contaminants prior to discharge. The VMS will be designed to provide a sufficient rate of air exchange to maintain a negative pressure inside the structure and to process recovered air from within the structure. The VMS will be equipped

with a blower, particulate filter with breakthrough indicator, and vapor phase carbon adsorber. The system will be sized to provide at least 6 air changes per hour. Emissions from the VMS will be routinely monitored.

Generally, the VMS must be located adjacent to the TCS, with a footprint that is roughly one-half the size of the TCS footprint. It is anticipated that the VMS will be located east of the TCS as shown on Drawing C-005.

Based on data from one supplier, the VMS will consist of two 100-horse power units, each capable of treating 20,000 cubic feet of air per minute. It is anticipated that power will be obtained from the nearby utility pole (see Drawing C-005). Sound barriers will be erected around the blowers to minimize the noise during operations. It is anticipated that the units will be turned off at night.

3.3.7 Excavation

Excavation will be performed in a manner that allows the Contractor to control the distinctive odor of MGP wastes to the maximum degree practical. The majority of the excavation will be performed below a temporary containment system (TCS) to contain odors that are then treated in a vapor management system. As discussed in Section 3.3.4, however, the south and eastern perimeter of the excavation area must be excavated outside of a TCS, and so will be excavated under odor-suppresant foam,.

The excavation will be performed in three general stages:

- Initial Excavation of the south and east excavation area boundaries that will not be able to be covered by a TCS.
- Excavation under the TCS in Location 1.
- Excavation of the remainder of the contaminated soil under the TCS in Location 2.

Excavated soil will not be sampled for characterization prior to disposal. It will be stockpiled for direct loading onto trucks and shipment to the disposal facility. The Contractor will identify a disposal location using the chemical analytical data collected in the various site investigations, which will be included in Appendix A to the Contract Documents.

To meet relevant transportation requirements, the soil must be sufficiently dry that it could pass the USEPA paint filter test (Method 9095B). Since the soils to be excavated are relatively coare and free-draining, this is not expected to cause the Contractor any difficulties: after excavation, the soil will be stockpiled and allowed to drain within the TCS so as to achieve an aceptable moisture content.

3.3.8 Dewatering

The maximum anticipated depth of excavation is approximately 15 feet, which is approximately 10 feet below the water table in the area of planned excavation. Dewatering will be required to maintain dry conditions during excavation and backfill operations. The method of dewatering will be determined by the Contractor subject to the approval of the Engineer.

The excavation support system will be designed to be generally watertight, so the volume of water from the braced portions of the excavation will be minimized. The stabilized backfill used in the Initial Excavation Area will further restrict the inflow of groundwater from much of the rest of the perimeter. Water will still be able to enter the excavation along the unbraced and unstabilized southwestern corner of the excavation. Inflow from the bottom of excavation will be minimal in areas of clay. The inflow through the bedrock that will be exposed in the southern portion of the excavation is not expected to be significant, though the hydraulic characteristics of the bedrock are unknown.

The Village of Cold Spring has stated that discharge to their sanitary sewer or POTW will not be permitted. The Contractor will be required to dispose of potentially contaminated water by trucking to an approved disposal facility, or by treatment and discharge of the water to the Hudson River. Should discharge to the Hudson River be proposed, the Contractor will be

required to meet the requirements for construction water discharges outside of the New York City watershed presented in the August 28, 2013 memorandum from the NYSDEC Division of Water "Generic Effluent Criteria for Surface Water Discharges."

3.3.9 Remedial Excavation and Post-Excavation Compliance Sampling

Soil within the limits of excavation will be removed to the top of rock or clay, whichever is higher. That surface is shown on Figure 6 and Drawing C-006. The horizontal limits of excavation will be determined, and post-excavation compliance samples collected, in the following ways:

- When the bottom of excavation is determined by the top of clay, post-excavation compliance samples will be documentation samples collected in accordance with NYSDEC Guidance DER-10, one sample every 900 ft^2 of excavation bottom area.
- Where the excavation is braced, the bracing will be installed at the limits of remedial excavation as previously determined in the Pre-Design Investigation Report (URS, 2014). The excavation will be carried to the face of the sheetpile. No post-excavation documentation sampling of the sidewalls in this reach will be performed.
- Along the southern and southeastern boundary, where the excavation is not braced, the excavation will be carried to the abutting slope. The excavation will be shallow there as the top of bedrock is only a few feet below grade. Note that this is the area of initial excavation, which cannot be performed under the temporary containment structure and, so, will be performed under odor-suppressant foam instead. Since it will be difficult to see the remaining shallow sideslope, no post-excavation samples will be collected along this boundary.
- Along the southwestern boundary, the full depth of excavation will end at the limit determined in the Pre-Design Investigation Report (URS, 2014). The sideslope of the excavation will be as steep as the native material allows, estimated at approximately 1.5V:1H. The resultant configuration is shown on Drawing C-006. Post-excavation confirmation samples will be collected in accordance with the NYSDEC Guidance

DER-10: one sample for every 30 linear feet of sidewall. Depending on the results of that sample, the excavation may be extended farther and re-sampled.

3.3.10 Removal of Buried MGP Structures

All buried foundations, pipes, etc. within the limits of remedial excavation are to be excavated and removed from the site. Their depth is unknown, and may require excavation into the clay layer. These materials will be disposed of in the same manner and at the same facilities as the excavated soil.

3.3.11 Transportation

Access to the site for deliveries/removal of materials and equipment will likely be by truck, though some materials may be able to be brought in or removed by rail or barge. The determination of the means and methods for transportation of wastes and other materials will be the responsibility of the Contractor.

Space restrictions at the site will require that the Contractor haul the excavated materials in trucks that are sufficiently small that they can make the necessary turns into and out of the site and TCS. The specifications will state that the Contractor will transport the material for disposal in lined tri-axle dump trucks (without overweight permits).

Potential staging locations for construction truck traffic will be coordinated with the Village.

All construction traffic will have to use the bridge on Lunn Terrace, just east of the site. The bridge crosses over tracks of the Metro North Railroad Hudson Line, and is owned by the railroad. The bridge has no posted weight restrictions.

Routes for construction traffic between the site and NY Route 9, the principal arterial in and out of the area, are shown on the Drawing G-001 of the Contract Drawings.

3.3.12 Disposal

All excavated soil will be disposed of off-site at a thermal treatment and disposal facility or other regulated disposal facility permitted to approve this waste and as approved by the Department and the Engineer.

The excavated soil may not need to be regulated as a characteristic hazardous waste. As stated in Pre-Design Investigation Report (URS, 2014), the sample from boring WC-1 was analyzed for waste disposal parameters but did not exhibit any characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity). Other samples, not tested for waste characterization parameters, however, exhibited higher levels of PAHs, as shown in the tables of the Pre-Design Investigation Report (URS, 2014).

The results of those analyses will be provided to the Contractor in the Limited Site Data Document. The Contractor will be responsible for all additional soil characterization sampling required by the disposal facility.

The boat house slab, foundations, and other below grade structures will be prepared and decontaminated, as necessary, to meet the acceptance criteria of the selected disposal facility. Decontamination will consist of scraping soil from the surface and pressure washing.

The Contractor will be required to treat the soil as necessary to achieve the selected disposal facility's structural requirements for material disposal. The weight of any such treatment (cement, etc.) will be subtracted from the payment weight of soil disposal.

3.3.13 Backfill and Restoration

The excavation will be backfilled with either clean soil meeting the SCOs of Subpart 375 for restricted residential use or granular material from an approved virgin source. This material

will be placed to approximately 1 feet below finished grade. Above that will be 1 foot of granular material to blend with the graveled surfaces of the adjacent areas.

Any disturbed areas on the private residential property will be restored in-kind.

The proposed restoration plan grades are shown on Drawing C-007.

4.0 PERMITS

The following local permits from the Village of Cold Spring have been preliminarily identified as potentially required for the project:

- Work within a Village ROW.
- Curb cut or temporary construction driveway.
- Building Permit for site work and demolition of the boat house.
- Street opening for removal of water and sanitary lines to the boat house.

The Contractor will be required also to coordinate with the following utilities, as discussed in Section 3.3.2:

- Central Hudson Gas and Electric for the removal of their poles from in front of the site.
- The local telephone (Verizon) and cable (CableVision) companies for the burial of their lines in front of the site. It is assumed that the utilities themselves will perform or contract for this work.

A State Pollution Discharge Elimination System (SPDES) permit will be required from the NYSDEC for the discharge of any treated groundwater to the Hudson River.

This list will be finalized after completion of the design process and prior to finalization of the Contract Documents. The Contractor will be required to obtain all necessary permits.

5.0 SCHEDULE

The remedial design will be completed by April 2015. Remedial activities are not scheduled to start until Fall 2015 in order to avoid the tourist/boating season as much as possible. It is anticipated that 6 months will be required for remedial construction, assuming that operations will not be hampered by winter weather. If a winter-weather shut down is required, or if other delays are encountered, the project may extend into the spring/summer of 2016.

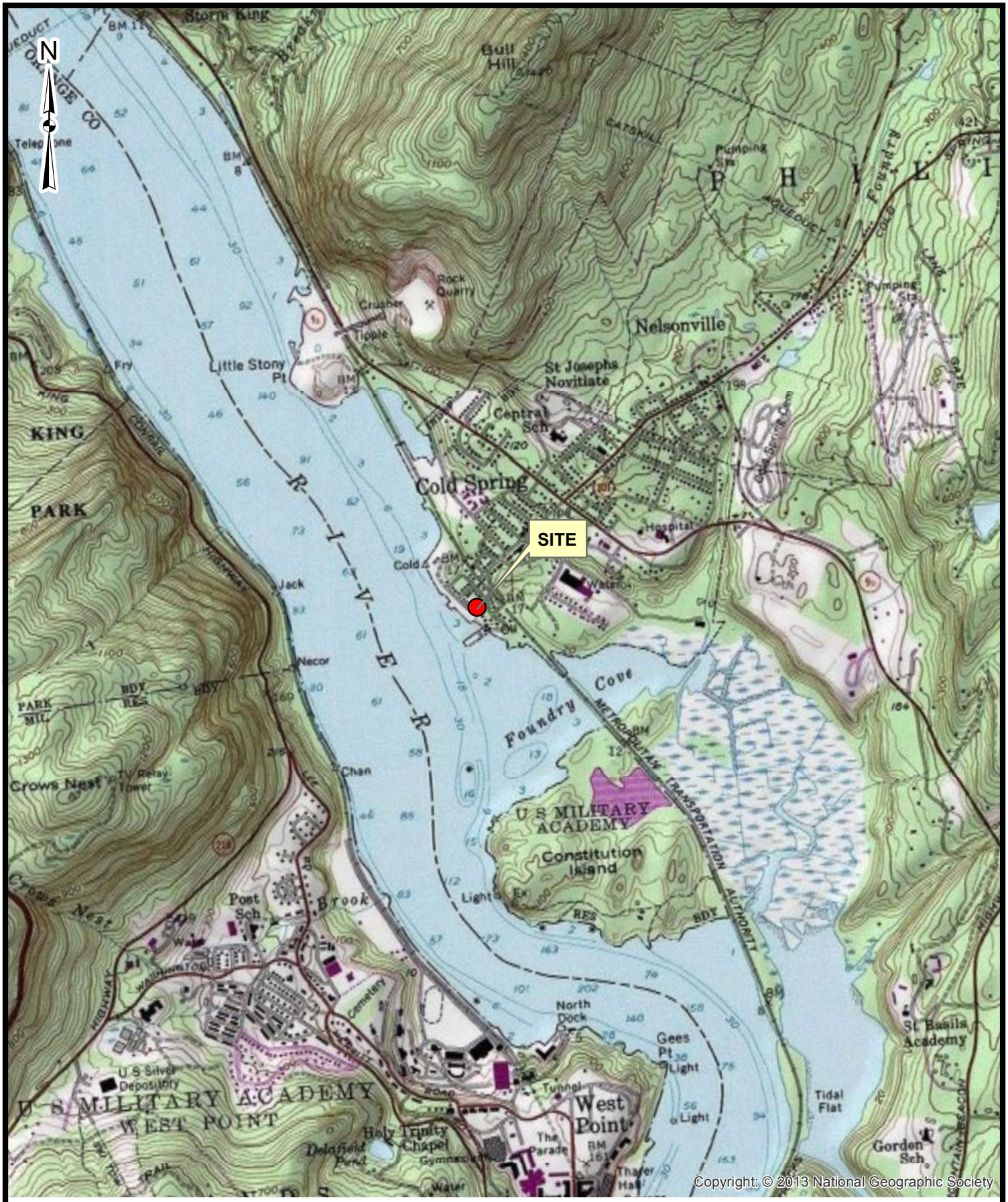
6.0 POST-CONSTRUCTION PLANS

The NYSDEC prepared a site management plan (SMP) for the site in accordance with the requirements in NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation, dated November 2009. The SMP was prepared in April 2010, at the same time as the original ROD. The SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Easement for the site.

The SMP will be revised to reflect the changes to the post-construction condition resulting from the revised selected remedy, specifically the elimination of the low permeability barriers and the need for them due to the more complete removal of any remaining source material beneath the boat house.

FIGURES

FIGURES



Source:
1:24,000-scale USGS Topographic Map, West Point, NY

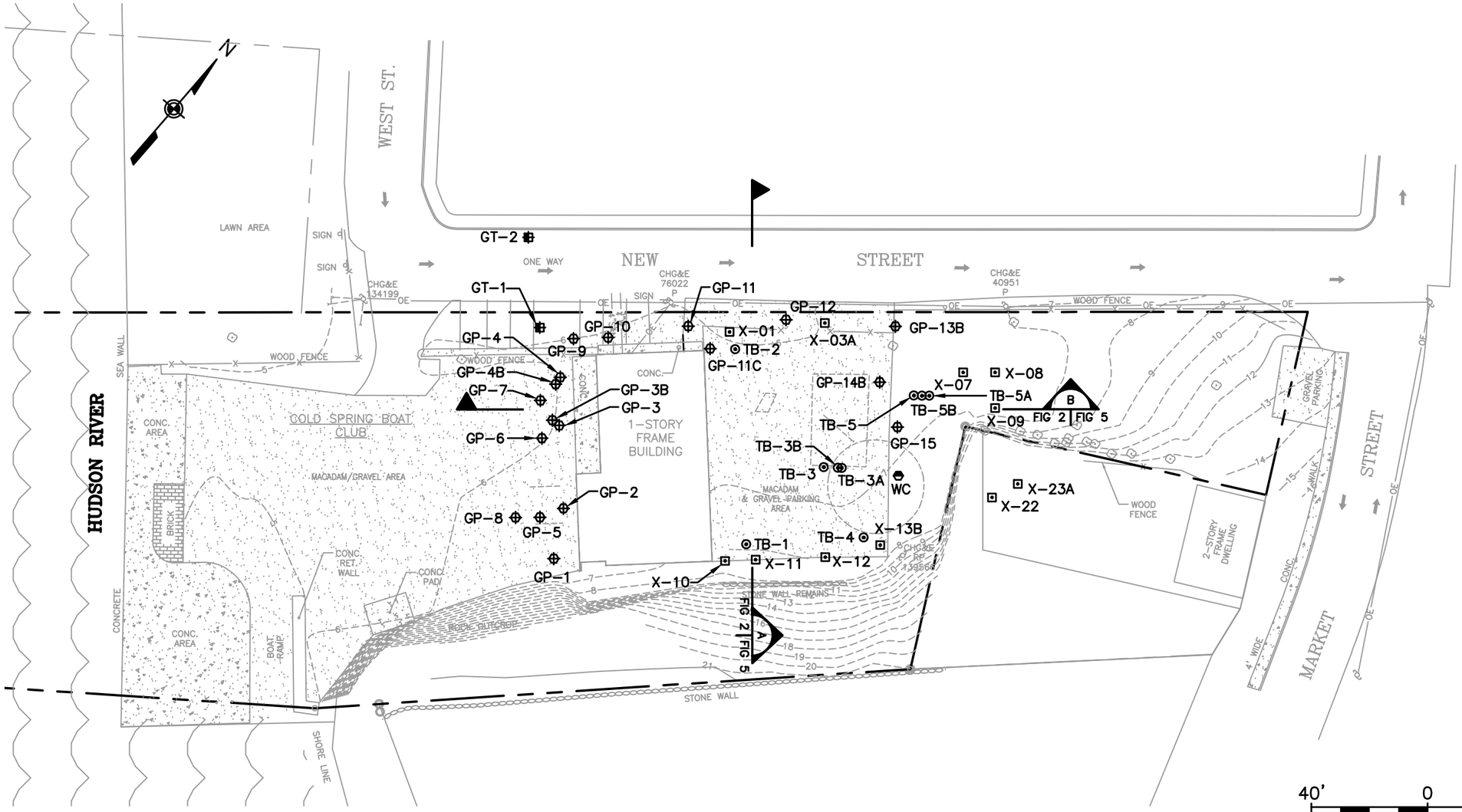
2,000 0 2,000 Feet

URS

NYSDEC COLD SPRING FORMER MGP SITE
5 NEW STREET
COLD SPRING, NEW YORK

FIGURE 1

I:\19998446.00004\GIS\MAPS\TOPO.mxd 2/25/2010 MDL



LEGEND:

GP-1 ⊕	GEOPROBE BORING (URS 2014)
WC ◓	WASTE CHARACTERIZATION BORING (URS 2014)
GT-1 ⊕	GEOTECHNICAL BORING (URS 2014)
TB-1 ⊙	URS APRIL 2013 BORING
X-18 ⊡	URS OCTOBER 2013 BORING

SUSPECTED FORMER MGP STRUCTURE BASED ON GEOPHYSICAL SURVEYS (URS 2014 AND DVIRKA AND BARTILUCCI 2008)

EXISTING GRADE CONTOUR WITH ELEVATION

MGP SITE BOUNDARY

SOURCE:

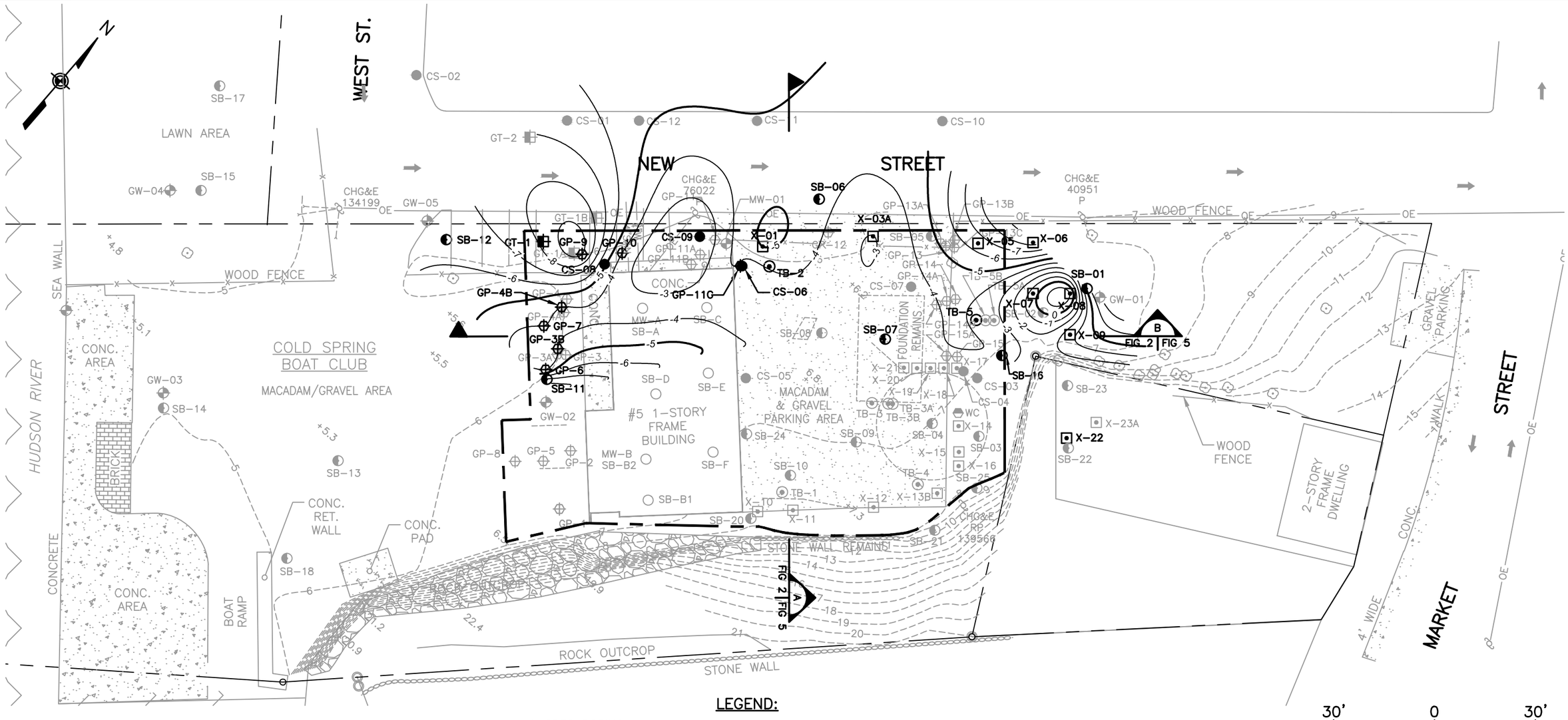
1. TOPOGRAPHIC SURVEY INFORMATION, FROM DRAWING P-1001, DATED 9/11/08, PROVIDED BY WILLIAM D. YOUNGBLOOD, LAND SURVEYING, P.C.
2. EXISTING GRADE ELEVATIONS FROM YEC, INC., DATED JUNE 2013.

COLD SPRING FORMER MGP SITE
URS SITE INVESTIGATION PLAN

URS

FIGURE 2

J:\Projects\11176853\CAD\30% DESIGN\FIGURE 2.dwg, 1:1, 3/3/2015, 1-JJS



Boring ID	Depth to Clay (ft)
CS-06	9.8
CS-08	11.2
CS-09	8.2
GP-3B	10
GP-4B	10
GP-6	10
GP-7	10
GP-9	15
GP-10	10
GP-11C	10
GT-1	14
SB-01	10
SB-06	10.5

Boring ID	Depth to Clay (ft)
SB-07	10
SB-11	13.1
SB-12	12
SB-16	10.9
TB-2	9
TB-5	8
X-01	11
X-03A	9
X-05	13
X-06	15
X-07	7
X-08	6
X-09	10
X-22	5

LEGEND:

- CS-08 ● NYSDEC BORING COMPLETED IN 2005
- SB-24 ◐ DVIRKA AND BARTILUCCI 2008 SOIL BORING LOCATIONS
- MW-01 ⊕ NYSDEC GROUNDWATER MONITORING WELL, COMPLETED IN 2005
- GW-04 ⊕ NYSDEC GROUNDWATER MONITORING WELL, COMPLETED IN 2005
- SB-D ○ GES 2012 BORINGS (AND MONITORING WELLS WHERE INSTALLED)
- REQUIRED HORIZONTAL EXTENT OF REMEDIATION EXCAVATION
- EXISTING BUILDING FOOTPRINT
- -8- EXISTING GRADE CONTOUR WITH ELEVATION
- -3- TOP OF CLAY CONTOUR WITH ELEVATION
- TB-1 ⊙ URS APRIL 2013 BORINGS
- X-18 ⊡ URS OCTOBER 2013 BORINGS
- GT-1 ⊞ GEOTECHNICAL BORING (URS 2014)
- GP-1 ⊕ GEOPROBE BORING (URS 2014)
- WC ⬭ WASTE CHARACTERIZATION BORING (URS 2014)
- SUSPECTED FORMER MGP STRUCTURE BASED ON GEOPHYSICAL SURVEYS (URS 2014 AND DVIRKA AND BARTILUCCI 2008)

30' 0 30'

SCALE IN FEET

SOURCE:

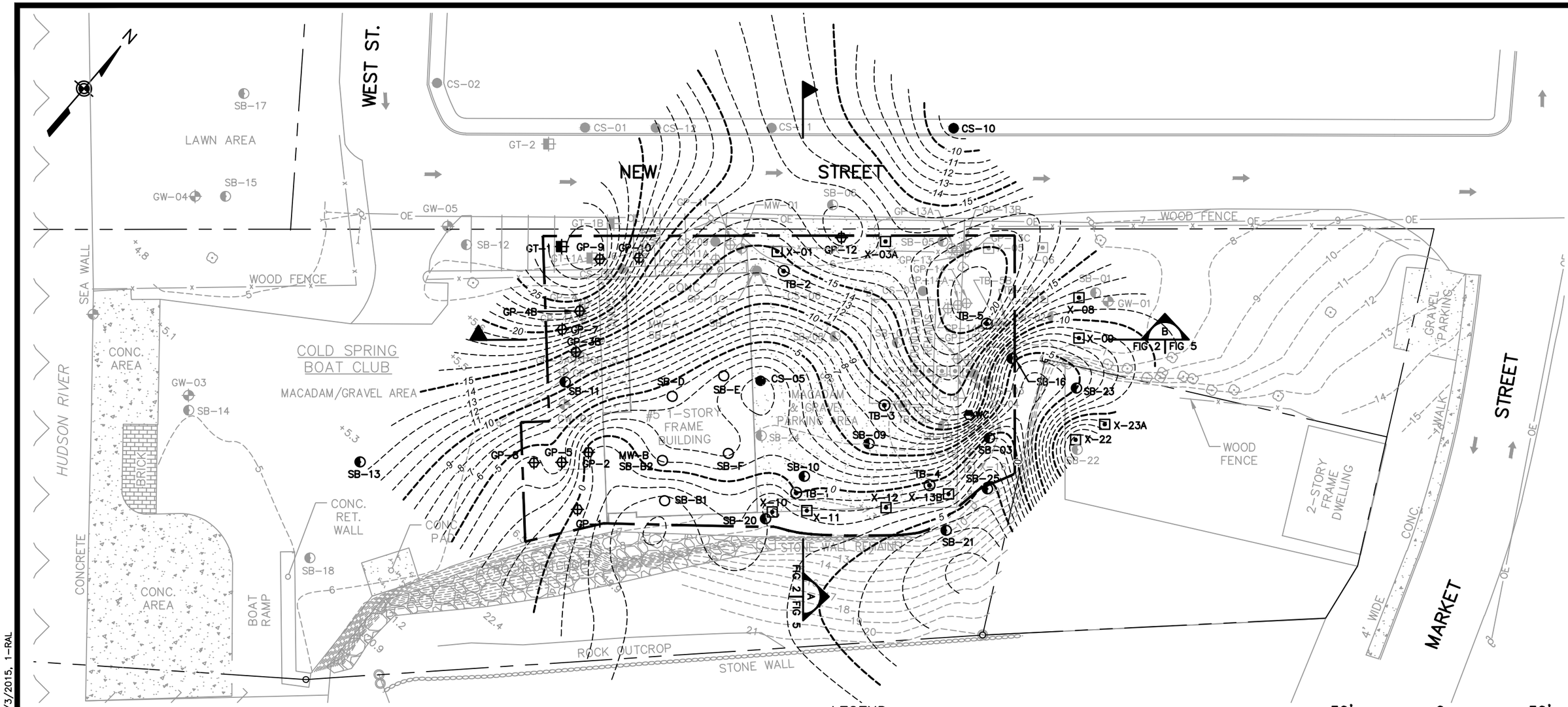
1. TOPOGRAPHIC SURVEY INFORMATION, FROM DRAWING P-1001, DATED 9/11/08, PROVIDED BY WILLIAM D. YOUNGBLOOD, LAND SURVEYING, P.C.
2. EXISTING GRADE ELEVATIONS FROM YEC, INC., DATED JUNE 2013.
3. BORINGS AND SAMPLE LOCATIONS SHOWN FULL-TONED ARE USED TO DETERMINE ELEVATIONS OF THE TOP OF CLAY.

COLD SPRING FORMER MGP SITE BORING LOCATIONS WITH TOP OF CLAY

URS

FIGURE 3

J:\Projects\11176853\CAD\30% DESIGN\Figure 3.dwg, 1:1, 3/3/2015, 1-ELB



Boring ID	Depth to Bedrock/Refusal (ft)
CS-05	7.5
CS-10	14.5
GP-1	6.5
GP-2	5.8
GP-3B	20.2
GP-4B	29
GP-5	11
GP-7	26
GP-8	10
GP-9	35.2
GP-10	28
GP-12	25.5
GT-1	34.5
MW-B/SB-B2	7.5
SB-B1	3.0

Boring ID	Depth to Bedrock/Refusal (ft)
SB-D	10
SB-E	9
SB-F	8.5
SB-03	7
SB-09	13
SB-10	8
SB-11	17
SB-13	19
SB-16	13.0
SB-20	5
SB-21	3
SB-23	18
SB-25	3.0
TB-1	7.5
TB-2	20

Boring ID	Depth to Bedrock/Refusal (ft)
TB-3	15
TB-4	7
TB-5	26
X-01	20.9
X-03A	23.7
X-08	19.3
X-09	14.4
X-10	3.7
X-11	5.4
X-12	5.4
X-13B	5.6
X-22	27.5
X-23A	24.3
WC	19.0

LEGEND:

- CS-08 ● NYSDEC BORING COMPLETED IN 2005
- SB-24 ◐ DVIRKA AND BARTILUCCI 2008 SOIL BORING LOCATIONS
- MW-01 ⊕ NYSDEC GROUNDWATER MONITORING WELL, COMPLETED IN 2005
- GW-04 ⊕ NYSDEC GROUNDWATER MONITORING WELL, COMPLETED IN 2005
- SB-D ○ GES 2012 BORINGS (AND MONITORING WELLS WHERE INSTALLED)
- REQUIRED HORIZONTAL EXTENT OF REMEDIATION EXCAVATION
- EXISTING BUILDING FOOTPRINT
- -----8----- EXISTING GRADE CONTOUR WITH ELEVATION
- -----6----- TOP OF BEDROCK CONTOUR WITH ELEVATION
- TB-1 ⊙ URS APRIL 2013 BORINGS
- X-18 ⊡ URS OCTOBER 2013 BORINGS
- GT-1 ⊞ GEOTECHNICAL BORING (URS 2014)
- GP-1 ⊕ GENERAL BORING (URS 2014)
- WC ⬭ WASTE CHARACTERIZATION BORING (URS 2014)
- SUSPECTED FORMER MGP STRUCTURE BASED ON GEOPHYSICAL SURVEYS (URS 2014 AND DVIRKA AND BARTILUCCI 2008)

30' 0 30'

SCALE IN FEET

SOURCE:

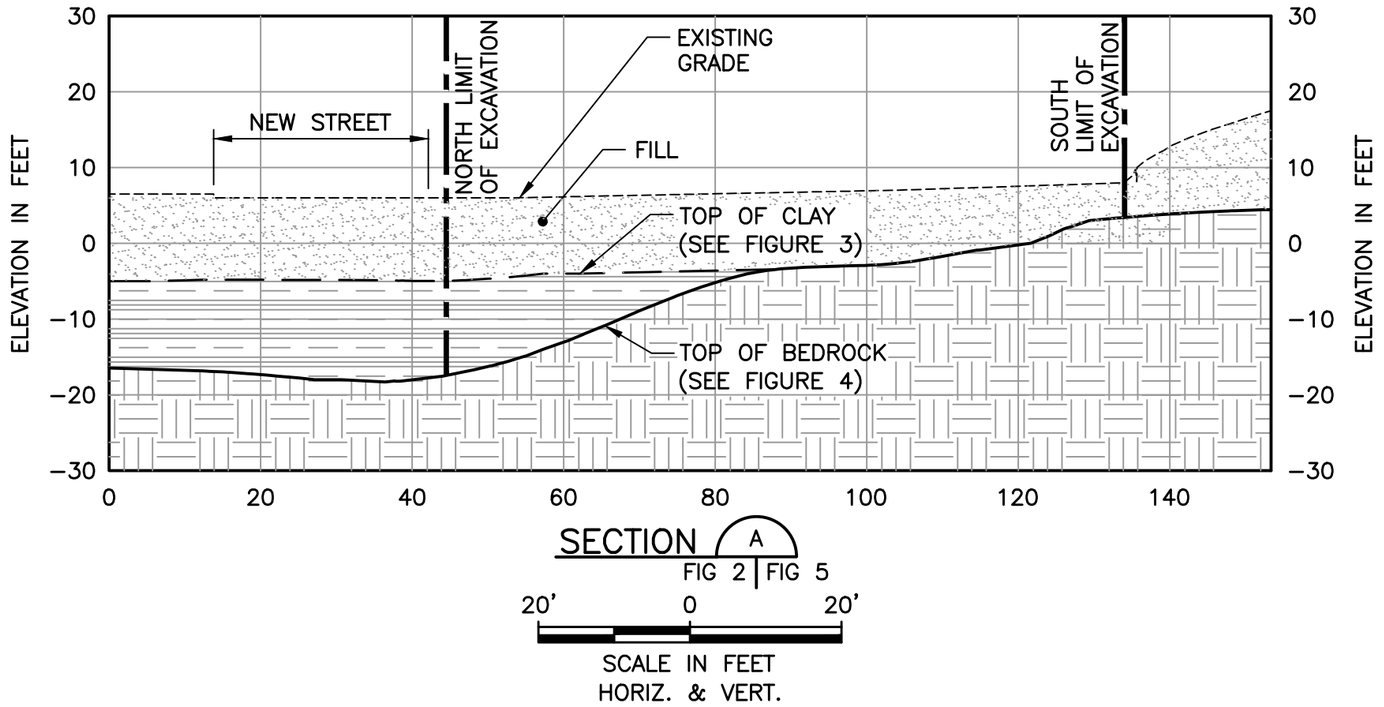
1. TOPOGRAPHIC SURVEY INFORMATION, FROM DRAWING P-1001, DATED 9/11/08, PROVIDED BY WILLIAM D. YOUNGBLOOD, LAND SURVEYING, P.C.
2. EXISTING GRADE ELEVATIONS FROM YEC, INC., DATED JUNE 2013.
3. BORINGS AND SAMPLE LOCATIONS SHOWN FULL-TONED ARE USED TO DETERMINE ELEVATIONS OF THE TOP OF BEDROCK.

COLD SPRING FORMER MGP SITE
BORING LOCATIONS WITH TOP OF BEDROCK

URS

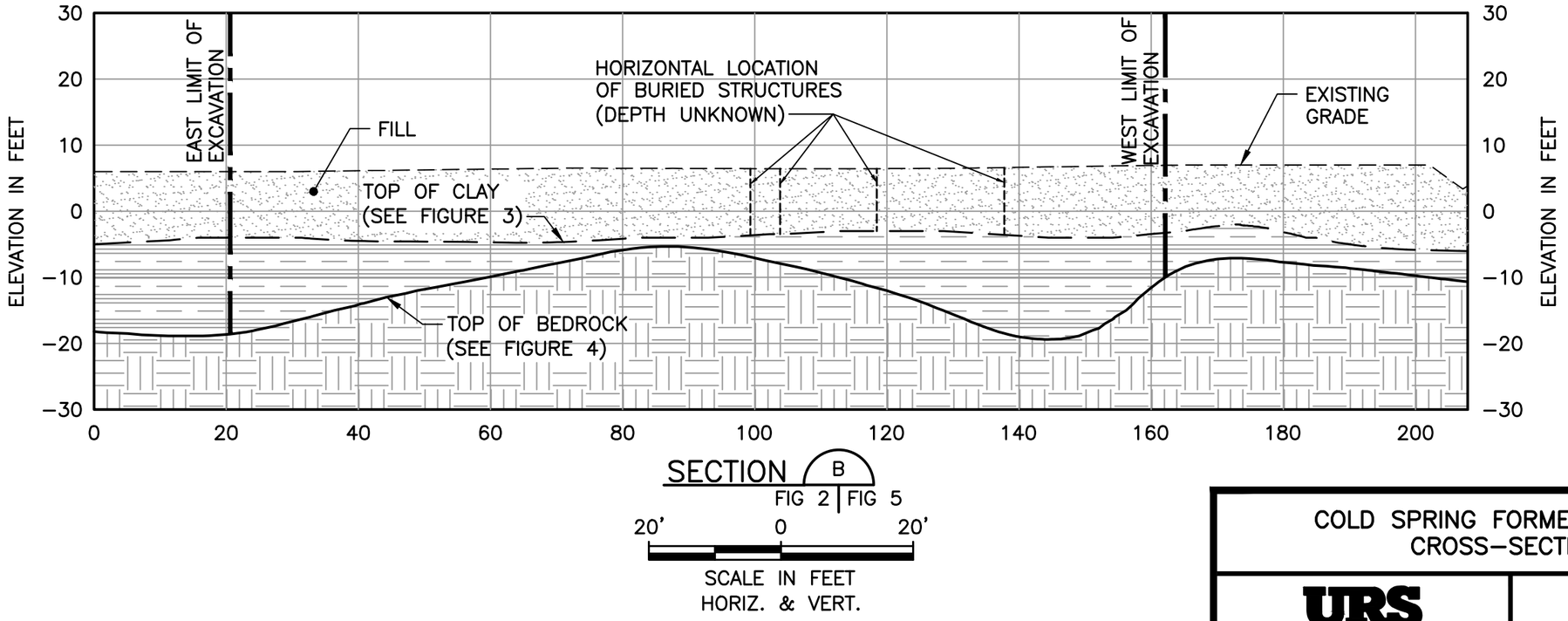
FIGURE 4

J:\Projects\11176853\CAD\30% DESIGN\Figure 4.dwg, 1:1, 3/3/2015, 1-RAL



LEGEND:

- APPROXIMATE EXISTING GRADE
- TOP OF CLAY
- TOP OF BEDROCK
- LIMIT OF EXCAVATION
- FILL
- CLAY
- BEDROCK

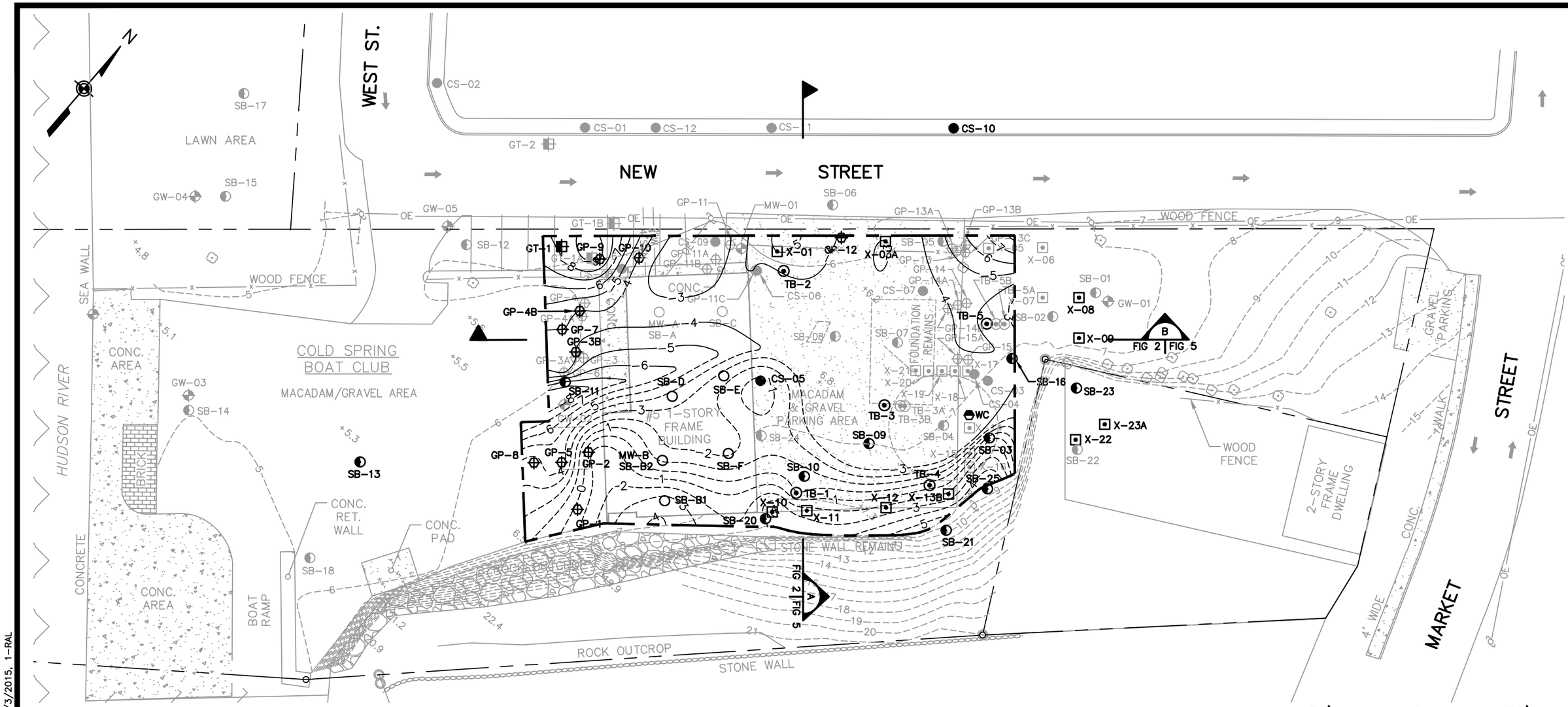


COLD SPRING FORMER MGP SITE
CROSS–SECTIONS

URS

FIGURE 5

J:\Projects\11176853\CAD\30% DESIGN\Figure 5.dwg, 1:1, 3/3/2015, 1-HAP



LEGEND:

- ------ –2 ------ ANTICIPATED BOTTOM OF EXCAVATION CONTOUR WITH ELEVATION (TOP OF BEDROCK FROM FIGURE 4)
- ——— –6 ——— ANTICIPATED BOTTOM OF EXCAVATION CONTOUR WITH ELEVATION (TOP OF CLAY FROM FIGURE 3)
- --------8-------- EXISTING GRADE CONTOUR WITH ELEVATION
- CS–08 NYSDEC BORING COMPLETED IN 2005
- SB–24 DVIRKA AND BARTILUCCI 2008 SOIL BORING LOCATIONS
- MW–01 NYSDEC GROUNDWATER MONITORING WELL, COMPLETED IN 2005
- GW–04 NYSDEC GROUNDWATER MONITORING WELL, COMPLETED IN 2005
- SB–D GES 2012 BORINGS (AND MONITORING WELLS WHERE INSTALLED)
- REQUIRED HORIZONTAL EXTENT OF REMEDIATION EXCAVATION
- EXISTING BUILDING FOOTPRINT
- TB–1 URS APRIL 2013 BORINGS
- X–18 URS OCTOBER 2013 BORINGS
- GT–1 GEOTECHNICAL BORING (URS 2014)
- GP–1 GEOPROBE BORING (URS 2014)
- WC WASTE CHARACTERIZATION BORING (URS 2014)
- SUSPECTED FORMER MGP STRUCTURE BASED ON GEOPHYSICAL SURVEYS (URS 2014 AND DVIRKA AND BARTILUCCI 2008)

SOURCE:

1. TOPOGRAPHIC SURVEY INFORMATION, FROM DRAWING P–1001, DATED 9/11/08, PROVIDED BY WILLIAM D. YOUNGBLOOD, LAND SURVEYING, P.C.
2. EXISTING GRADE ELEVATIONS FROM YEC, INC., DATED JUNE 2013.
3. BORINGS AND SAMPLE LOCATIONS SHOWN FULL–TONED ARE USED TO DETERMINE BOTTOM OF EXCAVATION CONTOURS.

COLD SPRING FORMER MGP SITE
BOTTOM OF EXCAVATION PLAN

URS

FIGURE 6

J:\Projects\11176853\CAD\30% DESIGN\Figure 6.dwg, 1:1, 3/3/2015, 1-RAL