Niagara Mohawk
A National Grid Company

James F. Morgan
*Lead Sr. Environmental Engineer*

October 7, 2005

John Spellman, P.E.
Project Manager, Remedial Section D
Bureau of Western Remedial Action
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7017

Re: Final Amsterdam Upland Area Remediation Work Plan
Greater Amsterdam Riverlink Park, Amsterdam (Front Street) Former MGP Site
Amsterdam. New York

Dear Mr. Spellman:

In accordance with the Voluntary Cleanup Agreement (VCA) for the Amsterdam (Front Street) Former Manufactured Gas Plant (MGP) Site (Index No. D4-0001-99-03), Niagara Mohawk, a National Grid Company (Niagara Mohawk) is submitting four copies of the attached *Upland Area Remediation Work Plan* (Work Plan) for your review. The Work Plan presents the remedial approach and design for implementing the selected remedial action, including Design Drawings, Technical Specifications, and associated support documents. This Work Plan incorporates the changes to the September 16, 2005 Draft Work Plan as agreed to between New York State Department of Environmental Conservation (NYSDEC) and Niagara Mohawk since submittal of the September Draft document.

Because the changes to the Draft Work Plan as provided herein have been previously agreed to, we anticipate that NYSDEC will provide approval of the Work Plan upon receipt. Once your approval has been received Niagara Mohawk will set a pre-bid date to initiate the contactor selection process.

If you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,

James F. Morgan

**James F. Morgan**
Lead Sr. Environmental Engineer

DEP/plf
Enclosures

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Remedial Bureau C
Division of Environmental Remediation

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# *Upland Area Remediation Work Plan*

## *Amsterdam (Front Street) Former Manufactured Gas Plant Site Amsterdam, New York*

**Niagara Mohawk**
**A National Grid Company**
**Syracuse, New York**

**October 2005**

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## CERTIFICATION STATEMENT

## AMSTERDAM (FRONT ST.) FORMER MANUFACTURED GAS PLANT (MGP) SITE AMSTERDAM, NEW YORK

## UPLAND AREA REMEDIATION WORK PLAN

I, James M. Nuss, P.E., am a Professional Engineer registered in the State of New York, and am employed by Blasland, Bouck & Lee, Inc. (BBL). Based on my inquiry of those individuals involved in the development of the *Upland Area Remediation Work Plan* (Upland Area RWP) for the Amsterdam (Front Street) Former MGP Site, I am providing certification that the said document was prepared in accordance with the November 26, 1999 Voluntary Cleanup Agreement (VCA), Index Number: D4-0001-99-03 between the New York State Department of Environmental Conservation (NYSDEC) and the Volunteers – Niagara Mohawk, a National Grid Company (Niagara Mohawk), the New York State Department of Transportation (NYSDOT), and the New York State Canal Corporation (NYSCC).

The Upland Area RWP presents Niagara Mohawk's remedial approach and design for implementing the selected remedial action to address the upland portion of the Phase II Area of the Greater Amsterdam Riverlink Park.

OCT. 7, 2005

James M. Nuss, P.E.
Vice President
New York State P.E. No. 67963

Date

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# Table of Contents


**Certification Statement** ..... i

**Section 1. Introduction** ..... 1-1

1.1 Purpose ..... 1-1
1.2 Background ..... 1-1
1.2.1 Site Description and Features ..... 1-2
1.2.2 Site History ..... 1-3
1.2.3 General Site Geology and Hydrogeology ..... 1-3
1.3 Remedial Action Objectives ..... 1-4
1.4 Summary of the Selected Remedy ..... 1-4
1.5 Report Organization ..... 1-5

**Section 2. Previous Investigations, Predesign Investigation, and Modeling** ..... 2-1

2.1 Summary of Previous Investigations ..... 2-1
2.2 Predesign Investigation Activities ..... 2-2
2.3 Groundwater Flow Modeling ..... 2-3
2.4 Mohawk River Hydrodynamic Modeling ..... 2-4

**Section 3. Pre-Remediation Activities** ..... 3-1

3.1 Citizen Participation Plan Implementation ..... 3-1
3.2 Contractor Procurement ..... 3-1
3.3 Permitting ..... 3-2
3.4 Contractor Submittals ..... 3-3
3.4.1 Contingency Plan ..... 3-3
3.5 Site Mobilization/Preparation ..... 3-4
3.5.1 Site Review ..... 3-4
3.5.2 Site Mobilization ..... 3-4
3.5.3 Site Preparation ..... 3-7

**Section 4. Remedial Action Activities** ..... 4-1

4.1 Overview ..... 4-1
4.2 Barrier Wall Installation ..... 4-1
4.2.1 Pre-Trenching, Pre-Drilling, and Pre-Driving to Install Barrier Wall Sheeting ..... 4-2
4.2.2 Sheetpile Driving ..... 4-3
4.3 Soil Excavation ..... 4-3
4.4 Recovery Wells ..... 4-5
4.4.1 Passive NAPL Recovery Well Installation ..... 4-5
4.4.2 Existing Wells ..... 4-6
4.5 Engineered Cover Installation ..... 4-6
4.6 Noise, Dust, and Vapor Emissions, and Odor Control ..... 4-7
4.7 Equipment Decontamination ..... 4-8
4.8 Waste Handling, Treatment, and Disposal ..... 4-8
4.9 Site Restoration/Demobilization ..... 4-8
4.10 Survey ..... 4-8

**Section 5. Post-Remedial Action Activities ..... 5-1**

5.1 Preparing a Final Remedial Action Engineering Report ..... 5-1
5.2 Establishing Institutional Controls ..... 5-1
5.3 Monitoring of Post-RA Conditions ..... 5-1

**Section 6. Design Drawings and Technical Specifications ..... 6-1**

6.1 Design Drawings ..... 6-1
6.2 Technical Specifications ..... 6-1

**Section 7. Schedule ..... 7-1**

**Section 8. References ..... 8-1**

## Appendices

A Design Documents
Design Drawings
Technical Specifications
B Waste Handling Plan
C Construction Quality Assurance Plan
D BBL's Health and Safety Plan, including Community Air Monitoring Plan
E Citizen Participation Plan
F Subsurface and Groundwater Elevation Information
G Modeling Summaries
G-1 Groundwater Flow Modeling Summary
G-2 Hydrodynamic Modeling Summary
H Storm Water Pollution Prevention Plan

Appendices B through H are provided in electronic format on the attached CD.

# *Upland Area Remediation Work Plan*

## *Amsterdam (Front Street) Former Manufactured Gas Plant Site Amsterdam, New York*

**Niagara Mohawk**
**A National Grid Company**
**Syracuse, New York**

**October 2005**

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# 1. Introduction

This *Remediation Work Plan* (RWP) has been prepared on behalf of Niagara Mohawk, a National Grid Company (Niagara Mohawk), and defines the implementation of remedial actions within the Upland Area of the Amsterdam (Front Street) Former Manufactured Gas Plant (MGP) Site in Amsterdam, New York. The Upland Area is generally composed of the Phase II Area of the Amsterdam Riverlink Park and the adjacent property below the New York State Route 30 bridge. The Upland Area and a small portion of the western side of the adjacent Riverlink Park Phase I Area were historically occupied by the former MGP.

This RWP has been developed in accordance with the New York State Department of Environmental Conservation (NYSDEC)-approved *Upland Area Remedial Design Work Plan* (Upland Area RDWP) (Blasland, Bouck & Lee, Inc. [BBL], 2004a; Morgan, 2005a, b) and to satisfy the requirements as specified in the Voluntary Cleanup Agreement (VCA) dated November 25, 1999 (Index Number: D4-0001-99-03; NYSDEC, 1999). The VCA was signed by NYSDEC, Niagara Mohawk, the New York State Department of Transportation (NYSDOT), and the New York State Canal Corporation (NYSCC) (collectively referred to as the Volunteers, the latter two own the property on which the Park is located). Collectively, the Upland Area RDWP and RWP satisfy the requirements of section I.D.3 of the VCA with regard to Development of a Remediation Work Plan to "eliminate or mitigate all significant threats to the environment or public health determined to result from Existing Contamination [impacts associated with the former MGP facility]" and provide "for safe implementation of the Contemplated Use [a public recreation area and a public highway] of the Site."

## 1.1 Purpose

The purpose of this RWP is to present the remedial approach and design for implementing the selected remedial action alternative for the Upland Area, as identified in the NYSDEC-approved Upland Area RDWP. As such, this plan provides the engineering design for each component of the selected remedial action, including specific design information and supporting technical information. This RWP, the associated Design Documents (including the Design Drawings and Technical Specifications), and the supporting documents are collectively referred to hereafter as the RWP Documents.

## 1.2 Background

This section summarizes the background information as it pertains to the development of this RWP including a summary of Site features, Site history, and prior investigation activities. A discussion of the remedial activities completed on the Phase I Area has been provided in prior Site documents (e.g., BBL, 2004b).

The background information provided below was obtained from the following project-related documents that summarize the result of the investigation activities conducted between 1999 and 2002 and the interim remedial measure (IRM) conducted between July 1999 and January 2000 at the Site:

- *Preliminary Site Assessment of the Amsterdam Riverlink Park* (PSA Report) (Harza, 1999);
- *Preliminary Interim Remedial Measure Investigation Report, Greater Amsterdam Riverlink Park Amsterdam (Front Street) Former MGP Site* (IRMI Report) (BBL, 1999);
- *Phase II Area Investigation Report, Greater Amsterdam Riverlink Park, Amsterdam (Front Street) Former MGP Site* (BBL, 2001);

- *Mohawk River Investigation Summary Report, Greater Amsterdam Riverlink Park, Amsterdam (Front Street) Former MGP Site* (BBL, 2002); and
- *Final Engineering Report, Riverlink Plaza Area, Interim Remedial Measure* (IRM Report) (BBL, 2003).

All of these documents are available for review at two public document repositories: the Amsterdam Free Library in Amsterdam, New York and NYSDEC's office in Albany, New York.

### 1.2.1 Site Description and Features

The Upland Area and the adjacent Phase I Area of the Amsterdam Riverlink Park is located along the northern bank of the Mohawk River/Erie Canal in Amsterdam, New York. Combined, these areas cover approximately 4.75 acres and consist of two adjacent properties – the NYSDOT property to the west and the NYSCC property to the east. Assessment and remedial activities for the Park have been generally divided into the Phase I and Phase II Areas.

- The Phase I Area encompasses the NYSCC property and a small portion of the eastern end of the NYSDOT property. An active terminal wall is located along the southern side of the Phase I Area. NYSCC rebuilt this terminal wall in 1998 to replace the pre-existing deteriorating terminal wall. The Phase I Area of the Park was officially opened on June 15, 2001.

- The Phase II Area of the park extends from the western extent of the Phase I Area to the eastern side of the State Route 30 bridge. The Upland Area, which is the subject of this RWP, consists of the Phase II Area plus the area below the State Route 30 bridge. Current conditions in this area generally consist of lightly vegetated ground surface with a riprap-covered riverbank along the southern edge of the area. An 8-foot high chain link fence is located along the northern, eastern, and western borders of the Phase II Area. The banks of the Mohawk River near the Park are generally armored with cobbles, boulders, and gravel.

A storm sewer traverses the Park and discharges to the Mohawk River via a 30-inch diameter outfall. This system is located, at its deepest, approximately 10 to 15 feet below grade and drains surface water runoff from the Phase I Area. Storm water from the City historically discharged through this system, but the City's stormwater was rerouted during the Park construction to discharge through a 60-inch diameter pipe located approximately 25 feet upstream of the Upland Area, west of the State Route 30 bridge. This bridge, constructed between approximately 1968 and 1972, traverses over the western portion of the Upland Area and an abutment for the bridge is located within the area. An overhead pedestrian bridge and a support tower, which provide access to the Riverlink Park from the north, are located east of the Upland Area and near the northwestern corner of the Phase I Area.

The portion of the Mohawk River adjacent to the Park is located between Locks 10 and 11 of the New State Canal System. The water level of the Mohawk River is regulated by a series of dams and locks, with the river level being raised each April by closing a series of dams so that the average high water level is attained by May 1, when the river is opened to commercial and recreational boat traffic. The river is then lowered each November, with a net change in the river level of approximately 10 feet between the summer and winter seasons.

### 1.2.2 Site History

The general history of the Site is summarized as follows:

- Chuctanunda Gas Light Company began operating an MGP on the NYSDOT property in 1866; MGP operations continued until the 1930s. In 1930, Chuctanunda Gas Light Company merged with New York Power and Light Corporation, a corporate predecessor of Niagara Mohawk. Around 1963, NYSDOT appropriated the property from a Niagara Mohawk predecessor to construct the State Route 30 bridge over the Mohawk River. Construction of the bridge began around 1968 and was completed in 1972.

- The MGP operations changed and increased in production and capacity though time. At the time of shutdown, the MGP appears to have consisted of three gas holders (Gas Holders Nos. 1 and 2 were apparently constructed with below-grade foundations, while Gas Holder No. 3 was apparently constructed with a foundation at grade), several retort buildings, three purifying buildings, and several associated support buildings and structures (e.g., boiler, coal shed, tool shed, and tar well). The Design Drawings (Appendix A) show the approximate locations of the historical buildings and known or suspected sub-grade structures formerly located onsite.

- The NYSCC property was used as a canal terminal for loading and unloading commercial goods along the Erie Canal. Commercial buildings, including warehouses, were present in the eastern portion of the Park from the 1920s until the 1960s, and were demolished by 1968 (Harza, 1999).

- Following completion of an IRM to address MGP-related impacts on the NYSCC property and the eastern end of the NYSDOT property (the Phase I Area), the City redeveloped the Phase I Area into a waterfront park. The park officially opened on June 15, 2001.

### 1.2.3 General Site Geology and Hydrogeology

The Upland Area is generally underlain by four main overburden units, including, from upper to lower units: a fill unit, silt unit, sand-and-gravel unit, and sand-and-silt unit with varying amounts of clay. A clay unit (which may be a till) and lower sand-and-gravel unit are also locally present below the sand-and-silt unit. The fill unit is generally composed of a heterogeneous mix of silt, sand, gravel, shell fragments, demolition debris (including bricks, wood, concrete, and metal), subsurface structures (including gas holder walls, foundations of two purifying houses and a coke house, piping likely related to the manufactured gas process, and concrete piers related to the elevated State Route 30 bridge), and MGP-related waste (including ash, ash-like material [potential purifier waste], slag, cinders, hardened coal tar, and coke).

The bedrock surface underneath the overburden slopes steeply toward the Mohawk River with a more gentle dip to the east. The slope appears to steepen dramatically near the river shoreline. The bedrock depth beneath the Upland Area ranges from 5 feet below ground surface (bgs) at soil boring SB-7 (along the northern edge of the Upland Area) to approximately 71 feet bgs at MW-4R (near the river). A geotechnical boring completed by NYSDOT in 1957 along the northern river edge during design of the State Route 30 bridge was advanced to approximately 87 feet below grade, but did not encounter bedrock at that depth. More detailed descriptions of subsurface geology are provided in the *Phase II Area Investigation Report* (BBL, 2001) and the *Mohawk River Investigation Summary Report* (BBL, 2002).

Each November, the water level in the Mohawk River is lowered approximately 10 feet over a period of 1 week, causing a rapid discharge of groundwater from the fill and the upper portion of the silt unit as these units dewater. These units rewet in response to the river rise in the spring. Smaller fluctuations in the river level, particularly during the winter when the canal water level is not dam controlled (i.e., run of river, natural flow), causes similar, but smaller drainage and rewetting of the silt unit and possibly portions of the fill, depending on the magnitude of the river elevation change. During the summer, the water table generally occurs in the fill, while in the winter, the water table drops and generally occurs within the silt layer. A more detailed discussion can be found in the *Phase II Area Investigation Report* (BBL, 2001).

## 1.3 Remedial Action Objectives

NYSDEC approved six Remedial Action Objectives (RAOs) for the Site in a November 7, 2002 letter to Niagara Mohawk (Spellman, 2002). Two of the RAOs are applicable to the Mohawk River and therefore are not presented herein. The following four RAOs apply to the Upland Area:

- Eliminate, to the extent practicable, discharges of nonaqueous phase liquid (NAPL) from the Phase II Area to the Mohawk River;
- Prevent exposure to Phase II Area-related constituents in soil and groundwater by the general public/visitors to the Phase II Area once construction of the Park is completed;
- Eliminate and/or control the Site-related source(s) of groundwater impacts to the extent practicable; and
- Restore groundwater quality to prerelease conditions to the extent practicable.

## 1.4 Summary of the Selected Remedy

The recommended remedial alternative for the Upland Area is a comprehensive approach that will effectively address Site-related materials and provide for the Contemplated Use of the Upland Area as a recreation area/public park and public highway. A detailed discussion of the rationale for selection of the proposed Upland Area remedy is provided in the Upland Area RDWP (BBL, 2004a).

The components of the remedy are summarized below:

- Installing a barrier wall around the eastern, western, and northern sides of the Upland Area, and along the top of bank on the southern side of the Area;
- As required to support redevelopment of the Phase II Area into a Park, regrading the Upland Area and removing, for offsite disposal/treatment, materials (potentially including demolition debris and piping) that cannot be used for regarding;
- Installing a multi-component cover or a 2-foot thick clean soil buffer (depending on the location) across the entire Upland Area;
- Long-term maintenance and monitoring, including collecting NAPL from passive NAPL recovery wells inside the barrier wall, which will be discussed in the *Site Management Plan*; and
- Establishing institutional controls to reduce the potential for exposure to MGP-impacted materials and prohibit the use of the Upland Area for purposes other than its Contemplated Uses (these controls are required by the VCA). Institutional controls are to be established and implemented by the property owners following completion of the remedial construction.

Following completion of the remedial program, the City of Amsterdam (the City) plans to expand the existing Riverlink Park (the Phase I Area) westward into the Upland Area. This expansion will comprise the Phase II

Area of the Riverlink Park. The Site grades shown on the Site Restoration Plan, included in the attached Design Drawings (Appendix A), reflect the preliminary Site grades of the Phase II Area as depicted by the City's designers, The Saratoga Associates (TSA) in a plan provided to BBL by TSA on August 15, 2005. Niagara Mohawk, BBL, and TSA worked interactively to develop the preliminary Site grades that would meet the needs of the remedy while providing the design components needed for the future park expansion. Once the Site restoration grades were defined, BBL worked from "top-down" to finalize the grades for the subsequently lower components of the multi-component cover and the limits of the required Upland Area excavation. The Site remedy, as detailed in this RWP, therefore integrates both the City's park development needs and the requirements of the Site remedy.

## 1.5 Report Organization

This RWP is organized into the sections listed below.

| Section | Description |
|---|---|
| 1 – Introduction | Presents the purpose and objective of this RWP, relevant background information, remedial action objectives, summary of selected Site remedy, related supporting documents, and report organization. |
| 2 – Previous Investigations, Predesign Investigation, and Modeling | Summarizes results of the previous investigations, predesign investigation, and modeling conducted to assist in developing the remedial design. |
| 3 – Pre-Remediation Activities | Describes the activities to be completed prior to implementation of the proposed remedial activities. |
| 4 – Remedial Action Activities | Summarizes the proposed remedial action activities to be conducted. |
| 5 – Post-Remedial Action Activities | Summarizes the post-remedial action activities to be conducted. |
| 6 – Design Drawings and Technical Specifications | Presents the list of Design Drawings and Technical Specifications to be used by the Contractor in implementing the remedial activities. |
| 7 – Schedule | Presents the anticipated schedule for the remedial activities. |
| 8 – References | Lists select sources consulted as references. |

In addition, the following RWP Documents (presented as appendices to this RWP) have been prepared to support the remedial activities at the Site.

| Title | Appendix | Description |
|---|---|---|
| Design Documents | A | Presents the Design Drawings and Technical Specifications. |
| Waste Handling Plan | B | Presents handling and disposition requirements for waste materials generated during the remedial activities. |
| Construction Quality Assurance Plan | C | Describes the Site-specific components of construction quality to document that construction activities meet or exceed the design criteria and specifications. |
| BBL's Health and Safety Plan, including Community Air Monitoring Plan | D | Describes the air monitoring activities to be implemented during the remedial activities. |
| Citizen Participation Plan | E | Describes the public participation activities that will be conducted relating to the remedial activities. |
| Subsurface and Groundwater Elevation Information | F | Provides detailed subsurface information for the Upland Area. |
| Modeling Summaries | G | Describes the additional groundwater and flood potential modeling activities completed as part of the remedial design subsequent to submission of the Upland Area RDWP. |
| Storm Water Pollution Prevention Plan | H | Summarizes the approach to mitigate potential storm water run-off issues during the Site remedial construction activities. |

# 2. Previous Investigations, Predesign Investigation, and Modeling

This section summarizes:

- Key environmental findings of the previous Site investigations,
- Activities completed during the predesign investigation (PDI); and
- Summary of the hydrogeologic and hydrodynamic modeling completed in support of remedial design activities.

## 2.1 Summary of Previous Investigations

The key findings regarding the nature and extent of MGP-impacted materials that are relevant to this Upland Area, as discussed in the *Phase II Area Investigation Report* (BBL, 2001) and *Mohawk River Investigation Summary Report* (BBL, 2002), are summarized below.

- MGP-impacted materials are present within the Upland Area, including in and around former MGP buildings and former utilities/structures.

- No discrete NAPL source areas were identified above the water table, and NAPL occurrence below the water table is widespread.

- Both dense NAPL (DNAPL) and light NAPL (LNAPL) are present in the subsurface below the Upland Area. In the Upland Area, NAPL is present (both as separate-phase tar and sheen) to depths of up to approximately 50 feet below the water table throughout much of the vertical thickness of the saturated overburden. NAPL has been observed to discharge to the river along the riverbank west of the existing terminal wall at one small discrete point during the annual lowering of the Mohawk River in 1998 and 1999. Following submittal of the *Phase II Area Investigation Report* (BBL, 2001), BBL conducted riverbank observation activities during the annual lowering of the Mohawk River in 2002 and 2003. The discrete NAPL discharge was observed in 2002; however, during the 2003 lowering of the river, no NAPL or sheens were observed along the riverbank. Hardened, immobile tar is also present on the riprap just east of the State Route 30 bridge.

- NAPL has not been observed in the competent bedrock underlying the area, nor has the bedrock groundwater quality been significantly impacted. The lack of significant impact within the bedrock may be the result of strong vertically upward hydraulic gradients that were observed between the underlying bedrock and saturated overburden along the north side of the river.

- Measurable vertical or horizontal gradients were not observed in the laterally and vertically extensive sand-and-gravel unit present below the Site. The lack of vertical gradients at locations where DNAPL was observed at depth below the river indicates that the DNAPL has not been, and therefore, will not likely be remobilized by existing hydraulic stresses (including the seasonal changes in the river level) within the unit.

- Dissolved-phase groundwater concentrations of MGP-related constituents, while causing exceedences of NYSDEC Class GA Standards and/or Guidance Values (NYSDEC, 1998) for groundwater quality

criteria in groundwater within the unconsolidated materials below the Upland Area, were shown to not adversely impact the Mohawk River surface water quality near and downstream of the Site.

- Groundwater from the Site is not currently used as a source of drinking water. The potential future use of groundwater as a drinking water source will be prevented by imposing a land use restriction in accordance with the VCA (NYSDEC, 1999). Direct contact with onsite groundwater by the general public is not likely because of the depth below the surface to groundwater.

- The Upland Area was found to be of poor wildlife habitat quality; therefore, no further evaluation of the terrestrial exposure pathway was warranted.

Appendix F presents subsurface and groundwater elevation information for reference. The subsurface information includes boring logs, test pit logs, well installation details, cross-sections with N-values, and available analytical data for soils. The groundwater elevation information provided herein was previously provided in the *Phase II Area Investigation Report* (BBL, 2001) and includes groundwater elevation contour maps and a table summarizing groundwater elevations.

## 2.2 Predesign Investigation Activities

A PDI was performed at the Upland Area in April and May 2005 to support the development of the remedial design. The scope of the PDI was detailed in the Upland Area RDWP, as approved by NYSDEC in a letter dated June 17, 2005 (Schick, 2005). The general activities completed during the PDI are outlined below along with a brief description as to how the findings were used in the development of this RWP.

- A detailed Site topographic and property boundary map was developed for use as the base map for the remedial design. All subsequent design components have been based on this map.

- A geotechnical investigation was completed along the alignment of the proposed barrier wall. The results of the geotechnical investigation, along with pre-existing subsurface data, were used in the development of the barrier wall configuration as shown on the Design Drawings (Appendix A).

- Hydraulic testing of piezometers installed in several of the geotechnical borings was completed. The results of this testing were used in refinement of the groundwater hydraulic model discussed in Section 2.3, below.

- Several test pits and additional borings were completed within the limits of Former Gas Holder No. 2. The findings of these investigations were used to evaluate whether the contents of the former holder would need to be removed or whether they could remain in place. The results of the evaluation indicated that the contents would not require removal as part of the remedy, other than incidental removal which may be needed in Site grading.

A complete summary of the activities completed and the results of the PDI were presented in the *Predesign Investigation Report* (BBL, 2005).

## 2.3 Groundwater Flow Modeling

BBL developed a three-dimensional (3-D) groundwater flow model using the United States Geological Survey (USGS) modular, 3-D, finite-difference groundwater flow model, known as MODFLOW (McDonald and Harbaugh, 1988). The model represents overburden and bedrock groundwater flow on a regional and site-specific scale. The model was calibrated to existing static and transient conditions, and then used to evaluate various barrier wall alternatives at the Upland Area and to predict water table configurations, hydraulic gradients, and groundwater flow rates associated with potential remedial alternatives, including the effects of seasonal water level changes in the river. The results of this modeling work were provided in the *Remedial Action Report* (BBL, 2004b). The data collected during the PDI were used to update and refine the previous version of the model. A memorandum documenting the revisions and subsequent output of the revised model is provided in Appendix G-1. The scenarios modeled and the associated results using the revised model are summarized below.

The following three remedial options were evaluated using the refined and recalibrated transient MODFLOW model.

(a) Full-perimeter, sealed sheetpile wall to the base of the sand and gravel;

(b) Full-perimeter, sealed sheetpile wall to a depth of 4 feet above the base of the sand and gravel along the southern wall alignment; and

(c) Full-perimeter, sealed sheetpile wall to the base of the sand and gravel except near boring locations BW-4 and BW-7 where the sheetpile wall is set to the depth of 6 feet above the base of the sand and gravel.

The latter two alternatives were developed to assess potential hydraulic conditions if the barrier wall were not installed to the base of the sand and gravel unit along all or a portion of the southern barrier wall alignment. These two scenarios were evaluated because the results of the geotechnical investigations completed during the PDI indicated that installation of sheetpiles to the base of the sand and gravel unit along certain portions of the southern wall alignment (particularly in the area of BW-4 and BW-7) may be difficult due to the presence of dense materials and/or cobbles/boulders.

The results for the baseline Option (a) indicated that a full sheetpile wall set to the base of the sand and gravel unit would produce neither the maximum nor the average downward vertical gradients greater than the threshold value that would be needed to mobilize LNAPL down from the upper part of the sand and gravel unit behind the sheetpile wall for the simulated period of 365 days. For the other two remedial options, the average downward gradients would also not mobilize LNAPL downward. Maximum downward hydraulic gradients sufficient to move LNAPL downward did occur for very short periods of time during the one-year simulation but during the balance of the year, the net driving force acting on LNAPL was upward. Although the model predicted a *potential* for downward LNAPL movement during brief, extreme periods, this assessment does not account for the capillary resistance of the formation, which could impede any downward LNAPL movement. In addition, during the balance of the year, buoyancy of the LNAPL would act to preferentially move the LNAPL upwards. Therefore, LNAPL is not expected to mitigate down along the inside of the sheetpile wall under any of the simulated scenarios.

With regard to the potential for upward DNAPL migration outside the barrier wall, none of the simulations indicated the presence of gradients sufficiently high to upwardly mobilize DNAPL in the sand and gravel outside of the barrier wall, even during peak upward flow conditions.

These results indicate that the sheetpile wall need not extend to the base of the sand and gravel at every location along the southern side of the Site to achieve the remedial goal of "*Eliminate, to the extent practicable, discharges of NAPL from the Phase II Area to the Mohawk River*" because the RAO can be achieved by cutoff of direct LNAPL discharge (i.e., physical containment) from the Upland Area to the river (if any is occurring) and hydraulic gradient control. Hydraulic gradient control is achieved because:

- The average hydraulic gradients on the inside of the wall do not result in the movement of LNAPL below the base of the wall (where the LNAPL could theoretically rise up into the base of the river due to its buoyancy relative to water); and

- The average hydraulic gradients on the outside (south side) of the wall do not result in the movement of DNAPL upward into the base of the river.

The model was also used to evaluate if the proposed sheetpile wall may produce groundwater mounding inside or outside the sheetpile wall. The modeling results indicate that within the limits of the sheetpile wall and following construction of the proposed remedy, groundwater mounding would not occur, above the existing groundwater condition in the Upland Area for any of the simulated sheetpile wall configurations. Slight mounding of the water table of approximately 1 foot relative to existing conditions, may occur north of the upgradient (north) side under each of the simulated conditions. Because of the potential for this slight groundwater mounding in this area, a high permeability backfill material along the exterior side of the northern and northern half of the western barrier wall has been included in the design. This high permeability backfill, installed with a base elevation of 259 feet (or approximately 1 foot higher that the previously observed highest groundwater elevation along the northern side of the Upland Area) will control the potential for unacceptable mounding in this area following installation of the barrier wall.

## 2.4 Mohawk River Hydrodynamic Modeling

The remedy for the Upland Area includes placement of fill materials as part of the composite cover construction. Because placement of this fill will raise existing grade, and much of the Upland Area is within the 100-year floodplain limits for the Mohawk River, an assessment of potential impacts to the 100-year flood elevation associated with the remedy was completed. This section briefly summarizes the assessment completed to evaluate the potential change in the 100-year flood elevation associated with the Upland Area remedial construction and the results of that assessment. A full summary of this assessment and the results is provided in Appendix G-2.

The general approach taken for this assessment was to model the 100-year flood elevation for the Mohawk River under baseline conditions (pre-remedial construction) and then model the 100-year flood elevation again after accounting for changes in grade elevation in the Upland Area following construction of the Site cover. The modeling was completed using an industry-standard model: RMA2. The RMA2 model is a public-domain, general purpose model designed for assessing surface water flow environments. RMA2 is a Federal Emergency Management Agency (FEMA)-approved model for determining water surface elevations for the National Flood Insurance Program (NFIP).

The RMA2 model grid used for this analysis extended from upstream of the Site at Lock 11E to downstream of the Site at Lock 10E (approximately 4.5 miles) and included overbank areas expected to flood during the 100-year flood. The RMA2 model required the following information as input data prior to conducting simulations:

- River bathymetry and floodplain topography;
- Bed roughness;
- Boundary conditions (upstream flow conditions and downstream water surface elevation); and
- Turbulent exchange coefficient.

Site-specific data or industry-standard default values (e.g., turbulent exchange coefficient) were utilized in this assessment. A detailed discussion of the input parameters is provided in Appendix G-2.

For this assessment, a 100-year flood was simulated to occur during the summer "navigation" season when the dams in the river cause the higher water surface elevations. Under this scenario, the upstream impacts of flooding are expected to produce the highest river stage. The 100-year flood was simulated with the RMA2 model for the baseline condition (pre-remedial construction). The model was then rerun using the Upland Area proposed post-remedial Site grades. The results of this modeling indicate that there is a maximum increase in potential 100-year flood elevation of 0.04 foot. These results suggest that there is not a significant upstream impact on flood stage due to the construction of the Upland Area remedy and that the grade elevations can be modified as proposed.

# 3. Pre-Remediation Activities

Before remedial activities can be initiated, a number of pre-remediation activities must be completed. These activities are discussed in this section and will include, but not be limited to, implementation of the Citizen Participation Plan, Contractor procurement, obtaining appropriate permits, Contractor submittals, and Site mobilization/preparation. This section identifies various activities and procedures that are general in nature, but are to be implemented by Niagara Mohawk, BBL, Niagara Mohawk's onsite representative, and/or the Niagara Mohawk-selected remedial Contractor. For all remedial construction activities, the Contractor is ultimately responsible for determining the means and methods to implement the Contractor-specific pre-remediation activities; however, the Contractor's approach (as detailed in a technical submittal to be prepared by the Contractor prior to performing the actual activity) will be subject to review by Niagara Mohawk and BBL.

As part of the engineering services performed during construction, Niagara Mohawk's onsite representative will be responsible for observing and documenting the remedial activities including the pre-remediation activities discussed in this section, the remediation activities discussed in Section 4 and the post remediation activities discussed in Section 5. The observation and documentation will be completed in accordance with the Construction Quality Assurance Plan (CQAP) provided as Appendix C.

## 3.1 Citizen Participation Plan Implementation

As discussed in Appendix E, Citizen Participation Plan, a number of public participation activities are implemented during the course of a remedial program. The most recent activities, distribution of a Fact Sheet in March 2005 and a public information meeting held on April 26, 2005, both discussed the proposed Upland Area remedy. Planned future Citizen Participation activities associated with this program consist of preparation and distribution of a Fact Sheet discussing the schedule and scope of the Upland Area remedial program. The Fact Sheet will be prepared and distributed by Niagara Mohawk in conjunction with NYSDEC prior to initiation of the remedial construction.

## 3.2 Contractor Procurement

Concurrent with NYSDEC's review of the RWP, Contract Documents, including a bid package, will be distributed to a number of qualified prospective contractors to solicit bids for the performance of the remedial activities. Prospective contractors wishing to perform the work will be required to submit a bid proposal in accordance with the requirements contained in the Contract Documents. Following receipt of the bid packages by the prospective contractors, a prebid meeting and Site visit will be conducted with all prospective contractors, Niagara Mohawk (the Owner for purposes of this project), BBL (the Engineer), and NYSDEC. The purpose of the prebid meeting and Site visit will be for prospective contractors to visually examine existing Site conditions and thoroughly acquaint themselves with the work required and potential challenges associated with performing the work. During the prebid meeting and Site visit, prospective contractors will have the opportunity to verify all existing Site conditions (including, but not limited to, materials of construction, structural conditions, and environmental conditions) to facilitate the preparation of an accurate proposal and work schedule.

Following the prebid meeting and Site visit, prospective contractors will submit their proposals for review by Niagara Mohawk and BBL. The review of the bid proposals will include, but not be limited to, conformance with the Contract Documents, proposed approach and methods for performing the remedial activities, comparison of bid prices and cost-sensitivity analysis, proposed work schedule, and experience and

qualifications. Following review of the bid proposals, a contractor will be selected and Niagara Mohawk will initiate the contracting process with the selected contractor.

## 3.3 Permitting

A number of permits and regulatory approvals or notifications will be obtained either by Niagara Mohawk and/or the Contractor (as applicable) before the start of remedial activities. Alternatively, as provided under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the substantive permit requirement approvals will be achieved in lieu of actual permits. Based on a review of the proposed design activities and information currently available, the following authorizations and/or notifications have been identified as potentially applicable with respect to permitting and regulatory approval of remedial activities:

| Number | Authorization/Notification | Issuing Party/ Organization | Potential Applicability |
|---|---|---|---|
| 1 | Highway Work Permit for Non-Utility Work | NYSDOT | The majority of the Upland Area is owned by NYSDOT. |
| 2 | Canal Work Permit | NYSCC | To access the Upland Area, land owned by NYSCC (including the railroad grade crossing) must be traversed. In addition, land owned by NYSCC will be used as a contractor/administrative area. |
| 3 | State Environmental Quality Review Act (SEQRA) Short Form | NYSDEC | Environmental assessment to address environmental impacts associated with the project. This is included with the Canal Work Permit application. |
| 4 | State Pollutant Discharge Elimination System (SPDES) General Permit for Storm Water (6 NYCRR Parts 750 through 757) | NYSDEC | Stormwater control measures during construction activities where greater than 1 acre is disturbed. Includes a Notice of Intent and completion of a Stormwater Pollution Prevention Plan (Appendix H). |
| 5 | Private Road Crossing Agreement | CSX Transportation, Inc. (CSX) | Required for access to Upland Area via Front Street grade crossing. |
| 6 | Right-of-Entry Agreement (Environmental Projects) | CSX | Required to perform work within permanent easement to the NYSDOT that is owned by CSX. |
| 7 | Local Permits or Approvals | City of Amsterdam, Montgomery County | Construction activities, floodplain issues, etc. |

Applicable permits (or substantive permit approvals) will be obtained by Niagara Mohawk and in place prior to initiation of remedial work at the Site. The Contractor will be responsible for procuring any local permits or approvals.

## 3.4 Contractor Submittals

Following award of the Contract, the Contractor will be required to prepare premobilization submittals, in accordance with the Contract Documents, and forward them to Niagara Mohawk and BBL for review and approval. Once approved by Niagara Mohawk, the Contractor submittals will be forwarded to NYSDEC for review. The Contractor will not be allowed to mobilize to the Site prior to review and approval of all required premobilization submittals. These submittals will include, but not necessarily be limited to:

- A *Site Management Plan* that addresses, at a minimum, procedures for the following: decontamination; materials handling and staging; erosion and sedimentation control; dust, vapor, and odor emissions control; excavation dewatering (if necessary); and the handling, transportation, and offsite disposal/treatment of wastes in accordance with the applicable rules and regulations. General descriptions of these procedures are discussed within the descriptions of the remedial activities.

- A *Contingency Plan* (see Section 3.3.1).

- A site-specific *Health and Safety Plan* (HASP) for use by the Contractor's onsite personnel. The health and welfare of the Contractor's staff will be the direct responsibility of the Contractor. The Contractor shall take all necessary precautions for the health and safety of all onsite Contractor employees, in compliance with all applicable provisions of federal, state, and local health/safety laws and the provisions associated with the site-specific HASP. The Contractor will be provided a copy of BBL's site-specific HASP prior to preparing its HASP to serve as a guideline. The Contractor will, however, assume sole responsibility for the accuracy and content of its HASP. The HASP will include an emission control plan that will present a detailed description of the air/odor emission controls to be implemented at the Site for each phase of the remedial action, and a *Community Air Monitoring Plan.*

- Shop drawings and other plans, as detailed in the Technical Specifications.

Additional submittals are outlined in the Technical Specifications (Appendix A).

### 3.4.1 Contingency Plan

The Contractor will prepare a *Contingency Plan* describing the provisions required for responding to Site-related emergencies that could occur during remedy implementation. The Contractor-prepared *Contingency Plan* will, at a minimum, include the following components:

- A Spill Response Plan for addressing spills that may occur onsite or within the adjacent Mohawk River as a result of the Contractor's activities or the remedial construction activities. The Spill Response Plan will describe the methods, means, and facilities required to prevent soil, water, structure, equipment, and material impacts caused by spills; provide information regarding spill containment and cleanup; and provide information related to decontamination measures;

- Procedures and routes for emergency vehicular access/egress;

- Procedures for evacuation of personnel from the Site;

- List of contact personnel with phone numbers that, at a minimum, includes NYSDEC Spill Response Hotline (1-800-457-7362); fire officials; ambulance service; local, county, and state police; local hospitals; and a spill response team. Procedures for notifying each party will also be included; and

- Routes to local hospitals, including written directions and a map that depicts the location of the Site relative to the hospital(s). The *Contingency Plan* shall also include protocols/procedures pertaining to the notification of the appropriate hospital personnel, depicting the nature and extent of possible chemical exposure.

In addition, the Contractor will be responsible for implementing non-spill response, non-emergency removal-related contingency measures.

## 3.5 Site Mobilization/Preparation

Following preparation of the submittals defined above, the selected Contractor will perform the Site mobilization/preparation activities and related functions described herein and as specified on the Design Drawings and in the Technical Specifications (Appendix A). As indicated in the Technical Specifications titled Submittals (MP-01310), the Contractor will be required to prepare a detailed schedule of proposed construction activities at the start of the project.

### 3.5.1 Site Review

Prior to or as part of Site mobilization, the Contractor will, at a minimum:

- Verify existing Site conditions to develop an understanding of the conditions that may be encountered during implementation of the remedial activities. This will include, but not be limited to, identifying the location of, and staking out, all aboveground and active underground utilities, equipment, and structures in the Upland Area.

- Establish survey control and limits of work.

- Contact the appropriate utility-locating agencies (e.g., Underground Facilities Protective Organization [UFPO]) prior to the start of intrusive activities. Certain utilities are located close to the barrier wall or excavation areas and will require demarcation and implementation of precautionary measures or temporary relocation to safeguard the utilities during intrusive activities. The Contractor will be responsible for identifying, relocating, protecting, or abandoning both aboveground and underground utilities, as required to facilitate the remedial activities.

### 3.5.2 Site Mobilization

Following establishment of the limits of work, the Contractor will, at a minimum:

- Provide all manpower, equipment, and supplies to the Site, as necessary, to implement the RWP. Equipment mobilized to the Site will be subjected to a visual review by Niagara Mohawk's onsite representative.

- Provide, mobilize, and maintain trailers at the Site, as required, to sustain the Contractor's offices, equipment, storage, and operations for the duration of the project. In addition, the Contractor shall provide a second trailer to accommodate Niagara Mohawk and Niagara Mohawk's onsite representative, and NYSDEC's onsite representatives.

- Provide and maintain a potable water supply and portable sanitary services for use by all onsite personnel engaged in the remedial activities.

- Install air monitoring equipment, as required, prior to intrusive activities and install emissions/odor controls in areas, as necessary, to mitigate potential offsite impacts.

- Install and maintain a chain link fence (with appropriate warning signs) and other Site controls to limit unauthorized access or unknowing access to those areas associated with the remedial activities, and to provide for safe work conditions. Prior to the start of remedial construction, segments of the existing Site fencing will be relocated. The segment of fencing along the western side of the Upland Area will be permanently relocated to the western property line. This fence is currently located to the east of the State Route 30 bridge. In addition, a portion of the fencing between the Phase I and Phase II Areas of the Park will be permanently removed and may be potentially reused elsewhere onsite. A temporary fence will be installed along the eastern edge of the project limit. Portions of the existing fencing that may be damaged during removal activities and cannot be reused will be disposed offsite in accordance with the *Waste Handling Plan* (Appendix B).

- Install temporary erosion and sedimentation controls in accordance with the *Draft New York Standards and Specifications for Erosion and Sediment Control* (National Resources Conservation Service [NRCS], 2003) and the *Storm Water Pollution Prevention Plan* (Appendix H) to temporarily control or divert surface water flow and mitigate the potential for erosion and migration of MGP-related constituents/materials. This includes installing an absorbent boom in the Mohawk River to mitigate the potential migration of oil sheens into portions of the Mohawk River that may be produced during installation of the barrier wall. If requested by Niagara Mohawk's onsite representative, the Contractor shall provide and install a silt (turbidity) curtain along the river's edge to contain excessive suspended solids. Work activities that initiated the need for the silt curtain will be suspended until the silt curtain is installed.

- Construct equipment and material decontamination area(s). As part of the Site preparation activities, the Contractor will construct a decontamination area for trucks, equipment, and personnel that come in contact with impacted materials during remedial activities. The Contractor will determine the final Site layout, including the location of the decontamination area. The decontamination area may be constructed in the Phase I Area if space is not available in the Upland Area. The Contractor will conduct sampling in the Phase I Area (if used) before and after construction of the decontamination area to confirm that this area was not affected by the decontamination activities. The decontamination area will be constructed as outlined in the Design Documents. Upon completion of the remedial activities, the decontamination area (including liner materials) will be removed and disposed/treated offsite in accordance with the *Waste Handling Plan* (Appendix B).

- Establish/construct the work areas and staging areas necessary for the remedial activities. Soil/debris excavated from the Upland Area that cannot be reused onsite for regrading shall be temporarily staged separately. The minimum requirements of the temporary soil staging areas are identified below within the descriptions of the remedial activities. To facilitate storage of the excavated soils, temporary staging areas will be constructed at one or more locations onsite. The Contractor will determine the final Site

layout, including the location of staging areas. Due to the nature of the Site, impacted materials that need to be transported offsite for treatment/disposal will likely be treated per NYSDEC's Technical and Administrative Guidance Memorandum (TAGM) No. 4061 (NYSDEC, 2002). Such materials, upon excavation, will generally not be considered a hazardous waste. The temporary staging areas will be constructed to contain surface water runoff, as defined in the Design Documents. Upon completion of the remedial activities, the temporary staging area(s) will be removed and disposed/treated offsite in accordance with the *Waste Handling Plan* (Appendix B).

- Provide temporary storage of water and waste materials removed/generated during implementation of the remedial activities. Upon completion of the remedial activities, the water will be removed and disposed/treated offsite in accordance with the *Waste Handling Plan* (Appendix B).

- Construct a temporary access road, as necessary, for ingress/egress of construction equipment and transporting excavated materials. Upon completion of the remedial activities, the temporary access road will be removed and disposed/treated offsite in accordance with the *Waste Handling Plan* (Appendix B).

- Implement Site controls and safety functions as follows:

  - A chain link fence exists and will be maintained along much of the Site perimeter. Additional warning signs will be posted along the perimeter fencing and in the vicinity of the entrance gates notifying the public that unauthorized entrance to the work area is prohibited. A sign-in/sign-out sheet will be maintained by the Contractor at the Site for the duration of the remedial activities.

  - Implementation of safe work practices will also provide for additional onsite security during remedial activities. Safe work practices that will contribute to overall Site security include the following:

    - Installing and maintaining temporary construction barriers (i.e., fencing, warning tape) around all open excavations, cleaning areas, stockpile areas, and other potentially dangerous areas;
    - Parking heavy equipment within designated areas and removing keys each day following completion of work activities;
    - Maintaining an organized work area, including proper storage of all tools, materials, and equipment;
    - Employing health and safety personnel at the Site while remediation activities are being conducted;
    - Employing security personnel to prevent entry of unauthorized personnel to the Site and to conduct periodic security checks during non-working hours; and
    - Providing an onsite security service person on the weekends for the duration of the remedial activities and/or as directed by Niagara Mohawk or BBL.

- Relocate light poles and jungle gym. The existing jungle gym and two light poles in the Phase I Area will be carefully disassembled and temporarily stored by the Contractor at a location designated by Niagara Mohawk.

### 3.5.3 Site Preparation

Following Site mobilization, a number of Site preparation activities will be completed prior to implementation of the remedial activities including, but not limited to:

- Protect and/or relocate utilities. All active onsite utilities must be protected during all Site-related activities. A waterline and storm sewer conflict with the barrier wall alignment. These utilities will be permanently relocated prior to remedial construction in accordance with the Design Documents. The hydrant associated with the waterline will also be removed. Utility-related materials taken out of service will be disposed offsite in accordance with the *Waste Handling Plan* (Appendix B).

- Remove and dispose vegetation. After the erosion controls are in place, and before construction activities begin, brush and trees will be removed, as needed, to provide access to the work areas. Above-grade vegetation that is cleared from the Site will be chipped, shredded, and/or cut and disposed offsite in accordance with the *Waste Handling Plan*. Below-grade materials (i.e., tree stumps and roots) that are cleared as part of the soil removal activities will be disposed offsite in accordance with the *Waste Handling Plan* (Appendix B).

- Abandon/remove select belowground structures. After the erosion controls are in place, and before construction activities begin, select belowground structures (e.g., catch basins in the southeast corner of the Upland Area, storm sewer piping, historical outfalls, top portion of existing steel sheeting to the east of Former Gas Holder No. 2, foundations and walls of historical structures including the former gas holders) will be abandoned or removed, as required. The structures to be abandoned/removed are specified on the Design Drawings (Appendix A).

  Decommission wells. After the erosion controls are in place, and before construction activities begin, all of the existing wells within the limits of the Phase II Area will be decommissioned, with the exception of MW-4S and MW-13. All other monitoring, recovery, and sentinel wells in the Upland Area will be decommissioned prior to initiation of surface grading activities. These wells will be decommissioned because they are:

  1) Along/within the proposed barrier wall alignment;
  2) Not needed for NAPL bailing (as they will be supplanted by the new 6-inch diameter recovery wells);
  3) Not needed for hydraulic monitoring. The barrier wall/engineered cover system will significantly flatten the water table within the Upland Area; therefore, one water table monitoring well will be sufficient to monitor the water table for potential mounding within the area; and
  4) Groundwater quality within the limits of the barrier wall is impacted by the presence of NAPL; therefore, collection of groundwater quality samples from multiple wells within the Upland Area is not needed to evaluate long-term trends in groundwater quality within this area.

  The wells to be decommissioned will be done so in general conformance with ASTM International (ASTM) Method D5299 (ASTM, 2005) and in accordance with Section 2 of the NYSDEC guidance document titled *Groundwater Monitoring Well Decommissioning Procedures* (NYSDEC, 1996). All existing well construction materials (i.e., casing, grout, and sand pack) will be removed by overdrilling each well. The removed materials will be disposed offsite in accordance with the *Waste Handling Plan*. Following removal of the well construction materials, the borehole will be tremie grouted with a cement/grout mixture. Detailed specifications for well decommissioning are provided in the Technical Specifications (MP-02414).

As indicated above, monitoring wells MW-4S and MW-13 within the Upland Area will be protected and retrofitted for continued use as monitoring wells following remedial construction. In addition, four monitoring wells, MW-5 and MW-11 (both of which are on the Phase I Area) and MW-16S and MW-16D (located west of the Upland Area) will be maintained for use in the post-remedial monitoring program. The locations of MW-11, MW-16S, and MW-16D are shown on the Design Drawings (Appendix A). Monitoring well MW-5 is located further to the east of MW-11 and is not shown. Unlike the other wells to be maintained, monitoring well MW-5 is not in or near the work area of the activities associated with the Upland Area and should, therefore, not require protection during implementation of the remedy.

# 4. Remedial Action Activities

This section presents a discussion of the RA components to be implemented as part of the selected remedy following the pre-remediation activities described in Section 3 above.

## 4.1 Overview

The following remedial activities will be performed by the Contractor:

- Installation of a barrier wall around all four sides of the Upland Area;
- Regrading of approximately 2,200 cy of soil at the Site to achieve desired grading;
- Offsite transportation and disposal/treatment of unsuitable materials that cannot be used in regrading;
- Importation of clean soil needed to achieve desired grading;
- Installation of NAPL recovery wells for passive recovery of NAPL that may be present in the subsurface at the Site;
- Installation of an engineered cover;
- Handling of soil and other construction-related materials (e.g., concrete, rip-rap, etc.) with associated transportation and offsite disposal/treatment by a NYSDEC- (or other state-) permitted waste management facility(ies);
- Handling of water, NAPL, and miscellaneous waste generated during the RA; and
- Site restoration.

## 4.2 Barrier Wall Installation

The Upland Area remedial alternative includes constructing a barrier wall around the perimeter of the Upland Area. The riverside wall will be placed along the approximate top of riverbank. The overall intent of the barrier wall is to eliminate (to the extent practicable) the migration/discharge of subsurface NAPL from the Upland Area to the Mohawk River through a combination of physical containment and hydraulic control. To accomplish this objective, approximately 1,170 linear feet of Waterloo Barrier® steel sheeting is to be installed around the perimeter of the project area and sealed to establish the barrier wall. The design configuration (i.e., location, alignment, depth) of the steel sheeting is depicted on the Design Drawings (Appendix A). In the event that field conditions limit the effectiveness of standard installation equipment and practices and/or preclude the advancement of the steel sheeting to the design configuration, the Contractor will be required to implement one or more of the contingency measures identified in the Technical Specifications or a Niagara Mohawk-approved alternate approach identified by the Contractor.

In addition to designing the barrier wall to support achievement of the RAOs, the design considered (but was not limited to) the following items: adequate clearance to the State Route 30 bridge and bridge pier, including the batter piles; the presence of subsurface obstructions such as debris and boulders that may be encountered while installing the barrier wall; the potential change in water table elevations in and around the Upland Area; the presence of subsurface utilities (storm sewer and water lines) and the presence of an existing terminal wall located along the southern boundary of the Phase I Area of the Park; and available information from the City regarding future development of the Phase II Area of the Park.

Based on the design configuration and existing subsurface information (Appendix F), additional measures (contingency measures) may be necessary above and beyond the standard methods typically employed to install steel sheetpile. The Technical Specification for the sheetpile identifies several contingency measures that the Contractor shall be prepared to implement. In addition, the Contractor is encouraged to identify possible alternate means and methods for advancing the steel sheeting in difficult installation areas. The contingency measures identified in the Technical Specification, as well as any potential Contractor-proposed and Niagara Mohawk-approved alternate means and methods, represent "best efforts" related to the installation of the steel sheeting.

In the event that "best efforts" have been implemented and the design depths for the southern and southern end of the eastern barrier wall have not been achieved, additional passive NAPL recovery wells will be installed as discussed in Section 4.4, below. However, no further action will be necessary along the remainder of the eastern wall, western wall, or along the northern wall because NAPL has not been observed in these areas.

The following items summarize the purpose, intent, installation approach, and acceptable outcome(s) related to the barrier wall:

- The overall goal of the barrier wall is to eliminate the migration/discharge of subsurface NAPL from the Site to the Mohawk River.

- While the above goal can be achieved through a combination of physical containment and hydraulic controls, as previously discussed in Section 2, NYSDEC desires additional conservative measures beyond what is necessary such that the barrier wall installation satisfies this goal through physical containment. The design configuration for the barrier wall reflects this NYSDEC-identified approach, and it is Niagara Mohawk's intent to achieve the design configuration. It is not certain, however, whether the existing subsurface conditions are amenable to the installation depths identified for portions of the barrier wall.

- In the event that difficult installation conditions are encountered, the Contractor will be required to implement one or more pre-identified contingency measures and/or alternate measures (if any are identified), and endeavor to achieve the design objective. These measures collectively represent "best efforts."

- In areas where the contingency measures are unable to achieve the design configuration, the remedial goal of the barrier wall can be achieved with the installation of appropriately located and installed NAPL recovery well(s) and inclusion of that well(s) in the future passive NAPL recovery program.

To connect the barrier wall to the engineered cover system, a concrete pile cap will be installed along the top of the barrier wall after the barrier wall has been installed.

### 4.2.1 Pre-Trenching, Pre-Drilling, and Pre-Driving to Install Barrier Wall Sheeting

As discussed in detail in the Technical Specification for Barrier Wall Installation (MP-02411), subsurface conditions present along portions of the barrier wall alignment could require that pre-trenching, pre-drilling, and/or pre-driving be completed to install the steel sheeting to the design configuration. As also discussed in the Technical Specification for Barrier Wall Installation (MP-02411), the Contractor will be encouraged to propose alternate methods for sheeting installation.

Pre-trenching involves excavating material from ground surface using a hydraulic excavator. The Contractor will be responsible for excavation support and safety during this activity. Material that is excavated will be temporarily stockpiled adjacent to the sheeting alignment and will be replaced and/or regraded elsewhere onsite either following removal of oversize materials or after the barrier wall sheeting is installed. In some cases, the material may not be suitable for reuse, as discussed in Section 4.3. If the material is not suitable for reuse, the material will be segregated for proper offsite disposal/treatment. It is anticipated that the volume of material that is temporarily stockpiled adjacent to the sheeting alignment at any given time (i.e., before it is reused following successful sheeting installation) will be limited to less than 100 cubic yards.

Pre-drilling involves drilling a hole with augers fitted with standard or special cutting heads on the lead auger. The primary intent of the pre-drilling is to loosen the materials and/or push oversize material to the side or, in some cases, to break the obstruction.

Pre-driving involves driving a sacrificial steel H-pile, pipe pile, or a heavy-gauge sheetpile to break oversize materials and/or push them to the side so that the barrier wall sheeting can be re-inserted and driven to the design depth.

All spoil generated during these activities will be appropriately handled and disposed/treated offsite in accordance with the Technical Specifications (Appendix A) and the *Waste Handling Plan* (Appendix B).

### 4.2.2 Sheetpile Driving

It is anticipated that pile driving equipment at the Site will include a crane-mounted vibratory hammer, a crane-mounted diesel impact hammer, and an excavator-mounted side-grip vibratory hammer. The Contractor will be responsible for installing the steel sheetpiling in accordance with the "best efforts" described in the Technical Specifications. "Best efforts" will include pre-trenching, pre-drilling, and pre-driving as described above in Section 4.2.1, and any additional Contractor-proposed/Niagara Mohawk-approved alternate measures.

The Contractor will contact and coordinate with NYSDOT prior to beginning sheetpile installation adjacent to and under the State Route 30 bridge overpass. The Contractor will also contact and coordinate with NYSCC prior to beginning work along the Mohawk River (i.e., prior to installing steel sheetpiling along the "South Wall" presented on the Design Drawings).

Additional pile driving details will be described in a *Sheetpile Installation Plan* to be prepared by the selected Contractor.

## 4.3 Soil Excavation

Prior to construction of the engineered cover and access road in the Upland Area, removal of soil will be required to achieve the desired subgrade elevations. Active underground piping and/or utilities present within the excavation areas would be appropriately addressed (e.g., supported, deactivated, disconnected, rerouted, and/or repaired). No deep excavations are anticipated for the Upland Area.

Excavation of the soils will be conducted using conventional construction equipment such as backhoes, front-end loaders, etc. In areas where active underground utilities or other piping structures are anticipated to be encountered, soil removal will be conducted by hand and/or a vacuum truck. Excavated materials from the

Upland Area will be reused as an onsite backfill and grading material (below the cover) or transported offsite for treatment/disposal as discussed below.

All soil placed during Site regrading activities will be placed within the limits of the barrier wall, below the engineered cover and above the water table. These soils will, therefore, be isolated and away from potential future human or environmental exposure. In addition, the engineered cover has been designed with the goal of reducing, to near zero, the infiltration of surface water into the Upland Area. Elimination of surface infiltration will mitigate dissolution of constituents located above the water table and will also prevent transport of NAPL (if any is present above the water table) via hydraulic mechanisms.

Because of these factors, the criteria for soil that would require offsite disposal/treatment will be as follows:

- Soils containing significant volumes of NAPL will be segregated for offsite transportation and disposal/treatment;

- Soils containing minimal volumes of NAPL, which would be incorporated into the soil volume when excavated, may be reused as backfill under the engineered cover. A determination as to whether the soil will be used as backfill will be based on a field review of the soil conditions by Niagara Mohawk's onsite representative and NYSDEC's onsite observer;

- Soil exhibiting staining or sheening will be used for Site regrading below the engineered cover; and

- Soil exhibiting odors (and no staining) and soil exhibiting no characteristics of MGP-related oils or tars will be used onsite for regrading below the engineered cover.

The suitability of excavated soil for use in regrading the Site will be determined in the field in accordance with the above criteria by Niagara Mohawk's onsite representative who will consult with the onsite NYSDEC observer on an as-need basis in the event that a clear distinction between reuse and offsite disposal/treatment cannot be made for soil from a particular area or areas.

Soils slated for offsite transportation will be placed within a staging area(s), which will be bermed and lined with an impermeable membrane. Staged materials will be temporarily covered with a polyethylene cover to protect the materials from wind and rain. The polyethylene cover will be sufficiently anchored to withstand wind forces and minimize the potential for ponding of water on top of the cover. Precautions will be taken to protect the integrity of the staging area impermeable membrane (e.g., placement of a granular cushion layer over the membrane and geotextiles directly above and below the membrane). As needed, waste characterization samples of the staged material will be submitted for laboratory analysis prior to offsite transportation and disposal/treatment.

Groundwater removal from the various excavations is not anticipated as the excavations are anticipated to be above Site groundwater elevations. However, if water does collect within the excavations as a result of, for example, surface water run-on, and that water must be removed to facilitate completing the required excavation activities, the water will be pumped out of the excavation and managed in accordance with the Contractor's water management plan and in accordance with all applicable rules and regulations.

Air monitoring will be conducted during the excavation activities as described in the Contractor's HASP, Appendix D – BBL's HASP, and the Technical Specification titled Air Monitoring Program (MP-02508). To the extent possible, excavation activities will not be performed during periods of precipitation. Odor-suppression foams will be used to control odors and/or emissions on an as-needed basis.

Backfilling and regrading activities will be conducted in accordance with the Technical Specifications (Appendix A).

## 4.4 Recovery Wells

### 4.4.1 Passive NAPL Recovery Well Installation

Eleven new passive NAPL recovery wells (RW-4 through RW-14) will be installed proximate to the interior southern and eastern sides of the barrier wall. The passive NAPL recovery wells will be installed at "predetermined" locations spaced approximately 50 feet from each other, generally 5 feet from the inside of the barrier wall. The wells will be installed as outlined in the Technical Specification for Passive NAPL Recovery Well and Well Decommissioning (MP-02414). As discussed in the Technical Specification for Barrier Wall Installation (MP-02411), the location of the "predetermined" recovery wells maybe modified, or "supplemental" recovery wells added to the proposed recovery well layout depending on whether or not the barrier wall sheeting can be installed to the design depth. For the purpose of this discussion only, areas (if any are encountered) where the sheeting is not installed to the design depth will be collectively referred to as "area(s) of non-attainment."

The criteria that will be used to determine whether the locations of the "predetermined" recovery wells are modified, and/or whether supplemental recovery wells are added, is provided below.

- Modification of "Predetermined" Recovery Well Location
    - The location of a "predetermined" recovery well will be modified, without adding a "supplemental" recovery well, if the general area of non-attainment can be addressed (i.e., placing the recovery well in the general area of the non-attainment) by adjusting the location of a "predetermined" recovery well by up to 10 feet along the length of alignment of the sheeting.
- Addition of "Supplemental" Recovery Well(s) (with or without adjusting the "predetermined" recovery well locations)
    - One or more "supplemental" recovery wells will be added between the locations of any two "predetermined" recovery wells if adjustment of the location of the "predetermined" recovery well alone will not place the "predetermined" recovery well in the general area of non-attainment. In no instance, however, will the average spacing between "supplemental" recovery wells to the adjacent two "predetermined" recovery wells be less than less than 25 feet to satisfy the criteria of being "in the general area of non-attainment."

BBL will provide NYSDEC with the proposed locations of the passive NAPL recovery wells for approval prior to installation.

As indicated on the Design Drawings and in the Technical Specifications (Appendix A), the passive NAPL recovery wells will be constructed of a 6-inch diameter PVC casing well sump and 0.020-inch slot screens. The screened intervals will extend from the elevation of the base of the barrier wall adjacent to each recovery well to above the seasonal "high" water table, as represented by water table elevation contours developed for November 18, 1999, as shown on Figure 10 of the *Phase II Area Investigation Report* (BBL, 2001). The recovery wells will be equipped with a locking inner cap contained within a bolt-down, flush-mount curb box.

The top of casing of all new wells will be marked and the elevation determined by survey to the nearest 0.01 foot, relative to the onsite datum. The measuring point on all wells will be the innermost PVC casing, at the highpoint of the casing, if any.

Following well installation, a detailed log of each passive NAPL recovery well will be prepared and included in the *Final Remedial Action Engineering Report* discussed in Section 5.1 below.

### 4.4.2 Existing Wells

The risers of the existing two wells located within the Upland Area (i.e., MW-4S and MW-13) will be extended. The wells will be extended as outlined in the Technical Specifications (Appendix A). The three wells located outside of the limits of the engineered cover system (i.e., MW-16S/16D and MW-5) do not need an extension to be accessed. The extended top of all existing wells will be marked and the elevation determined by survey to the nearest 0.01 foot. The measuring point on all wells will be the innermost PVC casing, at the highpoint of the casing, if any.

A long-term groundwater sampling and analysis plan and a NAPL monitoring plan, including the existing and new wells, will be presented in the forthcoming *Site Management Plan.*

## 4.5 Engineered Cover Installation

As part of the remedial activities, an engineered cover system will be installed over certain portions of the Site as depicted on the Design Drawings. The engineered cover system within the limits of the barrier wall will consist of (from bottom to top) a geosynthetic gas venting layer to relieve the potential buildup of air pressure underneath the liner system as a result of fluctuating groundwater conditions, a high-density polyethylene (HDPE) flexible membrane liner (FML) to minimize the potential for downward migration of infiltrated surface water, a geosynthetic drainage layer to reduce the potential for excessive pore water pressure buildup above the FML, and a minimum of 30 inches of protective soil cover over the top of the geosynthetic drainage layer. The FML component of the cover system will be attached to the top of the barrier wall concrete pile cap. The FML will also be connected to the four State Route 30 bridge piers. Additionally, a demarcation layer (anticipated to consist of bright yellow or orange construction fencing-type material laid flat) will be installed approximately 1 foot above the geosynthetic drainage layer to reduce the potential for damage to the cover system geosynthetics as a result of future, uncontrolled excavations. To provide for changes in the groundwater elevation and subsequent change in the thickness of the saturated zone within the area of the barrier wall, a 6-inch diameter perforated PVC soil gas vent line will be installed as part of the engineered cover system. A gas vent/intake will be installed in the northwest corner of the Site under the State Route 30 bridge, and the gas vent/intake will be surrounded by a chain link fence.

The area of the Site immediately north (outside) of the barrier wall, and within the property limits, will be covered with a minimum of 2 feet of soil material underlain with a demarcation layer as described above. The primary purpose of the soil cover north of the barrier wall is to reduce the potential for human and animal contact with residual subsurface soils. Where proposed final grades within this area are less than 2 feet above pre-construction grades, existing soils will be excavated as required to achieve a minimum of 2 feet of soil cover above existing Site soils following the completion of final grading and Site restoration activities. Excavated soils from the area north of the barrier wall will be either utilized as subgrade fill within the limits of the barrier wall or disposed/treated offsite, as appropriate.

The finished surfaces of the engineered and soil cover will be stabilized as appropriate to their anticipated future use (e.g., gravel for the proposed access road, vegetated topsoil for lawn areas, etc.) to reduce the potential for erosion.

To reduce erosion of the engineered cover system due to surface runon, extensions will be installed on the two downspouts from the State Route 30 bridge. The extension pipe will be the same size and material as the existing downspouts, and will run from the existing end to the Mohawk River. To divert surface runon from areas upgradient of the Site, a drainage ditch will be installed along a segment of the Upland Area perimeter. In addition, a new HDPE storm sewer line, including two new catch basins and two new manholes, will be installed along the northern and eastern sides of the Phase II Area. One of the manholes will be tied into the storm sewer from the Phase I Area.

Subsequent to completion of the Upland Area remedial activities, the City of Amsterdam will expand the existing Riverlink Park (the Phase I Area) to include most of the Upland Area. Park construction activities will occur above the engineered cover system and will likely include installation of storm sewers, shallow utilities (e.g., for lighting), sidewalks, and shallow building foundations.

## 4.6 Noise, Dust, and Vapor Emissions, and Odor Control

Adequate measures will be taken during implementation of the remedial activities to keep noise levels, produced by construction equipment, to safe and tolerable limits, as set forth by the Occupational Safety and Health Administration (OSHA), the United States Environmental Protection Agency (USEPA), and any applicable New York State or local code ordinances. All construction equipment posing a potential noise nuisance will be outfitted by the Contractor with noise-muffling devices.

Air emissions/odors from the soil excavation areas and stockpiles of excavated soil will be controlled to limit offsite impacts. The emissions will be controlled through the use of emission suppressants. The Contractor will be required to submit an emission control plan to address potential emissions during the excavation efforts. This plan will contain a monitoring program that includes both real-time and time-integrated air sampling to document that the treatment system is working as designated.

During intrusive Site excavation and materials handling activities, the Contractor will implement real-time air monitoring (in accordance with requirements set forth in the New York State Department of Health's [NYSDOH's] *Generic Community Air Monitoring Plan*) at the Site perimeter/fenceline for polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and particulate matter less than 10 microns in diameter ($PM_{10}$). The Site perimeter will be considered the start of the surrounding community for the purposes of the community air monitoring program. Monitoring will be performed continuously during intrusive Site excavation and materials handling activities at locations upwind and downwind along the fenceline with instrumentation that is equipped with electronic data-logging capabilities. Monitoring station locations will be determined daily through observation of an onsite meteorological monitoring station. A more detailed description of the air monitoring program, including routine requirements, action levels for increased monitoring, provisions for corrective actions to address air emissions, and/or provisions for remedial action modifications/work stoppage, is provided in BBL's HASP (Appendix D) and will be included in the Contractor's HASP. Details regarding the air monitoring activities to be conducted by Niagara Mohawk's onsite representative during implementation of the RWP are presented in Section 6 of BBL's HASP.

## 4.7 Equipment Decontamination

All non-disposable equipment used during implementation of the remedial construction activities will be decontaminated before being removed from the Site. If MGP-related by-products are encountered and equipment is in contact with this material, equipment decontamination will be performed in the designated onsite area. All material used in equipment washing including, but not limited to, detergent solution, rinsate, rinse water, towels, disposable equipment, and polyethylene sheeting, will be collected and managed as described in the *Waste Handling Plan* (Appendix B).

## 4.8 Waste Handling, Treatment, and Disposal

Soil, water, NAPL, debris, and miscellaneous wastes generated during the remedial activities will be handled and disposed/treated offsite in accordance with: the Technical Specifications (Appendix A); the *Waste Handling Plan*; (Appendix B) and all applicable federal, state, and local regulations. Excavated soils that meet the criteria for reuse, as discussed above in Section 4.3, will be used as an onsite backfill material below the engineered cover. Water, NAPL, debris, and miscellaneous wastes generated during remedial activities will be collected, characterized, and disposed/treated offsite.

## 4.9 Site Restoration/Demobilization

At the conclusion of remedial construction activities, the Upland Area will be restored as provided for on the Design Drawings and in the Technical Specifications (Appendix A). Site restoration activities will generally include the following activities:

- Importing, placing, and compacting selected fill materials in the Upland Area to provide final elevations as shown on the Design Drawings;
- Restoring all other surface features disturbed, damaged, or destroyed during implementation of the remedial activities to their pre-construction condition; and
- Vegetating the engineered cover and installation of temporary and permanent erosion control measures.

Site demobilization activities will consist of:

- Dismantling the work area(s), staging area(s), equipment and material decontamination area(s), and non-site restoration-related sediment and erosion control measures;
- Cleaning/decontaminating equipment and construction-related materials prior to removal from the Site; and
- Removing from the Site all materials, equipment, and support structures.

## 4.10 Survey

Survey measurements will be conducted by a New York State licensed surveyor to establish and confirm the remedial construction work. Ultimately, the surveyed information will be used to establish the proper location and grade control for the construction components, as well as to document that the remedial activities have been completed consistent with the project design requirements. This information will be presented in the *Final Remedial Action Engineering Report* to be prepared upon completion of the remedial activities. Survey work

associated with the remedial activities will be performed in accordance with the Technical Specification for Survey Control (MP-01160).

# 5. Post-Remedial Action Activities

## 5.1 Preparing a Final Remedial Action Engineering Report

Upon completion of the remedial activities, a *Final Remedial Action Engineering Report* will be prepared by BBL for submittal to NYSDEC. A Professional Engineer licensed in New York State will prepare the *Final Remedial Action Engineering Report.*

In general, the *Final Remedial Action Engineering Report* will present the following information:

- Description of the remedial activities, including variations (if any) from the NYSDEC-approved RWP;
- Record construction plans detailing the remedial activities;
- Certification Statement; and
- Information and documentation regarding the final disposition of materials disposed/treated offsite during implementation of the remedial activities.

A professional engineer licensed in New York State will prepare, sign, and seal the *Final Remedial Action Engineering Report*, including the record drawings and certification.

## 5.2 Establishing Institutional Controls

The VCA (Paragraph XI) requires that institutional controls be established at the Upland Area. Institutional controls would prohibit the Upland Area from being used for purposes other than the Contemplated Use (a public recreation area and public highway) and prohibit the use of onsite groundwater without treatment. Institutional controls would be implemented to facilitate maintaining the integrity of a remedy and associated engineering controls, and to inform future workers (e.g., Park maintenance crews) engaged in potential subsurface activities on the health and safety considerations associated with MGP-impacted materials. As required by the VCA, the institutional controls are to be established by the property owner following NYSDEC acceptance of the *Final Remedial Action Engineering Report* documenting the remedial activities.

## 5.3 Monitoring of Post-RA Conditions

At the conclusion of the RA activities, a *Site Management Plan* will be prepared that will describe additional post-remedial activities to be completed at the Site. This plan will include the following activities:

- A groundwater monitoring program consisting of annual sampling and analysis of wells associated with the Site will be conducted for 5 years following completion of the RA. After 5 years, the groundwater monitoring program will be evaluated to determine if the program should be modified.

- An inspection and maintenance program for maintaining the integrity of the surface cover.

- Passive NAPL monitoring and collection will continue in the newly installed wells and remaining existing wells. The NAPL assessment program includes using an oil/water interface probe to monitor

the potential accumulation of NAPL in each of the onsite wells. If a measurable thickness of NAPL is present, then the NAPL is removed.

- A contingency plan that will outline the steps to be implemented if any element of the remedial design fails to achieve its objectives or otherwise fails to protect human health or the environment.

# 6. Design Drawings and Technical Specifications

As required by the VCA, this RWP contains the biddable quality documents for the remedial design including, but not limited to, Design Drawings and Technical Specifications. Once these design documents are finalized, they will be signed and sealed by a professional engineer licensed in New York State. These drawings and specifications are to satisfy applicable local, state, and federal laws, rules, and regulations.

## 6.1 Design Drawings

The following Design Drawings are provided in Appendix A:

G-1 General Notes
G-2 Existing Site Plan
G-3 Erosion and Sedimentation Control Plan
G-4 Erosion and Sedimentation Control Details
G-5 Site Preparation, Utilities Relocation, and Material Handling Plan
G-6 Barrier Wall Plan
G-7 Tie-Wall Plan and Profile
G-8 Barrier Wall Profile - North Wall (Stations 0+00 to 3+93)
G-9 Barrier Wall Profile - South Wall (Stations 5+82 to 10+56)
G-10 Barrier Wall Profile - East Wall (Stations 3+93 to 5+82) and West Wall (Stations 10+56 to 11+52)
G-11 Subgrade Preparation Plan
G-12 Liner System Grading Plan
G-13 Surface Grading and Site Drainage Plan
G-14 Site Restoration Plan
G-15 Section and Details
G-16 Section and Details
G-17 Section and Details
G-18 Section and Details
G-19 Section and Details
G-20 Section and Details
G-21 Section and Details

When these drawings are finalized and signed/sealed by a professional engineer, they will be issued to prospective contractors in the form of Contract Drawings.

## 6.2 Technical Specifications

Technical Specifications related to materials to be used by the Contractor in implementing the remedial activities, as well as performance requirements have been developed as part of the final design. As with the Design Drawings, once the specifications are finalized, these Technical Specifications will be issued to prospective contractors in the form of Contract Documents. The Technical Specifications prepared as part of this design include:

Section 01010 - Summary of Work
Section 01046 - Control of Work

Section 01110 - Environmental Protection Procedures
Section 01160 - Survey Control
Section 01200 - Project Meetings
Section 01300 - Submittals
Section 01540 - Site Security
Section 01720 - Project Record Documents
Section 01901 - Field Office Trailer and Other Support
Section 02201 - Earthwork
Section 02202 - Rock and Debris Removal
Section 02203 - Site Grading
Section 02205 - Excavation Support and Protection
Section 02206 - Selected Fill
Section 02208 - Restoration of Surfaces
Section 02209 - Clearing
Section 02210 - Topsoil and Seeding
Section 02232 - Geotextile Fabric
Section 02273 - Geosynthetic Drainage Composite
Section 02274 - Flexible Membrane Liner
Section 02399 - Piping/Utility Abandonment
Section 02411 - Barrier Wall Installation
Section 02414 - Installation of NAPL Passive Recovery Wells and Well Decommissioning
Section 02415 - Impacted Material Handling and Soil Excavation Procedures
Section 02500 - Drainage Piping Installation
Section 02501 - Underground Pressure Piping Installation
Section 02508 - Air Monitoring Program
Section 02510 - Water Distribution System
Section 02514 - Precast Concrete Manholes, Catch Basins, and Structures
Section 02675 - Pressure and Leakage Testing
Section 02711 - Galvanized Chain Link Fence
Section 03002 - Reinforced Concrete Pile Cap

# 7. Schedule

This section discusses the schedule from the initial submittal of design components for review to NYSDEC through initiation of remedial construction Site activities. The selected remedial contractor will be responsible for development of a remedial construction schedule from construction initiation through completion of construction.

| Schedule Component | Date |
|---|---|
| Draft Barrier Wall Design Document submittal to NYSDEC | September 6, 2005 |
| Draft RWP submittal to NYSDEC | September 16, 2005 |
| Niagara Mohawk and NYSDEC conference call to review RWP comments | September 26, 2005 |
| Niagara Mohawk and NYSDEC address/approve changes on Draft RWP | October 6, 2005 |
| Niagara Mohawk distributes final RWP | October 7, 2005 |
| Niagara Mohawk receives NYSDEC unconditional approval of RWP | October 11, 2005 |
| Niagara Mohawk places sheetpile order | October 14, 2005 |
| Niagara Mohawk distributes requests for proposal to prospective remedial contractors | October 14, 2005 |
| Niagara Mohawk conducts pre-bid Site meeting | October 21, 2005 |
| Prospective contractors submit bids | November 4, 2005 |
| Niagara Mohawk reviews received bids and awards contract | November 23, 2005 |
| Contractor prepares/submits initial submittals and Niagara Mohawk approves submittals | December 14, 2005 |
| Contractor mobilizes to the Site | December 19, 2005 |

Initiation of remedial construction will be contingent on meeting all of the initial schedule components defined above and receipt of all required permits, access agreements, and approvals. Niagara Mohawk, as indicated above, intends to "pre-purchase" the sheetpile so as to mitigate potential schedule impacts resulting from the lead time associated with ordering these materials; however, the exact duration of the lead time will not be known until the order is placed and remedial construction cannot start until the sheeting is delivered.

# 8. References


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# *Appendices*

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# *Appendix A*

# Design Documents

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# *Design Drawings*

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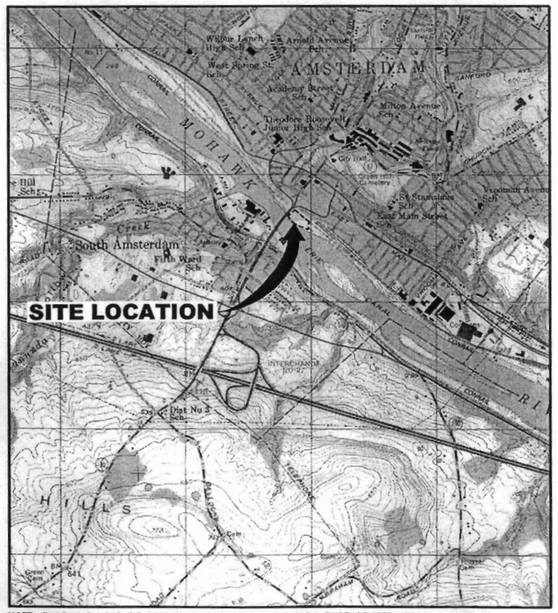
## DESIGN DRAWINGS

# UPLAND AREA REMEDIATION WORK PLAN

## FORMER MANUFACTURED GAS PLANT SITE

## FRONT STREET, AMSTERDAM, NEW YORK




NOTE: BASE MAP USGS 7.5 MIN. QUAD., AMSTERDAM, NY, 1954, PHOTOREVISED 1980.

0 2000' 4000'
GRAPHIC SCALE

LOCATION MAP

X: 36676X01.TIF, 36676X02.TIF
L: ON=*, OFF=REF
P: PAGESET/SYR-DL
10/07/05 SYR-85-KLS GHS BCP
36676040/CONTRACT/WORKPLAN/36676G01.DWG

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**OCTOBER 2005**

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**INDEX TO DRAWINGS**


**GENERAL**

| | |
|---|---|
| G-1 | GENERAL NOTES |
| G-2 | EXISTING SITE PLAN |
| G-3 | EROSION AND SEDIMENT CONTROL PLAN |
| G-4 | EROSION AND SEDIMENT CONTROL DETAILS |
| G-5 | SITE PREPARATION, UTILITY RELOCATION, AND MATERIAL HANDLING PLAN |
| G-6 | BARRIER WALL PLAN |
| G-7 | TIE-WALL PLAN AND PROFILE |
| G-8 | BARRIER WALL PROFILE - NORTH WALL (STATIONS 0+00 TO 3+93) |
| G-9 | BARRIER WALL PROFILE - SOUTH WALL (STATIONS 5+82 TO 10+56) |
| G-10 | BARRIER WALL PROFILES - EAST WALL (STATIONS 3+93 TO 5+82) AND WEST WALL (STATIONS 10+56 TO 11+52) |
| G-11 | SUBGRADE PREPARATION PLAN |
| G-12 | LINER SYSTEM GRADING PLAN |
| G-13 | SURFACE GRADING AND SITE DRAINAGE PLAN |
| G-14 | SITE RESTORATION PLAN |
| G-15 | SECTIONS AND DETAILS |
| G-16 | SECTIONS AND DETAILS |
| G-17 | SECTIONS AND DETAILS |
| G-18 | SECTIONS AND DETAILS |
| G-19 | SECTIONS AND DETAILS |
| G-20 | SECTIONS AND DETAILS |
| G-21 | SECTIONS AND DETAILS |

## GENERAL NOTES (DRAWINGS G-1 THROUGH G-21):

1. BASE MAP INFORMATION (EXISTING CONDITIONS) BASED ON FEBRUARY AND APRIL 2005 FIELD SURVEYS PROVIDED BY C.T. MALE ASSOCIATES, P.C., PHASE I AREA BUILDING AND JUNGLE GYM APPROXIMATE LOCATIONS PROVIDED BY THE SARATOGA ASSOCIATES.
2. ELEVATIONS ARE IN FEET AND BASED ON NEW YORK STATE CANAL CORP. VERTICAL DATUM FOR SECTION 3, LOCK E-11. BENCHMARK LOCATED AT EASTERLY END OF EXISTING TERMINAL WALL (ELEVATION 264.32).
3. ORIGINAL PLAN ORIENTATION AND BEARING BASE PER PERMANENT SURVEY MARKERS 2E37 AND 2E38 (NYSDOT AMSTERDAM NORTH NORTH-SOUTH ARTERIAL PROJECT) LOCATED IN THE FIELD. CURRENT BASE MAP TRANSLATED INTO NY STATE PLANE, EASTERN ZONE, NAD83 COORDINATE SYSTEM (FEET) BY C.T. MALE ASSOCIATES, P.C.
4. APPROXIMATE LOCATION OF HISTORICAL FEATURES SHOWN ON BASE MAP TAKEN FROM A MAP BY HARZA DATED 12/2/98 AND TITLED: SITE MAP WITH HISTORICAL STRUCTURES. ALL ABOVE-GRADE PORTIONS OF HISTORICAL FEATURES HAVE BEEN DEMOLISHED.
5. APPROXIMATE LOCATION OF FORMER GAS HOLDER NO. 1 BASED ON FIELD OBSERVATIONS DURING THE INSTALLATION OF TEST PIT TP-17A DURING THE PSA AND TP-32 DURING THE PHASE II AREA INVESTIGATION.
6. ALL EQUIPMENT OPERATED WITHIN THE PROJECT LIMITS SHALL BE CLEANED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS UPON ARRIVAL TO THE SITE, PRIOR TO TRANSPORT OFFSITE, AND PRIOR TO HANDLING CLEAN BACKFILL MATERIALS.
7. THE CONTRACTOR SHALL VERIFY THE PRESENCE AND LOCATION OF ALL ABOVEGROUND AND UNDERGROUND SITE FEATURES RELEVANT TO AND POTENTIALLY TO BE ENCOUNTERED DURING PERFORMANCE OF THIS PROJECT. THE LOCATIONS OF ALL STRUCTURES/UTILITIES SHOWN ARE APPROXIMATE. ADDITIONAL SITE FEATURES MAY BE PRESENT THAT ARE NOT SHOWN ON THE DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE PRESENCE AND LOCATION OF SUCH FEATURES.
8. THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF UNDERGROUND AND OVERHEAD UTILITIES, WHICH MAY POTENTIALLY BE ENCOUNTERED DURING CONSTRUCTION.
9. THE CONTRACTOR SHALL COORDINATE WITH THE APPROPRIATE UTILITY COMPANIES FOR THE TEMPORARY BRACING, REMOVAL, RELOCATION, AND REPLACEMENT OF ANY UTILITY POLES, GUY WIRES, UNDERGROUND UTILITIES, AND/OR OVERHEAD WIRES THAT ARE NEAR OR WITHIN THE LIMITS OF CONSTRUCTION, OR THAT MAY INTERFERE WITH THE REMEDIAL ACTIONS.
10. DIFFERENCES IDENTIFIED BY THE CONTRACTOR BETWEEN THE DESIGN DRAWINGS AND ACTUAL SITE CONDITIONS, WHICH MAY AFFECT THE CONSTRUCTION, SHALL BE SUBMITTED TO THE ENGINEER IN WRITING FOR CLARIFICATION.
11. THE CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING AND MAINTAINING SURVEY CONTROL TO VERIFY EXISTING GRADES AND FOR THE PERFORMANCE OF WORK. THE OWNER WILL PROVIDE THE CONTRACTOR WITH SURVEY CONTROL INFORMATION AND COPIES OF THE DESIGN DRAWINGS IN ELECTRONIC FORMAT DURING PREMOBILIZATION ACTIVITIES. THE CONTRACTOR WILL BE RESPONSIBLE FOR VERIFYING AND ACHIEVING THE PROJECT LIMITS IN THE FIELD.
12. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ESTABLISH, MAINTAIN, AND PROTECT THE PROJECT LIMITS INCLUDING SUPPORT ZONES, EXCLUSION ZONES, AND CONTAMINATION REDUCTION ZONES.
13. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE ANY NECESSARY TRAFFIC CONTROLS AND OBTAIN ANY NECESSARY PERMITS THAT MAY BE REQUIRED IN CONJUNCTION WITH VEHICLE USE ON PUBLIC ROADS.
14. THE CONTRACTOR IS RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH REMEDIAL CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE THE NECESSARY PRECAUTIONS TO PREVENT DAMAGE, INJURY, OR LOSS TO, SITE WORKERS, CONSTRUCTION OVERSIGHT PERSONNEL, AND SITE VISITORS.
15. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND ORDERS OF PUBLIC BODIES HAVING JURISDICTION FOR THE SAFETY OF PERSONS OR PROPERTY OR TO PROTECT THEM FROM DAMAGE, INJURY, OR LOSS, INCLUDING, WITHOUT LIMITATION, THE DEPARTMENT OF LABOR SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION PROMULGATED UNDER THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (PL 91-596) AND UNDER SECTION 107 OF THE CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (PL 91-54) AND AMENDMENTS THERETO. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS SET FORTH UNDER 29 CFR 1910, AND 29 CFR 1926. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND THE PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR THE SAFETY AND PROTECTION OF PERSONS AND PROPERTY AND SHALL COMPLY WITH ALL APPLICABLE RECOMMENDATIONS OF THE MANUAL OF ACCIDENT PREVENTION IN CONSTRUCTION OF THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC.
16. THE CONTRACTOR SHALL FURNISH AND PLACE PROPER GUARDS FOR PREVENTION OF ACCIDENTS, AND PROVIDE ALL TRENCH SHORING, SCAFFOLDING, SHIELDING, DUST/FUME PROTECTION, MECHANICAL/ELECTRICAL PROTECTION, SPECIAL GROUNDING, SAFETY RAILINGS, BARRIERS, OR OTHER SAFETY FEATURES REQUIRED. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SUFFICIENT LIGHT DURING NIGHT HOURS TO SECURE SUCH PROTECTION.
17. THE CONTRACTOR SHALL RESTORE ALL SUPPORT AREAS THAT ARE IMPACTED BY REMEDIAL ACTIVITIES, INCLUDING BUT NOT LIMITED TO, EQUIPMENT AND MATERIAL STORAGE AREAS, MATERIAL LOADING AND STAGING AREAS, PARKING AREAS, AND LOCATIONS OF OFFICE TRAILERS, EXCEPT AS NOTED OTHERWISE IN THE DESIGN DRAWINGS OR TECHNICAL SPECIFICATIONS.
18. ALL SURFACES DAMAGED OR DESTROYED AS A RESULT OF WORK PERFORMED SHALL BE RESTORED TO THEIR PRECONSTRUCTION CONDITION AND/OR AS INDICATED ON THE DRAWINGS IN A TIMELY MANNER AND PRIOR TO CONTRACTOR DEMOBILIZATION. THE CONTRACTOR IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE RESTORATION WORK.
19. THE CONTRACTOR SHALL CONTROL ODORS, DUST, AND VAPORS THAT RESULT FROM THE CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH THE DESIGN DRAWINGS, TECHNICAL SPECIFICATIONS, AND APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS. THE CONTRACTOR SHALL MONITOR AMBIENT AIR AS OUTLINED IN THE CONTRACTOR'S HASP. PERIMETER AIR MONITORING LOCATIONS WILL BE DETERMINED IN THE FIELD BASED ON WIND DIRECTION AND LOCATED WITHIN THE PROJECT LIMITS. THE CONTRACTOR SHALL PERFORM PERIMETER AIR MONITORING AS OUTLINED IN ITS HASP.
20. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE ALL ABOVEGROUND AND BELOW GROUND UNWANTED MATERIALS INCLUDING, BUT NOT LIMITED TO: DEBRIS, BRUSH, LOGS, TREES, STUMPS, REFUSE, AND RUBBISH FROM WITHIN THE PROJECT LIMITS, AS REQUIRED TO PERFORM THE WORK.
21. THE MATERIALS SUBJECT TO HANDLING AS PART OF REMEDIAL CONSTRUCTION WORK MAY CONTAIN HAZARDOUS CONSTITUENTS OR CHEMICALS AND SHOULD BE HANDLED IN ACCORDANCE WITH APPLICABLE REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING AND IMPLEMENTING APPROPRIATE HEALTH AND SAFETY MEASURES FOR ITS EMPLOYEES, SUBCONTRACTORS, CONSTRUCTION OVERSIGHT PERSONNEL, AND SITE VISITORS, AND FOR PROTECTION OF THE ENVIRONMENT AND SURROUNDING COMMUNITY. THE CONTRACTOR'S HEALTH AND SAFETY PLAN SHALL BE DEVELOPED AS SPECIFIED AND IN ACCORDANCE WITH APPLICABLE OSHA, FEDERAL, STATE, AND LOCAL REGULATIONS AS WELL AS NIAGARA MOHAWK'S HEALTH AND SAFETY PROTOCOLS.
22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CHARACTERIZATION, LOADING, TRANSPORTATION, AND OFFSITE DISPOSAL/TREATMENT OF ALL WASTE MATERIAL GENERATED AS A RESULT OF REMEDIAL ACTIVITIES AT APPROPRIATE DISPOSAL/TREATMENT FACILITIES APPROVED BY THE OWNER.
23. THE CONTRACTOR SHALL COLLECT, CONTAINERIZE, CHARACTERIZE, AND APPROPRIATELY DISPOSE/TREAT WATER GENERATED FROM EQUIPMENT, PERSONNEL CLEANING, AND MATERIAL STAGING ACTIVITIES. TWO 1,000-GALLON AND ONE 550-GALLON FRAC TANKS ARE CURRENTLY ONSITE.
24. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH CSX TRANSPORTATION, INC. ON SCHEDULE FOR REQUIRED CROSSING GUARD AND ASSOCIATED COSTS. THE GRADE CROSSING IS #508719G, LOCATED AT MILE POST QC 175.60.
25. IT IS THE CONTRACTOR'S RESPONSIBILTY TO OBTAIN ANY COUNTY AND/OR CITY SPECIFIC PERMITS THAT MAY BE REQUIRED TO PERFORM THE WORK.
26. THE CONTRACTOR SHALL NOT INITIATE ANY SITE ACTIVITIES THAT COULD POTENTIALLY GENERATE DUST WITHOUT FIRST CONFIRMING THAT THE PERIMETER AIR MONITORING PROGRAM IS ONGOING.
27. THE CONTRACTOR IS RESPONSIBLE FOR PERFORMANCE OF ALL WORK SHOWN ON THESE DRAWINGS, IN THE TECHNICAL SPECIFICATIONS, AND AS MAY BE REQUESTED BY THE ENGINEER, IN ACCORDANCE WITH THE PROJECT REMEDIATION WORK PLAN AND ASSOCIATED/RELATED DOCUMENTS.
28. THE CONTRACTOR SHALL NOT STORE FUEL OR ANY OTHER FLAMMABLE OR HAZARDOUS MATERIALS NEAR OR BELOW THE STATE ROUTE 30 BRIDGE.
29. FOR INFORMATION, THE DIG SAFELY NEW YORK NUMBER IS 1-800-962-7962. THEIR WEBSITE IS WWW.DIGSAFELYNEWYORK.COM.
30. THE CONTRACTOR SHALL MAINTAIN A BOAT ONSITE TO BE USED TO MAINTAIN THE FLOATING BOOM AND, AS NECESSARY, DEPLOY SPILL CONTROL EQUIPMENT. THE CONTRACTOR SHALL ALSO MAINTAIN ONSITE SPILL CONTROL EQUIPMENT AS DISCUSSED IN ITS CONTINGENCY PLAN.
31. THE CONTRACTOR SHALL FURNISH, INSTALL, AND MAINTAIN A 5-FOOT LONG BY 3-FOOT HIGH PROJECT SIGN ON THE TEMPORARY FENCING FACING THE PHASE I AREA. THE SIGN SHALL BE ERECTED WITHIN 21 CALENDAR DAYS FOLLOWING THE NOTICE TO PROCEED AND SHALL BE MAINTAINED UNTIL THE COMPLETION OF ALL REMEDIAL ACTIVITIES. THE SIGN SHALL BE PROFESSIONALLY MANUFACTURED, WEATHER PROOF, AND FASTENED SECURELY TO THE FENCE AT THE LOCATION SHOWN ON THE DESIGN DRAWINGS. THE LETTERING SHALL BE LEGIBLE FROM A DISTANCE OF 50 FEET AND SHALL READ "AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE REMEDIAL PROJECT, NYSDEC REGION 4" AND SHALL INCLUDE THE NATIONAL GRID LOGO (TO BE PROVIDED TO CONTRACTOR FOLLOWING PROJECT AWARD).
32. ACCORDING TO THE NYSCC, THE NORMAL POOL ELEVATION AT THE STATE ROUTE 30 BRIDGE IS 255 FEET.
33. SOIL AND DEBRIS ENCOUNTERED DURING EXCAVATION WITHIN PHASE I AREA SHALL BE MANAGED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND ALL APPLICABLE REGULATIONS.

## LEGEND:

- APPROXIMATE PROJECT LIMITS
- 270 — NEW ELEVATION CONTOUR (SEE NOTE 6 ON DRAWING G-11)
- GRADE BREAK
- 275 — INDEX ELEVATION CONTOUR
- 276 — INTERMEDIATE ELEVATION CONTOUR
- PERMANENT EASEMENT BOUNDARY LINE
- PROPERTY LINE
- EDGE OF WATER (AT TIME OF SURVEY ON APRIL 8, 2005)
- RAILROAD RIGHT OF WAY
- RAILROAD TRACKS
- EXISTING FENCE
- NEW CHAIN LINK FENCE (2 / G-16)
- TEMPORARY FENCE (SEE NOTE 19 ON DRAWING G-5)
- SILT FENCE (1 / G-4)
- STRAW BALE/SILT FENCE (SEE NOTE 18 ON DRAWING G-3) (2 / G-4)
- BARRIER WALL WITH PILE CAP
- TEMPORARY STONE AND BLOCK DROP INLET PROTECTION (SEE NOTE 13 ON DRAWING G-3) (4 / G-4)
- FLOATING BOOM (3 / G-4)
- GRANULAR FILL (SEE NOTE 14 ON DRAWING G-3)
- HISTORICAL STRUCTURE (ABOVE GRADE REMOVED)
- EXISTING FEATURES TO BE REMOVED/ABANDONED
- SOIL EXCAVATION AREA (SEE NOTE 2 ON DRAWING G-11)
- ACCESS ROAD (7 / G-17)
- ENGINEERED COVER - TYPE I (1 / G-17)
- ENGINEERED COVER - TYPE II (2 / G-17)
- PERMANENT EROSION CONTROL MAT (SEE NOTE 2 ON DRAWING G-14)
- TEMPORARY EROSION CONTROL MAT (SEE NOTE 3 ON DRAWING G-14)
- TYPE E GRANULAR FILL (9-INCH THICK LAYER)
- TYPE C GRANULAR FILL (6-INCH THICK LAYER)
- NEW RIPRAP (SEE NOTE 7 ON DRAWING G-14)

- MW-4S — EXISTING WELL
- MW-4S — EXISTING WELL TO BE EXTENDED (2 / G-16)
- RW-26 — NEW PASSIVE NAPL RECOVERY WELL (SEE NOTE 4 ON DRAWING G-11) (1 / G-16)
- (260/195) — TOP/BOTTOM OF SCREEN ELEVATION FOR NEW NAPL RECOVERY WELL (SEE NOTE 9 ON DRAWING G-11)
- BW-4 — GEOTECHNICAL BORING
- SB-40 — GEOTECHNICAL BORING
- 11 — SURVEY CONTROL POINT (SEE TABLE ON DRAWING G-6)
- HP — HIGH POINT
- 279.2 X — NEW SPOT ELEVATIONS
- EXISTING WELLS TO BE DECOMMISSIONED (SEE NOTE 8 ON DRAWING G-5)
- EXISTING WELLS TO BE PROTECTED (SEE NOTE 3 ON DRAWING G-5)
- W — WATER LINE
- ST — STORM SEWER AND FLOW DIRECTION
- DMH-1 — NEW PRECAST DRAIN MANHOLE (1 / G-19)
- DCB-1 — NEW PRECAST DRAIN CATCH BASIN (5 / G-19)
- PERMEABLE FILL (3 / G-21)
- DRAINAGE GATE (SEE NOTE 10 ON DRAWING G-11)
- UP — LIGHT POLE
- CB — EXISTING CATCH BASIN
- IRF — IRON ROD FOUND (RE-BAR)
- EXISTING MANHOLE
- CIRF — CAPPED IRON ROD FOUND
- GMON — GRANITE MONUMENT
- HYD — HYDRANT

## ABBREVIATIONS:

| | |
|---|---|
| BOL | BOLLARD |
| DIP | DUCTILE IRON PIPE |
| ES | END SECTION |
| INV | INVERT |
| LP | LIGHT POLE |
| NYSCC | NEW YORK STATE CANAL CORPORATION |
| RCP | REINFORCED CONCRETE PIPE |
| TBD | TO BE DETERMINED |
| TF | TOP FRAME |
| UP | UTILITY POLE |

X: 36676X00.DWG
L: ON=*, OFF=*REF
P: PAGESET/SYR-CDL
10/07/05 SYR-85-NES SDL BGP
36676040/CONTRACT/WORKPLAN/36676G01.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

Init

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

| Professional Engineer's Name | |
|---|---|
| JAMES M. NUSS | |
| Professional Engineer's No. | |
| # 067963 | |
| State | Date Signed |
| NY | 10/7/05 |
| Project Mgr. | Designed by |
| GMT | TAS |
| Drawn by | |
| NES | |

STATE OF NEW YORK · JAMES M. NUSS · 067963 · PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

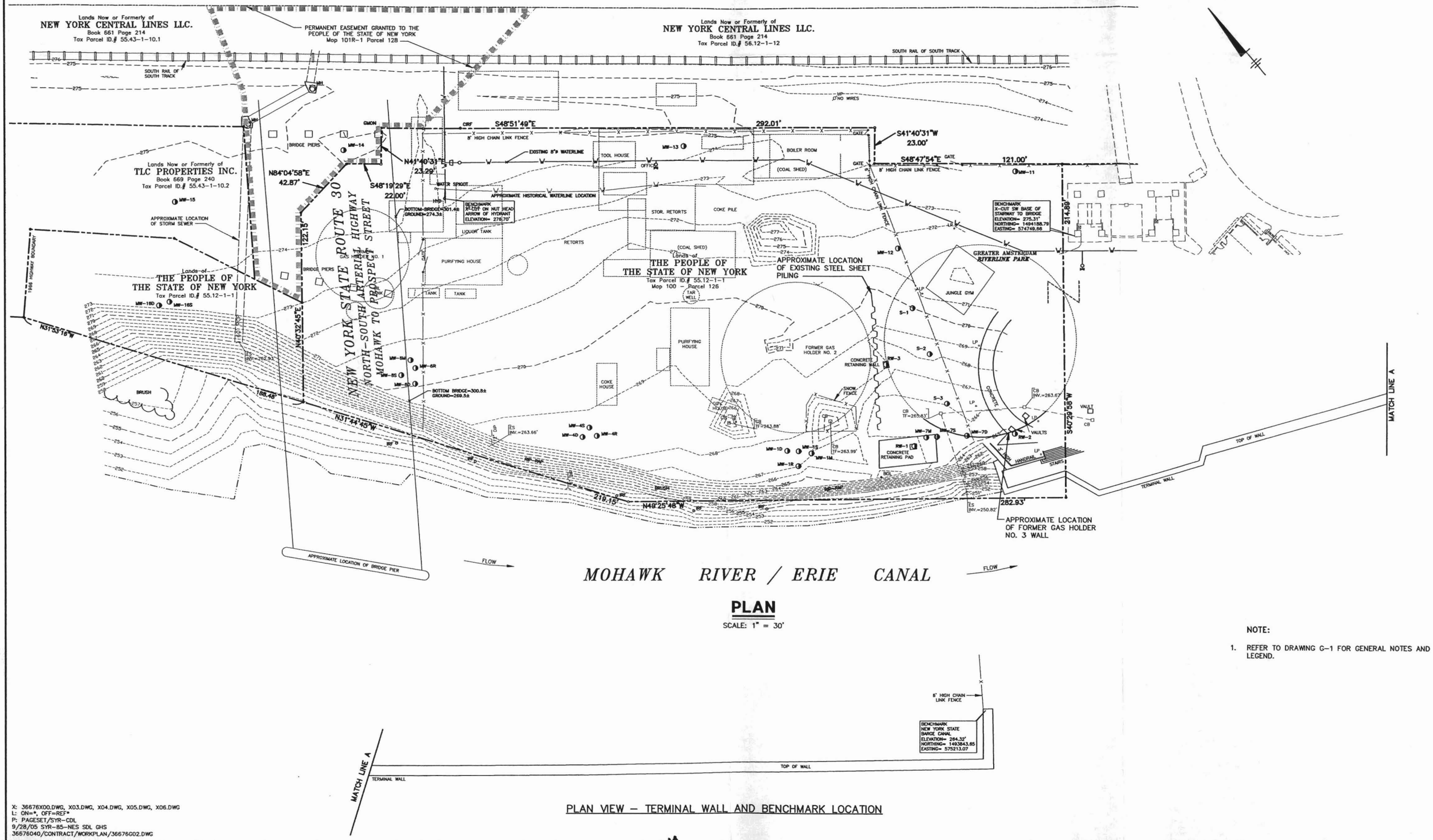
# GENERAL NOTES

GENERAL

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-1




## PLAN

SCALE: 1" = 30'

NOTE:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND.

PLAN VIEW – TERMINAL WALL AND BENCHMARK LOCATION

X: 36676X00.DWG, X03.DWG, X04.DWG, X05.DWG, X06.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-CDL
9/28/05 SYR-85-NES SDL GHS
36676040/CONTRACT/WORKPLAN/36676G02.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
30' 0 30' 60'
1"=30'

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| No. | Date | Revisions | Init |
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NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: TAS
Drawn by: NES

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

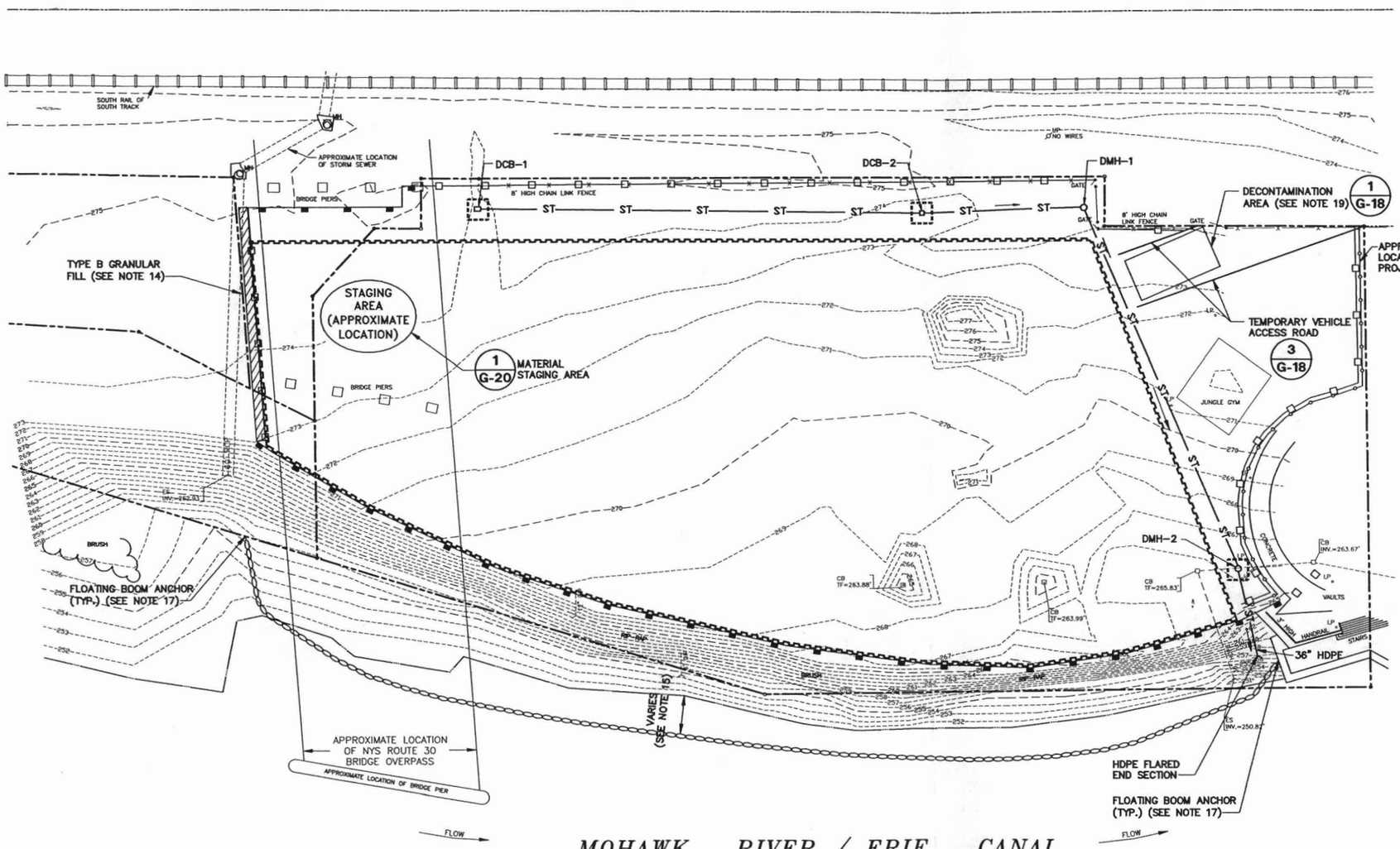
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# EXISTING SITE PLAN

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-2




## PLAN

SCALE: 1" = 30'

NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM (SPDES) GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL PROVIDE CERTIFICATION REGARDING COMPLIANCE WITH THE REQUIREMENTS AND THE CONDITIONS OF THE SPDES GENERAL PERMIT PRIOR TO UNDERTAKING ANY WORK AT THE SITE. AS APPROPRIATE, THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND SUBMITTING ANY NECESSARY PERMITS ASSOCIATED WITH MANAGING STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES.
3. THE CONTRACTOR IS ADVISED THAT SECTION 404 OF THE CLEAN WATER ACT (33 U.S.C. 1344) PROHIBITS THE DISCHARGE OF DREDGE OR FILL MATERIALS INTO THE WATERS OF THE UNITED STATES WITHOUT A PERMIT FROM THE U.S. ARMY CORPS OF ENGINEERS.
4. REFER TO DRAWING G-5 FOR APPROXIMATE PROJECT LIMITS.
5. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO DISTURBANCE OF EXISTING SITE SOILS AND VEGETATION.
6. ALL WORK SHALL BE LIMITED TO WITHIN THE DESIGNATED PROPERTY, RIGHT OF WAY, EASEMENT, OR PROJECT WORK LIMITS.
7. ALL NECESSARY PRECAUTIONS SHALL BE TAKEN TO PREVENT MIGRATION OF CONSTRUCTION RELATED SILT, SEDIMENT, FUELS, SOLVENTS, LUBRICANTS, CONCRETE, LEACHATE, OR ANY OTHER POLLUTANT BEYOND THE WORK LIMITS.
8. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE MAINTAINED THROUGHOUT THE COURSE OF THE REMEDIAL CONSTRUCTION ACTIVITIES. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED ONLY AFTER ESTABLISHMENT OF A DURABLE AND MAINTAINABLE VEGETATIVE COVER.
9. ANY CONSTRUCTION-RELATED DEBRIS OR EXCESS MATERIALS SHALL BE REMOVED IMMEDIATELY/COMPLETELY FROM THE BED AND/OR BANKS OF THE RIVER TO AN APPROPRIATE UPLAND SITE AREA FOR PROPER DISPOSAL.
10. HEAVY EQUIPMENT SHALL NOT BE DRIVEN IN THE RIVER WATER.
11. EXISTING VEGETATION WILL BE LEFT IN PLACE TO THE FULLEST EXTENT PRACTICABLE IN AREAS THAT WILL NOT IMMEDIATELY (I.E., 24 HOURS) UNDERGO CONSTRUCTION ACTIVITIES.
12. IF REQUESTED BY NIAGARA MOHAWK'S ONSITE REPRESENTATIVE, TEMPORARY SEED AND MULCHING PRACTICES SHALL BE UTILIZED IN DISTURBED AREAS NOT SCHEDULED FOR CONSTRUCTION ACTIVITY WITHIN TEN (10) CALENDAR DAYS OF INITIAL SOIL DISTURBANCE.
13. STONE AND BLOCK DROP INLET PROTECTION SHALL BE INSTALLED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE NEW CATCH BASINS IF CATCH BASINS ARE SUBJECT TO INFLOW FROM UNSTABILIZED PORTIONS OF SITE. INLET PROTECTION TO BE REMOVED ONLY WHEN UPGRADIENT RUNOFF AREAS ARE FULLY STABILIZED (SEE DETAIL 4 ON DRAWING G-4).
14. BACKFILL SILT FENCE ANCHOR TRENCH WITH TYPE B GRANULAR FILL AT LOCATIONS SHOWN ON PLAN.
15. FLOATING BOOM SHALL BE MAINTAINED AT A DISTANCE OF APPROXIMATELY 10 FEET FROM THE WATER'S EDGE IN SUFFICIENT DEPTH OF WATER AS RECOMMENDED BY THE MANUFACTURER, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. FLOATING BOOM SHALL NOT EXTEND OUT INTO THE NAVIGATION CORRIDOR DURING THE NAVIGATION SEASON. NAVIGATION SEASON DATES ARE AVAILABLE BY CALLING 1-800-4CANAL4, OR BY VISITING THE NYS CANALS WEBSITE AT "WWW.CANALS.STATE.NY.US" AND CHECKING ON "NOTICES TO MARINERS".
16. CONTRACTOR TO MAINTAIN/REPLACE FLOATING BOOM AS NECESSARY. CONTRACTOR TO REMOVE FLOATING BOOM JUST PRIOR TO THE BOOM FREEZING INTO RIVER ICE.
17. ENDS OF FLOATING BOOM SHALL BE SECURELY ANCHORED TO BANKS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS/SPECIFICATIONS. CONTRACTOR SHALL UTILIZE REDUNDANT AND/OR INTERMEDIATE ANCHOR POINTS IF NECESSARY.
18. STRAW BALE/SILT FENCE ALONG RIVER BANK SHALL BE LOCATED DOWNGRADIENT OF BARRIER WALL.
19. CONTROL OF SUSPENDED SOLIDS GENERATED DURING THE PROJECT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. IF REQUESTED BY NIAGARA MOHAWK'S ONSITE REPRESENTATIVE, THE CONTRACTOR SHALL PROVIDE AND INSTALL A SILT (TURBIDITY) CURTAIN ALONG THE RIVER'S EDGE TO CONTAIN EXCESSIVE SUSPENDED SOLIDS. WORK ACTIVITIES THAT INITIATED THE NEED FOR THE SILT CURTAIN WILL BE SUSPENDED UNTIL THE SILT CURTAIN IS INSTALLED. THE SOURCE OF ANY EXCESSIVE SUSPENDED SOLIDS SHALL BE CORRECTED IMMEDIATELY UPON IDENTIFICATION.

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L: ON=*, OFF=REF*
P: PAGESET/SYR-CDL
10/07/05 SYR-85-NES GHS BGP
36676040/CONTRACT/WORKPLAN/36676G04.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

1"=30' 30' 0 30' 60'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

| No. | Date | Revisions | Init |
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Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: TAS
Drawn by: NES

STATE OF NEW YORK JAMES M. NUSS 067963 LICENSED PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

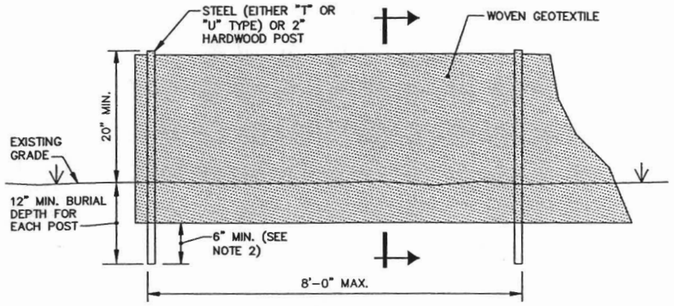
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# EROSION AND SEDIMENT CONTROL PLAN

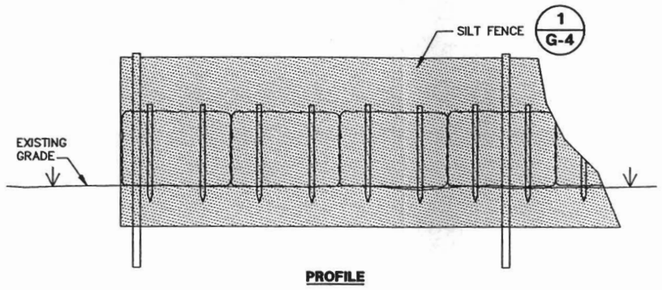
BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

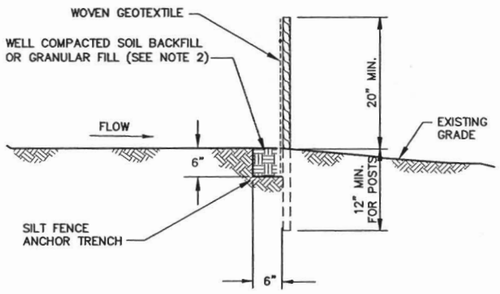
G-3




**PROFILE**




**PROFILE**



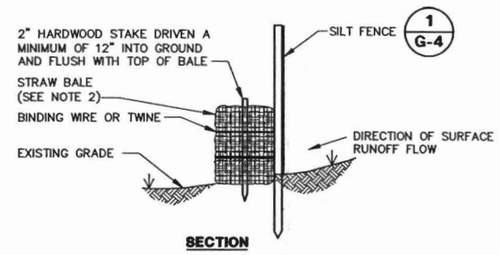

**SECTION**

NOTES:

1. SEDIMENT DEPOSITS SHALL BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF OF THE HEIGHT OF THE SILT FENCE (OR LESSER HEIGHT IF FENCE GEOTEXTILE IS OVER STRESSED).
2. THE SILT FENCE SHALL BE FOLDED INTO A TRENCH AND BACKFILLED WITH GRANULAR FILL WHERE INDICATED ON DRAWING G-3.

## SILT FENCE DETAIL (1)

NOT TO SCALE




**SECTION**

NOTES:

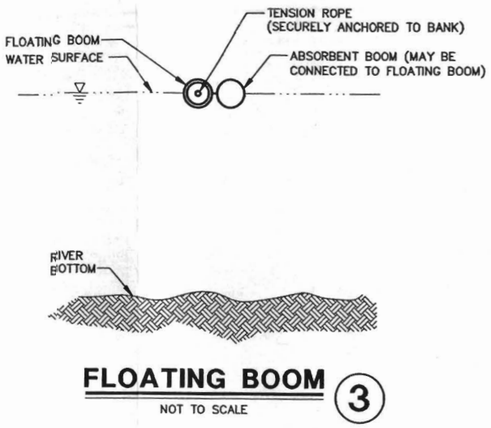
1. SEDIMENT DEPOSITS SHALL BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF OF THE HEIGHT OF THE SILT FENCE (OR LESSER HEIGHT IF FENCE GEOTEXTILE IS OVER STRESSED).
2. STRAW BALES SHALL BE OATS, WHEAT, RYE GRAIN, BROOMSAGE OR OTHER STRAW, OR NATIVE GRASS HAY.
3. BALES SHALL BE SOUND WITH BALE TIES INTACT.

## STRAW BALE/SILT FENCE DETAIL (2)

NOT TO SCALE

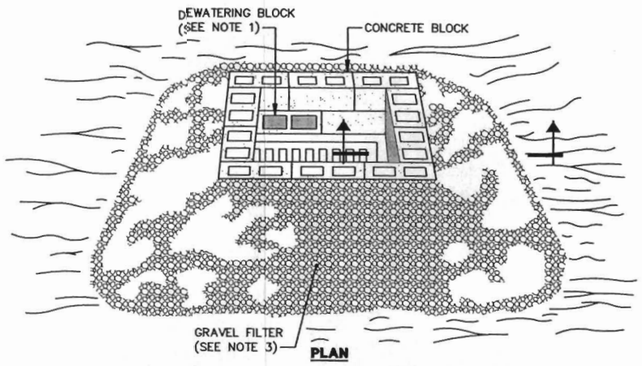
GENERAL NOTE:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.

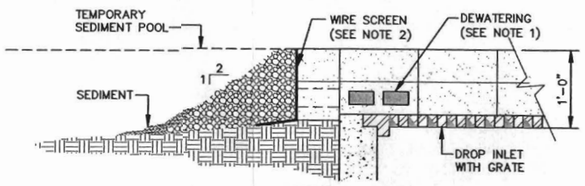



## FLOATING BOOM (3)

NOT TO SCALE




**PLAN**




**SECTION**

NOTES:

1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING PURPOSES.
2. WIRE SCREEN (1/2 INCH OPENINGS) SHALL BE PLACED AROUND STRUCTURE TO SUPPORT STONE.
3. USE TYPE B GRANULAR FILL FOR GRAVEL FILTER.

## TEMPORARY STONE AND BLOCK DROP INLET PROTECTION (4)

NOT TO SCALE

X: 36676X00.DWG
L: ON=*, OFF=REF
P: PAGESET/SYR-CDL
10/07/05 SYR-85 RCA SDL BGP
36676040/CONTRACT/WORKPLAN/36676G05.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

NOT TO SCALE

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

| No. | Date | Revisions | Init |
|---|---|---|---|

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: TAS
Drawn by: RCA

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

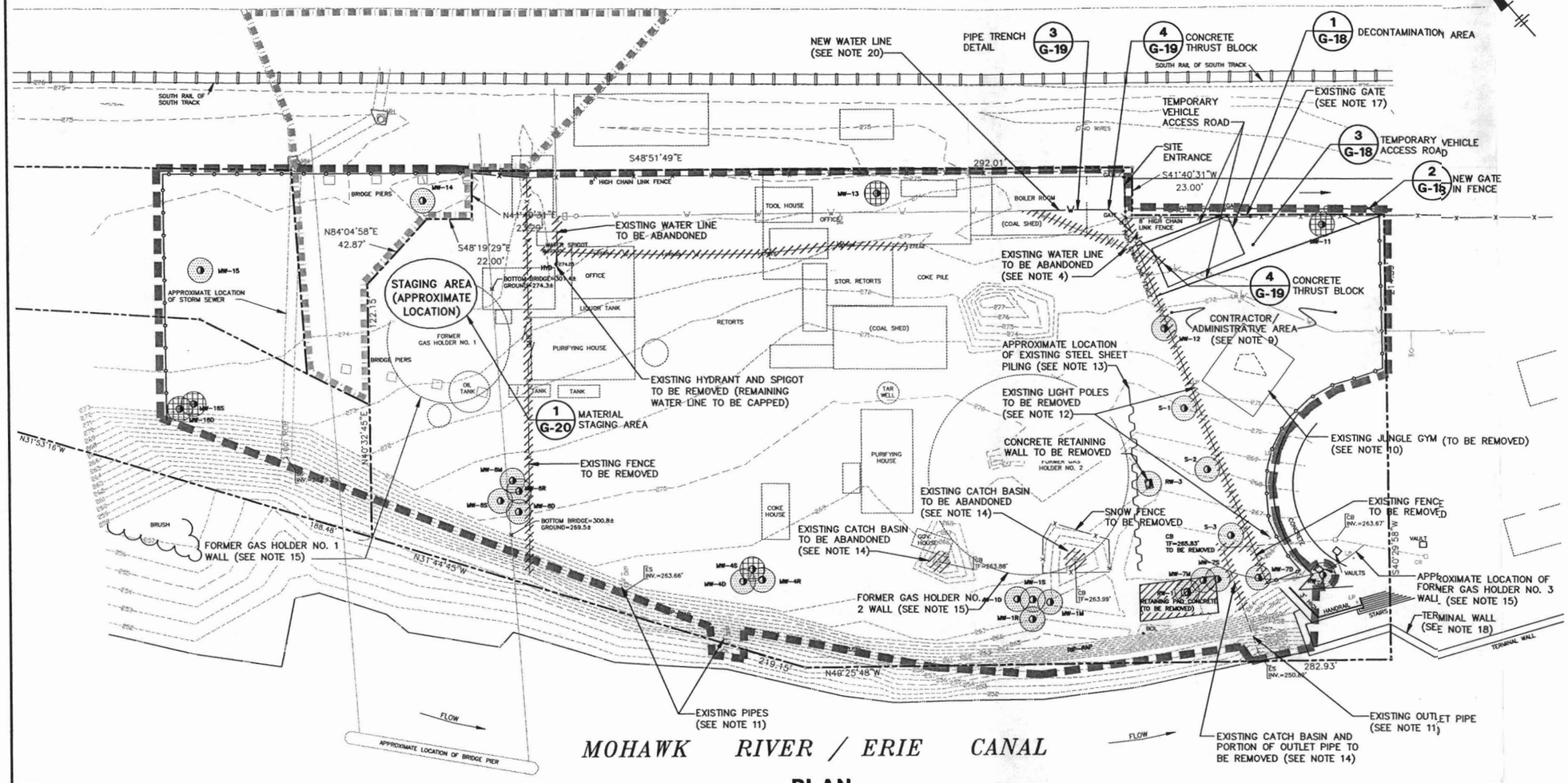
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# EROSION AND SEDIMENT CONTROL DETAILS

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-4




## PLAN

SCALE: 1" = 30'

NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES, ABBREVIATIONS, AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. REFER TO DRAWING G-3 FOR TEMPORARY EROSION AND SEDIMENT CONTROLS.
3. CONTRACTOR SHALL CLEARLY MARK, MAINTAIN, AND PROTECT EXISTING WELLS NOT SUBJECT TO DECOMMISSIONING. CONTRACTOR SHALL BE RESPONSIBLE FOR DECOMMISSIONING AND REPLACEMENT OF DAMAGED WELLS.
4. EXISTING STRUCTURES AND FEATURES CONFLICTING WITH THE BARRIER WALL AND ENGINEERED COVER AS DETERMINED BY NIAGARA MOHAWK'S ONSITE REPRESENTATIVE AT TIME OF CONSTRUCTION SHALL BE REMOVED. ANY STRUCTURES CROSSING THE BARRIER WALL ALIGNMENT SHALL BE REMOVED A SUFFICIENT DISTANCE BACK FROM THE WALL STRUCTURE TO FACILITATE INSTALLATION OF THE WALL.
5. MISCELLANEOUS PIPES MAY BE ENCOUNTERED DURING SITE ACTIVITIES. MATERIAL ENCOUNTERED IN PIPES SHALL BE COLLECTED AND HANDLED AS SPECIFIED IN THE TECHNICAL SPECIFICATIONS. PIPES SHALL THEN BE CAPPED OR PLUGGED.
6. THE CONTRACTOR SHALL REMOVE SEGMENTS OF THE EXISTING SITE CHAIN LINK FENCE AS NECESSARY TO PERFORM REMEDIAL WORK ACTIVITIES. THE CONTRACTOR SHALL INSTALL NEW CHAIN LINK FENCE ALONG THE ORIGINAL FENCE LINE LOCATION UNLESS OTHERWISE DIRECTED/SHOWN. CONTRACTOR SHALL PRESERVE AND REUSE THE EXISTING FENCE TO THE FULLEST EXTENT PRACTICABLE.
7. CONTRACTOR SHALL COORDINATE WITH CSX TRANSPORTATION, INC., AS NECESSARY, TO IMPLEMENT PROPER RAILROAD CROSSING PROCEDURES FOR THE CROSSING ON FRONT STREET. CONTRACTOR IS RESPONSIBLE FOR PROVIDING NECESSARY SIGNAGE OR FLAGGER IN ACCORDANCE WITH CSX SPECIFICATIONS.
8. WELLS SHALL BE DECOMMISSIONED IN ACCORDANCE WITH TECHNICAL SPECIFICATION 02414.
9. CONTRACTOR/ADMINISTRATIVE AREA SHALL INCLUDE A DECONTAMINATION AREA AND SITE TRAILERS AS DESCRIBED IN THE TECHNICAL SPECIFICATIONS.
10. EXISTING JUNGLE GYM IS TO BE CAREFULLY DISASSEMBLED AND TEMPORARILY STORED BY CONTRACTOR AT A LOCATION DESIGNATED BY THE CITY OF AMSTERDAM AT THE TIME OF CONSTRUCTION. CONTRACTOR TO COORDINATE WITH THE CITY OF AMSTERDAM.
11. EXISTING PIPES SHALL BE ABANDONED IN ACCORDANCE WITH THE MATERIALS AND PERFORMANCE SPECIFICATIONS. PORTIONS OF EXISTING PIPES (I.E., WITHIN THE BARRIER WALL) MAY BE REMOVED AS REQUIRED TO FACILITATE REMEDIAL ACTIVITIES. THE EXTENT OF REMOVAL SHALL BE DETERMINED AT THE TIME OF CONSTRUCTION.
12. LIGHT POLES WITHIN PROJECT WORK LIMITS SHALL BE CAREFULLY DISASSEMBLED AND TEMPORARILY STORED BY CONTRACTOR AT A LOCATION DESIGNATED BY THE CITY OF AMSTERDAM AT THE TIME OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE TEMPORARY LIGHTING UNTIL PERMANENT LIGHTING FEATURES ARE RESTORED. CONTRACTOR TO COORDINATE WITH THE CITY OF AMSTERDAM.
13. PORTIONS OF EXISITING STEEL SHEETPILING MAY REQUIRE REMOVAL BY CONTRACTOR TO FACILITATE REMEDIAL CONSTRUCTION WORK. STEEL SHEETING TO BE REMOVED TO A MINIMUM DEPTH OF 8 INCHES BELOW LINER SUBGRADE.
14. EXISTING CATCH BASINS AND ASSOCIATED PIPES DESIGNATED FOR ABANDONMENT TO BE FILLED WITH FLOWABLE FILL IN ACCORDANCE WITH TECHNICAL SPECIFICATION 02206. UPPER PORTIONS OF CATCH BASIN STRUCTURES TO BE REMOVED TO A MINIMUM OF 18 INCHES BELOW LINER SUBGRADE. THE CONTRACTOR WILL COORDINATE WITH THE CITY OF AMSTERDAM REGARDING THE VAULTS IN THE PHASE I AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MANAGING STORM FLOWS FROM THE REMAINING UPGRADIENT STORM SEWER SYSTEM DURING THE PERIOD FOLLOWING ABANDONMENT/REMOVAL OF DOWNGRADIENT PORTIONS OF THE SYSTEM AND INSTALLATION OF THE NEW STORM SEWER SYSTEM SHOWN ON DRAWING G-11.
15. PORTIONS OF FORMER GAS HOLDER WALLS AND FLOOR MAY REQUIRE REMOVAL BY CONTRACTOR TO FACILITATE REMEDIAL CONSTRUCTION WORK.
16. EXISTING SUBSURFACE STRUCTURES NOT SPECIFICALLY IDENTIFIED ON THESE DESIGN DRAWINGS MAY REQUIRE REMOVAL BY CONTRACTOR TO FACILITATE REMEDIAL CONSTRUCTION WORK.
17. EXISTING GATE MAY REQUIRE MODIFICATION OR REPLACEMENT BY CONTRACTOR TO PROVIDE ADEQUATE WIDTH FOR VEHICLE USAGE.
18. CONTRACTOR TO DETERMINE/VERIFY LOCATION OF EXISTING TERMINAL WALL ANCHORING STRUCTURES (E.G., SHEETING, TIE-BACKS) PRIOR TO INITIATION OF CONSTRUCTION ACTIVITIES.
19. TEMPORARY FENCE SHALL BE A MINIMUM 6 FEET TALL AND SELF-SUPPORTED (I.E., POLES SHALL NOT BE DRIVEN, OR SET INTO GROUND). CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL PROPOSED TEMPORARY FENCE DETAILS 1 WEEK PRIOR TO INSTALLATION. TEMPORARY FENCE TO BE REMOVED FROM THE SITE FOLLOWING COMPLETED CONSTRUCTION ACTIVITIES. ADJUSTMENT OF THE TEMPORARY FENCE LOCATIONS SHOWN ON THIS DRAWING MAY BE REQUIRED TO FACILITATE CONSTRUCTION ACTIVITIES AS DETERMINED AND PERFORMED BY THE CONTRACTOR.
20. NEW WATER LINE SHALL CONSIST OF LIKE SIZE, MATERIALS, DEPTH, AND JOINT TYPES AS EXISTING WATER LINE. THE CONTRACTOR WILL COORDINATE WITH THE CITY OF AMSTERDAM REGARDING ANY WORK (NEW INSTALLATION AND ABANDONMENT) ON THE WATER LINE PRIOR TO CONSTRUCTION. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH CITY REQUIREMENTS/ SPECIFICATIONS. FOR THE PURPOSE OF BIDDING THE CONTRACTOR SHOULD ASSUME THAT THE PIPE IS 8 INCH DIAMETER DUCTILE IRON PIPE LOCATED APPROXIMATELY 4 FEET BELOW GRADE.

X: 36676X00.DWG, X03.DWG, X04.DWG, X05.DWG, X06.DWG
L: ON=*, OFF=REF*, |GYM, |SPOT-ELEV*
P: PAGESET/SYR-CDL
10/07/05 SYR-85-NES SDL BGP
36676040/CONTRACT/WORKPLAN/36676G03.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
1"=30' 30' 0 30' 60'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

| No. | Date | Revisions | Init |
|---|---|---|---|

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

| | | |
|---|---|---|
| Professional Engineer's Name: JAMES M. NUSS | | |
| Professional Engineer's No.: # 067963 | | |
| State: NY | Date Signed: 10/7/05 | |
| Project Mgr.: GMT | Designed by: MBH/TAS | Drawn by: NES |

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

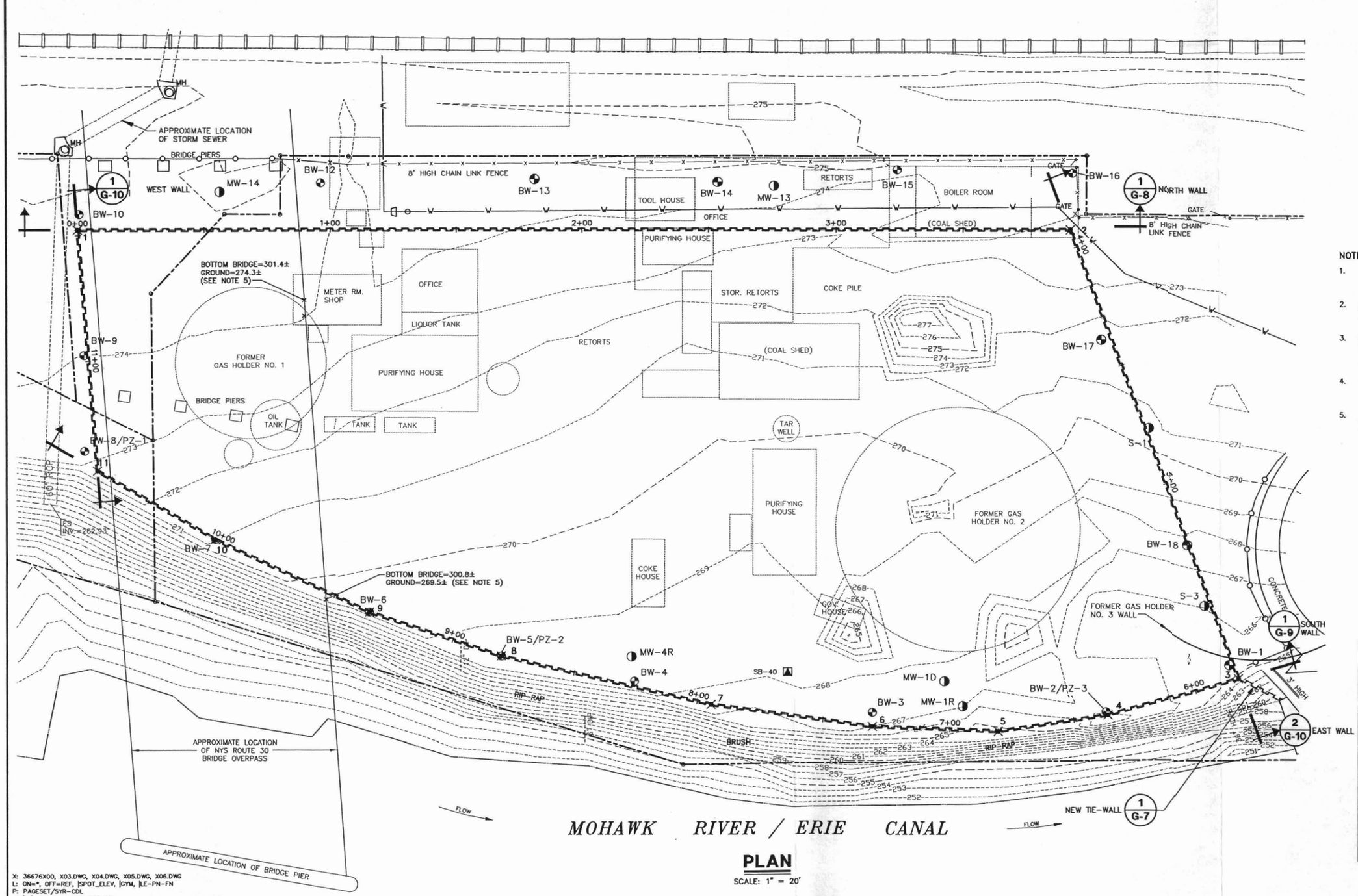
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SITE PREPARATION, UTILITY RELOCATION, AND MATERIAL HANDLING PLAN

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-5




**PLAN**

SCALE: 1" = 20'

NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. INSTALL BARRIER WALL AND TIE-WALL SHEETING TO THE LINES AND GRADES SHOWN ON DRAWINGS G-7 THROUGH G-10.
3. BARRIER WALL SHEETING TO CONSIST OF WATERLOO BARRIER® TYPE WEZ95 STEEL SHEETING. INSTALL BARRIER WALL SHEETING TO DESIGN DEPTHS IN ACCORDANCE WITH TECHNICAL SPECIFICATION 02411.
4. CONTRACTOR'S ATTENTION IS DIRECTED TO THE BRIDGE OVERPASS WHERE OVERHEAD CLEARANCE IS LIMITED AND PILE SPLICING MAY BE REQUIRED.
5. NOTE THAT BURIED STRUCTURES AND DEMOLITION DEBRIS ASSOCIATED WITH PRIOR SITE DEVELOPMENT IS KNOWN TO EXIST IN PLACES ALONG THE BARRIER WALL ALIGNMENT.

**SURVEY CONTROL POINTS**

| POINT NO. | STATION | NORTHING | EASTING |
|---|---|---|---|
| 1 | 0+00 = 11+52.14 | 1494565.6227 | 574377.2395 |
| 2 | 3+92.83 | 1494307.9557 | 574673.7568 |
| 3 | 5+82.22 | 1494130.2993 | 574608.1171 |
| 4 | 6+36.27 | 1494153.1490 | 574559.1387 |
| 5 | 6+80.65 | 1494177.0515 | 574521.7509 |
| 6 | 7+30.49 | 1494211.0802 | 574485.3227 |
| 7 | 7+94.45 | 1494259.1907 | 574443.1773 |
| 8 | 8+79.66 | 1494328.1023 | 574393.0583 |
| 9 | 9+34.77 | 1494375.5097 | 574364.9663 |
| 10 | 10+02.38 | 1494437.4345 | 574337.8268 |
| 11 | 10+56.44 | 1494488.6119 | 574320.4219 |

X: 36676X00, X03.DWG, X04.DWG, X05.DWG, X06.DWG
L: ON=*, OFF=REF, |SPOT_ELEV, |GYM, |LE-PN-FN
P: PAGESET/SYR-CDL
10/5/05 SYR-85-NES BGP SDL
36676040/CONTRACT/WORKPLAN/36676G07.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
1"=20' (20' 0 20' 40')

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

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

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Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: PAB
Drawn by: NES

STATE OF NEW YORK JAMES M. NUSS 067963 PROFESSIONAL ENGINEER

BBL® BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

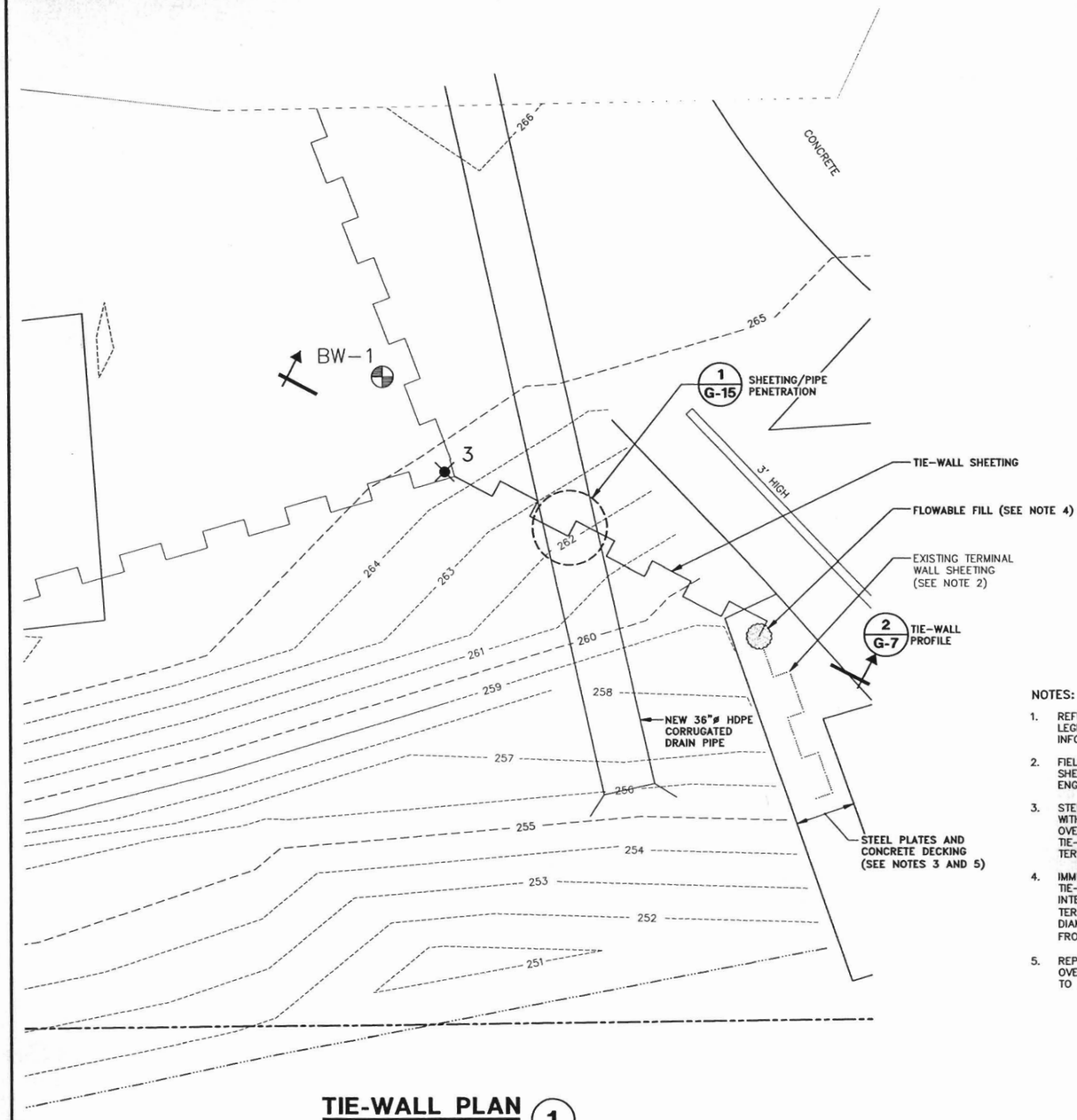
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# BARRIER WALL PLAN

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-6

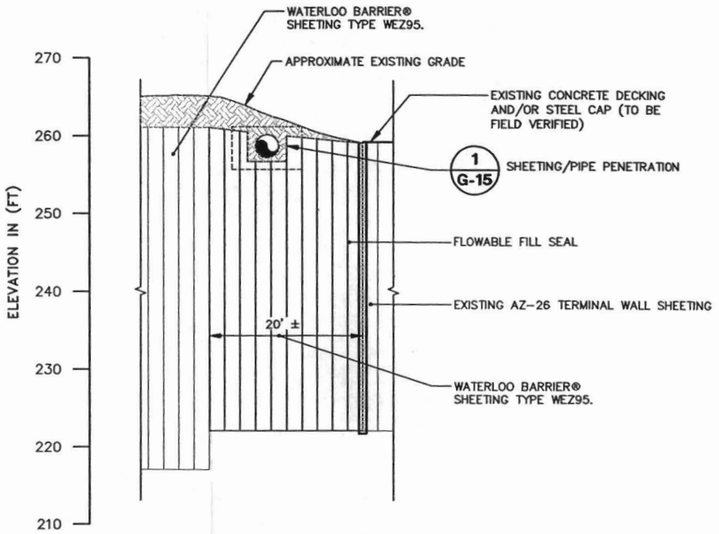



## TIE-WALL PLAN (1)

SCALE: 1"=4'

NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. FIELD VERIFY LOCATION OF EXISTING TERMINAL WALL SHEETING AND REALIGN TIE-IN WALL AS DIRECTED BY ENGINEER.
3. STEEL SHEETING AT EXISTING TERMINAL WALL IS CAPPED WITH STEEL PLATES. REMOVE STEEL PLATES AND OVERLYING CONCRETE DECKING AS REQUIRED TO DRIVE TIE-WALL SHEETING WITHIN 6 INCHES OF EXISTING TERMINAL WALL SHEETING.
4. IMMEDIATELY PRIOR TO INSTALLING THE SOUTHERN-MOST TIE-WALL SHEET, CONSTRUCT FLOWABLE FILL AT INTERSECTION OF TIE-WALL SHEETING AND EXISTING TERMINAL WALL SHEETING BY DRIVING A 20' LONG x 20" DIAMETER TEMPORARY STEEL CASING AND REMOVING SOIL FROM WITHIN CASING USING AN 18" DIAMETER AUGER.
5. REPLACE STEEL PLATES AND/OR CONCRETE DECKING OVER TERMINAL WALL SHEETING AND REPAIR ANY DAMAGE TO EXISTING TERMINAL WALL.




## TIE-WALL PROFILE (2)

HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"=10'

X: 36676X00, X03.DWG, X06, X10.DWG
L: ON=*, OFF=REF, |SPOT_ELEV, |GYM, |LE-PN-FN
P: PAGESET/SYR-CDL
10/7/05 SYR-85-NES BGP GHS
36676040/CONTRACT/WORKPLAN/36676G19.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
1"=4' 4' 0 4' 8'
1"=10' 10' 0 10' 20'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

| No. | Date | Revisions | Init |
|---|---|---|---|

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Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: PAB
Drawn by: NES

STATE OF NEW YORK JAMES M. NUSS 67963 PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

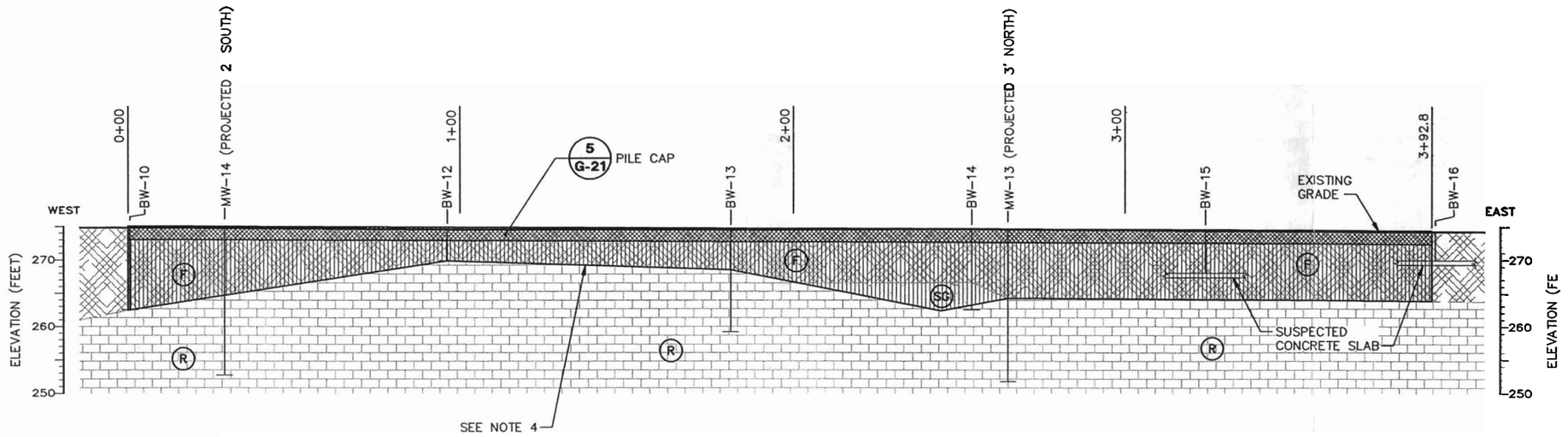
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# TIE-WALL PLAN AND PROFILE

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-7




## NORTH WALL (1)

HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=10'
(VERTICAL EXAGGERATION = 2X)

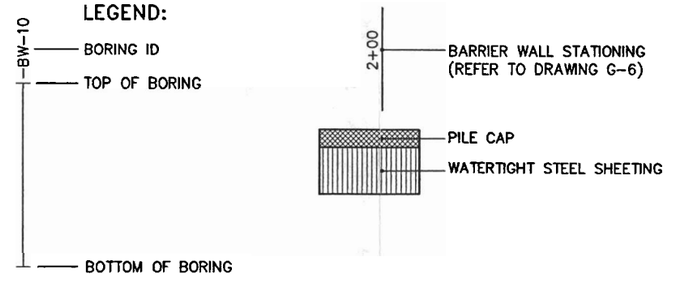
### NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.
2. SUBSURFACE CONTACTS ARE APPROXIMATE AND ARE INFERRED BETWEEN BORINGS. SUBSURFACE CONDITIONS HAVE BEEN GENERALIZED.
3. THE GEOLOGIC CROSS SECTIONAL INFORMATION SHOWN REPRESENTS CONDITIONS ALONG THE LINE OF BW- SERIES OF BORINGS DRILLED DURING THE PREDESIGN INVESTIGATION (I.E., NOT DIRECTLY ALONG THE WALL ALIGNMENT). **REFER TO DRAWING G-6 FOR LOCATIONS OF BORINGS RELATIVE TO THE BARRIER WALL ALIGNMENT.**
4. THE BARRIER WALL WILL BE INSTALLED TO THE APPROXIMATE/ESTIMATED BEDROCK LEVEL ALONG THE NORTH WALL THAT RUNS APPROXIMATELY PARALLEL TO AND SOUTH OF THE GEOLOGIC CROSS SECTIONAL INFORMATION SHOWN. SINCE THE BEDROCK GENERALLY DIPS IN A SOUTHERLY DIRECTION, THE BARRIER WALL BOTTOM LEVEL MAY BE DEEPER THAN SHOWN.

### GENERAL SOIL UNITS:

- (F) FILL, PREDOMINANTLY GRANULAR
- (SG) VARIES FROM FINE TO COARSE SAND, LITTLE GRAVEL, LITTLE SILT TO FINE TO COARSE GRAVEL, LITTLE SAND, LITTLE SILT, FEW COBBLES, OCCASIONAL BOULDERS SUSPECTED
- (R) BEDROCK

### LEGEND:




X: 36676X00.DWG
L: ON=*, OFF=REF
P: PAGESET/SYR-CDL
9/29/05 SYR-85-NJR SDL BCP
36676040/CONTRACT/WORKPLAN/36676V01.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
10' 0 10' 20'
1"=10'
20' 0 20' 40'
1"=20'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

| No. | Date | Revisions | Init |
|---|---|---|---|

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| Professional Engineer's Name | |
|---|---|
| JAMES M. NUSS | |
| Professional Engineer's No. | |
| # 067963 | |
| State | Date Signed |
| NY | 10/7/05 |
| Project Mgr. | Designed by / Drawn by |
| GMT | PAB / NJR |

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

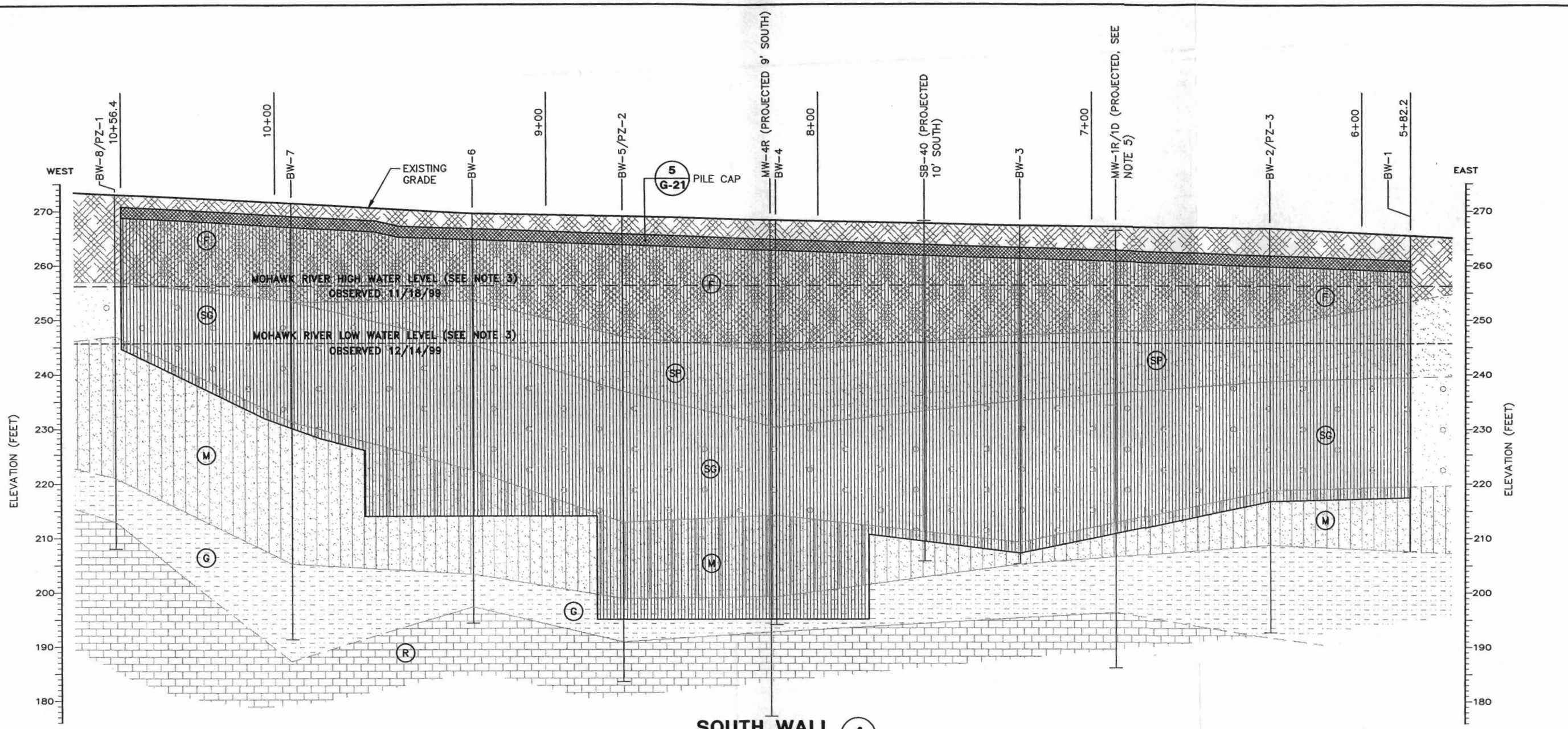
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# BARRIER WALL PROFILE - NORTH WALL (STATIONS 0+00 TO 3+93)

BBL Project No 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-8




## SOUTH WALL (1)

HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=10'
(VERTICAL EXAGGERATION = 2X)

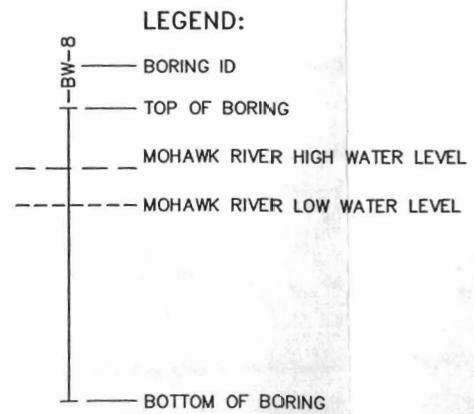
### NOTES:

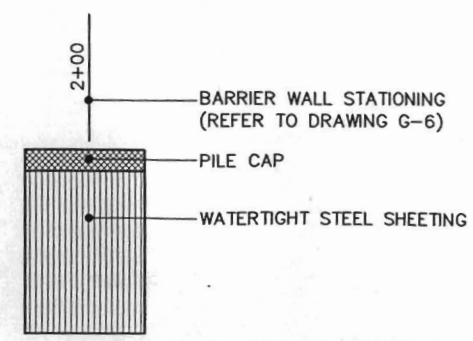
1. REFER TO DRAWING G-1 FOR GENERAL NOTES.
2. SUBSURFACE CONTACTS ARE APPROXIMATE AND ARE INFERRED BETWEEN BORINGS. SUBSURFACE CONDITIONS HAVE BEEN GENERALIZED.
3. MOHAWK RIVER HIGH AND LOW WATER LEVELS INTERPOLATED/TAKEN FROM FIGURE 10 "WATER TABLE ELEVATION CONTOURS PRIOR TO CANAL LOWERING-11/18/99", AND FIGURE 11 "WATER TABLE ELEVATION CONTOURS AFTER CANAL LOWERING-12/14/99" FROM PHASE II AREA INVESTIGATION REPORT (BBL, DECEMBER 2001).
4. EDGE OF WATER IN MOHAWK RIVER IS LOCATED APPROXIMATELY 25 FEET SOUTH OF BARRIER WALL AT HIGH WATER, AND 45 FEET SOUTH OF BARRIER WALL AT LOW WATER.
5. BORINGS MW-1D AND MW-1R WERE COMBINED. DATA FROM GROUND SURFACE TO 36' BELOW GROUND SURFACE WERE OBTAINED FROM MW-1D. REMAINDER OF DATA WAS OBTAINED FROM MW-1R. LOCATION BASED ON MW-1R, WHICH WAS PROJECTED 2' SOUTH.
6. THE GEOLOGIC CROSS SECTIONAL INFORMATION SHOWN REPRESENTS CONDITIONS ALONG THE LINE OF BW- SERIES OF BORINGS DRILLED DURING THE PREDESIGN INVESTIGATION (I.E., NOT DIRECTLY ALONG THE WALL ALIGNMENT). REFER TO DRAWING G-6 FOR LOCATIONS OF BORINGS RELATIVE TO THE BARRIER WALL ALIGNMENT.

### GENERAL SOIL UNITS:

- (F) FILL, PREDOMINANTLY GRANULAR
- (SP) VARIES FROM FINE TO MEDIUM SAND, SOME SILT TO FINE SAND AND SILT TO CLAYEY SILT AND FINE SAND
- (SG) VARIES FROM FINE TO COARSE SAND, LITTLE GRAVEL, LITTLE SILT TO FINE TO COARSE GRAVEL, LITTLE SAND, LITTLE SILT, FEW COBBLES, OCCASIONAL BOULDERS SUSPECTED
- (M) VARIES FROM LAMINATED CLAY AND SILT, OCCASIONAL FINE SAND LENSES TO LAMINATED SILTY CLAY, LITTLE FINE SAND TO FINE SAND, LITTLE SILT, OCCASIONAL COBBLES AND BOULDERS
- (G) FINE TO COARSE GRAVEL AND SAND, LITTLE TO SOME CLAYEY SILT
- (R) BEDROCK

### LEGEND:

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9/29/05 SYR-85-NJR SDL BGP
36676040/CONTRACT/WORKPLAN/36676V02.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
1"=10' (10' 0 10' 20')
1"=20' (20' 0 20' 40')

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

| No. | Date | Revisions | Init |
|---|---|---|---|

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

| | |
|---|---|
| Professional Engineer's Name | JAMES M. NUSS |
| Professional Engineer's No. | # 067963 |
| State | NY |
| Date Signed | 10/7/05 |
| Project Mgr. | GMT |
| Designed by | PAB |
| Drawn by | NJR |

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

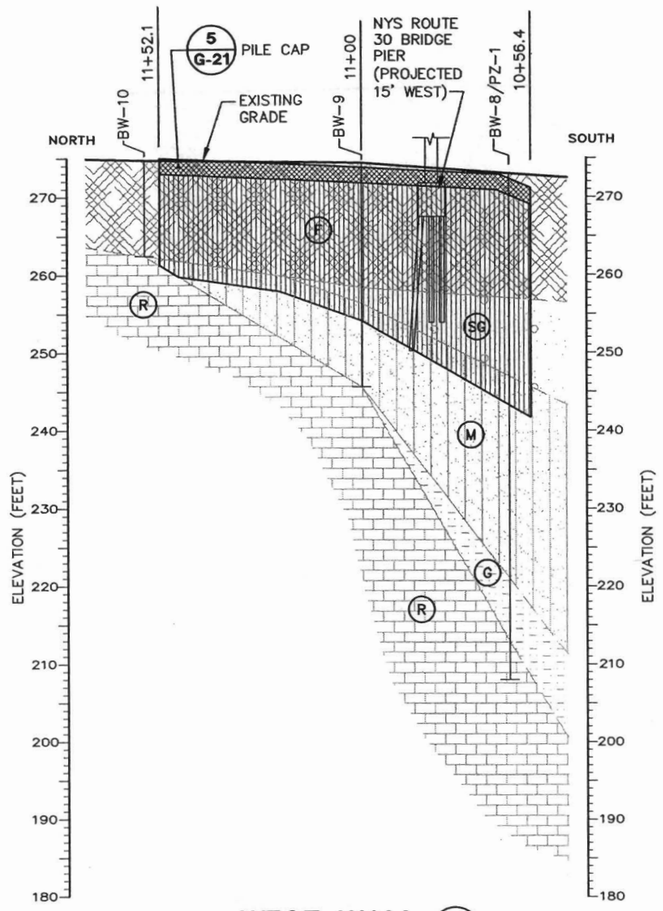
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# BARRIER WALL PROFILE - SOUTH WALL (STATIONS 5+82 TO 10+56)

| | |
|---|---|
| BBL Project No. | 366.76 |
| Date | OCTOBER 2005 |

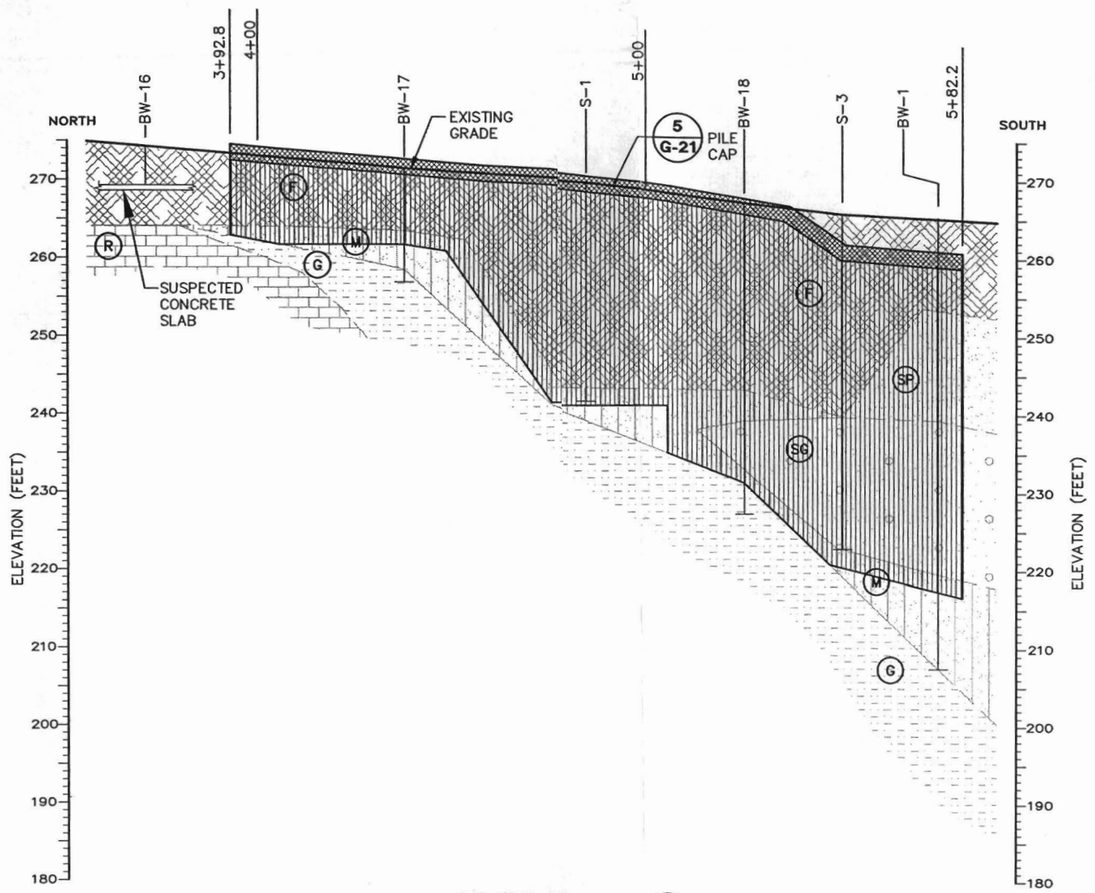
Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-9




## WEST WALL (1)

HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=10'
(VERTICAL EXAGGERATION = 2X)




## EAST WALL (2)

HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=10'
(VERTICAL EXAGGERATION = 2X)

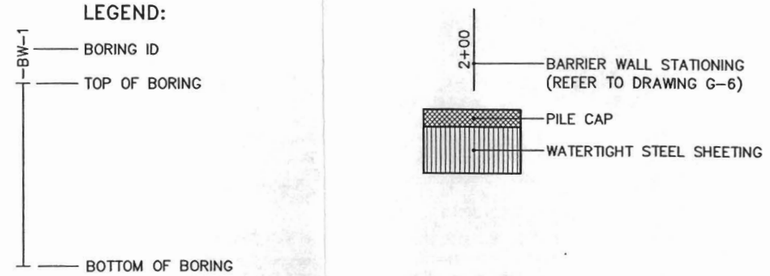
### NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.
2. CONTACTS ARE APPROXIMATE AND ARE INFERRED BETWEEN BORINGS. SUBSURFACE CONDITIONS HAVE BEEN GENERALIZED.
3. THE GEOLOGIC CROSS SECTIONAL INFORMATION SHOWN REPRESENTS CONDITIONS ALONG THE LINE OF BW- SERIES OF BORINGS DRILLED DURING THE PREDESIGN INVESTIGATION (I.E., NOT DIRECTLY ALONG THE WALL ALIGNMENT). REFER TO DRAWING G-6 FOR LOCATIONS OF BORINGS RELATIVE TO THE BARRIER WALL ALIGNMENT.
4. DESIGN OF NYS ROUTE 30 BRIDGE PIER, FROM: AMSTERDAM NORTH-SOUTH ARTERIAL, MOHAWK RIVER TO GROVE STREET, MONTGOMERY COUNTY, SHEET NO. 105, DRAWING NO. 17 OF 113, STATE OF NEW YORK, (UNKNOWN DATE). PILING LENGTHS VARY FROM 14.5 FEET TO 36 FEET LONG. INDIVIDUAL PILE LENGTHS ARE UNKNOWN.

### GENERAL SOIL UNITS:

- (F) FILL, PREDOMINANTLY GRANULAR
- (SP) VARIES FROM FINE TO MEDIUM SAND, SOME SILT TO FINE SAND AND SILT TO CLAYEY SILT AND FINE SAND
- (SG) VARIES FROM FINE TO COARSE SAND, LITTLE GRAVEL, LITTLE SILT TO FINE TO COARSE GRAVEL, LITTLE SAND, LITTLE SILT, FEW COBBLES, OCCASIONAL BOULDERS SUSPECTED
- (M) VARIES FROM LAMINATED CLAY AND SILT, OCCASIONAL FINE SAND LENSES TO LAMINATED SILTY CLAY, LITTLE FINE SAND TO FINE SAND, LITTLE SILT, OCCASIONAL COBBLES AND BOULDERS.
- (G) FINE TO COARSE GRAVEL AND SAND, LITTLE TO SOME CLAYEY SILT
- (R) BEDROCK

### LEGEND:




X: 36676X00.DWG
L: ON=*, OFF=REF
P: PAGESET/SYR-CDL
9/29/05 SYR-85-NJR SDL BGP
36676040/CONTRACT/WORKPLAN/36676V03.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
10' 0 10' 20'
1"=10'
20' 0 20' 40'
1"=20'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

| No. | Date | Revisions | Init |
|---|---|---|---|

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: PAB
Drawn by: NJR

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

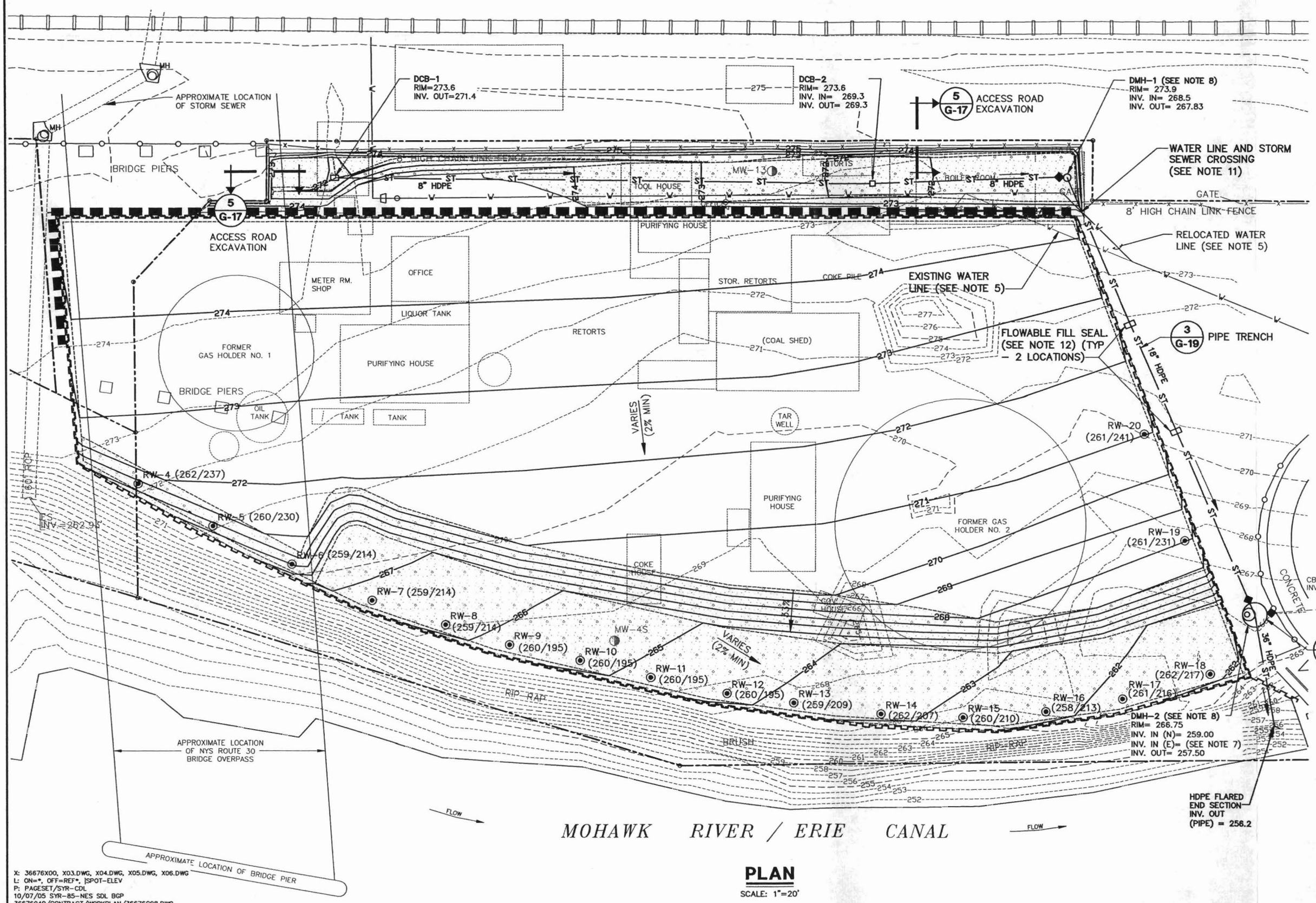
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# BARRIER WALL PROFILES - EAST WALL (STATIONS 3+93 TO 5+82) AND WEST WALL (STATIONS 10+56 TO 11+52)

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-10




**PLAN**

SCALE: 1"=20'

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P: PAGESET/SYR-CDL
10/07/05 SYR-85-NES SDL BGP
36676040/CONTRACT/WORKPLAN/36676G08.DWG

**NOTES:**

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. SUITABLE EXCAVATED SITE SOILS SHALL BE USED AS LINER SUBGRADE FILL WITHIN LIMITS OF BARRIER WALL.
3. ADDITIONAL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE ESTABLISHED AND MAINTAINED BY THE CONTRACTOR AS APPROPRIATE TO MINIMIZE THE POTENTIAL FOR OFFSITE MIGRATION OF SEDIMENTS.
4. PASSIVE NAPL RECOVERY WELLS SHALL BE INSTALLED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
5. SEE DRAWING G-5 FOR INFORMATION RELATED TO RELOCATION OF EXISTING WATER LINE.
6. ELEVATIONS REPRESENT TOP OF SUBGRADE.
7. INVERT ELEVATION TO BE DETERMINED BY THE ENGINEER IN THE FIELD AT TIME OF CONSTRUCTION BASED ON EXISTING PIPE INVERT ELEVATIONS.
8. CONTRACTOR SHALL PROVIDE A SOLID COVER FOR DMH-1 AND A GRATED COVER FOR DMH-2.
9. BASE OF BORING ELEVATIONS FOR RECOVERY WELLS WILL BE APPROXIMATELY 5 FEET LOWER THAN BOTTOM OF SCREEN TO PROVIDE FOR INSTALLATION OF A BLIND SUMP BELOW THE SCREEN.
10. DRAINAGE GATES TO BE INSTALLED ON INLET PIPES WITHIN MANHOLES WHERE INDICATED. DRAINAGE GATE SHALL BE NEENAH R-5050 SERIES TYPE CF OR EQUAL AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.
11. CONTRACTOR SHALL MAINTAIN A MINIMUM 18" OF SEPARATION BETWEEN THE BOTTOM OF THE NEW WATER LINE AND THE TOP OF THE STORM SEWER PIPE.
12. CONTRACTOR SHALL INSTALL A FLOWABLE FILL SEAL A MINIMUM 2 FEET BEYOND THE OUTER DIMENSION OF THE HDPE PIPE AND FOR A LENGTH OF 2 FEET ALONG THE PIPE.

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

1"=20' (20' 0 20' 40')

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|---|---|
| Professional Engineer's Name | JAMES M. NUSS |
| Professional Engineer's No. | # 067963 |
| State | NY |
| Date Signed | 10/7/05 |
| Project Mgr. | GMT |
| Designed by | TAS |
| Drawn by | NES |

STATE OF NEW YORK JAMES M. NUSS 067963 PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SUBGRADE PREPARATION PLAN

BBL Project No. 366.76

Date OCTOBER 2005

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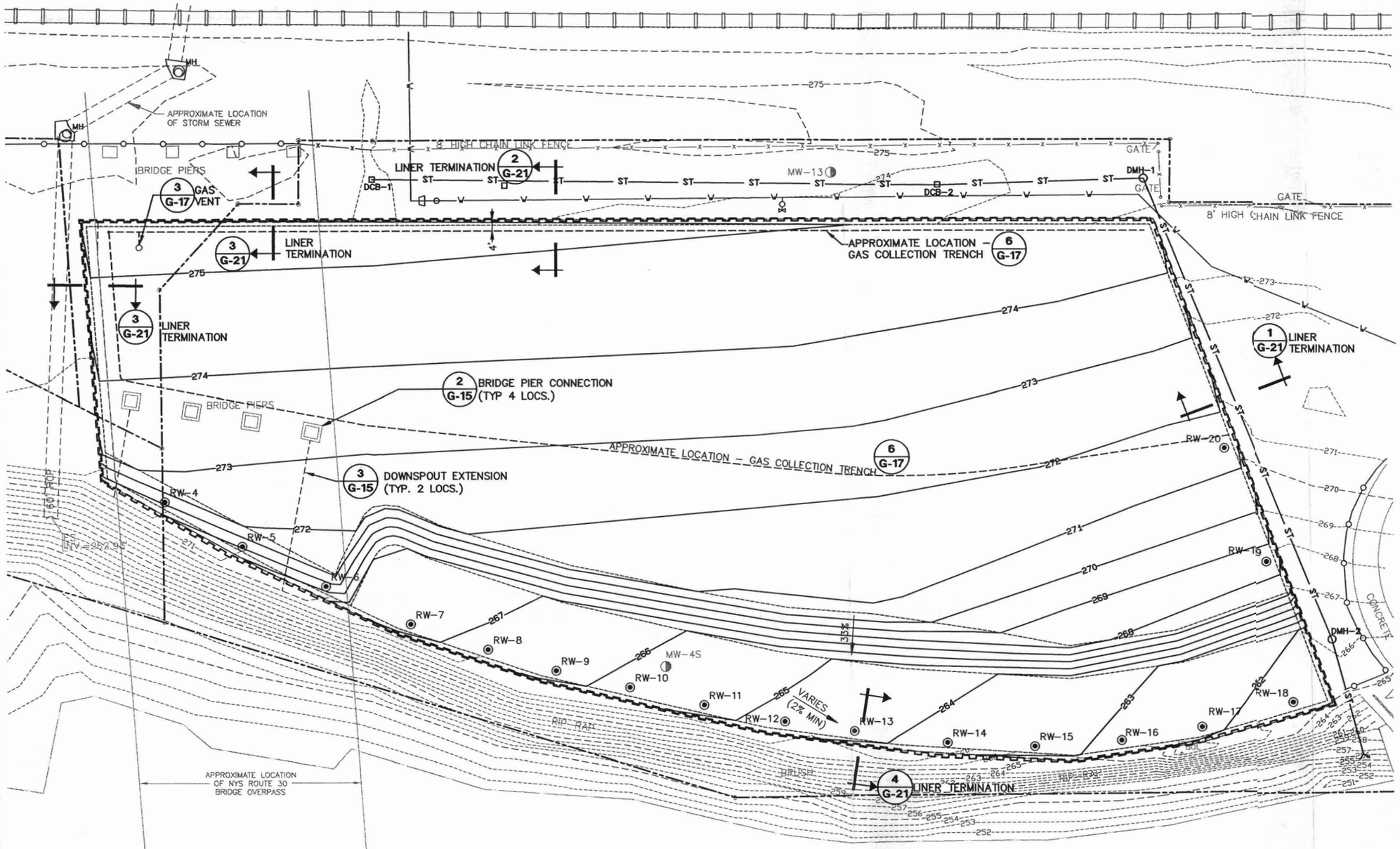
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-11




**PLAN**
SCALE: 1"=20'

NOTES:

1. REFER TO DRAWING G–1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G–2 FOR ADDITIONAL BASE MAP INFORMATION.
2. REFER TO DRAWING G–11 FOR ADDITIONAL WATER LINE AND STORM SEWER INFORMATION.
3. ELEVATIONS REPRESENT TOP OF GEOSYNTHETIC DRAINAGE LAYER.

X: 36676X00, X04.DWG, X05.DWG, X06.DWG, X08.DWG
L: ON=*, OFF=REF*, |LZ-HZ-MN
P: PAGESET/SYR-CDL
10/4/05 SYR-85-NES KLS SDL
36676040/CONTRACT/WORKPLAN/36676G09.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
20' 0 20' 40'
1"=20'

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| No. | Date | Revisions | Init |
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| Professional Engineer's Name | JAMES M. NUSS |
| Professional Engineer's No. | # 067963 |
| State | NY |
| Date Signed | 10/7/05 |
| Project Mgr. | GMT |
| Designed by | TAS |
| Drawn by | NES |

BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

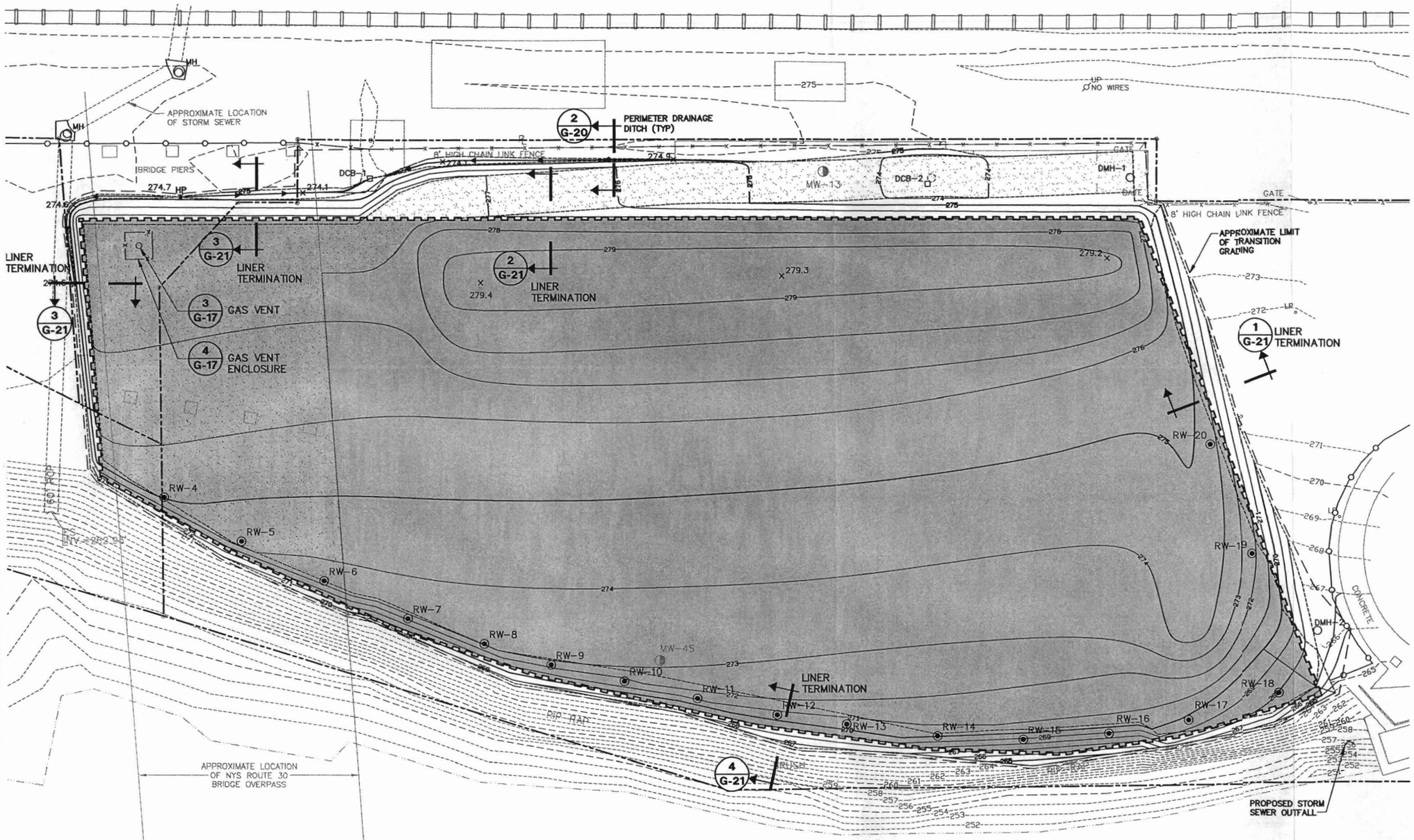
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# LINER SYSTEM GRADING PLAN

| | |
|---|---|
| BBL Project No. | 366.76 |
| Date | OCTOBER 2005 |

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315–446–9120

G-12




**PLAN**

SCALE: 1"= 20'

NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. ELEVATIONS REPRESENT TOP OF VEGETATED TOPSOIL OR GRANULAR FILL (SEE DETAILS 1, 2 AND 7 ON DRAWING G-17).

X: 36676X00, X03.DWG, X04.DWG, X05.DWG, X06.DWG
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P: PAGESET/SYR-CDL
10/4/05 SYR-85-NES KLS SDL
36676040/CONTRACT/WORKPLAN/36676G10.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING
1"=20' 20' 0 20' 40'

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

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|---|---|---|
| Professional Engineer's Name: JAMES M. NUSS | | |
| Professional Engineer's No.: # 067963 | | |
| State: NY | Date Signed: 10/7/05 | |
| Project Mgr.: GMT | Designed by: TAS | Drawn by: NES |

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

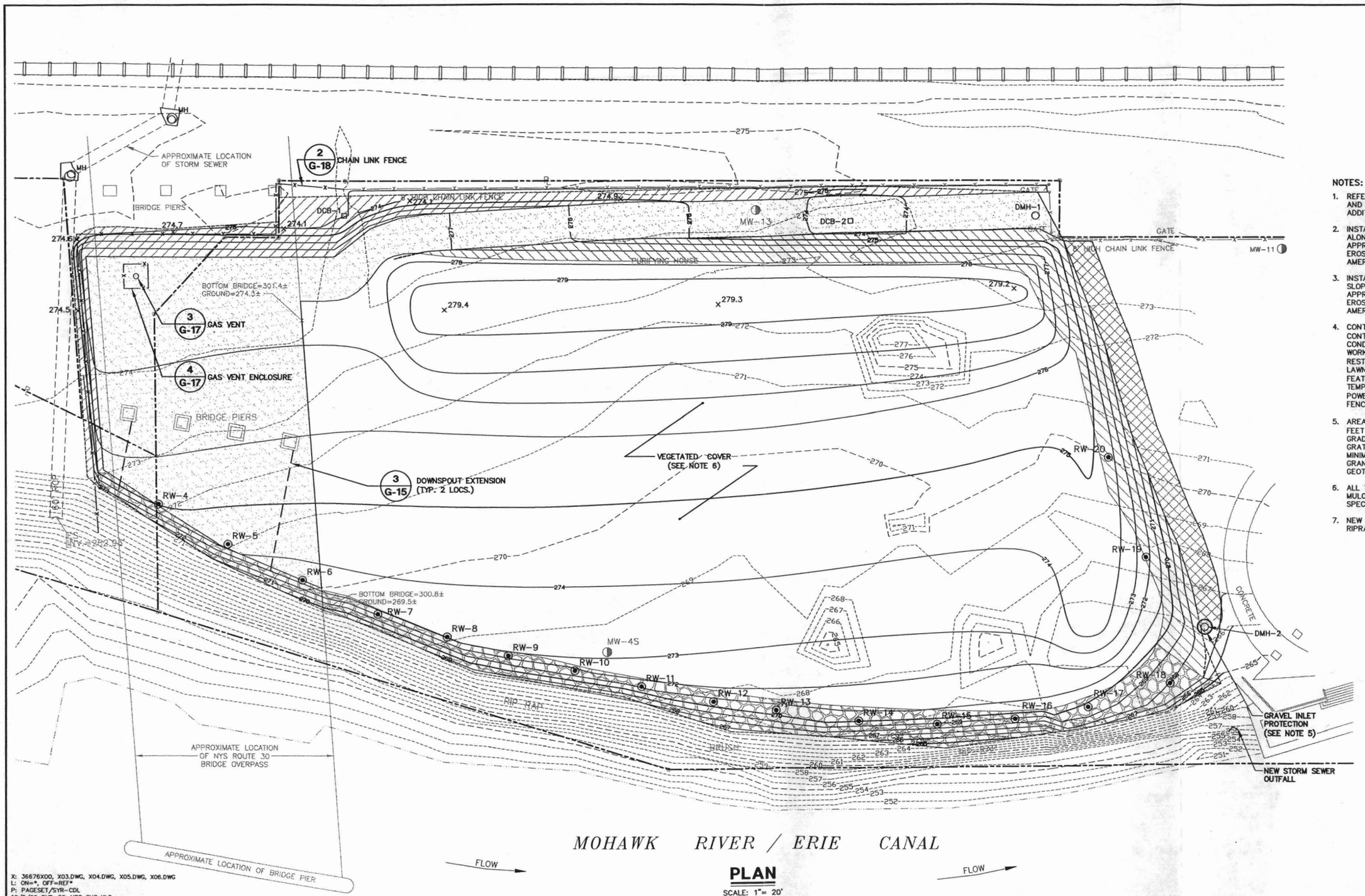
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SURFACE GRADING AND SITE DRAINAGE PLAN

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-13




**PLAN**

SCALE: 1"= 20'

NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. INSTALL PERMANENT EROSION CONTROL MAT ALONG TOE OF EAST-FACING SLOPE TO THE APPROXIMATE EXTENTS SHOWN. PERMANENT EROSION CONTROL MAT SHALL BE NORTH AMERICAN GREEN P300.
3. INSTALL TEMPORARY EROSION CONTROL MAT ON SLOPES GREATER THAN 4H:1V AT THE APPROXIMATE LOCATIONS SHOWN. TEMPORARY EROSION CONTROL MAT SHALL BE NORTH AMERICAN GREEN S-150, OR APPROVED EQUAL.
4. CONTRACTOR SHALL RESTORE CONTRACTOR/ADMINISTRATIIVE AREA TO LIKE CONDITIONS AS EXISTED PRIOR TO INITIATION OF WORK ACTIVITIES. THIS INCLUDES, AT A MINIMUM, RESTORATION OF ALL SURFACE FEATURES (E.G. LAWN, SIDEWALKS, VEGETATION, LIGHTING FEATURES, JUNGLE GYM) AND REMOVAL OF TEMPORARY FENCING AND POWER/COMMUNICATION DROPS. GATE IN NORTH FENCE SHALL REMAIN.
5. AREA SURROUNDING INLET DRAIN MANHOLE (3 FEET OFFSET FROM GRATE) TO BE SLOPED AND GRADED TO PROMOTE INFLOW TO MANHOLE GRATE. GRADED AREA TO BE LINED WITH A MINIMUM 6 INCH THICK LAYER OF TYPE C GRANULAR FILL UNDERLAIN WITH NON-WOVEN GEOTEXTILE.
6. ALL TOPSOIL SURFACES TO BE SEEDED AND MULCHED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
7. NEW RIPRAP SHALL BE SIMILAR SIZE AS EXISTING RIPRAP.

X: 36676X00, X03.DWG, X04.DWG, X05.DWG, X06.DWG
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P: PAGESET/SYR-CDL
10/5/05 SYR-85-NES GHS KLS
36676040/CONTRACT/WORKPLAN/36676G16.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

1"=20' 20' 0 20' 40'

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| Professional Engineer's Name: JAMES M. NUSS | | |
| Professional Engineer's No.: # 067963 | | |
| State: NY | Date Signed: 10/7/05 | |
| Project Mgr.: GMT | Designed by: TAS | Drawn by: NES |

STATE OF NEW YORK JAMES M. NUSS 067963 PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

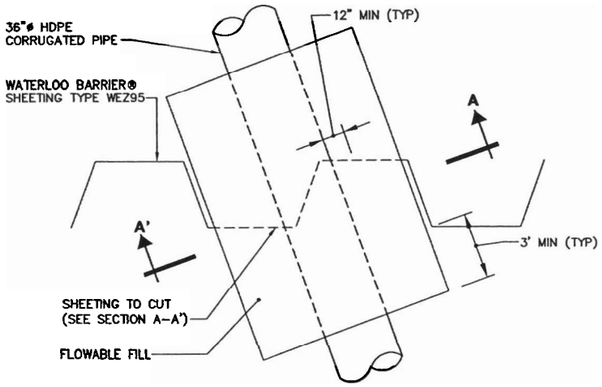
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SITE RESTORATION PLAN

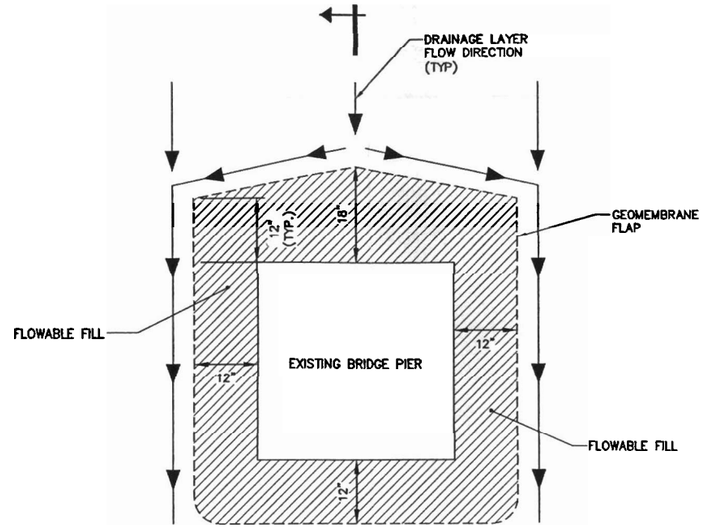
BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-14




**PLAN**

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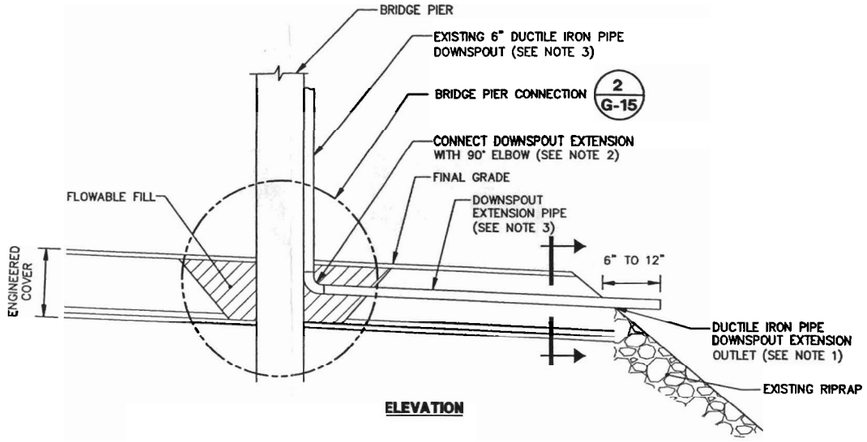
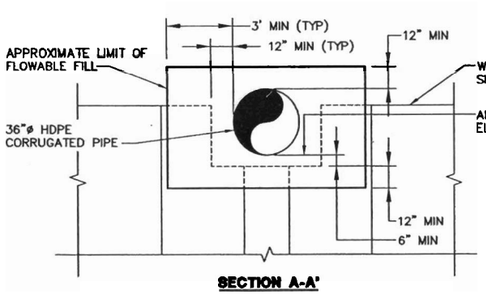



**ELEVATION**



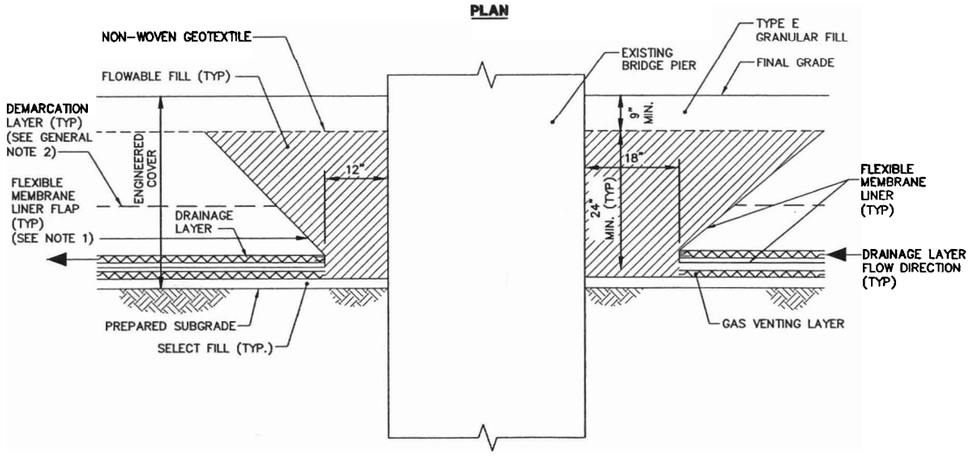

**SECTION A-A'**

NOTE:

1. ACTUAL LOCATION AND INVERT ELEVATION OF PIPE PENETRATION TO BE DETERMINED BASED ON FIELD CONDITIONS AT TIME OF CONSTRUCTION.

## SHEETING/PIPE PENETRATION DETAIL 1

NOT TO SCALE



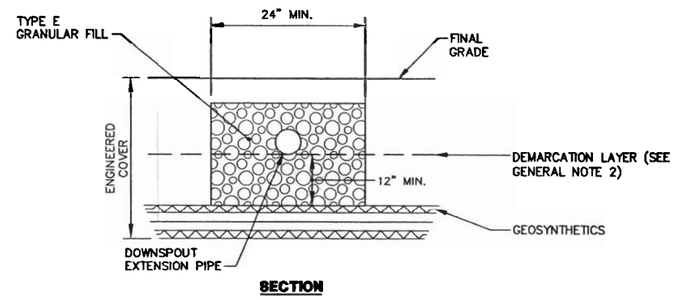

**SECTION**

NOTES:

1. FLEXIBLE MEMBRANE LINER SHALL BE TURNED AND HELD IN PLACE WITH FLOWABLE FILL.
2. SIDE SLOPES WILL BE AS REQUIRED.

## BRIDGE PIER CONNECTION DETAIL 2

NOT TO SCALE




**SECTION**

NOTES:

1. OUTLET DOWNSPOUT EXTENSION ONTO EXISTING RIPRAP. WHERE EXISITING RIPRAP IS NOT AVAILABLE, PROTECT DOWNGRADIENT SURFACE WITH RIPRAP OR CONCRETE APRON.
2. REMOVE AND REPLACE EXISITING 90° ELBOW, AS NECESSARY, TO INSTALL DOWNSPOUT EXTENSION AT REQUIRED ELEVATION.
3. CONTRACTOR SHALL VERIFY SIZE AND MATERIAL OF EXISTING DOWNSPOUT AT TIME OF CONSTRUCTION. DIAMETER AND MATERIAL OF DOWNSPOUT EXTENSION PIPE SHALL MATCH DIAMETER OF EXISTING DOWNSPOUT.

## DOWNSPOUT EXTENSION DETAIL 3

NOT TO SCALE

GENERAL NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.
2. DEMARCATION LAYER SHALL BE A BRIGHT YELLOW OR ORANGE PLASTIC MESH MADE OF POLYPROPYLENE OR HDPE. CONTRACTOR TO PROVIDE ENGINEER WITH SUBMITTAL OF INTENDED PRODUCT FOR REVIEW.

X: 36676X00.DWG
L: ON=*, OFF=REF
P: PAGESET/SYR-CDL
10/07/05 SYR-85-GJD KLS GHS
36676040/CONTRACT/WORKPLAN/36676G11.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

NOT TO SCALE

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Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: TAS
Drawn by: GJD

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SECTIONS AND DETAILS

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

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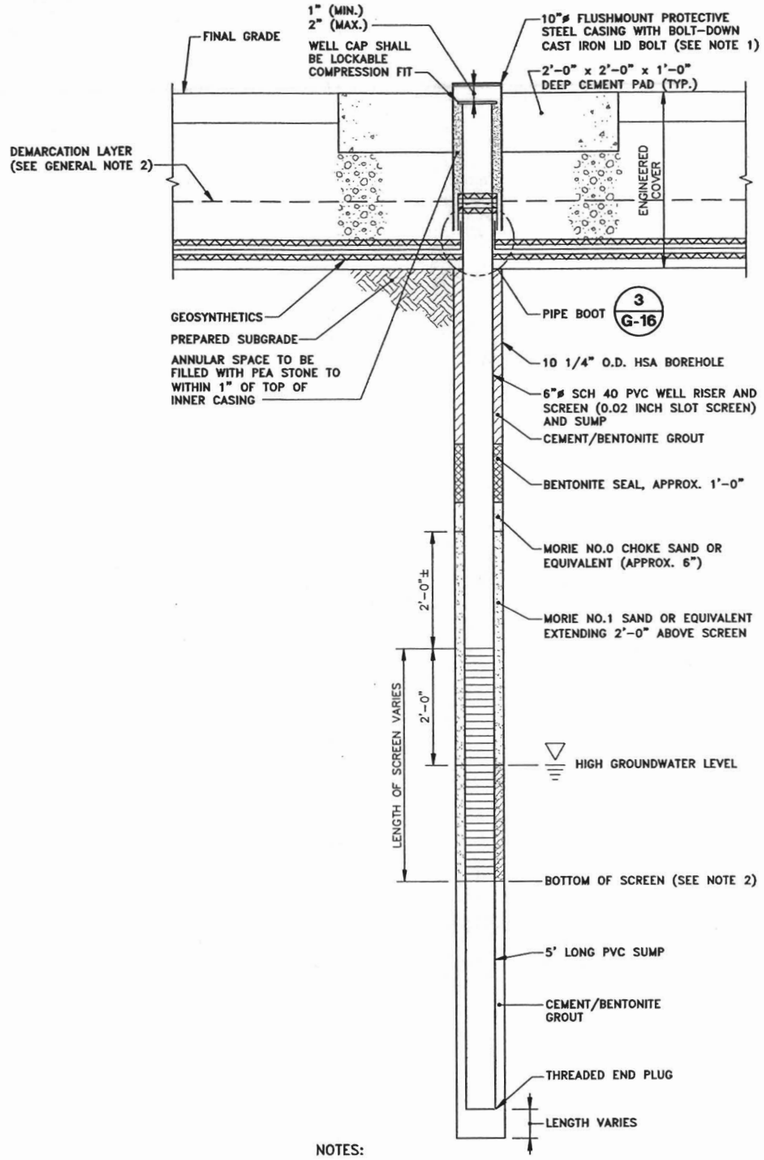
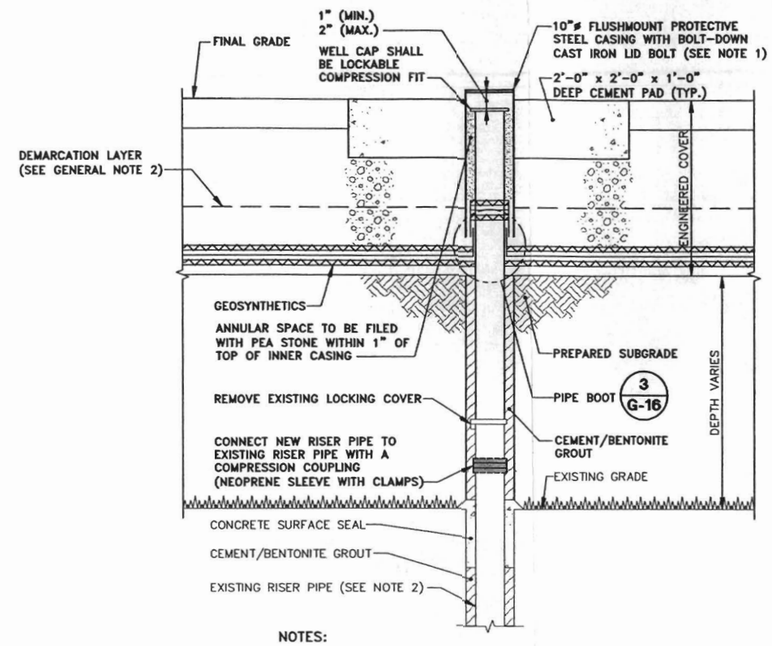



NOTES:

1. PROTECTIVE STEEL CASING SHALL REACH A DEPTH OF 24", AND SHALL NEVER BE IN CONTACT WITH THE GEOSYNTHETICS.
2. TOP/BOTTOM ELEVATION OF SCREEN IS SHOWN ON DRAWING G-11 FOR EACH RECOVERY WELL.
3. REFER TO TECHNICAL SPECIFICATION 02414 FOR WELL SPECIFICATION DETAILS.

## PASSIVE NAPL RECOVERY WELL DETAIL (1)

NOT TO SCALE




NOTES:

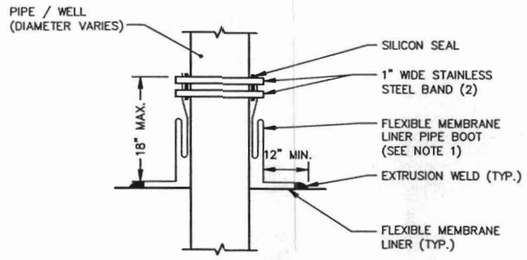
1. PROTECTIVE STEEL CASING SHALL REACH A DEPTH OF 24", AND SHALL NEVER BE IN CONTACT WITH THE GEOSYNTHETICS.
2. RISER PIPE AND STEEL CASING SIZES AND TYPES MAY DIFFER FOR EACH WELL. NEW WELL EXTENSION MATERIALS TO BE OF THE SAME SIZE AND TYPE AS EXISTING. EXPECTED TO BE SCHEDULE 40 2-INCH DIAMETER PVC.
3. EXISTING MONITORING MW-13 IS LOCATED OUTSIDE THE AREA REQUIRING GEOSYNTHETICS AND WON'T REQUIRE A PIPE BOOT.

## EXISTING MONITORING WELL EXTENSION DETAIL (2)

NOT TO SCALE

GENERAL NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.
2. DEMARCATION LAYER SHALL BE A BRIGHT YELLOW OR ORANGE PLASTIC MESH MADE OF POLYPROPYLENE OR HDPE. CONTRACTOR TO PROVIDE ENGINEER WITH SUBMITTAL OF INTENDED PRODUCT FOR REVIEW.




NOTE:

1. THE PIPE BOOT SHALL HAVE A MINIMUM 12" OF EXCESS FLEXIBLE MEMBRANE LINER.

## PIPE BOOT DETAIL (3)

NOT TO SCALE

X: 36676X00.DWG
L: ON=*, OFF=REF
P: PAGESET/SYR-DL
9/15/05 SYR-85-RCA GHS BGP
36676040/CONTRACT/WORKPLAN/36676G12.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

NOT TO SCALE

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| No. | Date | Revisions | Init |
|---|---|---|---|

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Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: TAS
Drawn by: RCA

STATE OF NEW YORK JAMES M. NUSS 067963 PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

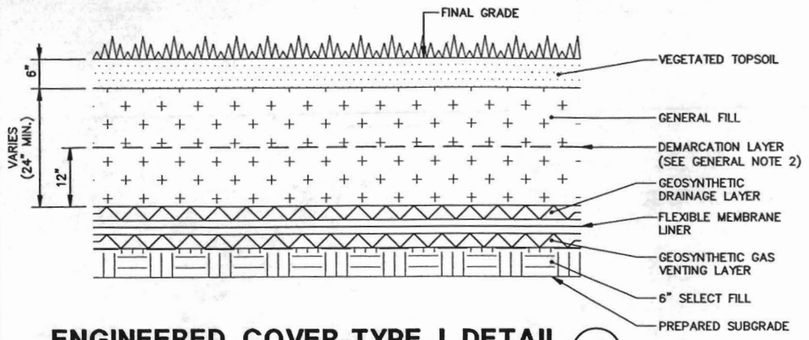
# SECTIONS AND DETAILS

GENERAL

BBL Project No. 366.76
Date OCTOBER 2005

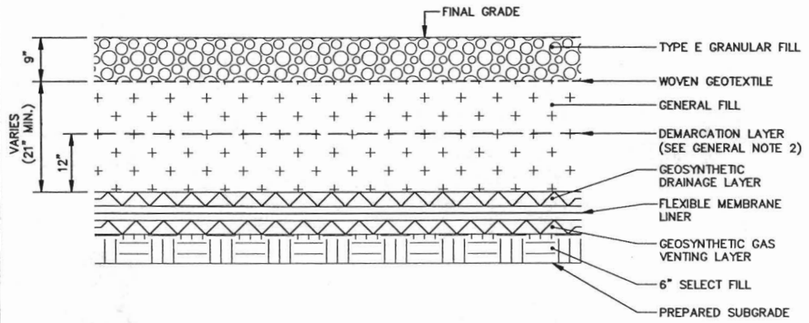
Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-16



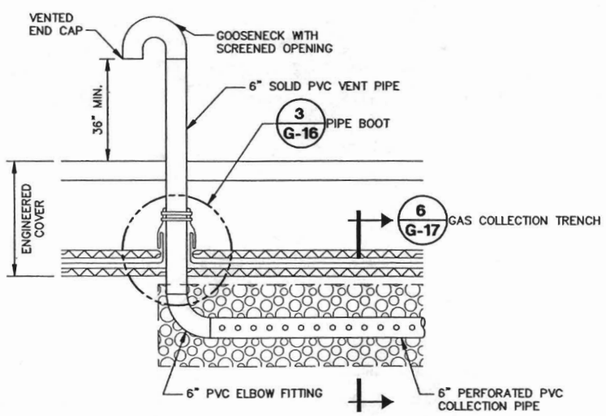

## ENGINEERED COVER-TYPE I DETAIL (1)

NOT TO SCALE



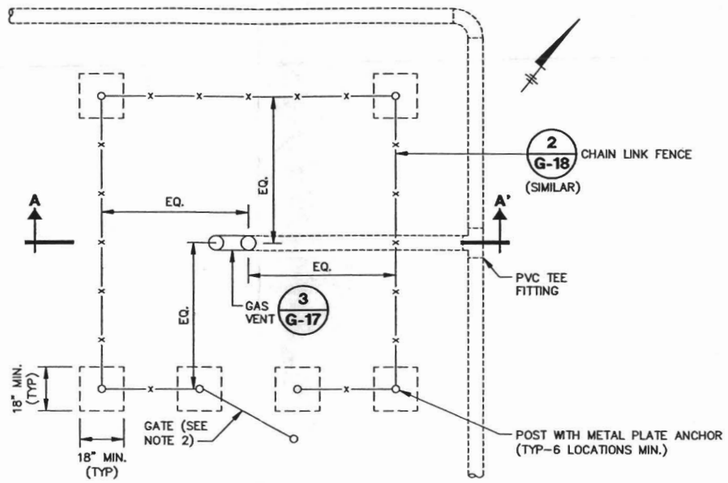

## ENGINEERED COVER-TYPE II DETAIL (2)

NOT TO SCALE

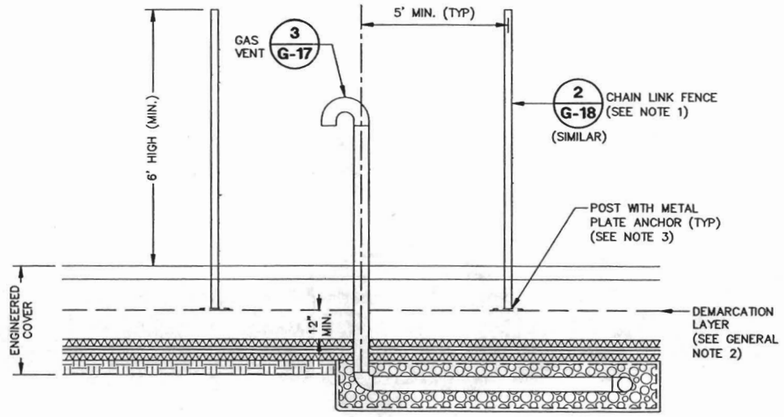



## GAS VENT DETAIL (3)

NOT TO SCALE




**PLAN**



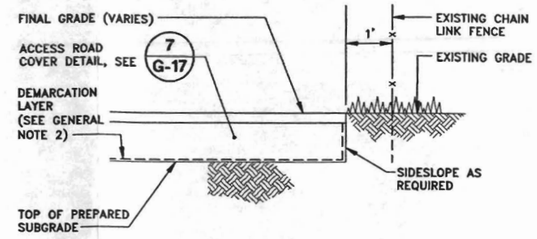

NOTES:

1. SEE TECHNICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION RELATED TO CHAIN LINK FENCE.
2. INSTALL SWING GATE WITH LOCKABLE LATCH TO ALLOW/RESTRICT ACCESS TO GAS VENT PIPE.
3. EXTEND POSTS 18" AND WELD METAL PLATE ACHORS TO BOTTOM. BURY PLATE 1' ABOVE GEOSYNTHETICS (I.E., ON TOP OF DEMARCATION LAYER). FENCE FABRIC SHALL NOT EXTEND BELOW GRADE. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS OF METAL PLATE AND ATTACHMENT IN ADDITION TO SUBMITTALS REQUIRED BY THE TECHNICAL SPECIFICATIONS.

**SECTION A-A'**

## GAS VENT ENCLOSURE DETAIL (4)

NOT TO SCALE

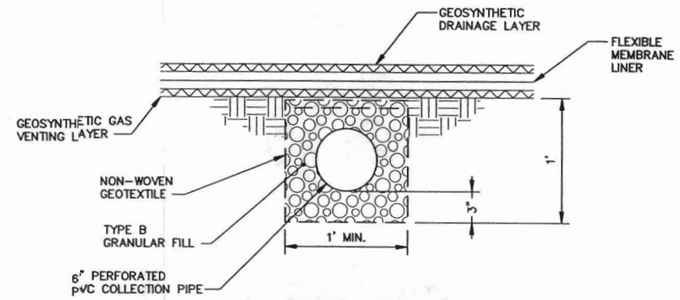



NOTE:

1. REFER TO DRAWING G-11 FOR BOTTOM OF EXCAVATION ELEVATIONS.

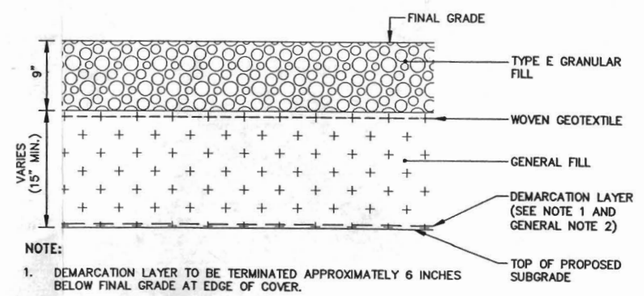
## ACCESS ROAD EXCAVATION DETAIL (5)

NOT TO SCALE




## GAS COLLECTION TRENCH DETAIL (6)

NOT TO SCALE




NOTE:

1. DEMARCATION LAYER TO BE TERMINATED APPROXIMATELY 6 INCHES BELOW FINAL GRADE AT EDGE OF COVER.

## ACCESS ROAD COVER DETAIL (7)

NOT TO SCALE

GENERAL NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.
2. DEMARCATION LAYER SHALL BE A BRIGHT YELLOW OR ORANGE PLASTIC MESH MADE OF POLYPROPYLENE OR HDPE. CONTRACTOR TO PROVIDE ENGINEER WITH SUBMITTAL OF INTENDED PRODUCT FOR REVIEW.

X: 36676X00.DWG
L: ON=*, OFF=REF
P: PAGESET/SYR-CDL
10/04/05 SYR-85-BGP BGP KLS
36676040/CONTRACT/WORKPLAN/36676G15.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

NOT TO SCALE

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

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| | | |
|---|---|---|
| Professional Engineer's Name: JAMES M. NUSS | | |
| Professional Engineer's No.: # 067963 | | |
| State: NY | Date Signed: 10/7/05 | |
| Project Mgr.: GMT | Designed by: TAS | Drawn by: BGP |

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

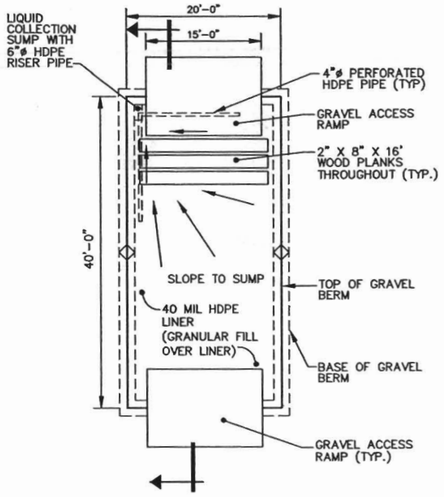
# SECTIONS AND DETAILS

BBL Project No. 366.76

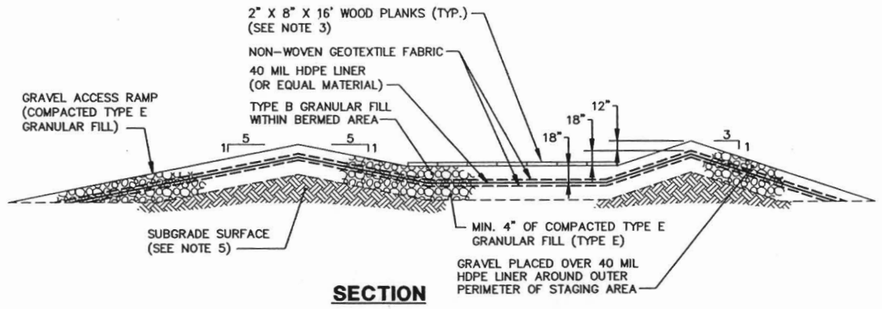
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-17




**PLAN**



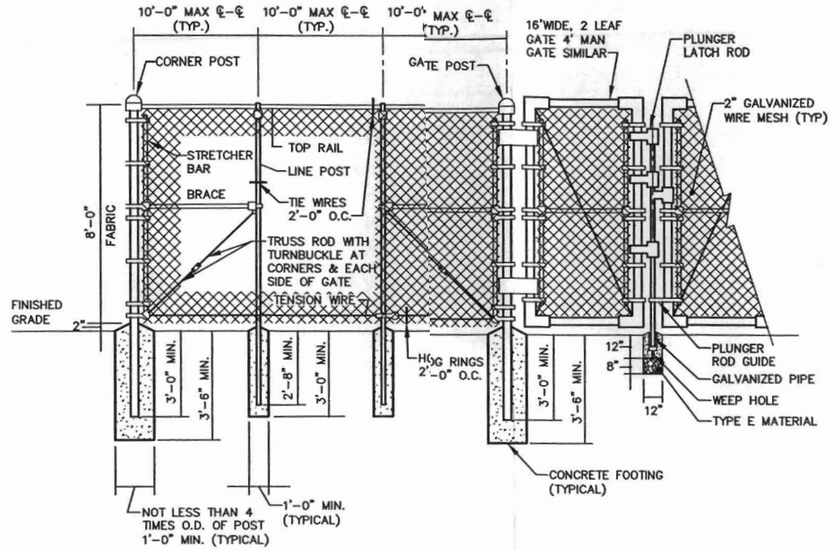

**SECTION**

NOTES:

1. DECONTAMINATION AREA TO BE SLOPED TOWARD A COLLECTION SUMP TO FACILITATE COLLECTION AND REMOVAL OF WASH FLUIDS. FLUIDS SHALL BE PUMPED FROM COLLECTION SUMP INTO 55 GALLON DRUMS OR A TEMPORARY STORAGE TANK (IF NECESSARY).
2. UPON COMPLETION OF CONSTRUCTION ACTIVITIES, THE DECONTAMINATION AREA, INCLUDING GEOSYNTHETICS, SHALL BE REMOVED BY THE CONTRACTOR FOR OFFSITE DISPOSAL.
3. WOOD PLANKS SHALL BE PLACED ABOVE THE GRAVEL DRAINAGE LAYER THROUGHOUT THE WORKING SURFACE OF THE DECONTAMINATION AREA TO PROVIDE A STABLE SURFACE FOR VEHICLES AND EQUIPMENT TO BE DECONTAMINATED. WOOD PLANKS DAMAGED DURING USE, SHALL BE REPLACED TO MAINTAIN STABLE SURFACE.
4. PERSONNEL DECONTAMINATION AREA SHALL BE OF SIMILAR DETAIL DIMENSIONED AS NECESSARY AND WITHOUT WOODEN PLANKS. PERSONNEL DECONTAMINATION AREA SHALL BE CONSTRUCTED WITHIN THE CONTAMINATION REDUCTION ZONE, AS ESTABLISHED BY THE CONTRACTOR.
5. SUBGRADE SURFACE SHALL BE UNIFORM AND FREE OF DELETERIOUS MATERIALS THAT COULD DAMAGE THE HDPE LINER (E.G., SHARP STONES, WOODY DEBRIS, CONSTRUCTION DEBRIS).

## DECONTAMINATION AREA DETAIL (1)

NOT TO SCALE

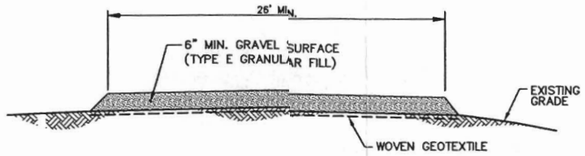



NOTE:

1. CONCRETE SHALL BE TAMPED & RODDED IN PLACE.

## CHAIN LINK FENCE DETAIL (2)

NOT TO SCALE




NOTE:

1. ACTUAL THICKNESS OF GRAVEL TO BE DETERMINED BY CONTRACTOR BASED ON SITE CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION AND APPROVED BY THE ENGINEER.

## TEMPORARY VEHICLE ACCESS ROAD SECTION (3)

NOT TO SCALE

GENERAL NOTE:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.

X: 36676X00.DWG
L: ON=*, OFF=REF
P: PAGESET/PLT-CDL2B
10/07/05 SYR-85 NJR KLS BGP
36676040/CONTRACT/WORKPLAN/36676G13.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

NOT TO SCALE

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Professional Engineer's Name: JAMES M. NUSS
Professional Engineer's No.: # 067963
State: NY
Date Signed: 10/7/05
Project Mgr.: GMT
Designed by: TAS
Drawn by: NJR

STATE OF NEW YORK · JAMES M. NUSS · 067963 · LICENSED PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

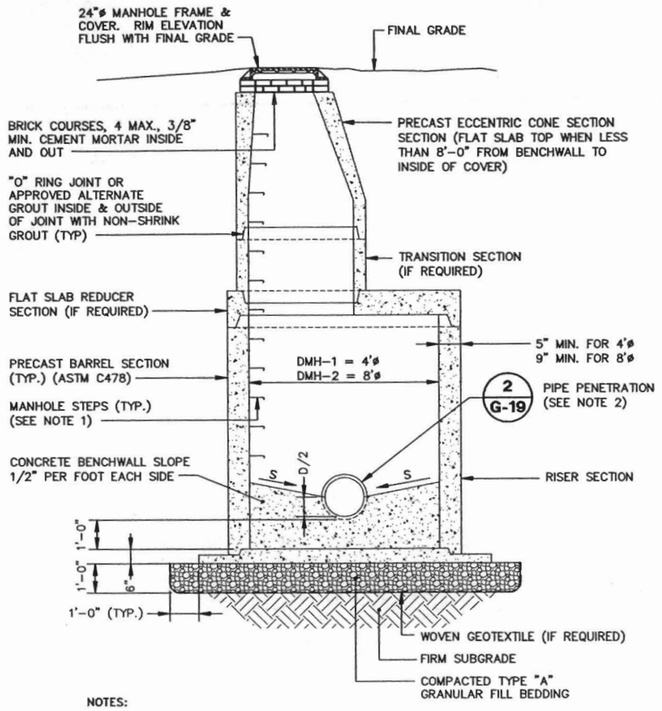
NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SECTIONS AND DETAILS

BBL Project No. 366.76
Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-18

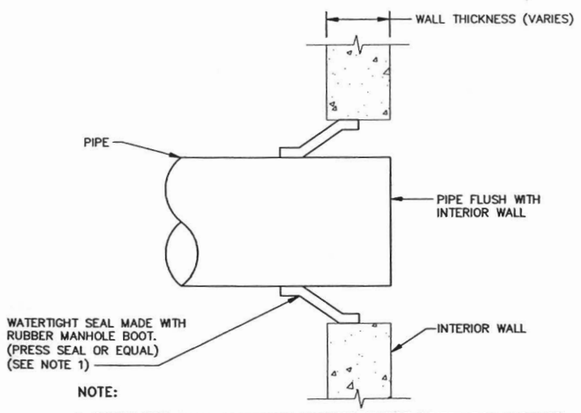



NOTES:

1. MANHOLE STEPS SHALL BE REQUIRED IN ALL DRAINAGE STRUCTURES DEEPER THAN 4 FEET.
2. REFER TO DRAWING G-11 FOR DRAIN PIPE SIZES AND INVERT ELEVATIONS.
3. WOVEN GEOTEXTILE MAY BE REQUIRED IF SOFT SUBGRADE ENCOUNTERED. SEE THE TECHNICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION RELATED TO UNSUITABLE SUBGRADE CONDITIONS.

## TYPICAL PRECAST DRAIN MANHOLE SECTION (1)

NOT TO SCALE

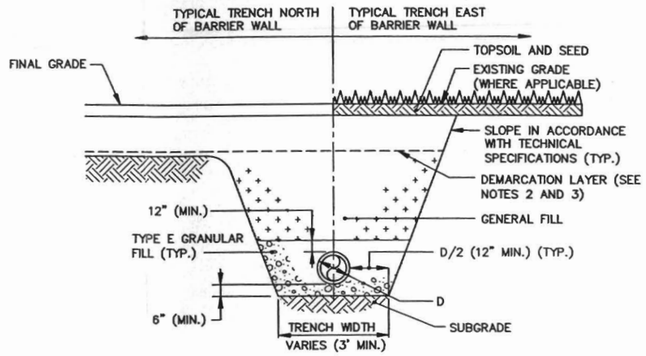



NOTE:

1. CONTRACTOR SHALL COORDINATE DIAMETER OF PIPE PENETRATION OPENINGS WITH MANUFACTURER'S REQUIREMENTS FOR RUBBER MANHOLE BOOT.

## MANHOLE PIPE PENETRATION DETAIL (2)

NOT TO SCALE

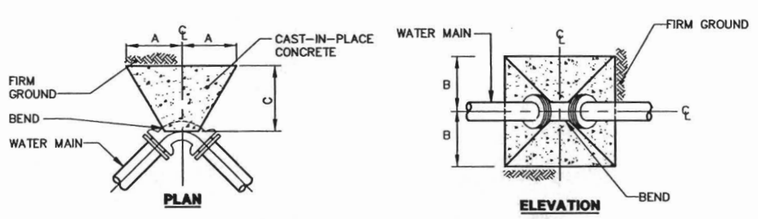



NOTES:

1. REFER TO TECHNICAL SPECIFICATIONS FOR PLACEMENT AND COMPACTION REQUIREMENTS.
2. DEMARCATION LAYER SHALL BE A BRIGHT YELLOW OR ORANGE PLASTIC MESH MADE OF POLYPROPYLENE OR HDPE. CONTRACTOR TO PROVIDE ENGINEER WITH SUBMITTAL OF INTENDED PRODUCT FOR REVIEW.
3. EXISTING DEMARCATION LAYER WITHIN PHASE I AREA TO BE REPLACED IN-KIND WITH LIKE MATERIALS AND TO SAME ELEVATIONS, IF ENCOUNTERED.

## PIPE TRENCH DETAIL (3)

NOT TO SCALE



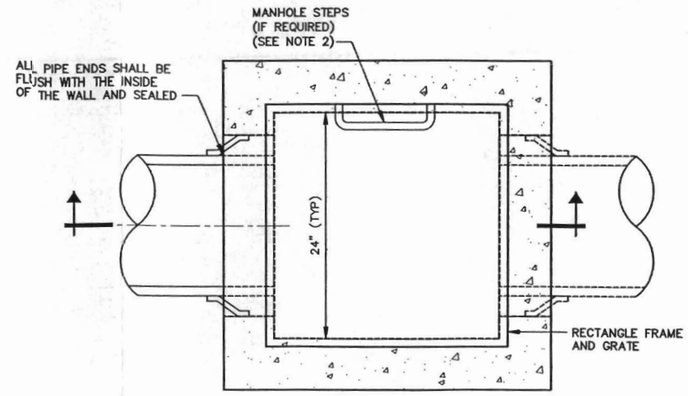

| PIPE SIZE | FITTING | MINIMUM THRUST BLOCK DIMENSION | | |
|---|---|---|---|---|
| | | A | B | C |
| 8" | 22.5° BEND | 1'-2" | 1'-2" | 1'-3" |
| 8" | 45° BEND | 1'-6" | 1'-6" | 1'-6" |

NOTE:

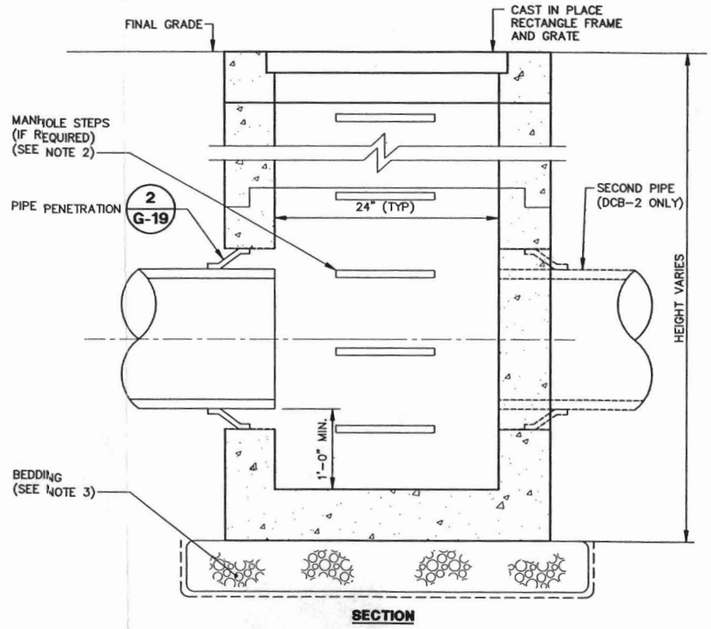
1. 28-DAY STRENGTH OF CONCRETE SHALL BE AT LEAST 3,000 PSI AS DETERMINED BY ASTM C39.

## CONCRETE THRUST BLOCK DETAIL (4)

NOT TO SCALE




PLAN




SECTION

NOTES:

1. A CORNER PIPE ENTRY SHALL NOT BE PERMITTED.
2. MANHOLE STEPS SHALL BE REQUIRED IN ALL DRAINAGE STRUCTURES DEEPER THAN 4 FEET.
3. CATCH BASIN SHALL BE BEDDED AS SHOWN FOR TYPICAL PRECAST MANHOLE.
4. REFER TO DRAWING G-11 FOR PIPE SIZES AND INVERT ELEVATIONS.

## PRECAST DRAIN CATCH BASIN DETAIL (5)

NOT TO SCALE

GENERAL NOTE:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.

X: 36676X00.DWG
L: ON=*, OFF=REF
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10/07/05 SYR-85 NJR SDL BGP
36676040/CONTRACT/WORKPLAN/36676G14.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

AS NOTED

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Corporate Headquarters
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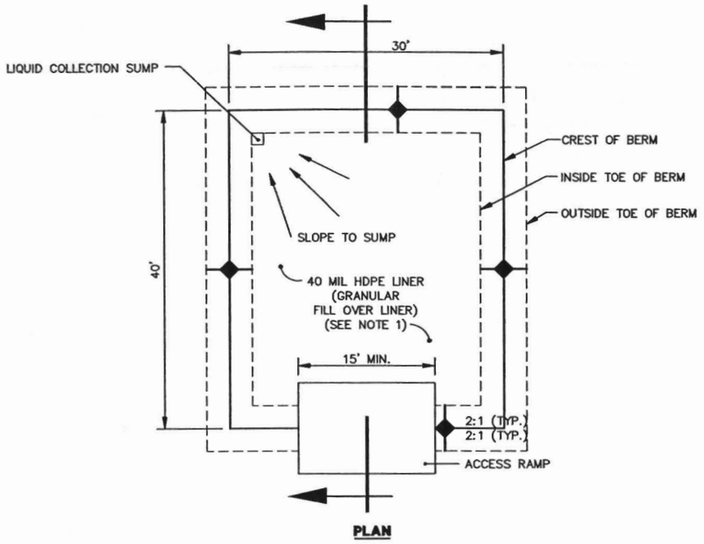
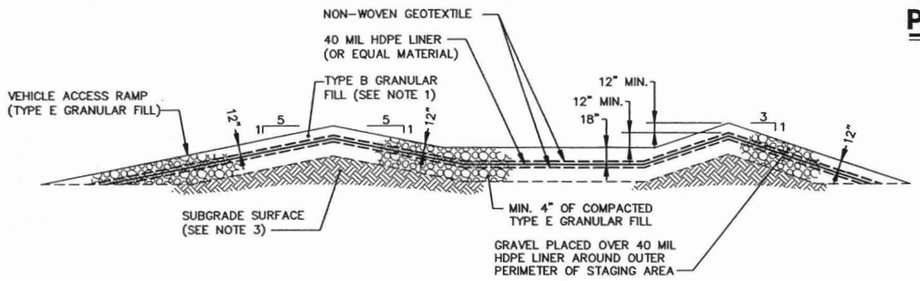
Syracuse, NY 13214
315-446-9120

G-19




**PLAN**



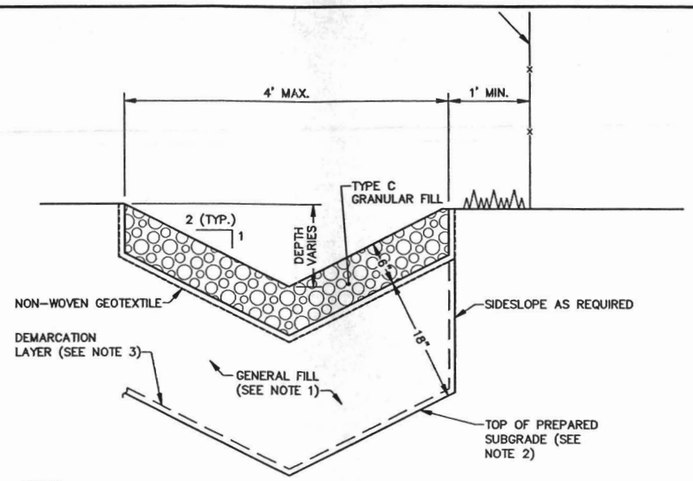

**SECTION**

NOTES:

1. CONTRACTOR SHALL MAINTAIN A MINIMUM OF 12 INCHES OF GRANULAR FILL OVER LINER. ADDITIONAL THICKNESS OF GRANULAR FILL TO BE PLACED ON ACCESS RAMP ABOVE LINER BASED ON ANTICIPATED VEHICLE LOADING (TO BE DETERMINED BY CONTRACTOR).
2. CONTRACTOR RESPONSIBLE FOR CHARACTERIZATION, TRANSPORTATION, AND OFFSITE DISPOSAL OF ALL MATERIALS USED IN CONSTRUCTION OF MATERIAL STAGING AREA AT COMPLETION OF PROJECT.
3. SUBGRADE SURFACE SHALL BE UNIFORM AND FREE OF DELETERIOUS MATERIALS WHICH COULD DAMAGE THE HDPE LINER (E.G., STONES, WOODY DEBRIS, CONSTRUCTION DEBRIS).
4. LOCATION OF STAGING AREA SHOWN ON DRAWING G-3 IS APPROXIMATE. CONTRACTOR TO DETERMINE ACTUAL LOCATION OF STAGING AREA. CONTRACTOR DESIGNATED LOCATION TO BE REVIEWED BY ENGINEER PRIOR TO CONSTRUCTION.

## MATERIAL STAGING AREA DETAIL (1)

NOT TO SCALE




NOTES:

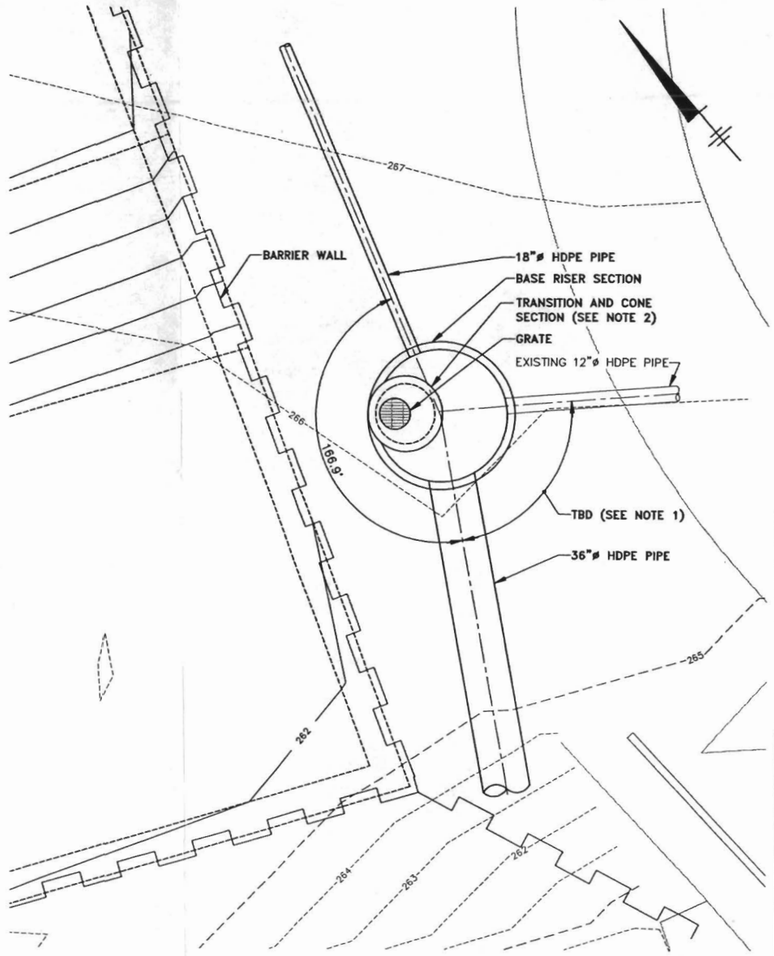
1. 18 INCHES OF GENERAL FILL REQUIRED ONLY FOR SEGMENT OF DITCH CONSTRUCTED WITHIN LIMITS OF EXCAVATION AREA SHOWN ON DRAWING G-13.
2. PREPARED SUBGRADE BASED ON PROVIDING A MINIMUM OF 24 INCHES OF COVER MATERIAL (I.E., TYPE C GRANULAR FILL AND GENERAL FILL) BELOW FINAL SURFACE ELEVATIONS (SEE DRAWING G-11 FOR SUBGRADE INFORMATION).
3. DEMARCATION LAYER TO BE TERMINATED APPROXIMATELY 6 INCHES BELOW FINAL GRADE. LAYER SHALL BE A BRIGHT YELLOW OR ORANGE PLASTIC MESH MADE OF POLYPROPYLENE OR HDPE. CONTRACTOR TO PROVIDE ENGINEER WITH SUBMITTAL OF INTENDED PRODUCT FOR REVIEW.

## PERIMETER DRAINAGE DITCH DETAIL (2)

NOT TO SCALE

GENERAL NOTE:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES.




NOTES:

1. ACTUAL ORIENTATION OF EXISTING STORM SEWER PIPE TO BE DETERMINED IN THE FIELD AT THE TIME OF CONSTRUCTION.
2. TRANSITION AND CONE SECTION SHALL BE OFFSET TO WESTERN EDGE OF MANHOLE.

## DMH-2 PLAN (3)

SCALE: 1" = 5'

X: 36676X00.DWG
L: ON=*, OFF=*REF*
P: PAGESET/SYR-85-BGP BGP TJR
36676040/CONTRACT/WORKPLAN/36676G17.DWG

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

NOT TO SCALE

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| No. | Date | Revisions | Init |
|---|---|---|---|

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

| | | |
|---|---|---|
| Professional Engineer's Name: JAMES M. NUSS | | |
| Professional Engineer's No.: # 067963 | | |
| State: NY | Date Signed: 10/7/05 | |
| Project Mgr.: GMT | Designed by: TAS | Drawn by: NJR |

STATE OF NEW YORK JAMES M. NUSS 067963 PROFESSIONAL ENGINEER

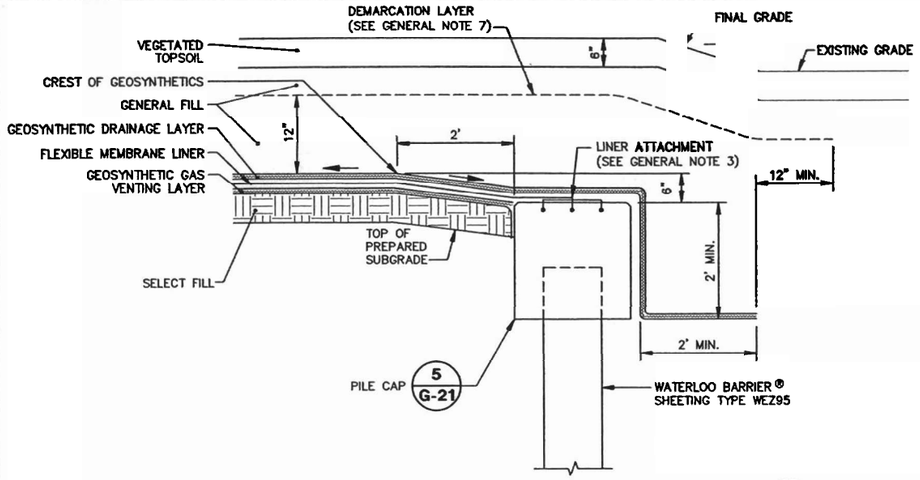
BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SECTIONS AND DETAILS

BBL Project No. 366.76
Date OCTOBER 2005
Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-20




## TERMINATION DETAIL - EAST WALL (1)

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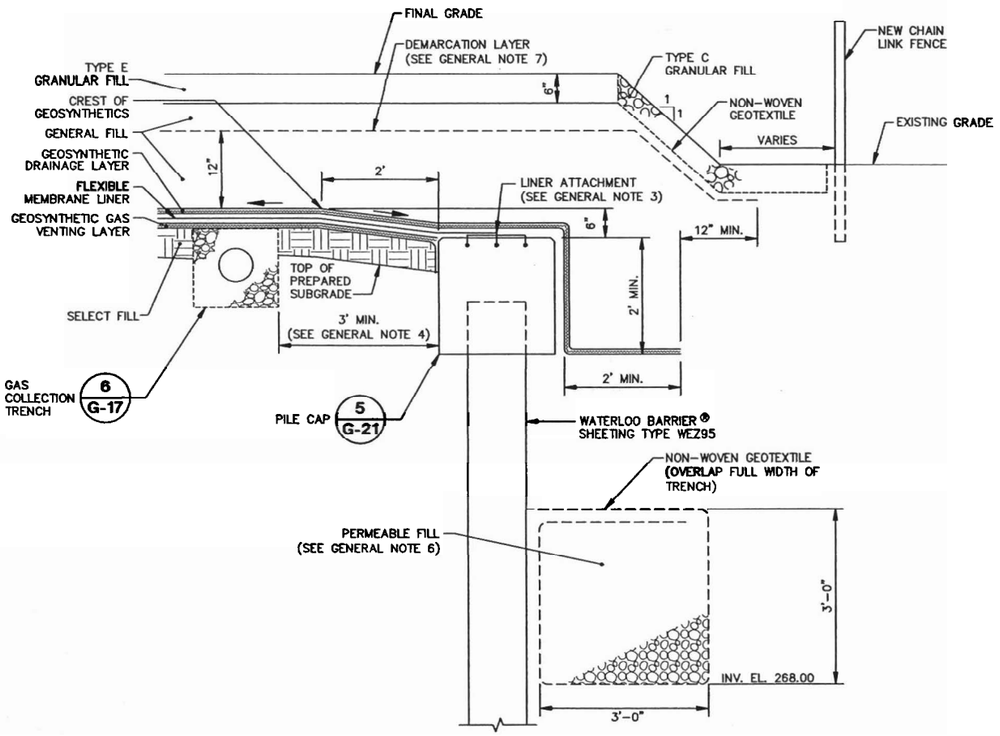
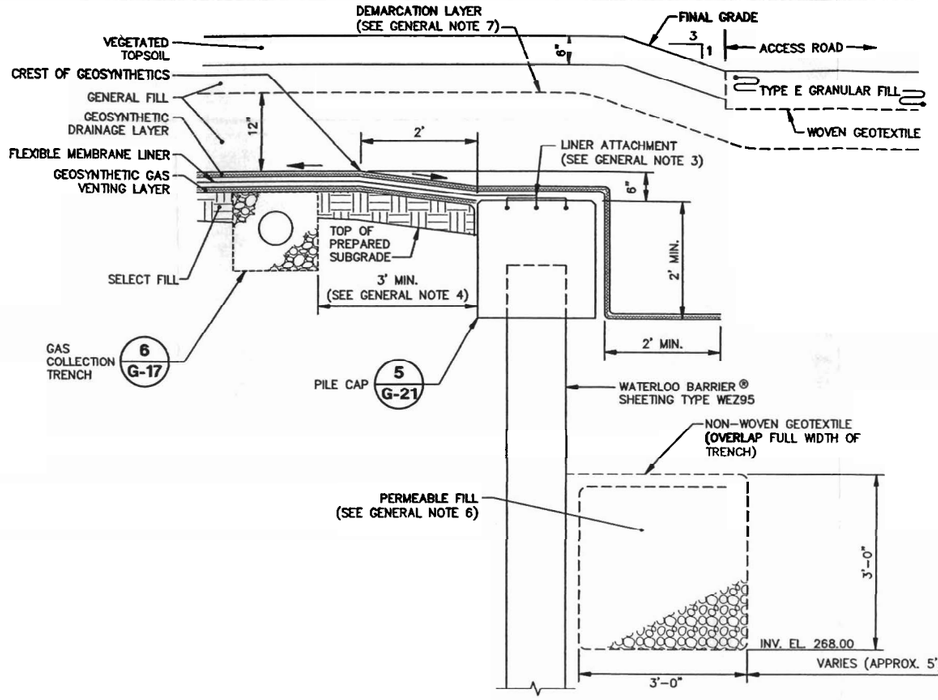



## TERMINATION DETAIL - NORTH WALL UNDER BRIDGE AND WEST WALL (3)

NOT TO SCALE

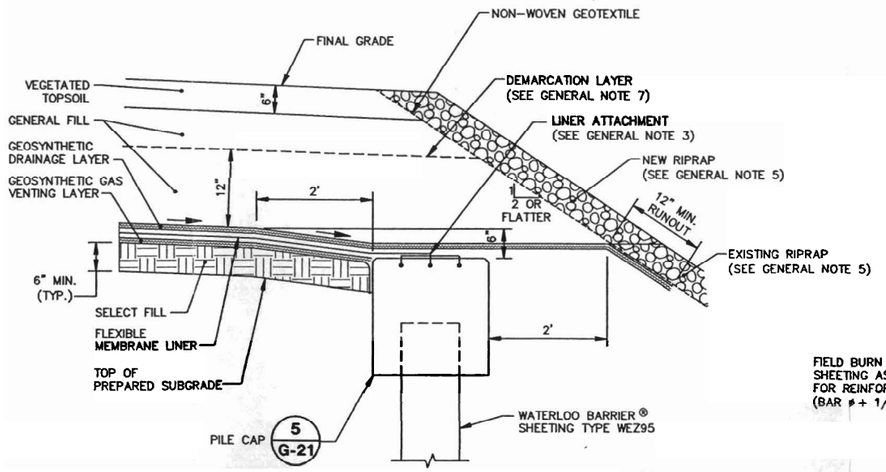



## TERMINATION DETAIL - NORTH WALL (2)

NOT TO SCALE

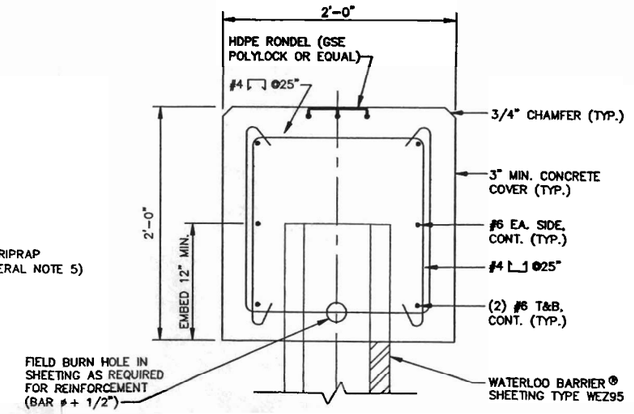
### GENERAL NOTES:

1. REFER TO DRAWING G-1 FOR GENERAL NOTES AND LEGEND, AND DRAWING G-2 FOR ADDITIONAL BASE MAP INFORMATION.
2. SUITABLE EXCAVATED SITE SOILS SHALL BE USED AS LINER SUBGRADE FILL WITHIN LIMITS OF BARRIER WALL.
3. FLEXIBLE MEMBRANE LINER TO BE ATTACHED (WELDED) TO HDPE RONDEL IN ACCORDANCE WITH RONDEL MANUFACTURER'S SPECIFICATIONS.
4. CONTRACTOR SHALL PROVIDE ADEQUATE SEPARATION NECESSARY TO PROTECT PILE CAP DURING INSTALLATION OF GAS VENT PIPE AND TRENCH.
5. EXISTING RIPRAP TO BE REMOVED/REPLACED AS REQUIRED TO INSTALL GEOSYNTHETIC DRAINAGE LAYER RUNOUT. NEW RIPRAP SHALL BE SIMILAR SIZE AND TYPE AS EXISTING RIPRAP.
6. PERMEABLE FILL SHALL CONSIST OF TYPE B GRANULAR FILL. SEE DRAWING G-11 FOR APPROXIMATE LIMITS OF PERMEABLE FILL.
7. DEMARCATION LAYER TO BE TERMINATED APPROXIMATELY 6 INCHES BELOW FINAL GRADE. LAYER SHALL BE A BRIGHT YELLOW OR ORANGE PLASTIC MESH MADE OF POLYPROPYLENE OR HDPE. CONTRACTOR TO PROVIDE ENGINEER WITH SUBMITTAL OF INTENDED PRODUCT FOR REVIEW.




## TERMINATION DETAIL - SOUTH WALL (4)

NOT TO SCALE




## PILE CAP SECTION

NOT TO SCALE

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P: PAGESET/SYR-CDL
9/29/05 SYR-85-GJD TJR KLS
36676040/CONTRACT/WORKPLAN/36676G20.DWG

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| | |
|---|---|
| Professional Engineer's Name | JAMES M. NUSS |
| Professional Engineer's No. | # 067963 |
| State | NY |
| Date Signed | 10/7/05 |
| Project Mgr. | GMT |
| Designed by | TAS |
| Drawn by | GJD |

STATE OF NEW YORK JAMES M. NUSS 067963 PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT SITE
REMEDIATION WORK PLAN

# SECTIONS AND DETAILS

BBL Project No. 366.76

Date OCTOBER 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

G-21

# *Technical Specifications*

BBL®
BLASLAND, BOUCK & LEE, INC.
*engineers, scientists, economists*

## LIST OF TECHNICAL SPECIFICATIONS

## AMSTERDAM (FRONT STREET) FORMER MANUFACTURED GAS PLANT (MGP) SITE
## AMSTERDAM, NEW YORK
## NIAGARA MOHAWK, A NATIONAL GRID COMPANY

## UPLAND AREA REMEDIATION WORK PLAN


Section 01010 - Summary of Work
Section 01046 - Control of Work
Section 01110 - Environmental Protection Procedures
Section 01160 - Survey Control
Section 01200 - Project Meetings
Section 01300 - Submittals
Section 01540 - Site Security
Section 01720 - Project Record Documents
Section 01901 - Field Office Trailer and Other Support
Section 02201 - Earthwork
Section 02202 - Rock and Debris Removal
Section 02203 - Site Grading
Section 02205 - Excavation Support and Protection
Section 02206 - Selected Fill
Section 02208 - Restoration of Surfaces
Section 02209 - Clearing
Section 02210 - Topsoil and Seeding
Section 02232 - Geotextile Fabric
Section 02273 - Geosynthetic Drainage Composite
Section 02274 - Flexible Membrane Liner
Section 02399 - Piping/Utility Abandonment
Section 02411 - Barrier Wall Installation
Section 02414 - Installation of NAPL Passive Recovery Wells and Well Decommissioning
Section 02415 - Impacted Material Handling and Soil Excavation Procedures
Section 02500 - Drainage Piping Installation
Section 02501 - Underground Pressure Piping Installation
Section 02508 - Air Monitoring Program
Section 02510 - Water Distribution System
Section 02514 - Precast Concrete Manholes, Catch Basins, and Structures
Section 02675 - Pressure and Leakage Testing
Section 02711 - Galvanized Chain Link Fence
Section 03002 - Reinforced Concrete Pile Cap

# MATERIALS AND PERFORMANCE – SECTION 01010

## SUMMARY OF WORK

## PART 1 - GENERAL

### 1.01 LOCATION OF WORK

The Amsterdam (Front Street) Former Manufactured Gas Plant (MGP) Site (Site) is located in the community of Amsterdam, Montgomery County, New York, along the Mohawk River/New York State Barge Canal. The Upland Area of the Site (also referred to as the Phase II Area) comprises approximately 1.9 acres and is bounded to the north by an active CSX Transportation Inc. (CSX) railroad right-of-way, to the south by the River, to the east by the Greater Amsterdam Riverlink Park, and to the west by property owned by TLC Properties, Inc. and State Route 30 bridge. The Site is generally flat with grades sloping from the railroad tracks to the river with elevations ranging from approximately El. 275 immediately south of the tracks to approximately El. 265 at a low point along the top of the existing river bank.

The remedial construction activities will be performed for Niagara Mohawk, a National Grid Company (Owner); the Remedial Design has been prepared for the Owner by Blasland, Bouck & Lee, Inc. (Engineer). A summary of the project work and overall Contractor's responsibilities is provided herein. Also, reference to other components of the Remedial Design and Contract Document is provided, as well as certain implementation details.

### 1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment, subcontractor services, and incidentals related to the implementation of the Remedial Design, including but not limited to excavation/grading of site materials, demolition and removal of existing structures that are encountered, construction of subsurface barrier wall and pile cap, installation of nonaqueous phase liquid (NAPL) passive recovery wells, installation/extension of monitoring wells, construction of final site cover, grading and drainage, and other appurtenances in their entirety as shown on the Design Drawings and specified herein.

   The work shall also include all activities required of the Contractor to plan, organize, monitor, and coordinate the logical and timely sequence of site activities, in accordance with all applicable regulatory requirements. This includes activities such as preparation of submittals, permits, attendance at project meetings, incidental expenses, administrative activities, etc.

B. The scope of work and related background information is generally described in the narrative portion of the *Upland Area Remediation Work Plan* (BBL, October 2005). (Although the narrative components of that work plan are not part of the Remedial Design, several attachments to that work plan are part of the Remedial Design, and are listed in 1.02C below.) The Work includes, but is not necessarily limited to, the following:

   1. General:

      General activities include setting up Contractor's field office, staff, and construction facilities; mobilizing and demobilizing all equipment, materials, and labor; performing site monitoring and protection; mobilizing and implementing health and safety equipment and practices; setting up and performing site security during the project construction period; and performing a perimeter air monitoring program.

MATERIALS AND PERFORMANCE – SECTION 01010

SUMMARY OF WORK

In addition, general activities include ancillary support services and activities throughout the performance of site activities, as well as post-construction activities (e.g., as-built documentation).

2. Site Preparation:

Site preparation includes all activities involving preparation of the Site. Work includes: obtaining all necessary permits; performing water management; providing erosion and environmental controls; clearing and grubbing; providing traffic controls and temporary construction entrances; setting up work zones, including staging and decontamination areas; demolishing and removing existing site structures that are encountered, fences, and other features; relocating active utilities; removing and plugging abandoned utilities, as encountered; decommissioning monitoring wells; and protecting monitoring wells inside the limits of work.

3. Stormwater Management:

Stormwater drainage involves providing, installing, and testing precast catch basins and manholes, new storm sewer piping, and all necessary appurtenances as shown on the Design Drawings and applicable specifications, and includes excavation, bedding, and backfill of trenches.

4. Barrier Wall Construction:

Barrier wall construction generally involves construction of a watertight steel sheetpile barrier wall, to the extent possible using "best efforts." This task includes obtaining and transporting all barrier wall materials, performing quality control (QC) testing, and the removal and demobilization of all barrier wall equipment (following wall completion). This work task also includes the construction of a concrete pile cap along the perimeter of the barrier wall.

5. NAPL Passive Recovery Wells:

NAPL passive recovery wells generally involve installation of the wells as shown on the Design Drawings.

6. Final Cover:

Final cover generally involves site grading of areas inside and outside the barrier wall, including re-grading of the subgrade, installation of final cover components (i.e., geosynthetics, gas venting piping, fill materials), and QC testing as specified herein and as shown on the Design Drawings.

7. Site Restoration:

Site restoration generally includes installing and repairing fences and gates, installing permanent erosion control measures, repairing and replacing any damaged or temporarily relocated site features, seeding and mulching disturbed areas, and

removing temporary construction and erosion and sediment control practices (e.g., decontamination pads, site trailers, silt fencing, and hay bales, etc.), as specified herein and as shown on the Design Drawings.

C. The detailed scope of work and Contractor requirements are described in several components that collectively represent the Remedial Design. These components include the following:

- Design Drawings;
- Technical Specifications; and
  Certain appendices to the *Upland Area Remediation Work Plan*, including the Waste Handling and Disposal Plan; Construction Quality Assurance Plan; Health and Safety Plan; and Storm Water Pollution Prevention Plan.

The above components address various elements of the Remedial Design and should be thoroughly reviewed by the Contractor. Nothing presented in one of the above documents should preclude the Contractor from satisfying the components specified in the other documents. In addition, in the event that there are discrepancies in the information contained in the above-listed documents, the Contractor shall identify such discrepancies for the Owner's and Engineer's review. Unless otherwise directed, precedence for discrepancies identified in the above documents shall be as follows: Design Drawings, Technical Specifications, and *Upland Area Remediation Work Plan* appendices.

1.03 WORK SEQUENCE/WORK HOURS

A. Perform Work to ensure completion of the Work in the Contract time. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the Contractor. For planning purposes, the Contractor shall assume a 6-month project duration.

B. The Contractor must submit a proposed Draft Work Schedule for review and approval. The Draft Work schedule should include all elements of the remedial actions and be neatly prepared and labeled as a bar graph indicating all anticipated start and completion dates. Additional requirements are provided below.

Submit a horizontal bar chart with separate lines for each section of work, identifying the first work day of each week.

- At a minimum, the following major work items should be included, with appropriate subtasks included as necessary:

  - Technical Submittals
  - Mobilization
  - Site Preparation
  - Barrier Wall Installation
  - Engineered Barrier/Surface Cover Installation
  - Site Restoration Activities
  - Demobilization/Recordkeeping

MATERIALS AND PERFORMANCE – SECTION 01010

SUMMARY OF WORK

- Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities, including work by subcontractors. Indicate the early and late start, early and late finish, float dates, and duration.

C. The Owner anticipates that work activities can be conducted between the hours of 7:00 a.m. and 6:00 p.m. (as restricted by any local ordinances), 5 days per week (Monday through Friday), except in cases of emergency or unless prior approval has been obtained from the Owner. Special requests by property owners should be considered as allowable.

1.04 CONTRACTOR'S USE OF PREMISES

A. Coordinate use of premises with the Owner and the Engineer within the project limits shown on the Design Drawings. All conflicts over use of the premises shall be resolved without additional cost to the Owner. Costs related to property use (e.g., telephone, electric, etc.) shall be borne by the Contractor.

B. Contractor shall assume full responsibility for security of all of its and its subcontractors' materials and equipment stored onsite.

C. If directed by the Owner or Engineer, move any stored items that interfere with operations of Owner or other Contractors.

1.05 OWNER OCCUPANCY

A. Coordinate all construction operations with Owner and Engineer to minimize conflict and to facilitate public usage of adjacent park area during construction.

1.06 CARE AND PROTECTION OF WORK

From the commencement until the acceptance of the Work, the Contractor shall be solely responsible for the care of the Work covered by the Purchase Order and for the materials, supplies and equipment delivered at the Site intended to be used in the Work (whether provided by the Contractor or the Owner); and all injury or damage to the same from whatever cause, shall be the responsibility of the Contractor. The Contractor shall provide suitable means of protection for and shall protect all materials intended to be used in the Work, all Work in progress, and all completed Work. The Contractor shall take all necessary precautions to prevent injury or damage to the Work by flood, fire, freezing, or from other inclemencies of the weather.

1.07 ONSITE OBSERVATION OF WORK

A. Engineer

1. The Engineer will provide onsite and office-based assistance to the Owner during the construction period. The Engineer will observe the progress and quality of the Work and determine, in general, if the Work is proceeding in substantial compliance with the Remedial Design. The Engineer will inform the Owner as to the progress of the Work and possible defects and deficiencies in the Work. The Engineer may disapprove Work as failing to conform to the Remedial Design. Whenever the Engineer considers it necessary or advisable for the proper carrying out of the intent

of the Remedial Design, the Engineer (on behalf of the Owner) can require the Contractor to make special examination or testing of the Work (whether or not fabricated, installed, or completed).

2. The Engineer will not have any duty or obligation with reference to and will not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, and will not be responsible for the Contractor's failure to carry out the Work in substantial compliance with the Design Documents. The Engineer's duties, services, and work shall in no way supersede or dilute the Contractor's obligation to perform the Work. The Engineer is empowered when directed by the Owner to act on its behalf with respect to the proper execution of the Work and to give instructions when necessary to require such corrective measures as may be necessary in the Engineer's professional opinion to endeavor to protect the Owner's interest.

B. Access to Work

1. All parties who may enter into contracts with the Owner for doing work at the Site shall, for all purposes that may be required by their contracts, and representatives of State and Federal regulatory agencies shall, for any purpose, have access to the Work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefore.

1.08 MATERIALS AND EQUIPMENT

A. Quality and Workmanship

1. All items of equipment and materials of like type furnished shall be the product of one manufacturer, unless otherwise specified or approved by the Owner/Engineer.

2. All materials furnished or incorporated in the Work shall be new, unused, of the best quality, and especially adapted for the service required; whenever the characteristics of any material are not particularly specified, such material shall be utilized as is customary in first class work of a nature for which the material is employed.

3. All materials and workmanship shall be subject to inspection, examination, and tests by the Engineer and other representatives of the Owner at any and all times during manufacture or construction and at any and all places where such manufacture or construction are carried on.

4. The Contractor's selection and use of organizations for the inspection and tests of supplies, materials, and equipment shall be subject to the approval of the Owner and Engineer. Satisfactory documentary evidence that the material has passed the required inspection and tests shall be furnished by the Contractor prior to the incorporation of the material in the Work.

5. All laboratory and field testing shall be at the sole cost and expense of the Contractor unless specifically stated otherwise in the Design Documents.

MATERIALS AND PERFORMANCE – SECTION 01010

SUMMARY OF WORK

B. Equivalent Products and Changes to Design Documents

1. The words "similar and equal to," "or equal," "equivalent," and such other words of similar content and meaning (hereinafter, "or equal") shall, for the purposes of this work, be deemed to mean similar and equivalent to one of the named products.

2. Whenever any product is specified in the Design Documents by a reference to the name, trade name, make or catalog number of any manufacturer or supplier, the intent shall not be to limit competition, but to establish a standard of quality which the Engineer has determined is necessary for the project. If any product other than that specified is proposed for use by the Contractor, it shall submit to the Engineer either its certification that the "or equal" strictly conforms to the Design Documents, or a statement specifically identifying all differences between the "or equal" and the Design Documents. Any variation of a proposed "or equal" from the Design Documents which is not specifically noted in the Shop Drawing or Contractor's submittal shall be at the sole risk and expense of the Contractor. In addition, the Contractor shall provide all the information that the Engineer requests concerning the product. The proposed product shall not be used until it is accepted by the Engineer. Any "or equal" incorporated into the Work without the Engineer's written acceptance shall be at the Contractor's sole risk, and the Engineer may require the removal and replacement of any unaccepted "or equal."

3. In all cases, the Engineer shall determine whether a proposed "or equal" is acceptable, and the Contractor shall have the burden of proving, at its expense, to the satisfaction of the Engineer that the proposed "or equal" is similar and equal to the named product. In making such determination the Engineer may establish such criteria as it deems proper for acceptance of the "or equal."

4. Any requested change in the Design Documents not pertaining to an "or equal" must be submitted to the Engineer in writing and must be stated with sufficient clarity and detail to permit proper consideration by the Engineer. Unless accepted by the Engineer after submission as herein provided, any deviation from the Design Documents, or the use of any product which varies from the Design Documents, shall be at the Contractor's sole risk and expense.

C. Suppliers

1. All supplies and equipment shall be furnished by manufacturers who shall have at least 3 years of experience in the design, production, assembly, and field service of equipment of like type, size, and capacity. Where required by the Engineer, the Contractor shall supply a list of at least three successful installations.

PART 2 - PRODUCTS (NOT USED)

MATERIALS AND PERFORMANCE – SECTION 01010

SUMMARY OF WORK

PART 3 - EXECUTION

3.01 OPERATIONS PLAN

To gauge the Contractor's understanding of the intended remedial design and construction, and to demonstrate compliance with several elements of the Remedial Design, the Contractor shall prepare and submit an Operations Plan.

The plan shall address, but not be limited to, the following items:

- List/schedule of equipment to be used onsite;
- Site security/property protection procedures;
- Work schedule;
- The Contractor's proposed plan for controlling vehicular and pedestrian traffic;
- Storm water (including run-on and run-off), erosion, noise, and dust control measures;
- Materials handling and staging approach; and
- Equipment cleaning procedures.

3.02 HEALTH AND SAFETY PLAN

The Contractor will be required to prepare a site-specific HASP that identifies the health and safety procedures, methods, and requirements to be implemented by the Contractor during the performance of work activities. The Contractor's HASP shall cover all personnel who will be employed by the Contractor to perform remedial work at the work site, including direct employees, as well as subcontractors. If the Contractor does not wish to include subcontractors under its HASP, then each subcontractor will be responsible for developing and implementing a HASP that meets the requirements outlined herein. The Contractor will be responsible for ensuring that all of its subcontractors have adequate HASPs prior to onsite work by the subcontractor and are adhering to the HASPs during the work activities. If a subcontractor agrees to be included under the Contractor's HASP, then a statement to this effect shall be submitted to the Owner. The minimum requirements/conditions that shall be included in the Contractor's (or any of its subcontractor's) site-specific HASP are provided in the *Upland Area Remediation Work Plan*.

Prior to commencement of field activities, the Contractor must certify that personnel employed at the work site who are directly involved with remedial activities, including employees and subcontractors, have completed a 40-hour health and safety training course (and annual refresher training) in accordance with 29 CFR 1910.120 and 29 CFR 1926.65. The Contractor must also certify that any individuals who later become employed by the Contractor also receive such training prior to performing work at the work site. This requirement does not apply to carpenters, landscapers, or other personnel who will be involved in site restoration activities only after all specified materials have been either removed from the work site or completely covered with engineered barriers.

The Contractor must certify that all personnel who will be employed by the Contractor to perform work at the work site, including direct employees as well as subcontractors, have received the initial and annual (if applicable) medical examinations and are enrolled in an on-going medical surveillance program as required by 29 CFR 1910 and 29 CFR 1926.

# MATERIALS AND PERFORMANCE – SECTION 01010

## SUMMARY OF WORK

The Contractor must also comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54).

The Contractor will be responsible for the safety of his/her employees, subcontractors, suppliers, and other parties at the work site as a result of the Contractor's direction.

The Contractor must prepare, submit, and implement a HASP in accordance with 29 CFR 1910.120 and 29 CFR 1926.65. The plan must address, but not be limited to, the following components:

- Identification of Key Personnel - Identify, by name and by title, the onsite and offsite health and safety personnel responsible for the implementation of health and safety procedures. All onsite personnel involved in the measures must have OSHA 40-hour Hazardous Waste Training (29 CFR 1910.120 and 1926.65) and the corresponding 8-hour refresher course update.

- Training - Describe and provide certification of all supervisory and onsite personnel having received appropriate health and safety training.

- Medical Surveillance - Certify that all supervisory and onsite personnel have received appropriate medical examinations and are able to conduct the tasks required for this project.

- Task-specific Hazard/Risk Analysis - Identify and provide a means of mitigating all foreseeable biological, chemical, and physical hazards associated with the work including, but not limited to, hazards associated with exposure to constituents of concern, heavy equipment operation, site conditions, weather, materials handling, work around excavated areas, and work near water.

- Work Zones - Provide a site plan that depicts the designation of zones, including: (1) Exclusion Zones, (2) Decontamination Zones, and (3) Support Zones. The level of personal protection required for each zone must be included.

- Personal Safety Equipment and Protective Clothing - Identify personal safety equipment and protective clothing to be available at the work site and used by project personnel. This shall include identifying expected levels of protection (EPA Protection Levels A, B, C, and D) for each task and the action levels for personal protective equipment (PPE) upgrades. A respiratory protection program that meets the requirements of 29 CFR 1910.134 and establishes specific requirements for respirator use shall be included.

- Personal Air Monitoring - Identify protocols and criteria associated with personal air monitoring of on-site personnel.

- Community Air Monitoring - Identify protocols and criteria associated with community air monitoring.

- Personnel Decontamination - Describe methods and procedures to be used for personnel decontamination.

MATERIALS AND PERFORMANCE – SECTION 01010

SUMMARY OF WORK

- Confined Space Entry - Describe procedures for confined space entry in accordance with OSHA's Confined Space Standard.

- Material Safety Data Sheets - Provide Material Safety Data Sheets (MSDSs) for all materials to be brought on site, as well as constituents which are expected to be encountered in the course of implementation of the remedial activities.

- Construction Safety Procedures (OSHA 1926.1 - 1926.652, Subpart A-P) to address excavation shoring and trenching safety, as well as a daily site safety inspection checklist to evaluate these items.

- Standard Operating Procedures (SOPs) and Safety Programs as required by applicable sections of 29 CFR 1910 and 1926.

3.03 CONTINGENCY PLAN

The Contractor must prepare, submit, and implement a Contingency Plan that includes, at a minimum, the following items:

- A spill prevention control and countermeasures plan for all materials brought to the work site;
- Emergency vehicular access/egress;
  Evacuation procedures of personnel from the work site;
- For work sites that include or are adjacent to a surface water drainageway, a flood control contingency plan to identify measures to protect the work site(s) and the waterway from impacts in the event of high water and/or flood conditions;
- A list of all contact personnel with phone numbers, including: the Contractor; the City of Amsterdam fire official(s); ambulance service; local, county, and State Police; and local hospitals, including routes to local hospitals and procedures for notifying each; and
- Identification of responsible personnel who will be in a position at all times to receive incoming phone calls and to dispatch Contractor personnel and equipment in the event of an emergency situation.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 01046

## CONTROL OF WORK

## PART 1 - GENERAL

### 1.01 LAND AVAILABLE TO CONTRACTOR

A. Owner will provide access to the lands upon which the Work is to be done.

B. The Contractor shall confine its operations to the Project Limits. Private property adjacent to the Work shall not be entered upon or used by the Contractor for any purpose whatsoever without the written consent of Owner thereof.

C. All Work within or bordering on private or public property shall be conducted in such manner as will cause the minimum inconvenience and disturbance to it. No excavated materials or supplies of any kind shall be stored on private or public premises without Owner's written consent and in accordance with all applicable regulations.

D. The Contractor shall, at its expense and whenever so required by Owner, erect new and/or maintain existing fences along the roadways and around the grounds occupied by the Contractor. The fences shall be sufficient for the protection of the adjoining property and all persons lawfully using the same.

### 1.02 PROTECTION OF EXISTING STRUCTURES

A. The Contractor shall protect adjacent and other property or premises from damage of any kind during the progress of the Work and shall erect and maintain guards around its Work in such a way as to afford protection to the public.

B. The Contractor shall sustain in their places and permanently protect from direct or indirect injury any and all pipelines, subways, pavements, sidewalks, curbs, railways, buildings, trees, poles, wells, and other property in the vicinity of the Work.

C. The Contractor shall be responsible for damage or injury sustained by any structure whatsoever due to settlement of trenches or excavations or to settlement or lateral movement of the sides of such trenches or excavations, whether such movement occurs during or after excavation or backfilling of such trenches or excavations.

D. The Contractor shall at all times have available onsite suitable and sufficient material and shall use the same as may be necessary or required for sustaining and supporting any and all such structures that are uncovered, undermined, weakened, endangered, threatened, or otherwise materially affected.

E. In case injury occurs to any portion of a pipeline or structure, or to the material surrounding or supporting the same, the Contractor shall immediately notify the Owner and Engineer, and, at the Contractor's expense, shall remove such injured Work and shall furnish such material and perform such work of repairs or replacements. In the case of utilities, the Contractor shall immediately notify the utility company, and provide all assistance for the repair of the utility by the utility company unless authorized to undertake such repairs directly by the utility company. Any damage shall be promptly, completely, and satisfactorily repaired by the Contractor at its expense to the satisfaction of Owner, or the owner of the utility.

MATERIALS AND PERFORMANCE – SECTION 01046

CONTROL OF WORK

1.03 EXISTING SUBSURFACE STRUCTURES

A. General

1. Certain existing subsurface structures may be encountered during the performance of the Work or located in close proximity to the Work that will require special precautions and methods for their protection, such as sewers, drains, water mains, and conduits, together with appurtenances, are shown on the Design Drawings. The sizes, locations, and depths shown are approximate.

2. Certain subsurface structure related to former (historic) operations at the Site may also be encountered during the performance of the Work. Such structures could include former building foundations, vaults, tanks, gas holders, etc. Where encountered, the Contractor shall consult with the Owner and Engineer regarding the need for and scope of activities necessary to remove, protect, or otherwise address such structures to accommodate the Remedial Design.

3. It is the obligation of the Contractor to verify the accuracy and completeness of the information shown, and the Contractor agrees that it shall neither have nor assert against Owner or Engineer any claim for damages by reason of the inaccuracy, inadequacy, incompleteness, or other deficiency of the information given or the failure to furnish additional or further information in the possession of Owner or Engineer, except as set forth below.

4. Contractor is hereby given notice that subsurface structures and facilities may be located on the Site that are either not identified or not accurately shown on the Design Drawings.

5. Where any existing subsurface structure such as a sewer, drain, gas pipe, water pipe, conduit, or other structure is found that is not anticipated or that is found to be materially different in size, location, or depth from that anticipated by the Design Drawings, the Contractor shall immediately notify the Engineer, and also the superintendent of the utility, before disturbing the structure.

6. Contractor shall use due care to avoid damage to subsurface facilities identified, not identified, or inaccurately depicted on Design Drawings.

7. In certain instances, it may be beneficial to the overall project implementation to assess the potential presence of subsurface structures in advance of specific work activities that may encounter such structures. As such, the Owner may request that the Contractor conduct exploratory excavations in the vicinity of the existing water mains and bulkhead wall associated with the adjacent City park, to verify/modify conditions in such areas, and to change the Remedial Design as may be necessary. Such activities shall be done in a safe manner, consistent with all applicable provisions of the Contract, and at the expense of the Contractor. The Contractor will also be required to temporarily backfill any such exploratory testing, unless otherwise directed by the Owner or Engineer.

B. Existing subsurface structures that require changes in the Work:

1. The Engineer will determine whether changes should be made in the Design Drawings for construction of the Work to avoid the subsurface structure, whether the Work can proceed without changes in the Design Drawings, or whether the structure should be removed, realigned, or changed.

2. Any increase or decrease in cost of the Work resulting from any changes in the Design Drawings necessitated by the unanticipated presence or difference in size, location, or depth of the subsurface structure will be reviewed by the Owner.

C. Existing subsurface structures which require changes in the existing Structure:

1. Where the size, location, or depth of the existing subsurface structure has been anticipated and the Design Drawings require removal, realignment, or change, all Work under this Purchase Order shall be done in accordance with the Contract Documents in mutual cooperation with the utility or other parties concerned.

2. Where the presence of the subsurface structure or its size, location, or depth is not anticipated by the Design Drawings, any work by the Contractor required to remove, realign, or change the structure shall be done under the provisions for changes in the Work for the removal, realignment, or change and shall be done as mutually agreed by the Contractor, Engineer, and utility or other parties concerned.

D. Interruption of Service

1. Where it is necessary to interrupt water, gas, or other public utility service to remove, realign, or change a subsurface structure, the Work shall proceed with expedience and shall be continuous after interruption of service until completion of the removal, realignment, or change and return of the utility service to its normal state.

1.04 SUBSURFACE CONDITIONS OTHER THAN STRUCTURES FOUND DIFFERENT

A. Contractor is obligated to perform all necessary subsurface investigations prior to bidding. Furthermore, the Contractor shall not be entitled to rely upon the subsurface investigation performed by Owner or the Engineer.

1.05 PROTECTION OF UTILITIES

A. All utilities whose facilities may be affected by the Work shall be notified by the Contractor at least 72 hours in advance of the start of any operations that might affect such facilities.

B. The removal, replacement, support, or other handling of private and public utilities coming within the lines of the Work shall be accomplished by the Contractor at its expense in accordance with arrangements satisfactory to Owner or operator of the utility involved. The Contractor, at its expense, shall remove, replace, or support all utilities as required.

C. The Contractor shall not permit nor cause any hindrance to or interference with any individual, municipal department, public service corporation, or other company or companies in protecting its or their mains, pipes, poles, posts, or other structures, nor in

shifting, removing, or replacing the same. The Contractor shall allow said individual, department, company, or companies to take all such measures as they may deem prudent to protect their structures.

1.06 REPLACEMENT OF PROPERTY

A. The Contractor shall replace all pavement, driveways, fences, shrubs, lawns, trees, and any other public or private property damaged as a result of the Work. In all cases said replacement shall be new and at least equal to the original conditions.

1.07 OPEN EXCAVATIONS

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights, and other means to prevent accidents to persons, and damage to property. The length or size of excavation will be controlled by the particular surrounding conditions. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures.

B. Precautions shall be taken to prevent injury to all personnel due to open excavations. All excavations, excavated material, equipment, or other obstacles that could be dangerous to personnel shall be well-lighted at night.

1.08 CLEANING STRUCTURES AND SITE

A. As the Work progresses, the Contractor shall remove all unused materials, tools, equipment and machinery, waste materials, rubbish, refuse, and other debris from the Site and see to it that the Site is at all times maintained in a neat and orderly condition.

B. At the completion of the Work, the Contractor shall promptly remove all construction tools, equipment and machinery, surplus materials, waste materials, rubbish, refuse, and other debris from the Site and leave the Site in a neat and orderly condition.

C. If it is observed that the Contractor neglects his responsibilities as set forth above, or neglects the repairing of streets, roadways, passageways or areas, or the repairing of fences or damages, the Owner or Engineer will give notice to that effect to the Contractor. If the Contractor does not take reasonable steps upon receipt of such notice to correct the neglected situation, the Owner may do so, and the expense thereby incurred shall be deducted from any monies due or that may become due to the Contractor.

D. If a dispute arises between the separate Contractors as to their responsibilities for cleaning, etc., as required above, the Owner may do such work as it deems appropriate and charge the cost thereof to the several Contractors as it shall determine to be just. The Owner's determination shall be binding and final.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 01110

# ENVIRONMENTAL PROTECTION PROCEDURES

## PART 1 – GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, materials, and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water, and land, and involves management of noise and solid waste, as well as other pollutants.

C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching, or other special surface treatments as are required to prevent silting and muddying of existing and new drainage systems, streams, rivers, impoundments, lakes, etc.

D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. **These are general guidelines. It is the Contractor's responsibility to** determine the specific construction techniques to meet these guidelines.

E. All phases of sedimentation and erosion control shall comply with the conditions of the General Permit for the Discharge of Stormwater Associated with Construction Activities, and shall be subject to the approval of the New York State Department of Environmental Conservation. A *Stormwater Pollution Prevention Plan* (prepared by others) shall be maintained onsite during all phases of the Work.

F. The Contractor shall prepare a Contingency Plan in accordance with Section 01010, titled Summary of Work, which identifies the proposed spill prevention, control, and countermeasures plan for all materials brought onsite.

### 1.02 APPLICABLE REGULATIONS

A. Comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement.

### 1.03 NOTIFICATIONS

A. The Owner and/or Engineer will notify the Contractor in writing of any detected non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements may also provide notification of any non-compliance with State or local requirements. After receipt of such notice, the

Contractor shall immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION

A. Prior to commencement of the work, meet with the Owner and Engineer to develop mutual understandings relative to compliance with these provisions.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 EROSION CONTROL

A. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting, and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented to the extent practicable. Potentially contaminated water shall be collected, containerized, treated, and disposed of accordingly and in accordance with the *Waste Handling Plan*.

B. Temporary erosion and sediment control measures shall be installed as indicated on the Design Drawings prior to earthwork operations, or as otherwise directed by the Owner or Engineer.

3.02 PROTECTION OF SURFACE WATERS

A. Take all precautions to prevent, or reduce to a minimum, any damage to surface water from pollution by debris, sediment, or other material, or from the manipulation of equipment **and/or materials in or near such streams. Water that has been used for washing or** processing shall not be directly returned to the water bodies and shall be collected, containerized, treated, and disposed of accordingly and in accordance with the *Waste Handling Plan*.

B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any sanitary or storm sewer.

3.03 PROTECTION OF LAND RESOURCES

A. Restore land resources within the project boundaries, outside the limits of permanent work and within right-of-ways, after completion of construction to a condition that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Design Drawings.

B. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-inch in diameter shall be coated as soon as possible with an approved tree

wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

C. Remove all signs of temporary construction facilities such as work areas, structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling, and plowing of roadways will be required to restore the area to near natural conditions, which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as described in Section 02210, or as approved by the Engineer.

D. All debris and excess material will be disposed of in an environmentally sound manner. Removed bulk debris (e.g., piping, foundations, concrete pads, boulders, etc.) may need to be disposed of as hazardous waste.

3.04 PROTECTION OF AIR QUALITY

A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control

1. Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust that could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

2. An approved method of dust control consisting of wetting or other similar methods will be permitted. The use of petroleum products is prohibited.

3. Wetting, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

4. Appropriate dust control measures include the following:

- Spraying water on access roads;
- Spraying water on excavation faces, buckets during excavation, and excavated soil when loading transport vehicles;
- Spraying water on backfill stockpiles and on backfill materials that have been placed within excavated areas;
- Hauling excavated materials and clean backfill materials in properly tarped vehicles;
- Restricting vehicle speeds to 5 miles per hour; and
- Covering excavation faces with a layer of polyethylene sheeting (anchored appropriately to resist wind forces) after excavation activities cease for the day.

MATERIALS AND PERFORMANCE – SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

The Contractor should make a source of water (e.g., water tank truck) available at the work site. The Contractor will be responsible for maintaining, in the immediate vicinity of the work, a supply of water and means of dispersion (e.g., a water tank and sprayer) such that water may be applied for dust control immediately as required. If the dust control measures being utilized by the Contractor do not lower particulates to acceptable limits, based on visual observations and/or the results of airborne particulate monitoring, excavation activities must be suspended until the Contractor develops the appropriate corrective measure(s) to remedy the situation.

5. The Contractor shall implement and adhere to the requirements specified in the Community Air Monitoring Plan (contained in the *Upland Area Remediation Work Plan*).

3.05 NOISE CONTROL

A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal, State, and local noise ordinance regulations. Normal working hours shall be between 7:00 A.M. and 6:00 P.M., Monday through Friday.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.07 PROHIBITED CONSTRUCTION PROCEDURES

A. Prohibited construction procedures include, but are not limited to:

1. Dumping of spoil material into any 100-year flood hazard area, stream corridor, any wetlands, any surface waters, or at unspecified locations.

2. Indiscriminate, arbitrary, or capricious operation of equipment in any stream corridors, any wetlands or any surface waters.

3. Pumping of silt-laden water from trenches or other excavations into any surface waters, any stream corridors, or any wetlands.

4. Damaging vegetation beyond the extent necessary for construction.

5. Disposal of trees, brush, and other debris in any stream corridors, any wetlands, any surface waters, or at unspecified locations.

- END OF SECTION -

MATERIALS AND PERFORMANCE – SECTION 01160

# SURVEY CONTROL

## PART 1 – GENERAL

### 1.01 DESCRIPTION

A. Survey control for construction and documentation purposes shall be the responsibility of the Contractor. The Contractor shall safeguard all survey points and bench marks. Should any of these points be destroyed, the replacement cost shall be borne by the Contractor. The Contractor shall assume the entire expense of rectifying work improperly constructed due to failure to maintain and protect such established survey points and bench marks.

B. The Contractor shall be responsible for the layout of any additional survey controls, grid coordinate locations, lines, grades, and elevations necessary for the proper construction, documentation, and testing of the work at no additional cost to the Owner. Survey activities shall include, but not be limited to: verifying existing conditions, excavation depths and horizontal limits through performance of a post-excavation survey, ensuring specified layer thicknesses are used during backfilling activities, and performing an as-built survey of all constructed site features (e.g., final grades, top of barrier wall, top of pile cap, locations/elevations of gas venting piping, top of geosynthetics, manhole rim and sump/invert elevations and locations, storm sewer pipe locations and invert elevations, locations and elevations of any discovered site utilities, etc.).

C. Vertical survey tolerance to be maintained during construction is 0.10 foot for general site grading and 0.05 foot for structural features (e.g., pipes, manholes, etc.) unless otherwise specified in the Design Documents or approved by the Engineer.

D. The Contractor shall employ a New York State licensed surveyor to provide the surveying functions necessary for the proper construction and documentation of the work. All survey-related work products shall be sealed and signed by a registered New York State Professional Engineer or Licensed Surveyor.

E. The survey documentation shall be consistent with and comply with the requirements of MP-01720 (Project Record Documents).

## PART 2 – PRODUCTS (NOT USED)

## PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

# MATERIAL AND PERFORMANCE – SECTION 01200

## PROJECT MEETINGS

## PART 1 - GENERAL

### 1.01 REQUIREMENTS INCLUDED

A. The Engineer shall schedule and administer a pre-construction meeting, weekly progress and coordination meetings, and any other site meetings throughout progress of the Work. The Engineer shall:

1. Prepare agendas for meetings.
2. Make physical arrangements for meetings.
3. Preside at meetings.
4. Record the minutes; include significant proceedings and decisions.
5. Reproduce and distribute copies of minutes after each meeting:
   a. To participants in the meeting.
   b. To parties affected by decisions made at the meeting.

B. Representatives of Contractors, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. The Contractor shall attend meetings.

### 1.02 RELATED REQUIREMENTS

A. Section 01300 - Submittals

### 1.03 PRE-CONSTRUCTION MEETING

A. Schedule a pre-construction meeting no later than 15 days after date of Notice to Proceed.

B. Location: A central site, convenient for all parties, designated by the Owner.

C. Attendance:

1. Owner.
2. New York State Department of Environmental Conservation (NYSDEC).
3. Engineer.
4. Contractor.
5. Major Subcontractors.
6. Major Suppliers.

7. Utilities.

8. Others, as appropriate (property owners, City, etc.).

D. Potential Agenda Items:

1. Safety/safe work practices.

2. Distribution and discussion of:

   a. List of major subcontractors and suppliers.
   b. Projected construction schedules.

3. Major equipment deliveries and priorities.

4. Project Coordination:

   a. Designation of responsible personnel.

5. Procedures and processing of:

   a. Field decisions.
   b. Proposal requests.
   c. Submittals.
   d. Change Orders.
   e. Applications for payment.

6. Procedures for maintaining Record Documents.

7. Use of premises:

   a. Office, work, and storage areas.
   b. Owner's requirements.

8. Construction facilities, controls, and construction aids.

9. Temporary utilities.

10. Housekeeping procedures.

11. Other

1.04 PROGRESS AND COORDINATION MEETINGS

A. Schedule regular progress and coordination meetings, as required by the progress of the Work.

MATERIAL AND PERFORMANCE – SECTION 01200

PROJECT MEETINGS

B. Attendance:

1. Owner or its representative.
2. NYSDEC.
3. Engineer.
4. Contractor.
5. Subcontractors.
6. Suppliers.
7. Others, as appropriate.

C. Potential Agenda Items:

1. Safety/safe work practices.
2. Review, approval of minutes of previous meeting.
3. Review of work progress since previous meeting.
4. Field observations, problems, and conflicts.
5. Problems that impede construction schedule.
6. Review of offsite fabrication and delivery schedules.
7. Corrective measures and procedures to regain projected schedule.
8. Revisions to construction schedule.
9. **Progress and schedule during succe**eding Work period.
10. Coordination of schedules.
11. Review submittal schedules.
12. Maintenance of quality standards.
13. Pending changes and substitutions.
14. Review proposed changes for:
    a. Effect on construction schedule and on completion date.
    b. Effect on other contracts of the Project.

MATERIAL AND PERFORMANCE – SECTION 01200

PROJECT MEETINGS

15. Other.

16. Construction schedule.

17. Critical/long lead items.

D. The Contractor is to attend progress meetings and be prepared to discuss pertinent topics such as deliveries of materials and equipment, progress of the Work, etc.

E. The Contractor is to provide a current submittal log at each progress meeting in accordance with Section 01300.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the State of New York and that he/she has been employed by

_____ to design
(Name of Contractor)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the Amsterdam (Front Street) Former MGP Site.

The undersigned further certifies that he/she has performed the design of the Amsterdam (Front Street) Former MGP Site, that said design is in conformance with all applicable local, state, and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the Owner or Owner's representative with seven days following written request therefore by the Owner.

| | |
|---|---|
| _____ | _____ |
| P.E. Name | Contractor's Name |
| _____ | _____ |
| Signature | Signature |
| _____ | _____ |
| Address | Title |
| | _____ |
| | Address |

# MATERIALS AND PERFORMANCE – SECTION 01300

## SUBMITTALS

## PART 1 – GENERAL

### 1.01 DESCRIPTION OF REQUIREMENTS

A. This Section specifies the general methods and requirements of submissions applicable to Contractor submittals, including various plans, shop drawings, product data, samples, mock-ups, and construction or submittal schedules. Detailed submittal requirements are specified in the Technical Sections.

B. All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number, or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

### 1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings as specified in individual Sections include work plans, samples, supporting vendor information, calculations, test reports, custom-prepared data such as fabrication and erection/installation (working) drawings, schedules for carrying out the work, setting diagrams, actual shop work manufacturing instructions, custom templates, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the work.

2. Shop drawings provided by subcontractors shall not be sent to the Engineer until first reviewed by the Contractor, and should only be forwarded to the Engineer once the Contractor has verified that they are complete. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

3. The Contractor shall be responsible for checking all subcontractor shop drawings regarding measurements, size of members, materials, and details to make sure that they conform to the intent of the shop drawings and related Sections. The Contractor must return shop drawings found to be inaccurate or otherwise in error to the subcontractors for correction before submission thereof.

4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the shop drawings before being submitted.

5. Submittals for equipment specified under Divisions 2, 3, 13, and 16 shall include a listing of all installations where identical or similar equipment has been installed and been in operation for a period of at least 1 year.

B. Product Data

1. Product data as specified in individual Sections include standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs,

standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the work.

C. Samples

1. Samples specified in individual Sections include physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.

D. Construction Schedule

1. The Contractor shall prepare and submit a Construction Schedule. All work shall be done in accordance with this schedule, and the Contractor shall be responsible for updating the schedule as necessary. The Construction Schedule may be prepared with Microsoft Project or similar software.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Review shop drawings, product data, and samples, including those by subcontractors, prior to submission to determine and verify the following:

1. Field measurements;
2. Field construction criteria;
3. Catalog numbers and similar data; and
4. Conformance with related Sections.

B. Each shop drawing, sample, and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable shop drawings and all Contract requirements." Shop drawings and product data sheets 11-inch x 17-inch and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Engineer a copy of each transmittal sheet for shop drawings, product data, and samples at the time of submittal to the Engineer.

C. The Contractor shall utilize a 10-character submittal identification numbering system in the following manner:

1. The first character shall be a D, S, P, or M which represents shop/working drawing and other product data (D), sample (S), preliminary submittal (P), or operating/maintenance manual (M).

2. The next five digits shall be the applicable Section Number.

3. The next three digits shall be the numbers 001 to 999 to sequentially number each initial separate item or drawing submitted under each specific Section Number.

4. The last character shall be a letter, A to Z, indicating the submission, or resubmission of the same Drawing, i.e., A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

D-03300-008-B

| | | |
|---|---|---|
| D | = | Shop Drawing |
| 03300 | = | Section for Concrete |
| 008 | = | The eighth initial submittal under this section |
| B | = | The second submission (first resubmission) of that particular shop drawing |

D. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Design Drawings and/or Technical Specifications.

E. The Engineer shall review shop drawings, samples, and product data for conformance with the Design Drawings and/or Technical Specifications. The Engineer's review shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefore.

F. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to review of the applicable submittal items by the Engineer. Fabrication performed, materials purchased, or onsite construction accomplished that does not conform to the Design Drawings and Technical Specifications shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

G. Project work, materials, fabrication, and installation shall conform to the Design Drawings and Technical Specifications.

1.04 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other contractor.

B. Each submittal, appropriately coded, will be returned following review of submittal by the Engineer.

C. Number of submittals required:

1. Shop Drawings: Six copies.
2. Product Data: Six copies.
3. Samples: Submit the number and/or size stated in the respective Sections.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The project title and number.

3. Contractor submittal identification number.

4. The names of:

   a. Contractor or subcontractor.
   b. Supplier.
   c. Manufacturer.

5. Identification of the product, with the section number, page and paragraph(s).

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the work or materials.

8. Applicable standards, such as ASTM International (ASTM) or Federal Standards numbers.

9. Identification of deviations from the Design Drawings and/or Technical Specifications.

10. Identification of revisions on resubmittals.

11. A blank space suitably sized for Contractor and Engineer stamps.

12. Where calculations are required to be submitted by the Contractor or subcontractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

1.05 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS, AND SAMPLES

A. The review of shop drawings, data, and samples will be for general conformance with the design concept, Design Drawings, and Technical Specifications. They shall not be construed:

   1. As permitting any departure from the Contract requirements;

   2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials; or

   3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

B. The Contractor shall remain responsible for details and accuracy, coordinating the work with all other associated work and trades, selecting fabrication processes, techniques of assembly, and performing work in a safe manner.

C. If the shop drawings, data, or samples as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the

MATERIALS AND PERFORMANCE – SECTION 01300

SUBMITTALS

Owner and to be so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed shop drawings without noting an exception.

D. Submittals will be returned to the Contractor under one of the following codes.

"R" - "REVIEWED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.

"N" - "REVIEWED AND NOTED" is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

"S" - "RESUBMIT" is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

"J" - "REJECTED" is assigned when the submittal does not meet the intent of the Design Drawings and/or Technical Specifications. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Design Drawings and/or Technical Specifications.

"I" - "FOR YOUR INFORMATION" is assigned to acknowledge receipt of a submittal that does not require the Engineer's review and is being filed for informational purposes only. This code is generally used in acknowledging receipt of field conformance test reports and *Health and Safety Plans*.

E. Resubmittals shall be handled in the same manner as first submittals. On resubmittals the Contractor shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittal shall clearly respond to each comment made by the Engineer on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.

F. Partial submittals may not be reviewed. Submittals not complete shall be returned to the Contractor and considered "Rejected" until resubmitted as a complete submittal. The Engineer may at its option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

G. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Design Drawings and/or Technical Specifications, the Contractor shall give written notice thereof to the Engineer at least 7 working days prior to release for manufacture.

H. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

MATERIALS AND PERFORMANCE – SECTION 01300

SUBMITTALS

1.06 DISTRIBUTION

A. Distribute reproductions of reviewed shop drawings and copies of reviewed product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed six.

1.07 SCHEDULES

A. Provide all schedules as required in the Technical Specifications.

1.08 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, a P.E. Certification shall be submitted for each item required, in the form attached to this Section, completely filled in and stamped.

1.09 GENERAL PROCEDURES FOR SUBMITTALS

A. **Coordination of Submittal Times:** Each submittal shall be prepared and transmitted sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including rejection and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -
(ATTACHMENT FOLLOWS)

# P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the State of New York and that he/she has been employed by

_____ to design
(Name of Contractor)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the Amsterdam (Front Street) Former MGP Site.

The undersigned further certifies that he/she has performed the design of the Amsterdam (Front Street) Former MGP Site, that said design is in conformance with all applicable local, state, and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the Owner or Owner's representative with seven days following written request therefore by the Owner.

| | |
|---|---|
| _____ | _____ |
| P.E. Name | Contractor's Name |
| _____ | _____ |
| Signature | Signature |
| _____ | _____ |
| Address | Title |
| | _____ |
| | Address |

# MATERIALS AND PERFORMANCE – SECTION 01540

## SITE SECURITY

## PART 1 – GENERAL

### 1.01 DESCRIPTION

A. Contractor shall safely guard all work, materials, equipment, and property from loss, theft, damage, and vandalism. Contractor's duty to safely guard property shall include Owner's property and other private property from injury or loss during the performance of the Contract.

B. Contractor's health and safety personnel shall be present while site remediation activities are being conducted (i.e., during work hours). Security checks shall be conducted by security personnel during non-work hours, as needed, to provide required security.

C. Contractor may make no claim against the property owner(s) or the Owner for damage resulting from trespass.

D. Contractor shall make good all damage to property of Owner and others arising from failure to provide adequate security.

E. If existing fencing or barriers are breached or removed for purposes of construction, Contractor shall provide and maintain temporary security fencing equal to the existing.

F. Warning signs shall be posted along the perimeter fencing at a minimum frequency of **one every 100 feet and at entrance gates. Signs shall read "UNAUTHORIZED** ENTRANCE TO THE WORK AREA IS PROHIBITED", with black lettering on a white surface. Signs shall be rectangular in shape with a minimum dimension of 24 inches wide of 18 inches high. Signs shall be attached to the fencing securely, maintained during construction and removed upon project completion.

G. The Contractor shall restrict access of persons and vehicles into the site and existing facilities.

H. The Contractor shall allow entrance only to authorized persons with proper identification.

I. The Contractor shall maintain log of workers and visitors and make available to the Owner or Engineer on request. The log shall include the date, name, address, company employed by, company/person visited, time in and time out for each person, and record of deliveries and security incidents.

J. The Contractor shall maintain security program throughout construction until the Owner's acceptance and occupancy precludes need for Contractor's security program.

K. The Contractor shall employ security personnel to prevent entry of unauthorized personnel to the Site and to conduct periodic security checks during non-working hours.

## PART 2 – PRODUCTS (NOT USED)

## PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 01720

## PROJECT RECORD DOCUMENTS

## PART 1 – GENERAL

### 1.01 REQUIREMENTS INCLUDED

A. Contractor shall maintain at the site for the Owner one record copy of:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Engineer's Field Orders or written instructions.
6. Approved shop drawings, working drawings, and samples.
7. Field test records.
8. Detailed Schedule.
9. As-Built Drawings

### 1.02 CHANGES TO DESIGN DOCUMENTS

A. No additions to, deletions from, or alterations in the Work and no amendment or repeal of, and no substitution for any terms, conditions, provisions or requirements of the Agreement shall be made unless first authorized in writing by the Engineer. It is a violation of New York State Consolidated Law, Education, Article 145, for any person, unless he or she is acting under the direction of a Licensed Professional Engineer or Land Surveyor, to alter the Design Documents in any way. If Design Drawings or Technical Specifications bearing the seal of an Engineer or Land Surveyor are altered, the altering Engineer or Land Surveyor shall affix to them his or her seal and the notation "Altered By" followed by his or her signature and the date of such alteration, and a specific description of the alteration.

### 1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.

B. File documents and samples in accordance with Construction Specifications Institute (CSI) format.

C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by the Engineer.

E. As a prerequisite for monthly progress payments, the Contractor is to exhibit the currently updated "record documents" for review by the Engineer and Owner.

MATERIALS AND PERFORMANCE – SECTION 01720

PROJECT RECORD DOCUMENTS

1.04 RECORDING

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress.

1. Do not conceal any work until required information is recorded.

C. Drawings; legibly mark to record actual construction:

1. Elevations of various structure elements in relation to grade.

2. All installed underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc.

3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. Field changes of dimension and detail.

5. Changes made by Field Order or by Change Order.

6. Details not on original Design Drawings.

D. Specifications and Addenda; legibly mark each Section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.

2. Changes made by Field Order or by Change Order.

E. Shop Drawings (after final review):

1. One complete set of Record Drawings.

F. At the end of the project, and prior to final payment, submit certified drawings (signed and sealed by the registered land surveyor) of the items listed below. These drawings shall be included with, and made a part of, the project record documents. These drawings will be supplied in both paper copies and digital format, AutoCAD Release 2000 or newer.

1. Certified site survey at 1-inch = 50-feet scale on reproducible tracing sheet(s) 24 inches by 36 inches and in digital format, indicating paved areas and location of all above ground structures and berms, drainage control structures, ditches, and any discovered utilities not shown on the original Design Drawings within the project site.

2. Certified drawing showing the location, lines, and grades of all active utilities present within the site. This shall be at the same scale as the Engineer's drawings and submitted on reproducible tracing paper. Elevations of piping to be shown at 50-foot minimum intervals.

3. Certified survey at the same scale as the Engineer's line drawings (i.e., culverts, drainage structures, etc.) indicating lines, grades, elevations, and stationing at 50-foot increments. Provide elevations of structure bottom, pipe invert(s), and rim elevations or top of all structures.

4. Certified site topographic survey (on reproducible Mylar) for the constructed areas, including existing surface topography, prepared subgrade (prior to liner placement), and final grades (following surface restoration). Spot elevations shall be shown at a minimum 50-foot rectangular grid sufficient to show all important topographic features with a minimum 0.5-foot contour at a scale of 1 inch = 50 feet. In addition to spot elevations at the grid nodes, the topography survey shall include grade changes and other significant topographic features not otherwise depicted by a 50-foot survey grid.

G. Maintain a complete, accurate log of all control and survey work as it progresses.

H. Update the Record Drawings on a monthly basis based on the work performed during the month ending at the pay request as a condition for approval of monthly progress payment requests.

I. Maintain an accurate record of all changes, revisions, and modifications to the Technical Specifications and Design Drawings.

1.06 SUBMITTAL

A. Submit name and address of registered land surveyor or professional engineer to the Engineer.

B. At Contract Substantial Completion, deliver reproducible Mylars of the Record Documents to the Engineer for the Owner. Deliver AutoCAD files of complete as-built files to Engineer (AutoCAD Release 2000 or newer).

C. Accompany submittals with transmittal letter in duplicate, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each Record Document.
5. Signature of Contractor or authorized representative.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 01901

# FIELD OFFICE TRAILER AND OTHER SUPPORT

## PART 1 – GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. This section includes the furnishing, installation, and maintenance of one field trailer containing two separate office spaces: one for use by the Engineer/Owner and one for use of the New York State Department of Environmental Conservation (NYSDEC). In addition, this section shall include all operating expenses (except long distance telephone and facsimile charges) associated with the field office trailer. The Contractor is required to supply its own field trailer for its personnel and office-related equipment.

2. The field office trailer shall be ready for occupancy within 10 days following acceptable Engineer review of the associated submittal and shall be provided and maintained until final acceptance of the work conducted under this contract.

3. Following final acceptance of the work, the Contractor shall remove the field office trailer from the Site.

### 1.02 SUBMITTALS

A. Within 1 calendar week following award of Contract, the Contractor shall submit to the Engineer drawings showing the layout, furnishings, and facilities of the field office trailer, and information concerning how the Contractor proposes to furnish the required utilities.

## PART 2 – PRODUCTS

### 2.01 FIELD OFFICES

A. The field office trailer shall provide a minimum of 400 square feet of floor space and shall be partitioned to provide two separate office spaces. A total of two outside doors and eight windows will be required.

B. The Contractor shall install and maintain, in accordance with all applicable codes and regulations, the electric and heat services for the office trailer.

C. The field office trailer shall have the following built-in items:

1. One drafting table (48 inches x 89 inches minimum) with double storage cabinets underneath.
2. Forced air heat.
3. Two 5,000 BTU (min.) air conditioners.
4. Sufficient supply of electrical outlets and a minimum of two telephone outlets.

D. The field office trailer shall have the following movable items:

1. Three desks and chairs with filing and lockable storage drawers.

2. Filing cabinets with locks.

3. Three folding tables, measuring 30 inches x 60 inches each, with eight folding or stacking chairs.

4. One 10-pound Class ABC fire extinguisher, (Protectoseal) Model No. 2A10SA, or approved equivalent.

5. One first aid kit.

6. One refrigerator (minimum 2.5-cubic-foot capacity).

7. Two telephones.

8. One facsimile machine.

E. Maintenance of the trailer shall include adequate heating and cooling, electric and telephone services, lighting, portable sanitary facilities, snow removal as required, and janitorial services not less than weekly. All garbage, dust, and miscellaneous material collected during clean-up of the facilities shall be disposed of at a sanitary landfill.

## 2.02 TEMPORARY FACILITIES

A. Upon mobilization to the Site and initiation of construction activities, the Contractor shall provide, but shall not be limited to, the following temporary facilities for use during the completion of remedial activities:

1. Telephone Service: The Contractor shall provide and maintain separate telephone service and equipment including two telephone units to the Engineer's/Owner's field office trailer (i.e., one for each separate office space). The Owner will be responsible for long distance telephone charges originating from that trailer.

2. Computer Service: The Contractor shall provide and maintain separate telephone service for laptop computer users for the Contractor's and Engineer's/Owner's field office trailer.

3. Facsimile Service: The Contractor shall provide and maintain separate facsimile service for the Contractor's and Engineer's/Owner's field office trailers. The Contractor shall provide a dedicated telephone line to the Engineer's/Owner's field office trailer. The Owner will be responsible for long distance charges made from their facsimiles.

4. Temporary Water Service: The Contractor shall provide and maintain suitable bottled drinking water service including one 5-gallon capacity bottled drinking water cooler for the field office trailer. It is the Contractor's responsibility to provide potable water service as deemed necessary for construction activities.

MATERIALS AND PERFORMANCE – SECTION 01901

FIELD OFFICE TRAILER AND OTHER SUPPORT

5. Temporary Sanitary Facilities: The Contractor shall provide and maintain temporary sanitary facilities and enclosures as required by the Occupational Safety and Health Administration (OSHA).

6. Portable Toilets: The Contractor shall provide a minimum of two portable sanitary toilets. The Contractor will be responsible for the removal and disposal/treatment of sanitary wastes off site on a periodic basis as required and in accordance with applicable laws and regulations.

7. Temporary Lighting for Construction Purposes: The Contractor shall provide and maintain lighting for construction operations.

8. Health and Safety Equipment (including equipment and personnel).

9. Eye Wash Station and Other First-Aid Equipment.

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02201

# EARTHWORK

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Excavation and backfilling for structures and trenches, including the loosening, removing, refilling, transporting, storage, and disposal/treatment of all materials classified as "earth" necessary to be removed for the construction and completion of all Work under the Contract.

2. Excavation to the widths and depths shown on the Design Drawings or as specified.

3. Excavating and backfilling for utility trenches.

B. Related Work Specified Elsewhere

1. Section 02202 - Rock and Debris Removal
2. Section 02205 - Excavation Support and Protection
3. Section 02206 - Selected Fill
4. Section 02415 - Impacted Material Handling and Soil Excavation Procedures

C. Definitions

1. Excavation (or Trenching)

a. Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

b. All diking, ditching, pumping, bailing, draining, dewatering, or otherwise disposing of water.

2. Earth

a. All materials, such as sand, gravel, clay, loam, ashes, cinders, pavements, muck, roots, pieces of timber, soft or disintegrated rock, not requiring blasting, barring, or wedging from their original beds, and specifically excluding all ledge or bedrock and individual boulders, masonry, or debris larger than ½-cubic yard in volume.

3. Backfill

a. The refilling of excavation and trenches to the elevations indicated on the Design Drawings or as directed using specified materials for refilling of excavations and trenches; and the compacting of all materials used in filling or refilling by rolling, ramming, or as may be required and approved by the Owner.

4. Spoil

   a. Surplus excavated materials not required or not suitable for backfills or embankments in accordance with Section 02415, titled Impacted Material Handling and Soil Excavation Procedures.

5. Limiting Subgrade

   a. The design bottom of trench as specified on the Design Drawings and/or in the Technical Specifications.

   b. The design subgrade elevations and/or excavated surfaces depicted on the Design Drawings and/or described in the Technical Specifications.

6. Excavation below Subgrade

   a. Excavation below the limiting subgrades of structures or pipelines.

   b. Where materials encountered at the limiting subgrades are not suitable for proper support of overlying materials or features, the Contractor shall excavate to such new lines and grades as required to provide adequate support of overlying materials or features.

1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specifications are referred to in this Technical Specification and are to be considered a part of this specification:

C33 Standard Specification for Concrete Aggregates

C150 Standard Specification for Portland Cement

C495 Standard Test Method for Compressive Strength of Lightweight Insulating Concrete

C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

D1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft$^3$(2,700 kN-m/m$^3$))

D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)

MATERIALS AND PERFORMANCE – SECTION 02201

EARTHWORK

D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity

D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile

B. American Association of State Highway and Transportation Officials (AASHTO). The following AASHTO specification is referred to in this Technical Specification and is to be considered a part of this specification:

M 288 **Standard Specification for Geotextile Specification for Highway Applications**

## PART 2 - PRODUCTS

### 2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CD, MH, OM, and PT according to ASTM D2487, or a combination of these groups, unless otherwise required in the Technical Specifications. Where soils of these groups are specifically required in the Technical Specifications, the soils shall be considered satisfactory only for the specific use for which they are specified.

1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.

D. Fill Materials: See Section 02206, titled Selected Fill, for a complete listing and description of the fill materials identified on the Design Drawings.

### 2.02 EROSION AND SEDIMENT CONTROLS

A. Temporary Silt Fence

1. Silt fence fabric shall be a woven geotextile meeting the geotextile survivability requirements of AASHTO M 288-96 Class 1 or Class 2 with a minimum permeability of 0.2 centimeters per second (cm/sec) as tested by ASTM D4491 and a maximum AOS of 0.25 millimeter (mm) as tested by ASTM D4751.

B. Erosion Control Mat

1. Refer to the Design Drawings for type of matting to be used and additional information related to installation.

MATERIALS AND PERFORMANCE – SECTION 02201

EARTHWORK

C. Silt (Turbidity) Curtain

1. The turbidity curtain shall be a pre-assembled system, including floatation mechanisms (or other approved installation techniques), geomembrane, bottom weights, securing/tie-off mechanism, and joining mechanism.

2. Requirements for tie-down locations are site-specific. The number of locations is dependent on the desired shape of the ensuing containment, exterior currents, size of project, etc.

3. Maintain the silt curtain until the construction is stabilized and turbidity is reduced to specified levels.

D. Oil Absorbent Boom

1. The absorbent boom shall be a minimum of 8 inches in diameter.

2. The absorbent boom shall be placed such that there are no gaps to allow the potential migration of oil/sheens outside the boom.

3. Maintain the absorbent boom and change out, as appropriate, to ensure no release of oil/sheens outside the boom until restoration activities are completed.

## PART 3 - EXECUTION

### 3.01 UNAUTHORIZED EXCAVATION

A. Description

1. Whenever excavations are carried beyond or below the lines and grades shown on the Design Drawings, or directed by the Engineer, all such excavated space shall be backfilled as directed by the Engineer. All refilling of unauthorized excavations shall be at the Contractor's expense.

2. All material that slides, falls, or caves into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense and no extra compensation will be paid the Contractor for any materials ordered for refilling the void areas left by the slide, fall, or cave-in.

### 3.02 EXCAVATION DEWATERING

A. General

1. The Contractor shall, at all times, provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and shall remove all such water as it may collect, in such manner as shall not interfere with the prosecution of the work or the proper placing of pipes, structures, or other work.

2. Water shall not be allowed to rise over or come in contact with any masonry, concrete or mortar, until at least 24 hours after placement, and no stream of water shall be allowed to flow over such work until such time as the Engineer may permit.

3. Water pumped or drained from excavations, or any sewers, drains or water courses encountered in the work, shall be disposed of in a suitable manner approved by the Engineer and without injury to adjacent property, the work under construction or to pavement, roads, drives and water courses. No water shall be discharged to sanitary sewers. Sanitary sewage shall be pumped to sanitary sewers or shall be disposed of by an approved method.

B. Work Included

1. The construction and removal of dewatering systems.

2. The excavation and maintenance of ditches and sluiceways.

3.03 STORAGE OF MATERIALS

A. Excavated Materials

1. All excavated materials shall be stored in locations approved by the Owner so as not to endanger the work, and so that easy access may be had at all times to all parts of the excavation. Stored materials shall be kept neatly piled and trimmed, so as to cause as little inconvenience as possible to public traveler or adjoining property holders.

2. Special precautions must be taken to permit access at all times to fire hydrants, fire alarm boxes, police and fire department driveways, and other points where access may involve the safety and welfare of the general public.

3.04 DISPOSAL/TREATMENT OF MATERIALS

A. Spoil Material

1. Spoil material shall be disposed of off site at a location approved by the Owner. Locating and maintaining, and transport to such sites shall be the responsibility of the Contractor and no separate payment will be made for such work.

3.06 BACKFILLING

A. General

1. All excavations shall be backfilled to the original surface of the ground or to such other grades as shown on the Design Drawings, or directed by the Engineer.

2. Backfilling shall be done with satisfactory soils or specified materials, as appropriate.

3. Any settlement occurring in the backfilled excavations shall be refilled and compacted.

B. Compaction Requirements

1. Unless otherwise specified on the Design Drawings or elsewhere in the Technical Specifications, the degree of material compaction specified for the various items listed in Table 1, below, shall be the minimum required.

2. Unless the Contractor can successfully demonstrate that his methods will produce the required degree of compaction throughout the entirety of each lift, materials to be compacted shall be placed in layers not exceeding the uncompacted thicknesses listed in Table 1, below.

3. Moisture/density tests shall be performed, at the Contractor's expense, on all soil materials by a certified geotechnical testing laboratory, in accordance with ASTM Standard D1557 (Modified Method D), prior to placement.

   i. Laboratory moisture/density testing shall be performed on at least one sample of each fill material type delivered to the Site. Additional tests shall be performed if requested by the Engineer.

4. In-place density shall be determined by ASTM D1556 or ASTM D2922 and shall be expressed as a percentage of maximum dry density. In-place density tests shall be performed at the Contractor's expense.

   i. **In-place density testing shall be performed on each lift at a frequency of one** per 50 cubic yards of material placed, one per 20 linear feet of trench backfilled, or other frequencies deemed necessary by the Engineer to reliably and consistently determine the compaction level being achieved.

5. Where required to obtain the optimum moisture content, sufficient water shall be added during placement and compaction activities, at the Contractor's expense, to achieve the specified minimum density of the material. If, due to rain or other causes, the material becomes too wet and cannot be compacted as specified, the Contractor shall mechanically adjust (reduce) the moisture content of the material as required to achieve the required degree of compaction.

6. The Contractor shall dig test pits, at no additional cost to the Owner, when requested for the purpose of taking an in-place density test below the constructed fill level. The Contractor shall provide free access to trenches and fill areas for the purpose of making such tests. Payment for these tests will be made by the Contractor, unless otherwise specified in the Technical Specifications. The Contractor shall anticipate any additional time as may be needed to perform such testing and shall not have claims for extra compensation occasioned by such time.

7. Minimum field compaction requirements listed in Table 1, below, are expressed as a percentage of the maximum dry unit weight of the material as determined by the geotechnical testing laboratory.

MATERIALS AND PERFORMANCE – SECTION 02201

EARTHWORK

**TABLE 1**
**MINIMUM COMPACTION REQUIREMENTS**

| Type of Backfill | Maximum Uncompacted Fill Layer Thickness | Minimum Compaction | Per ASTM Method |
|---|---|---|---|
| 1. General/Select Fill Beneath Geosynthetics in Engineered Cover | 6" | 90% | D1557 |
| 2. General/Select Fill Above Geosynthetics in Engineered Cover and Outside of Barrier Wall | 12" (12" minimum for first lift over geosynthetics) | 90% | D1557 |
| 3. Type E Granular Fill Above Geosynthetics in Engineered Cover | 12" | 90% | D1557 |
| 4. Type A Granular Fill Bedding Beneath Manholes and Catch Basins | 6" | 95% | D1557 |
| 5. Type E Granular Fill Bedding in Pipe Trenches Outside of Barrier Wall | 12" | 93% | D1557 |
| 6. General Fill Backfill in Pipe Trenches Outside of Barrier Wall | 12" | 90% | D1557 |
| 7. Backfill of Excavations Along Sheetpile Alignment as a Result of Pre-trenching to Remove Obstructions | 12" | 90% | D1557 |
| 8. Access Road Type E Granular Fill Cover | 6" | 95% | D1557 |

The Contractor shall be responsible for all damage or injury done to pipes, structures, any other existing or new site features, property, or persons due to improper placement and/or compaction activities.

3.07 OTHER REQUIREMENTS

A. Drainage

1. All materials deposited in roadway ditches or other water courses shall be removed immediately after backfilling is completed and the section, grades, and contours of such ditches or water courses restored to their original condition, so that surface drainage will be obstructed no longer than necessary.

B. Unfinished Work

1. When, for any reason, the work is to be left unfinished, all trenches and excavations shall be filled and all roadways, sidewalks and watercourses left unobstructed with their surfaces in a safe and satisfactory condition. The surface of all roadways and sidewalks shall have a temporary pavement.

MATERIALS AND PERFORMANCE – SECTION 02201

EARTHWORK

C. Hauling Material on Streets

1. When it is necessary to haul material over the streets or pavement, the Contractor shall provide suitable tight vehicles so as to prevent deposits on the street or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as required to keep the crosswalks, streets, and pavements clean and free from dirt, mud, stone and other hauled material.

D. Dust Control

1. It shall be the sole responsibility of the Contractor to control the dust created by any and all of his operations to such a degree that it will not endanger the safety and welfare of the general public.

2. Air monitoring shall be in accordance with Section 02508, titled Air Monitoring Program.

E. Test Pits

1. For the purpose of obtaining detailed locations of underground obstruction, the Contractor shall make excavations in advance of the work.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02202

## ROCK AND DEBRIS REMOVAL

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Rock and debris removal to the widths and depths shown on the Design Drawings or as directed by the Engineer, including the loosening, removing, transporting, storing, and disposal/treatment of all materials requiring blasting, breaking, barring, or wedging for removal from their original locations.

2. Backfill of rock and debris excavations with acceptable materials.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02205 - Excavation Support and Protection
3. Section 02415 - Impacted Material Handling and Soil Excavation Procedures

C. Definitions

1. Rock

a. All pieces of ledge or bedrock, boulders, or masonry larger than ½-cubic yard in volume.

2. Debris

a. Man-placed buried material larger than ½-cubic yard in volume, including concrete slabs and foundations, demolition debris, and miscellaneous fill materials.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 REMOVAL

A. General

1. All existing pipes or structures to remain that are exposed during excavation shall be adequately protected from damage before proceeding with the removal.

2. The Owner and Engineer reserve the right to alter rock and debris removal techniques and activities, as required.

3. The Owner and Engineer reserve the right to discontinue rock and debris removal techniques and activities at any time.

B. Repair of Damages Due to Removal

1. Any injury or damage to the Work or to existing pipes or structures shall be repaired or rebuilt at the Contractor's expense.

C. Explosives

1. At no time shall explosives be kept at the site of the Work.

D. Rock Clearance in Trenches

1. Ledge rock, boulders, and large stones shall be removed from the sides and bottom of trenches to provide clearance for the specified embedment of each pipe section, joint, or appurtenance. In no instance shall the clearance be less than 6 inches. Additional clearance at pipe bells or joints shall be provided to allow for the proper installation of the joint.

2. At the transition from an earth bottom to a rock bottom, the minimum bottom clearance shall be 12 inches for a distance of not less than 5 feet.

3.02 EXCAVATION AND BACKFILL

A. Rock and debris removal and backfilling shall be performed in accordance with the applicable provisions of Section 02201, titled Earthwork.

B. The rock and debris excavated which cannot be incorporated into the backfill material, as specified, shall be disposed of in accordance with the provisions of Section 02415, titled Impacted Material Handling and Soil Excavation Procedures, and shall be replaced with the quantity of acceptable material required for backfilling.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02203

## SITE GRADING

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. The Contractor shall complete all rough and final grading to the elevations presented on the Design Drawings or as directed by the Engineer.

2. The Contractor shall provide survey verification and certification of existing surfaces, all prepared subgrade elevations, subsequent soil cover thickness, and final grade elevations as depicted on the Design Drawings or as directed by the Engineer.

3. The Contractor shall be responsible for all excavation, backfilling, compaction, slope protection, and erosion control required to complete site grading, as specified herein.

B. Related Work Specified Elsewhere

1. Section 01160 - Survey Control
2. Section 01720 - Project Record Documents
3. Section 02201 - Earthwork
4. Section 02208 - Restoration of Surfaces
5. Section 02209 - Clearing

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specification is referred to in this Technical Specification and is to be considered a part of this specification:

D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft$^3$(2,700 kN-m/m$^3$))

### 1.03 SUBMITTALS

A. As-built grading plans shall be stamped and signed by a land surveyor licensed in New York State.

## PART 2 - PRODUCTS

### 2.01 DESCRIPTION

A. Rough and final site grading shall be as specified in the Design Documents or as directed by the Engineer.

MATERIALS AND PERFORMANCE – SECTION 02203

SITE GRADING

PART 3 - EXECUTION

3.01 PLACEMENT

A. The subgrade beneath the engineered cover geosynthetics shall be prepared using existing site materials, to the extent suitable. Following rough grading, the materials shall be proof-rolled in an overlapping pattern to produce a dense and unyielding subgrade, as determined by the Engineer.

B. Fill placement and compaction requirements shall be as specified in Section 02201, titled Earthwork, for the type of fill and earthwork indicated.

C. Where fill materials are to be placed directly over geosynthetics, the first lift of materials shall be placed as required to achieve an in-place compacted thickness of no less than 12 inches.

D. The Contractor shall, at its own expense, moisture condition the soil fill, as needed, to meet the compaction requirements as specified.

E. The Contractor shall maintain survey control for each layer placed. All final subgrade elevations and final grade elevations shall be verified, and an as-built final grading plan produced and stamped by a land surveyor licensed in New York State, and shall be submitted by the Contractor to the Engineer for review.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02205

# EXCAVATION SUPPORT AND PROTECTION

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Design, furnish, install, monitor, and maintain excavation support and protection systems capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

   a. Provide professional engineering services, including preparation of shop drawings and a comprehensive engineering analysis by a qualified engineer.

   b. Prevent surface water from entering excavations by grading, dikes, or other means.

   c. Install excavation support and protection systems without damaging existing buildings, pavement, and other improvements adjacent to excavation.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02202 - Rock and Debris Removal

### 1.02 SUBMITTALS

A. Shop Drawings (for excavation support systems greater than 4 feet below adjacent grade)

1. Prepared by a New York State licensed professional engineer qualified for excavation support and protection system design.

2. Structural steel shop drawings indicating connections conforming to referenced codes.

### 1.03 PROJECT CONDITIONS

A Project-Site Information: Subsurface information has been provided for this Project and is available for information only. Owner will not be responsible for interpretations or conclusions drawn from this data.

B. Employ a qualified land surveyor licensed in New York State; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

MATERIALS AND PERFORMANCE – SECTION 02205

EXCAVATION SUPPORT AND PROTECTION

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, dewatering, and other hazards that could develop during excavation support and protection system operations.

1. Locate, shore, support, and protect utilities.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

C. Provide adequate clearance of support and protection systems within work areas to allow for proper installation/construction of required site features.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or leaks, to ensure that excavation remains stable and free of standing water.

E. Damages to adjacent facilities caused by installing excavation support and protection systems shall be promptly repaired at the Contractor's expense.

3.02 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02206

## SELECTED FILL

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Selected fill materials shall be used for subgrades, embedment, and backfill as shown on the Design Drawings, in the Technical Specifications, as specified herein, or as directed by the Engineer.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02202 - Rock and Debris Removal
3. Section 02203 - Site Grading
4. Section 02208 - Restoration of Surfaces
5. Section 02415 - Impacted Material Handling and Soil Excavation Procedures

C. Definitions

1. Embedment or Lining

a. Any type granular material specified or directly placed below an imaginary line drawn 1 foot above the crown of a pipe and within the limits of a trench.

2. Special Granular Material

a. Special granular material shall mean any of the granular materials listed in subsection 2.01 (C) or other materials ordered by the Engineer.

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECS

A. New York State Department of Transportation (NYSDOT) Standard Specifications

B. ASTM International (ASTM). The following ASTM specification is referred to in this Technical Specification and is to be considered a part of this specification:

D422 Standard Test Method for Particle-Size Analysis of Soils

C. New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) #4046 – *Determination of Soil Cleanup Objectives and Cleanup Levels*

### 1.03 SUBMITTALS

A. The name and location of the source of the selected fill material.

B. Samples and Sieve Analysis (ASTM D422) reports for the proposed selected fill material.

MATERIALS AND PERFORMANCE – SECTION 02206

SELECTED FILL

## PART 2 - PRODUCTS

### 2.01 LISTING OF MATERIALS

A. General Fill

Clean soil must be suitable for sustaining vegetative growth and free of lumps and rocks larger than 3 inches, and free of loam organic matter, very soft clays, swelling clays, and fine uniform sands that may be difficult to compact.

B. Select Fill

Same material description as General Fill except that compacted surface of material shall be smooth and free of any loose stones, protrusions, and other sharp objects or foreign matter that could damage overlying geosynthetics.

C. Granular Type Fill

1. Type "A"

NYSDOT Standard Specification Item 203-2.02 Type C, or similar, having the following gradation by weight:

| Percent Passing | Sieve |
|---|---|
| 100% | 4 inch |
| 0 to 70% | # 40 Sieve |
| 0 to 15% | #200 Sieve |

2. Type "B"

Thoroughly washed, clean, sound, tough, hard, crushed limestone, or approved equal, free from coatings having the following gradation by weight:

| Percent Passing | Sieve |
|---|---|
| 100% | 1 inch |
| 0 to 15% | ¼ inch |
| 0 to 1% | #200 sieve |

MATERIALS AND PERFORMANCE – SECTION 02206

SELECTED FILL

3. Type "C"

Thoroughly washed, clean, sound, tough, hard, crushed limestone such as NYSDOT size designation 4A, or approved equal, free from coatings, or equal, having the following gradation by weight:

| Percent Passing | Sieve |
|---|---|
| 100% | 3 inch |
| 90 to 100% | 2½ inch |
| 0 to 20% | 1½ inch |
| 0 to 1% | #200 Sieve |

4. Type "E"

Crushed, angular, well-graded stone such as NYSDOT Type A Local Road Surface, or approved equal, having the following gradation:

| Percent Passing | Sieve |
|---|---|
| 100% | 1 inch |
| 85 to 100% | ¾ inch |
| 50 to 75% | ¼ inch |
| 15 to 35% | #40 Sieve |
| 8 to 15% | #200 Sieve |

5. Type "F"

Crushed, angular, well-graded stone such as NYSDOT No. 1, or approved equal, having the following gradation:

| Percent Passing | Sieve |
|---|---|
| 100% | 1 inch |
| 90 to 100% | ½ inch |
| 0 to 15% | ¼ inch |
| 0 to 1% | #200 Sieve |

D. Flowable Fill

1. Flowable Fill: Low-density, self-compacting, flowable concrete material as follows:

   a. Portland Cement: ASTM C150, Type II.

   b. Fly Ash: ASTM C618, Class C or F.

   c. Normal-Weight Aggregate: ASTM C33, 3/8-inch nominal maximum aggregate size.

MATERIALS AND PERFORMANCE – SECTION 02206

SELECTED FILL

2. Produce conventional-weight, controlled low-strength material with 80 pounds per square inch (psi) (550-kPa) compressive strength when tested according to ASTM C495.

2.02 Any offsite materials brought onsite for use as general fill, select fill, or topsoil must be from a certified NYSDOT source, and results of analytical testing for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides/herbicides, and inorganics must be presented to demonstrate that the offsite materials meet the recommended soil cleanup objectives outlined in TAGM #4046. The laboratory used to analyze imported fill material shall be New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified for the parameters being analyzed.

2.03 Prior to importing selected fill materials to the Site, Contractor shall submit a laboratory test report for each material type that indicates the grain-size profile of the material in accordance with ASTM D422.

2.04 The Contractor will provide the analytical data to the Engineer at least 3 weeks prior to bringing any selected fill material onsite. If sample results show that the material does not meet the requirements, the Contractor must identify a new source for the material and provide the required data report for the new source of material prior to the use of such material onsite.

PART 3 - EXECUTION

3.01 GENERAL

A. Selected Fill materials shall be placed and compacted in accordance with Section 02201, titled Earthwork.

B. Materials displaced through the use of the above materials shall be incorporated into the subgrade within the limits of barrier wall, wasted, or disposed of by the Contractor in accordance with Section 02415, titled Impacted Material Handling and Soil Excavation Procedures. The cost of such disposal shall be borne by the Contractor.

C. Any settlements in the finished work shall be restored to design grade by the Contractor at no additional cost to the Owner.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02208

## RESTORATION OF SURFACES

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. All types of surfaces, sidewalks, curbs, gutters, culverts, and other features disturbed, damaged, or destroyed during the performance of the Work under or as a result of the operations of the Contract, shall be restored and maintained, as specified herein, as shown on the Design Drawings, or as specified in the Technical Specifications.

2. The quality of materials and the performance of work used in the restoration shall produce a surface or feature equal to or better than the condition of each before the Work began, as reviewed by the Engineer.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02210 - Topsoil and Seeding

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. New York State Department of Transportation (NYSDOT) Standard Specifications

### 1.03 SUBMITTALS

A. The Contractor shall submit a schedule of restoration operations for review.

### 1.04 SCHEDULE OF RESTORATION

A. After an accepted schedule has been agreed upon, the schedule shall be adhered to unless otherwise revised and reviewed by the Engineer.

B. The replacement of surfaces at any time, as scheduled or as directed, shall not relieve the Contractor of responsibility to repair damages by settlement or other failures.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 PERMANENT PAVEMENT REPLACEMENT

A. The Contractor shall perform the permanent and final repaving of all streets, driveways, and similar surfaces where pavement has been removed, disturbed, settled, or damaged by or as a result of performance of the Contract, by repairing or replacing with a new and similar pavement.

1. The edges of existing asphalt pavement shall be saw-cut a minimum of 24 inches beyond the excavation or disturbed base, whichever is greater. All cuts shall be parallel or perpendicular to the centerline of the street.

MATERIALS AND PERFORMANCE – SECTION 02208

RESTORATION OF SURFACES

2. The top surface shall conform to the grade of existing adjacent pavement and the entire replacement shall meet the current specifications of the local community for the particular types of pavement and/or as shown on the Design Drawings.

3. Where the local community has no specification for the type of pavement, the work shall be done in conformity with the NYSDOT Standard Specification that conforms to the closest to the type of surfacing being replaced, as determined by the Engineer.

4. When scheduled and within the time specified, the temporary pavement shall be removed and a base prepared, at the depth required by the local community or Highway Permit, to receive the permanent pavement.

   a. The base shall be in accordance with NYSDOT Standard Specification requirements and be brought to the required grade and cross-section and thoroughly compacted before placing the permanent pavement.

   b. Any base material which has become unstable for any reason shall be removed and replaced with compacted base materials as required by NYSDOT Standard Specifications.

3.02 STONE OR GRAVEL PAVEMENT

A. All pavement and other areas surfaced with stone or gravel shall be replaced with material to match the existing surface unless otherwise specified.

   1. The depth of the stone or gravel shall be at least equal to the existing.

   2. After compaction, the surface shall conform to the slope and grade of the area being replaced.

3.03 CONCRETE WALKS, CURBS, AND GUTTER REPLACEMENT

A. Concrete walks, curbs, and gutters removed or damaged in connection with or as a result of the construction operations shall be replaced with new construction.

   1. The minimum replacement will be a flag or block of sidewalk and 5 feet of curb or gutter.

B. Walks shall be constructed of Class "B" concrete, air-entrained with NYSDOT #1 stone aggregate on a 4-inch base of compacted gravel or stone.

   1. The walk shall be not less than 4 inches in thickness or the thickness of the replaced walk where greater than 4 inches, shall have construction joints spaced not more than 25 feet apart, shall have expansion joints spaced not more than 50 feet apart, and shall be sloped at right angles to the longitudinal centerline approximately ⅛-inch per foot of width.

   2. Class "B" concrete shall have the following characteristics.

| | | |
|---|---|---|
| a. | Comprehensive Strength at 28 Days (pounds per square inch [psi]) | 2,500 |
| b. | Maximum Net Water to Cement Ratio by Weight | 0.71 |
| c. | Minimum Cement per Yard of Concrete (pounds [lbs]) | 423 |
| d. | Consistency Range in Slump (inches) | 3 to 6 |

C. The minimum length of curb or gutter to be left in place or replaced shall be 5 feet. Where a full section is not being replaced, the existing curb or gutter shall be saw-cut to provide a true edge.

1. The restored curb or gutter shall be the same shape, thickness, and finish as being replaced and shall be built of the same concrete and have construction and expansion joints as stated above for sidewalks.

## 3.04 LAWNS AND IMPROVED AREAS

A. The area to receive topsoil shall be graded to a minimum depth of 6 inches below the proposed finish surface.

B. The furnishing and placing of topsoil, seed, and mulch shall be in accordance with Section 02210, titled Topsoil and Seeding.

C. When required to obtain germination, the seeded areas shall be watered in such a manner as to prevent washing out of the seed.

D. Any washout or damage which occurs shall be regraded and reseeded until a good sod is established.

E. The Contractor shall maintain the newly seeded areas, including regrading, reseeding, watering, and mowing, in good condition in accordance with Section 02210, titled Topsoil and Seeding.

## 3.05 CULTIVATED AREA REPLACEMENT

A. Areas of cultivated lands shall be graded to a depth to receive topsoil of not less than the depth of the topsoil before being disturbed or 6 inches, whichever is greater. All debris and inorganic material shall be removed prior to the placing of the topsoil.

B. The furnishing and placing of topsoil shall be in accordance with Section 02210, titled Topsoil and Seeding.

C. Grass areas shall be reseeded using perennial type grass seed, spread in conformance to the general requirements of Section 02210, titled Topsoil and Seeding.

1. Any debris or inorganic materials appearing shall be removed.

2. The removal of stones shall be governed by the adjacent undisturbed cultivated area.

D. Grass areas shall be reseeded using a mixture equal to that of the area before being disturbed, unless otherwise specified.

MATERIALS AND PERFORMANCE – SECTION 02208

RESTORATION OF SURFACES

## 3.06 OTHER TYPES OF RESTORATION

A. Trees, shrubs, and landscape items damaged or destroyed as a result of the construction operations shall be replaced in like species and size, unless otherwise directed by the Engineer.

B. Water courses shall be reshaped to the original grade and cross-section and all debris removed. Where required to prevent erosion, the bottom and sides of the water course shall be protected in accordance with the Design Drawings and/or Technical Specifications or as directed by the Engineer.

C. Culverts destroyed or removed as a result of the construction operations shall be replaced in like size and material and shall be replaced at the original location and grade. When there is minor damage to a culvert, and with the consent of the Engineer, a repair may be undertaken, if satisfactory results can be obtained.

D. Fences destroyed or removed as a result of the construction operations shall be replaced in like size and material and shall be replaced at the original or new location, as shown on the Design Drawings, or as directed by the Engineer.

E. Other Site features (e.g., jungle gym, light poles, water fountains, etc.) removed or damaged as a result of the construction operations shall be restored in-kind to their original location and condition unless otherwise indicated on the Design Drawings, or as directed by the Engineer.

## 3.07 MAINTENANCE

A. The finished products of restoration shall be maintained in an acceptable condition for and during a period of one year following the date of substantial completion or other such date as set forth elsewhere in the Contract Documents.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02209

# CLEARING

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Clearing and grubbing, within limits indicated on the Design Drawings or as directed by the Engineer, of the following:

   a. Topsoil.
   b. Pieces of rock up to ½-cubic yard in volume.
   c. Trees and bushes.
   d. Pavements.
   e. Brush.
   f. Logs and stumps.
   g. Refuse and Rubbish (on top of ground surface).
   h. Decayed and growing organic matter.
   i. Snow and ice.

2. All material, except topsoil and material suitable for fill, shall be staged on-site for disposal at a location proposed by the Contractor and accepted by the Owner/ Engineer.

3. The Contractor shall remove, replace, support, and protect all power and telephone poles and posts as required.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02203 - Site Grading
3. Section 02208 - Restoration of Surfaces
4. Section 02210 - Topsoil and Seeding
5. Section 02711 - Galvanized Chain Link Fence

## PART 2 - PRODUCTS

### 2.01 QUALITY OF MATERIALS

A. New power and utility poles and posts and the supporting and protecting of all poles and posts shall be in accordance with the requirements of the local power and telephone companies.

B. Topsoil, seed, and mulch shall be in accordance with Section 02210, titled Topsoil and Seeding.

C. Chain link fencing to be replaced shall be in accordance with Section 02711, titled Galvanized Chain Link Fence.

MATERIALS AND PERFORMANCE – SECTION 02209

CLEARING

PART 3 - EXECUTION

3.01 GENERAL

A. Tree Protection

1. Any tree that will not, in the opinion of the Engineer, hinder construction or landscaping shall be protected.

B. Debris Removal

1. All brush and trees shall be removed from the area and disposed of at a site selected by the Owner/Engineer and in conformance with local and State regulations. Disposal of cleared material unsuitable for reuse shall be disposed of as spoil in accordance with Section 02201, titled Earthwork.

C. Chain Link Fence

1. Existing chain link fence fabric, posts, and appurtenances suitable for re-use shall be dismantled and stored for such, as directed by the Engineer.

2. Existing chain link fence that is damaged shall be disposed of and replaced as directed by the Engineer in accordance with Section 02711, titled Galvanized Chain Link Fence.

D. Site and Access Clearing

1. Except where directed by the Engineer, no trees shall be removed or damaged. All trees that, in the opinion of the Engineer, have been damaged by the Contractor shall be removed and replaced by the Contractor at his/her own expense.

2. To the extent practicable, existing vegetation and topsoil shall be left in place in areas that will not immediately (i.e., within 24 hours) undergo construction activities.

E. Sediment and Erosion Control

1. Erosion control procedures, inclusive of mulching, shall be used on the Site. Erosion control shall occur as required, and immediately before and following (weather permitting) completion of Site and access clearing in accordance with the Design Drawings.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02210

## TOPSOIL AND SEEDING

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. The furnishing of topsoil, fertilizer, seed, and mulch; the preparation of the subgrade and the placing of the topsoil, fertilizer, seed, and mulch.

2. The maintenance required until acceptance.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02206 - Selected Fill
3. Section 02208 - Restoration of Surfaces

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. New York State Department of Transportation (NYSDOT) Standard Specifications

### 1.03 SUBMITTALS

A. The Contractor shall submit the location of source and data (including pH and organic content) for offsite topsoil.

B. Seed mixture (including, but not limited to, type and amount).

C. Should a hydroseeder be used, the Contractor shall submit all data including material and application rates.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Topsoil shall be unfrozen friable clayey loam free from clay lumps, stones, roots, sticks, stumps, brush, and foreign objects. The topsoil will have a pH ranging between 5.0 and 7.5 and an organic content between 5 and 20%, as determined by laboratory testing of representative samples.

B. Fertilizer shall be a standard-quality, commercial carrier of available plant food elements (a complete, prepared, and packaged material containing a minimum of 10% nitrogen, 10% phosphoric acid, and 10% potash).

1. Each bag of fertilizer shall bear the manufacturer's guaranteed statement of analysis.

MATERIALS AND PERFORMANCE – SECTION 02210

TOPSOIL AND SEEDING

C. Seed mixtures shall be of commercial stock of the current season's crop and shall be delivered in unopened containers bearing the guaranteed analysis of the mix.

1. All seed shall meet the NYSDOT Standard Specifications for germination and purity.

D. Seed mixtures:

| Species | Percent by Weight |
|---|---|
| Kentucky Bluegrass | 50 |
| Creeping Red Fescue | 30 |
| Manhattan or Pennfine Ryegrass | 20 |

E. Mulch shall be stalks of oats, wheat, rye, or other approved crops free from noxious weeds.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The area to receive topsoil shall be graded to a depth of not less than 6 inches below the proposed finished grades shown on the Design Drawings or as directed by the Engineer.

1. All debris and inorganic material shall be removed and the surface loosened for a depth of 2 inches prior to the placing of the topsoil.

2. The topsoil shall not be placed until the subgrade is in suitable condition and shall be free of excessive moisture and frost.

B. Satisfactory topsoil (that meets the minimum requirements of 2.01A of this Specification) removed from the excavations shall be placed on the prepared subgrade to the depth required.

1. In the event the topsoil removed during excavation does not meet the requirements of 2.01A of this Specification or is of insufficient quantity to obtain the required finished grades, the Contractor shall furnish the required quantity of satisfactory topsoil from approved sources offsite.

2. All topsoil shall be free from stones, roots, sticks, and other foreign substances and shall not be placed in a frozen or muddy condition.

3. The finished surface shall conform to the lines and grades of the area before disturbed or as shown on the Design Drawings. Any irregularities shall be corrected before the placement of fertilizer and seed.

C. The fertilizer shall be applied uniformly at the rate of 20 pounds per 1,000 square feet.

MATERIALS AND PERFORMANCE – SECTION 02210

TOPSOIL AND SEEDING

D. After the topsoil surface has been fine graded, the seed mixture shall be uniformly applied upon the prepared surface with a mechanical spreader at a rate of not less than 2 pounds per 1,000 square feet.

1. Seeding and mulching shall not be done during windy weather.

E. The mulch shall be hand or machine spread to form a continuous blanket over the seed bed, approximately 2 inches uniform thickness at loose measurement. Excessive amounts or bunching of mulch will not be permitted.

1. **Mulch shall be anchored by an acceptable method.**

2. Unless otherwise specified, mulch shall be left in place and allowed to disintegrate.

3. Any anchorage or mulch that has not disintegrated at time of first mowing shall be removed. Anchors may be removed or driven flush with ground surface.

F. Seeded areas shall be watered as often as required to obtain germination and to obtain and maintain a satisfactory sod growth. Watering shall be in such a manner as to prevent washing out of seed.

G. Hydroseeding may be accepted as an alternative method of applying fertilizer, seed, and mulch. The Contractor must submit all data regarding materials and application rates to the Engineer for review.

3.02 MAINTENANCE

A. All lawn areas shall be mowed by the Contractor before the new grass reaches a height of approximately 4 to 6 inches.

B. Contractor shall maintain the newly seeded areas in good condition until seeded areas indicate complete and satisfactory sod growth/coverage and until acceptance, including regular mowing to a height of approximately 2 inches. The Contractor shall be required to repair any areas of erosion and reseed as necessary until complete coverage and satisfactory sod growth is achieved.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02232

## GEOTEXTILE FABRIC

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. The Contractor shall supply all labor, materials, tools, and equipment required to furnish and install geotextile fabric as shown on the Design Drawings or as indicated in the Technical Specifications.

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specifications are referred to in this Technical Specification and are to be considered a part of this specification:

D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity

D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles

D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile

D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles

B. American Association of State Highway and Transportation Officials (AASHTO). The following AASHTO specification is referred to in this Technical Specification and is to be considered a part of this specification:

M 288 **Standard Specification for Geotextile Specification for Highway Applications**

### 1.03 SUBMITTALS

A. Manufacturer's data for geotextile including, at a minimum, physical properties, packaging, and installation techniques.

B. Geotextile material sample.

C. Certified results of all quality control testing pertaining to the rolls of geotextile to be used onsite. At a minimum, results shall be given in accordance with the Design Drawings and Technical Specifications for:

1. Unit weight (ASTM D5261).
2. Grab Tensile/Elongation (ASTM D4632).
3. Tear Strength (ASTM D4533).
4. Puncture Strength (ASTM D4833).
5. **Apparent Opening Size** (ASTM D4751).
6. Permittivity (ASTM D4491).
7. **Survivability: Class 2;** AASHTO M 288.

MATERIALS AND PERFORMANCE – SECTION 02232

GEOTEXTILE FABRIC

D. A list of the materials that comprise the geotextile, expressed in the following categories as percent by weight: base polymer, carbon black, other additives.

E. Written certification by the Contractor that the field-delivered material meets the Manufacturer's specifications.

F. A listing of lot and roll numbers for the material to be delivered to the Site.

G. Contractor's proposed transportation, handling, and storage techniques.

H. Shop drawings depicting installation details and a description of proposed installation techniques.

I. Written certification by the Contractor that the field-delivered geotextile has not been damaged due to improper transportation, handling, or storage. This certification shall be provided prior to installation of the geotextile.

## PART 2 - PRODUCT

2.01 Geotextile Fabrics

A. For these Technical Specifications and the Design Drawings, the terms "geotextile" and "geotextile fabric" shall be considered synonymous.

B. Non-woven geotextile: needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50%; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf (700 N); ASTM D4632.
3. Tear Strength: 56 lbf (250 N); ASTM D4533.
4. Puncture Strength: 56 lbf (250 N); ASTM D4833.
5. Apparent Opening Size: No.60 (0.250-mm) sieve, maximum; ASTM D4751.
6. Permittivity: 0.2 per second, minimum; ASTM D4491.
7. Weight: 10 ounces per cubic yard ($oz/yd^2$), minimum (unless otherwise noted on the Design Drawings); ASTM D5261.

B. Woven geotextile: manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50%; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D4632.
3. Tear Strength: 90 lbf (400 N); ASTM D4533.
4. Puncture Strength: 90 lbf (400 N); ASTM D4833.
5. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D4751.
6. Permittivity: 1.2 per second, minimum; ASTM D4491.

MATERIALS AND PERFORMANCE – SECTION 02232

GEOTEXTILE FABRIC

7. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.
8. Weight: 6 oz/yd$^2$, minimum (unless otherwise noted on the Design Drawings); ASTM D5261.

2.02 DELIVERY, STORAGE AND HANDLING

A. The geotextile shall be furnished in a protective wrapping labeled with the following information: Manufacturer's name, product identification, lot number, roll number, and dimensions.

B. The geotextile shall be protected from ultraviolet light, precipitation, mud, soil, excessive dust, puncture, cutting, and/or other damaging conditions prior to and during delivery and onsite storage. The geotextile shall be shipped and stored in relatively opaque and watertight wrappings. The geotextile shall be stored onsite at a location approved by the Owner.

C. Materials shall be deployed only after the required submittals have been received and reviewed by the Engineer.

2.03 QUALITY ASSURANCE

A. The field-delivered geotextile shall meet the specification values according to the Manufacturer's specification sheet.

B. The Manufacturer shall have in-place its own quality assurance program in the manufacture of the geotextile.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to installing the geotextile, any soil surface to be covered with geotextile shall be leveled and uniformly compacted, as necessary, to provide a stable interface for the geotextile that is as smooth as possible.

3.02 GEOTEXTILE INSTALLATION

A. The following procedures and requirements will be followed during the geotextile installation.

1. Placement:

a. Placement of the geotextile shall not be conducted during adverse weather conditions. The geotextile shall be kept dry during storage and up to the time of deployment. During windy conditions all geotextiles shall be secured with sandbags or an equivalent approved anchoring system. Removal of the sandbags or equal shall only occur upon placement of an overlying soil layer.

b. Proper cutting tools shall be used to cut and size the geotextile materials. Care shall be exercised while cutting geotextiles.

c. During the placement of geotextiles, all dirt, dust, sand, and mud shall be kept off to prevent clogging. If excessive amounts of such materials are present on the geotextile, the geotextile shall be cleaned or replaced as directed by the Engineer.

d. Geotextile shall be covered within the time period recommended by the manufacturer, and in no case later than 2 weeks after its placement.

e. In general, seams on slopes shall be parallel to the line of slope.

2. Seaming and Repairing

a. Adjacent panels of geotextile shall be overlapped a minimum 6 inches for woven and 12 inches for non-woven geotextiles.

b. Repair of tears or holes in the geotextile shall require the following procedures:

1. On slopes: A patch made from the same geotextile shall be double seamed into place; with each seam ¼-inch to ¾-inch apart and no closer than 1 inch from any edge. Should any tear exceed 10% of the width of the roll, that roll shall be removed from the slope and replaced.

2. Non-slopes: A patch made from the same geotextile shall be spot-seamed in place with a minimum 24-inch overlap in all directions.

3.04 WARRANTY

A. The Contractor shall obtain from the Manufacturer and submit to the Engineer, a standard warranty provided for the geotextiles.

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02273

# GEOSYNTHETIC DRAINAGE COMPOSITE

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. The Contractor shall provide all labor, materials, tools, and equipment necessary to furnish and install a geosynthetic drainage composite, herein referred to as "geocomposite," where specified in the Design Drawings. The geocomposite includes a geosynthetic drainage layer and a geosynthetic gas venting layer.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02206 - Selected Fill
3. Section 02274 - Flexible Membrane Liner

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specifications are referred to in this Technical Specification and are to be considered a part of this specification:

D413 Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate

D1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique

D1603 Standard Test Method for Carbon Black In Olefin Plastics

D1777 Standard Test Method for Thickness of Textile Materials

D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity

D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

D4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile

D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles

MATERIALS AND PERFORMANCE - SECTION 02273

GEOSYNTHETIC DRAINAGE COMPOSITE

D7005 Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites

F904 Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials

B. Geosynthetic Research Institute (GRI). The following GRI specification is referred to in this Technical Specification and is to be considered a part of this specification:

GRI GC7 Determination of Adhesion and Bond Strength of Geocomposites

1.03 SUBMITTALS

A. Manufacturer's data for the geocomposite including physical properties and roll size.

B. The origin (supplier's name and production plant) and identification (brand name and number) of the geotextile and geonet used to fabricate the geocomposite.

C. Geocomposite material sample.

D. Manufacturer's quality assurance/quality control program.

E. Written certification that the Minimum Average Roll Values (MARVs), provided under subsection 2.02, are guaranteed by the Manufacturer.

F. Contractor's proposed transportation, handling, and storage techniques.

G. The Contractor shall provide written certification that the field-delivered geocomposite has not been damaged due to improper transportation, handling, or storage. This certification shall be provided prior to the installation of the geocomposite.

H. Prior to installing the geocomposite, the Installer shall certify in writing that the surface on which the geocomposite will be installed is acceptable. The certification is subject to the review and approval or rejection by the Owner or Engineer.

I. The Contractor shall provide written certification that all personnel installing the geocomposite are appropriately qualified through previous on-the-job experience installing geocomposites.

J. The Contractor shall provide shop drawings depicting installation details, a panel layout diagram, and a description of proposed installation techniques.

K. The Contractor shall provide quality control certificates for the geocomposite, which identify the sections of field delivered material they represent, signed by a responsible party employed by the Manufacturer. The quality control certificates shall include lot and roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given in accordance with the Design Drawings and Technical Specifications for:

1. Unit weight (geotextile component) (ASTM D5261).
2. Thickness (ASTM D1777).

MATERIALS AND PERFORMANCE - SECTION 02273

GEOSYNTHETIC DRAINAGE COMPOSITE

3. Geotextile-geonet ply adhesion (ASTM D7005/F904 and GRI GC7).
4. Transmissivity testing (ASTM D4716).

Quality control tests for the list above shall be performed in accordance with the manufacturer's quality assurance/quality control program.

L. The Contractor shall submit written certification that the delivered material meets the manufacturer's specifications. The Contractor shall also provide the lot and roll number for the material delivered to the site.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. GSE Lining Technology, Inc.;
B. Tenax Corporation;
C. Skapps Industries; or
D. Approved equal.

### 2.02 MATERIALS

A. For these Technical Specifications and the Design Drawings, the terms "geocomposite," "geosynthetic drainage composite," and "GDC" shall be considered synonymous.

B. The geocomposite shall be comprised of a high-density polyethylene (HDPE) drainage net composited with two, 8 ounce per square yard ($oz/yd^2$) non-woven geotextiles. The geotextiles shall be heat bonded to both sides of the drainage net.

1. The drainage net to be used in the composite shall be a profiled mesh made by extruding two sets of high density strands together to form a diamond shaped, three-dimensional net to provide planar fluid flow. The drainage net shall be made of HDPE containing carbon black, anti-oxidants, and heat stabilizers that shall be manufactured from resin provided from one resin supplier.

2. The geotextile shall be a non-woven, needle punched polymeric material.

C. Geocomposite material may be acceptable for use provided the selected product meets the above-described requirements and the following conformance testing:

1. Drainage Net

| Property | Test Method | Test Value |
|---|---|---|
| Specific Gravity ($g/cm^3$) | ASTM D1505 | 0.94 minimum |
| Melt Flow Index (g/10 min) | ASTM D1238 – Condition E | 0.3 maximum |
| Carbon Black Content (%) | ASTM D1603 | 2.0 minimum |

MATERIALS AND PERFORMANCE - SECTION 02273

GEOSYNTHETIC DRAINAGE COMPOSITE

2. Geotextile

| Property | Test Method | Test Value |
|---|---|---|
| Fabric Weight (oz/yd$^2$) | ASTM D5261-92 | 8 minimum |
| Grab Strength (lbs.) | ASTM D4632 | 158 minimum |
| Puncture Resistance (lbs.) | ASTM D4833 | 56 minimum |
| A.O.S. (mm) | ASTM D4751 | 0.25 max. avg. roll value |
| Permittivity (sec$^{-1}$) | ASTM D4491 | 0.2 minimum |

3. Composited Materials

| Property | Test Method | Minimum Test Value |
|---|---|---|
| Transmissivity (m$^2$/s) (Geosynthetic Drainage Layer) | ASTM D4716* | $6.9 \times 10^{-4}$ |
| Transmissivity (m$^2$/s) (Geosynthetic Gas Venting Layer) | ASTM D4716* | $8.4 \times 10^{-4}$ |
| Ply Adhesion (lb/in width) | ASTM D413 | 0.5 |

* Conformance test methods to be performed with the following modifications:

| | |
|---|---|
| Geosynthetic Drainage Layer | |
| Substrate Material: | 40-mil HDPE geomembrane |
| Superstrate Material: | **6 inches of representative soil** |
| Applied Normal Compressive Load: | 3,500 pounds per square foot (lbs/sq. ft.) |
| Seating Time: | 100 hours (minimum) |
| Hydraulic Gradient: | 0.1 |
| Geosynthetic Gas Venting Layer | |
| Substrate Material: | 6 inches of representative soil |
| Superstrate Material: | 40-mil HDPE geomembrane |
| Applied Normal Compressive Load: | **3,500 lbs/sq. ft.** |
| Seating Time: | 100 hours (minimum) |
| Hydraulic Gradient: | **Geocomposite shall** be tested at a hydraulic gradient that produces laminar flow within the geocomposite. |

Conformance testing of alternative materials shall be at the Contractor's expense.

Conformance test results, if required, will be reviewed by the Engineer. The material shall either be accepted or rejected by the Engineer based on the results of the conformance testing. Deployment of the geocomposite shall not commence until the Engineer has determined that the material is acceptable. If the Contractor has reason to believe that failing tests may be the result of the Construction Quality Assurance (CQA) Laboratory incorrectly conducting the tests, the Contractor may request that the sample in question be retested by the CQA Laboratory with a technical representative of the Manufacturer present during the testing. This retesting shall be done at the expense of the Contractor. Alternatively, the Contractor may have the sample retested at two different approved CQA Laboratories at the expense of the Contractor. If both laboratories produce passing results, the material may be accepted at the discretion of the Engineer. If both laboratories do not

produce passing results, then the original CQA Laboratory's test results will be accepted. The use of these procedures for dealing with failed test results is subject to the approval of the Engineer.

If a test result is not in conformance with a required MARV, all material from the lot represented by the failing test shall be considered out of specification and rejected. Alternatively, at the option of the Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting specification (note that this procedure is valid only when all rolls in the lot are consecutively produced and numbered from one manufacturing line). To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next larger roll number) will be rejected. If one or both of the additional tests fail, then the entire lot will be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot. The additional conformance test samples will be collected by the Engineer and submitted to the same CQA Laboratory that was used for the original conformance testing. The costs associated with the additional conformance testing will be borne by the Contractor.

## 2.03 DELIVERY, STORAGE, AND HANDLING

A. The geocomposite shall be packaged and shipped by appropriate means so as to prevent damage. Geocomposite rolls will be wrapped in relatively opaque and water tight plastic to prevent damage during shipping and storage. Geocomposite rolls that have been delivered to the job site will be unloaded and stored in their original, unopened wrappers in a secure, dry area, and protected from weathering. Materials shall be delivered only after the required submittals have been received and reviewed by the Engineer.

B. The geocomposite shall be furnished in rolls, marked or tagged with the following information:

1. Manufacturer's name.
2. Product identification.
3. Lot/batch number.
4. Roll number.
5. Roll dimensions.

C. The geocomposite shall be stored in an area approved by the Owner/Engineer that prevents damage to the product or packaging.

D. The geocomposite shall be kept clean and free from dirt, dust, mud, and any other debris.

E. Any geocomposite found to be damaged shall be replaced with new material at the Contractor's expense.

## 2.04 QUALITY ASSURANCE

A. Field delivered material shall meet the specification values according to the manufacturer's specification sheet and meet or exceed the requirements in this Specification, as required for alternative materials.

MATERIALS AND PERFORMANCE - SECTION 02273

GEOSYNTHETIC DRAINAGE COMPOSITE

B. The manufacturer shall have developed and shall adhere to its own quality assurance program in the manufacture of the geocomposite.

## PART 3 - EXECUTION

### 3.01 PREPARATION

A. The areas designated for placement of geocomposite shall be free from any deleterious material.

B. If the geocomposite is not clean before installation, it shall be washed by the Contractor until accepted by the Engineer.

C. Prior to installation of any geocomposite, the Engineer and the Contractor must both concur that the underlying geocomposite subgrade surface (i.e., soil in the case of the geosynthetic gas venting layer and flexible membrane liner [FML] in the case of the geosynthetic drainage layer) is acceptable. In the case of the geosynthetic drainage layer, this will necessitate reviewing of all QA/QC testing of the FML by the Engineer and the Contractor. The Contractor shall submit written verification that both the Engineer and the Contractor agree that the underlying geocomposite subgrade surface is acceptable (refer to 1.03.H of this Specification).

### 3.02 INSTALLATION

A. Geocomposite shall be installed at locations shown on the Design Drawings.

B. Adjacent rolls shall be installed so that the geonet component will have a minimum overlap of 4 inches.

C. The geonet shall be tied with plastic fasteners every 5 feet along the slope, every 6 inches on butt seams, and every 6 inches in the anchor trench.

D. The geotextiles shall be continuously sewn using a polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile.

E. The geocomposite shall be unrolled downslope, keeping the net in slight tension to minimize wrinkles and folds.

F. If a tri-planar material is used, it must be installed in the appropriate flow direction.

G. Adequate loading shall be placed to prevent uplift by wind.

H. Holes or tears in the geocomposite shall be repaired in accordance with the manufacturer's recommendations.

I. Any portion of the geocomposite exhibiting a flaw shall be repaired. Prior to acceptance of the geocomposite, the Installer shall locate and repair all damaged areas as directed by the Engineer.

MATERIALS AND PERFORMANCE - SECTION 02273

GEOSYNTHETIC DRAINAGE COMPOSITE

3.03 QUALITY CONTROL

A. The Contractor shall provide as-built drawings identifying panel layout, locations or imperfections, and repairs and any other appropriate observations.

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02274

# FLEXIBLE MEMBRANE LINER

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Under this section, the Contractor shall furnish and install 40-mil thick, textured high-density polyethylene (HDPE) flexible membrane liner (FML) material as shown on the Design Drawings, and as specified herein and/or directed.

2. The Contractor shall be responsible for all Quality Assurance/Quality Control (QA/QC) testing specified herein and as indicated on the Design Drawings. All QA/QC testing, with the exception of non-destructive tests, shall be conducted by an independent laboratory at the Contractor's expense.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02206 - Selected Fill
3. Section 02273 - Geosynthetic Drainage Composite

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specifications are referred to in this Technical Specification and are to be considered a part of this specification:

D638 Standard Test Method for Tensile Properties of Plastics

D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

D1004 Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting

D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique

D1603 Standard Test Method for Carbon Black In Olefin Plastics

D4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique

D4437 Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes

D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

D5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

MATERIALS AND PERFORMANCE - SECTION 02274

FLEXIBLE MEMBRANE LINER

D5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics

D5994 Standard Test Method for Measuring Core Thickness of Textured Geomembrane

D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes

B. Geosynthetic Research Institute (GRI). The following GRI specification is referred to in this Technical Specification and is to be considered a part of this specification:

GRI Test Method GM-13: Standard Specification for Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

1.03 SUBMITTALS

A. FML Manufacturer

1. The Contractor shall submit to the Engineer for approval the following information regarding the FML Manufacturer:

a. Corporate background and information.

b. Manufacturing capabilities including:

1) Quality control procedures for manufacturing; and

2) List of material properties including certified test results, to which FML samples are attached.

c. A list of at least 5 completed facilities, totaling a minimum of 10,000,000 square feet ($ft^2$), for which the Manufacturer has manufactured FMLs. For each facility, the following information shall be provided:

1) Name and purpose of facility, its location, and date of installation.

2) Name of Owner, Project Manager, Designer, Fabricator (if any), and Installer.

3) Thickness of FML, surface area of FML manufactured.

d. Origin (resin supplier's name, resin production plant) and identification (brand name, number) of the resin.

e. Copies of dated quality control certificates issued by the resin supplier.

f. Results of tests conducted by the Manufacturer to verify that the resin used to manufacture the FML meets the project specifications for melt flow index and density.

g. A statement that the amount of reclaimed polymer added to the resin during manufacturing was done with appropriate cleanliness and did not exceed 2% by weight.

h. Written certification that the Minimum Average Roll Values (MARVs) given in the specification are guaranteed by the Manufacturer.

B. Installer

1. The Installer must be trained and approved and/or licensed by the FML manufacturer for the installation of FML.

2. The Contractor shall submit to the Engineer for approval the following written information, relative to the Installer:

a. Copy of Installer's letter of approval or license by the Manufacturer.

b. Resume of the "master seamer" to be assigned to this project, including dates and duration of employment.

3. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 $ft^2$ of FML of the type for this project, using the same type of seaming apparatus in use at the Site.

C. The Contractor shall submit the following items for approval at least 2 weeks prior to installation:

1. Shop drawings that shall include:

a. Layout plan;

b. Quality control program manuals covering all phases of manufacturing and installation; and

c. Complete and detailed written instructions for the storage, handling, installation, seaming, inspection plan fail criteria for liner inspections, and QA/QC testing procedures of the liner in compliance with these Technical Specifications and the condition of its warranty.

D. The Contractor shall obtain and submit to the Engineer from the manufacturer a standard warranty provided for the FML.

E. The Contractor shall provide quality control tests conducted by the Manufacturer. The quality control testing results shall include lot and roll identification numbers, representative of the field delivered material. At a minimum, results shall be given in accordance with the Design Drawings and Technical Specifications for:

1. Density (ASTM D1505);
2. Carbon black content (ASTM D1603);
3. Carbon black dispersion (ASTM D5596);
4. Thickness (ASTM D5994);
5. Tensile properties (ASTM D638); and
6. Tear strength (ASTM D1004).

F. The FML Installer shall certify in writing that the final surface on which the FML is to be installed is acceptable to both the Engineer and the Contractor prior to installation of the FML.

G. Quality Control/Quality Assurance

1. Written certification by the Contractor that the field-delivered FML has not been damaged due to improper transportation, handling, or storage. This certification shall be provided prior to the installation of the FML.

H. The Installer of the FML materials shall prepare and the Contractor shall submit to the Engineer, record drawings illustrating the following information following completion of installation:

1. Dimensions of all FML field panels.

2. Panel locations referenced to the Design Drawings which depict the identification number assigned to each FML panel.

3. All field seams and panels with the appropriate number or code.

4. Location of all patches, repairs, and destructive testing samples.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. Solmax International, Inc.;
B. GSE Lining Technology, Inc.;
C. Poly-Flex, Inc.; or
D. Approved equal.

### 2.02 MATERIALS

A. HDPE Lining Material Specifications:

1. HDPE FML material shall meet the following minimum specification values listed below and as listed in GRI GM-13.

MATERIALS AND PERFORMANCE - SECTION 02274

FLEXIBLE MEMBRANE LINER

| Property | Test Method | Specification Limit |
|---|---|---|
| | | 40 mil Textured |
| Density (min.) | ASTM D1505/D792 | 0.940 |
| Carbon Black Content | ASTM D1603 (3)/D4218 | 2.0 – 3.0% |
| Carbon Black Dispersion | ASTM D5596 | 8 of 10 views in categories 1 or 2<br>All 10 views in categories 1, 2 or 3 |
| Thickness (nominal)<br>Thickness (min. avg.)<br>lowest individual 8 of 10 values<br>lowest individual of 10 values | ASTM D5994 | 40 mil<br>38 mil<br>36 mil<br>34 mil |
| Tensile Strength at Break (min.) | ASTM D6693<br>Type IV | 60 pounds per inch (lb/in) |
| Tensile Strength at Yield (min.) | | 84 lb/in |
| Elongation at Break (min.) | | 100% |
| Elongation at Yield (min.) | | 12% |
| Tear Resistance (min.) | ASTM D1004 | 28 pounds (lbs) |
| Puncture Resistance (min.) | ASTM D4833 | 60 lbs |
| Stress Crack Resistance | ASTM D5397 | 200 hours |

B. Welding Material

1. The resin used in the welding material must be identical to the liner material.

2. All welding materials shall be of a type recommended and supplied by the manufacturer and shall be delivered in the original sealed containers, each with an indelible label bearing the brand name, Manufacturer's mark number, and complete directions as to proper storage.

C. Labeling FML Rolls

1. Labels on each roll or factory panel shall identify the following:

   a. Thickness of the material.
   b. Length and width of the roll or factory panel.
   c. Manufacturer.
   d. Directions to unroll the material.
   e. Product identification.
   f. Lot number.
   g. Roll or field panel number.

2.03 DELIVERY, HANDLING, AND STORAGE

A. The Contractor shall be liable for all damages to the materials incurred prior to and during transportation to the Site.

B. The Contractor shall be responsible for the handling, storage, and care of the FML prior to and following installation at the Site. The Contractor shall be liable for all damages to the materials incurred prior to final acceptance of the lining system by the Engineer.

C. The Contractor shall notify the Engineer of the anticipated delivery time.

2.04 QUALITY ASSURANCE

A. The Contractor shall provide quality control certificates, signed by a responsible party employed by the Manufacturer. The quality control certificates shall include lot and roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given in accordance with the Design Drawings and Technical Specifications for:

1. Density (ASTM D1505);
2. Carbon black content (ASTM D1603);
3. Carbon black dispersion (ASTM D5596);
4. Thickness (ASTM D5994);
5. Tensile properties (ASTM D638); and
6. Tear resistance (ASTM D1004).

These quality control tests shall be performed for each lot number at a minimum frequency of once every 40,000 $ft^2$ of FML produced. The Manufacturer shall provide a certification letter that will provide data for puncture, environmental stress, low temperature, and burial.

F. Field delivered material shall be subject to the following conformance tests by the Engineer:

1. Density (ASTM D1505);
2. Carbon black content (ASTM D1603);
3. Carbon black dispersion (ASTM D5596);
4. Thickness (ASTM D5994); and
5. Tensile properties (ASTM D638).

The Engineer shall review all conformance test results, and accept or reject material prior to the deployment of the FML. The Engineer shall review results from laboratory conformance testing. If the Contractor has reason to believe that failing tests may be the result of the Construction Quality Assurance (CQA) Laboratory incorrectly conducting the tests, the Contractor may request that the sample in question be retested by the CQA Laboratory with a technical representative of the Manufacturer present during the testing. This retesting shall be done at the expense of the Contractor. Alternatively, the Contractor may have the sample retested at two different approved CQA Laboratories at the expense of the Contractor. If both laboratories produce passing results, the material may be accepted. If both laboratories do not produce passing results, then the original CQA Laboratory's test results will be accepted. The use of these procedures for dealing with failed test results is subject to the approval of the Engineer.

If a test result is not in conformance with a required MARV, all material from the lot represented by the failing test shall be considered out of specification and rejected. Alternatively, at the option of the Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting specification (note that this procedure is valid

only when all rolls in the lot are consecutively produced and numbered from one manufacturing line). To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both of the additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next larger roll number) will be rejected. If one or both of the additional tests fail, then the entire lot will be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

## PART 3 - EXECUTION

### 3.01 FML INSTALLATION

A. Related Earthwork

1. The Contractor shall ensure that all related earthwork requirements under this section are complied with:

   a. The FML installations shall be performed on geotextile-covered surface free from stones or protruding objects.

   b. No FML shall be placed onto an area that has become softened by precipitation. Appropriate methods of moisture control are the responsibility of the Contractor.

   c. No FML shall be placed on frozen soil material. Such material shall be removed and replaced with new soil fill as specified in Section 02206, titled Selected Fill.

   d. All surfaces on which the FML is to be installed shall be acceptable to the Engineer prior to FML installation.

   e. Free edges of FML shall be secured so as to prevent uplift by wind or the intrusion of water under the liner. Edge protection shall include sandbags, polyethylene sheeting, or other methods as deemed necessary by the Contractor and approved by the Engineer.

   f. The FML shall be anchored within an anchor trench constructed to the dimensions shown in the Design Drawings. Care shall be taken while backfilling the trenches to prevent damage to the FML.

B. FML Deployment

1. FML shall be deployed according to the following procedures:

   a. Placement of the FML panels shall be according to the approved layout plan provided by the Installer. Placement shall follow all instructions on the boxes or wrapping containing the FML materials that describe the proper methods of unrolling panels.

   b. FML deployment shall not be undertaken if weather conditions will preclude material seaming following deployment.

c. The method of placement must ensure that:

1) Deployed FML must be visually inspected for uniformity, tears, punctures, blisters, or other damage or imperfections. Any such imperfections shall be immediately repaired and reinspected.

2) No equipment used shall damage the FML by handling, trafficking, leakage of hydrocarbons, or other means.

3) No personnel working on the FML shall smoke, wear damaging shoes, or engage in other activities that could damage the FML.

4) The prepared surface underlying the FML must not be allowed to deteriorate after acceptance, and must remain acceptable up to the time of FML placement and until completion of the project.

5) Adequate temporary loading and/or anchoring (e.g., sand bags), not likely to damage the FML, shall be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels).

6) Direct contact with the FML shall be minimized (i.e., the FML in excessively high-traffic areas shall be protected by geotextiles, extra FML, or other suitable materials).

7) The method used to unroll or adjust the panels does not cause excessive scratches or crimps in the FML and does not damage the supporting soil or underlying geotextile (where applicable).

8) The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels).

d. Any damage to the FML panels or portions of the panels as a result of placement must be replaced or repaired at no cost to the Owner. The decision to replace or repair any panel or portions of panels shall be made by the Engineer.

e. The Installer shall assign an "identification number" to each FML panel placed. The number system used shall be simple, logical, and shall identify the relative location in the field.

-sonnel performing seaming operations shall be qualified by experience or by
lly passing seaming tests.

MATERIALS AND PERFORMANCE - SECTION 02274

FLEXIBLE MEMBRANE LINER

2. The seaming procedures below shall be implemented, where applicable, during installation of the FML. The seaming procedures are as follows:

   a. Generally, all seams whether field or factory, shall be oriented parallel to the line of slope, not across slope. At liner penetrations and corners, the number of seams shall be minimized.

   b. The area of the FML to be seamed shall be cleaned and prepared according to the procedures specified by the material manufacturer. Any abrading of the FML shall not extend more than one-half inch on either side of the weld. Care shall be taken to eliminate or minimize the number of wrinkles and "fishmouths" resulting from seam orientation.

   c. Field seaming is prohibited when either the air or sheet temperature is below 32°F, when the sheet temperature exceeds 122°F, or when the air temperature is above 104°F. At air or sheet temperatures between 32°F and 40°F, seaming shall be conducted directly behind a preheating device. In addition, seaming shall not be conducted when FML material is wet from precipitation, dew, fog, etc., or when winds are in excess of 20 miles per hour.

   d. Seaming shall not be performed on frozen or excessively wet underlying soil surfaces.

   e. Seams shall have an overlap beyond the weld large enough to perform destructive peel tests, but shall not exceed 5 inches.

   f. The Contractor shall perform trial seams on excess FML material. A 1-foot by 3-foot seamed liner sample shall be fabricated with the seam running down the 3-foot length in the center of the sample. Such trial seaming shall be conducted prior to the start of each seaming succession for each seaming crew, every 4 hours, after any significant change in weather conditions or FML temperature, or after any change in seaming equipment. From each trial seam, four field test specimens **shall be taken. The test specimens shall be 1-inch by 12-inch strips cut** perpendicular to the trial seam. Two of these specimens shall be shear-tested, and two shall be peel-tested using a field tensiometer, and recorded as pass (failure of liner material) or fail (failure of seam). Upon initial failure, a second trial seam shall be made; if both trial seams fail, then the seaming device and its operator shall not perform any seaming operations until the deficiencies are corrected and two successive passing trial seams are produced. Completed trial seam samples cannot be used as portions of a second sample and must be discarded.

   g. Where fishmouths occur, the material shall be cut, overlapped, and an overlap weld shall be applied. Where necessary, patching using the same liner material shall be welded to the FML sheet.

h. Acceptable seaming methods for FML are:

1) Extrusion welding using extrudate with identical physical, chemical, and environmental properties; and

2) Hot wedge welding using a proven fusion welder and master seamer.

i. Seaming device shall not have any sharp edges that might damage the FML. Where self-propelled seaming devices are used, it shall be necessary to prevent "bulldozing" of the device into the underlying soil.

D. Seam Testing

1. The Contractor shall perform nondestructive seam testing on 100% of field seams. The following test method and procedures may be used:

a. Air pressure testing may be used if double-track hot-wedge welding has been used to seam the HDPE FML. Using approved pressure testing equipment, the following procedures will be followed:

1) Seal both ends of the air channel separating the double-track hot-wedge welds.

2) Insert pressure needle into air channel and pressurize the air channel to 27 pounds per square inch (psi).

3) Monitor pressure gauge for 3 minutes and determine whether pressure is maintained without a loss of more than 2 psi.

4) If the pressure test fails, then localize the leak and mark the area for repair.

a) Air pressure testing will be conducted under the direct observation of the Engineer.

b) Vacuum testing will be used on all seams not tested using air pressure testing. Using an approved vacuum box, the following procedures will be followed:

i. Apply a soapy water mixture over the seam.
ii. Place vacuum box over soapy seam and form a tight seal.
iii. Create a vacuum by reducing the vacuum box pressure to 5 psi for 10 seconds.
iv. Observe through the vacuum box window any bubbles.
v. Where bubbles are observed, mark seam for repair.
vi. Move vacuum box further down seam overlapping tested seam by 3 inches.
vii. Where hot-wedge seaming has been performed, the overlap must be cut back to the weld.

c) All vacuum testing will be conducted under the direct observation of the Engineer.

2. In addition to nondestructive seam testing, the Contractor will perform destructive testing. The destructive testing procedures are as follows:

a. Test samples will be prepared by the Installer every 500 feet of seam length, a minimum of one test for each seaming machine per day, or more frequently at the discretion of the Engineer. Sample location and size will be selected by the Engineer. The sample size (12 x 56 inches) will be large enough to produce three sets of test specimens for the following tests:

1) Seam Shear Strength, ASTM D4437; and
2) Peel Adhesion, ASTM D4437.

b. Ten specimens will compose a set. Five of these will be tested for peel and the other five for shear strength. Each specimen will be 1-inch wide and 12-inches long with the field seam at the center of the specimen. The 56-inch sample length will first be cut at the ends to produce two field peel test specimens. The remaining 54 inches will be divided up into thirds and one-third submitted to the Contractor, one-third to the independent testing laboratory, and one-third to the Engineer for storage and future reference.

c. Test specimens will be considered passing if the minimum values below are met or exceeded for four of the five test specimens tested by the independent laboratory. All acceptable seams will lie between two locations where samples have passed.

d. The cost of destructive testing will be borne by the Contractor.

e. Seams will meet the following minimum criteria:

| Field Seam Properties | Test Method | Specification Limit |
|---|---|---|
| Shear Strength at Yield (lb/in width) | ASTM D4437 | 60 pounds per inch (ppi) |
| Peel Adhesion – Fusion | ASTM D4437 | 50 ppi and Film tear bond |
| Peel Adhesion - Extrusion | ASTM D4437 | 44 ppi and Film tear bond |

3. If a sample fails destructive testing, the Contractor shall ensure that: the seam is reconstructed in each direction between the location of the sample that failed and the location of the next acceptable sample; or the welding path is retraced to an intermediate location at least 10 feet in each direction from the location of the sample that failed the test, and a second sample is taken for an additional field test. If this second test sample passes, the seam must be then reconstructed between the location of the second test and the original sampled location. If the second sample fails, the process must be repeated.

a. **All costs for work performed to achieve passing tests along with costs for retesting** will be borne by the Contractor.

4. If double-track hot-wedge welding is used, the Engineer and the Installer must agree on the track weld that will be used in the destructive testing. The weld chosen inside or outside must be consistently tested, and must pass according to the criteria above.

5. All holes created by cutting out destructive samples will be patched by the Contractor immediately with an oval patch of the same material welded to the membrane using extrusion welding. The patch seams will be tested using a vacuum box and using the procedures described above. Work will not proceed with materials covering the FML until passing results of destructive testing have been achieved.

6. At the ends of each field seam, two field test specimens will be taken and field tested with a field tensiometer. Both specimens must pass prior to placing the membrane in the anchor trench or continuing with additional seams. Failure of these specimens will require correcting the seaming device and repair of the preceding seam according to the failure testing and procedures described above.

E. Liner Repair

1. All imperfections, flaws, construction damage, and destructive and nondestructive seam failures shall be repaired by the Installer of the FML. The appropriate methods of repair are listed below:

   a. Patching, used to repair holes, tears, undispersed raw materials, and contamination by foreign matter.

   b. Grinding and rewelding, used to repair small sections of extruded seams.

   c. Spot welding or seaming, used to repair pinholes or other minor, localized flaws.

   d. Capping, used to repair large lengths of failed seams.

   e. Topping, used to repair areas of inadequate seams which have an exposed edge.

   f. Removing bad seams and replacing with a strip of new material welded into place.

F. Construction Material Placement and Penetrations

1. Wrinkles that develop from normal placement procedures must be controlled such that the underlying FML does not fold over. Small wrinkles, defined as having their height less than or equal to one-half their base width, may be trapped and pushed down by the overlying soil. Any wrinkle that becomes too large and uncontrollable or that folds the FML over must be brought to the attention of the Engineer. If necessary, the FML shall be uncovered, cut, laid flat, seamed by extrusion welding, and non-destructively tested.

MATERIALS AND PERFORMANCE - SECTION 02274

FLEXIBLE MEMBRANE LINER

3.02 POST-CONSTRUCTION

A. The Installer of the FML materials shall prepare and the Contractor shall submit to the Engineer, record drawings illustrating the following information:

1. Dimensions of all FML field panels.
2. Panel locations referenced to the Design Drawings.
3. All field seams and panels with the appropriate number or code.
4. Location of all patches, repairs, and destructive testing samples.

3.03 WARRANTY

A. The Contractor shall obtain and submit to the Engineer from the Manufacturer a standard warranty provided for the FML.

- END OF SECTION -

# MATERIALS AND PERFORMANCE SECTION - 02399

# PIPING/UTILITY ABANDONMENT

## PART 1 – GENERAL

### 1.01 WORK SPECIFIED

A. This Section specifies the abandonment and/or removal of existing piping, manhole structures, catch basins, historical outfalls, and other related items where such structures or piping will not be required for further service. **Such facilities will be removed from** service, as shown on the Design Drawings and/or specified in the Technical Specifications.

B. Related Work Specified Elsewhere

1. Section 01720 - Project Record Documents
2. Section 02201 - Earthwork
3. **Section 02206 - Selected** Fill
4. Section 02208 - Restoration of Surfaces
5. Section 02415 - Impacted Material Handling and Soil Excavation Procedures

### 1.02 SUBMITTALS

A. Proposed means and methods of plugging ends of pipe, at least 1 week prior to commencement of activities.

B. Mix design and material properties cut sheet for non-shrink grout, flowable fill, etc., at least 1 week prior to use.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

A. Non-shrink grout shall be Five Star Products, Inc. FSP® Construction Grout, or similar.

B. Flowable fill shall be as specified in Section 02206, titled Selected Fill.

## PART 3 - EXECUTION

### 3.01 ABANDONMENT

A. All encountered pipe segments no longer in service, or piping designated for removal on the Design Drawings, shall be permanently removed. Fluids encountered in these pipes, including NAPL, shall be gravity drained. The fluid collected shall be disposed/treated offsite in accordance with the *Waste Handling Plan*.

B. Ends of remaining sewer and drainage pipe shall be filled with non-shrink grout.

C. Cut and permanently cap or plug watertight remaining sections of other piping and conduits.

D. All pipes encountered and abandoned shall be surveyed and placed on the record drawings in accordance with Section 01720, titled Project Record Documents.

MATERIALS AND PERFORMANCE SECTION - 02399

PIPING/UTILITY ABANDONMENT

E. Pipe, manholes, and related materials shall be removed from the site and disposed of by the Contractor in accordance with the Technical Specifications, specifically Section 02415, titled Impacted Material Handling and Soil Excavation Procedures.

F. Manhole and catch basin structures to be abandoned shall be removed or demolished such that no part of the abandoned structure remains within 2 feet of final grade, adjacent structures, and geosynthetics. Bulkhead pipe both sides of abandoned manhole and catch basin. Use of manhole or catch basin material to backfill structures is prohibited.

G. Abandoned structures shall be filled with flowable fill as specified in Section 02206, titled Selected Fill, to the required grade and the surface shall be restored as required and specified in Section 02208, titled Restoration of Surfaces. Salvage all frames, covers, and castings from abandoned and/or removed structures and deliver to the location designated by the Owner or Engineer.

3.02 DISPOSAL OF MATERIALS

A. The material and debris excavated that cannot be incorporated into the backfill material as specified, shall be disposed of as spoil, in accordance with Section 02201, titled Earthwork, and Section 02415, titled Impacted Material Handling and Soil Excavation Procedures.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02411

## BARRIER WALL INSTALLATION

## PART 1 - INTRODUCTION, PURPOSE, AND OBJECTIVE

This technical specification sets forth various Contractor requirements related to the furnishing and installation of a subsurface barrier wall. As discussed in the *Remediation Work Plan* (RWP) (provided as an attachment to the *Contract Documents*), the overall intent of the barrier wall is to eliminate (to the extent practicable) the migration/discharge of subsurface nonaqueous phase liquids (NAPL) from the Upland Area to the Mohawk River through a combination of physical containment and hydraulic control. To accomplish this objective, approximately 1,150 linear feet of Waterloo Barrier® steel sheeting is to be installed around the perimeter of the project area and sealed to establish the barrier wall. The design configuration (i.e., location, alignment, depth) of the steel sheeting is depicted on the Design Drawings.

In addition to identifying the technical requirements related to this component of the project, this specification also establishes the Owner's expectations regarding the barrier wall installation, including the level of effort to be put forth by the Contractor concerning the installation activities. Specifically, in the event that field conditions limit the effectiveness of standard installation equipment and practices and/or preclude the advancement of the steel sheeting to the design configuration, the Contractor will be required to implement one or more of the contingency measures identified in this specification or an Owner-approved alternate approach identified by the Contractor.

Subsurface information obtained from prior site investigations is included in the RWP. This information includes geotechnical boring logs, visual classification of subsurface materials, Standard Penetration Test (SPT) N-values, groundwater elevations, etc. It is the Contractor's responsibility to thoroughly review the barrier wall design configuration and the available information concerning subsurface conditions. From this review, the Owner anticipates that the Contractor will review and understand the scope of the barrier wall installation and the nature of the subsurface conditions that may be encountered during installation. The Owner also anticipates that the Contractor will provide the materials, equipment, and level and experience of labor necessary to install the barrier wall consistent with the remedial design.

Based on the design configuration and existing subsurface information, additional measures (contingency measures) may be necessary above and beyond the standard methods typically employed to install steel sheetpile. The Contractor must recognize and respond to field conditions that could result in difficulties and/or an inability to achieve the design configuration. In addition, the Contractor must be fully equipped and prepared to implement contingency measures if difficulties are encountered during installation. This technical specification identifies several contingency measures that the Contractor shall be prepared to implement. In addition, the Contractor is encouraged to identify possible alternate means and methods for advancing the steel sheeting in difficult installation areas. Such alternate means and methods must be identified and fully described by the Contractor and approved by the Owner prior to implementation (it is preferred that the Contractor identify potential alternate approaches in his/her bid proposal, to be given an adequate level of consideration). The contingency measures identified in this specification, as well as any potential Contractor-proposed and Owner-approved alternate means and methods, represent "best efforts" related to the installation of the steel sheeting, and specifically the extent of the Contractor's obligations with respect to the level of effort, equipment, labor, experienced personnel, and materials necessary to install the sheetpile.

As part of the field implementation and evaluation of "best efforts," the Contractor may be asked to participate in onsite discussions between the Owner, the Engineer, and representatives of the New York State Department of Environmental Conservation (NYSDEC). Such discussions may be necessary in response to difficult installation conditions, and to determine whether "best efforts" have been implemented. The Contractor's role in these discussions is to provide input regarding the applicability, feasibility, and potential effectiveness of a specific list of pre-identified activities composed of the contingency measures identified in this specification and other Contractor-identified and Owner-approved alternate approaches. The outcome of these discussions will be either: 1) the identification of additional

installation measures that will be attempted; or 2) a decision that "best efforts" have been implemented, with concurrence from NYSDEC.

In the event that "best efforts" have been implemented and the design depths for a portion of the barrier wall have not been achieved, additional passive NAPL recovery wells will be installed along the southern wall, and a portion of the eastern wall between Stations 4+50 to 10+56, unless a passive NAPL recovery well is proposed to be installed in this general area, as discussed in Section 02414, Installation of Passive NAPL Recovery Wells and Well Decommissioning. No further action will be necessary, however, along the remainder of the eastern wall, the western wall, or along the northern wall (from Stations 0+00 to 4+50 and 10+56 to 11+52 [0+00]) because NAPL has not been observed in these areas. The Contractor's attention is directed to Section 02414, titled Installation of Passive NAPL Recovery Wells and Well Decommissioning, for requirements related to additional passive NAPL recovery well installation for these potential areas.

The narrative description presented in Part I of this specification has been included to assist the Contractor in better understanding the various design- and installation-related considerations associated with the barrier wall. Since the ability to achieve the design configuration relies in part on the means and methods employed by the Contractor, and the Contractor likely has valuable and potentially applicable experience related to sheetpile installation in a similar setting, the narrative is intended to solicit Contractor input during the bid preparation process of other installation measures and practices that can be potentially included as "best efforts."

## PART 2 - GENERAL

### 2.01 DESCRIPTION

A. Work Specified: All labor, materials, equipment, surveys, subcontractors, and other services and activities necessary for or incidental to the following:

1. The furnishing and installation of Waterloo Barrier® steel sheeting to the limits representing the design configuration shown on the Design Drawings. The goal of the barrier wall installation using Waterloo Barrier® steel sheeting is to achieve a permeability of $1x10^{-7}$ centimeters per second (cm/sec).

2. The implementation of "best efforts" in the event that difficult subsurface conditions are encountered prior to the achievement of the design configuration. Such efforts include the implementation of the contingency measures included in this specification, as well as any other Contractor-identified/Owner-approved alternative approaches.

3. The furnishing and installation of joint sealant within the completed barrier wall to decrease the effective permeability of the barrier wall.

4. All submittals, testing, documentation related to the purchase delivery, installation, and sealing of the steel sheetpile.

5. All other activities/items identified in this section, related Technical Specifications, and the Design Drawings.

MATERIALS AND PERFORMANCE – SECTION 02411

BARRIER WALL INSTALLATION

B. Related Work Specified Elsewhere:

1. Section 01160 - Survey Control
2. Section 01110 - Environmental Protection Procedures
3. Section 02201 - Earthwork
4. Section 02202 - Rock and Debris Removal
5. Section 02205 - Excavation Support and Protection
6. Section 02209 - Clearing
7. Section 02399 - Piping/Utility Abandonment
8. Section 02415 - Impacted Material Handling and Soil Excavation Procedures
9. Section 03002 - Reinforced Concrete Pile Cap

2.02. APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. American Welding Society (AWS). D1.1 - Structural Welding Code

B. ASTM International (ASTM). The following ASTM specifications are referred to in this Technical Specification and are to be considered a part of this specification:

A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

D4945 Standard Test Method for High-Strain Dynamic Testing of Piles

C. American Institute of Steel Construction (AISC)

2.03 QUALITY ASSURANCE

A. Driving and Erecting: Contractor shall be regularly engaged in the driving and erection of steel sheeting. Refer to Part 2.04, A of this specification.

B. Joint Sealing: The Contractor shall contract with a joint sealing company that has a licensing agreement with Waterloo Barrier Inc.® A representative of the joint sealing company will be onsite during pile driving activities to provide input and assistance to the Contractor.

C. Qualifications of Welders: In accordance with the AWS, qualified within the past year.

D. Sheetpile Tolerances: Contractor shall survey each installed sheetpile to verify proper sheeting configuration and to document the work in accordance with Part 4.02, C and Part 4.03 of this specification.

E. **Pile Testing:** Contractor shall retain a specialty dynamic pile testing contractor in accordance with Part 4.02, A to monitor pile stress during driving to mitigate damage during installation.

F. Sheetpile Installation Log: In addition to the preparation of as-built/record drawings, the Contractor shall develop and use a sheetpile installation log to track the progress/extent of installation activities. For each section of steel sheetpile (numerically identified), the log shall include, at a minimum, the following information: targeted design elevation, installation date(s), method of installation, difficulties (and corresponding elevations/depths) encountered in the installation, contingency measures that were

employed (if any), and the installed elevation/depth (approximated to the nearest 0.5-foot). In addition, where individual sheetpile sections were unable to be advanced to their design depth, the log shall indicate that the Owner and NYSDEC were consulted and concurred that "best efforts" were employed.

## 2.04 SUBMITTALS

A. Sheetpile Installer Qualifications Package:

Provide detailed qualification information including:

1. Number of years continuously engaged in sheetpile installation and summaries of representative project experience.

2. Project summaries for five projects where difficult driving conditions were encountered while installing sealed sheeting. The summary shall include the nature of the difficulty, a description of the steps taken to address the difficulties and increase sheeting penetration depth, the final penetration depth, and methodologies for assessing the integrity of the sealed joints.

3. Resumes for key Contractor/subcontractor personnel, including project manager, onsite superintendent, Waterloo Barrier® representative, onsite health and safety officer, and equipment operators.

4. List of equipment (including cut sheets) anticipated to be used for the installation of the barrier wall. For the sheetpile installation, the Contractor shall include certification that each pile hammer delivered to the work site is suitable for the anticipated conditions, including with regard to impact energy, static weight, and overhead clearance.

5. Experience in the installation of Waterloo Barrier®-type steel sheetpile.

B. Shop Drawings/Materials and Performance Submittals

1. Steel sheetpile shop drawings locating and defining all materials furnished. All structures, utilities, poles, and pertinent items shall be shown and dimensioned on a plan drawing. Shop drawings shall identify each individual sheetpile and each corner connection, indicate the length of each to the nearest 0.1 foot, and indicate where pile splicing will occur (where required).

2. Mill test documentation for sheeting to be used on project.

3. Steel sheetpile and corner connection splicing details.

4. Statement of steel sheetpile pipe penetration work defining work procedure and materials furnished.

MATERIALS AND PERFORMANCE – SECTION 02411

BARRIER WALL INSTALLATION

C. Certificates

1. Provide certification of License Agreement with Waterloo Barrier Inc. for the provision of quality control services for the Waterloo Barrier® steel sheeting installation and joint sealing.

2. Proposed welding procedures and certification of welders.

D. *Health and Safety Plan*: Prepare a *Health and Safety Plan* that outlines details of measures to be taken to protect worker and public health and safety. Must be prepared and signed by a Certified Industrial Hygienist (CIH). Must be developed in full accordance with all federal and state regulations.

E. ***Sheetpile Installation Plan***: Submit a *Sheetpile Installation Plan* that describes the anticipated approach for installing the steel sheeting to the design configuration, assuming that no significant installation difficulties are encountered. The plan shall include details of proposed methods to drive sheeting to the depths indicated on the Design Drawings and references to specific equipment makes/models and level of effort that will be used for standard steel sheetpile installation. The installation plan shall identify certain initial contingency measures (prior to those identified in Part 2.04 F and 2.04 G below) that the Contractor would employ in response to difficult subsurface conditions, including but not limited to, different hammer sizes and vibratory frequencies and attempts to partially extract and then re-advance a given sheet. The *Sheetpile Installation Plan* shall also describe quality control measures and equipment that will be used to seal the sheetpile joints and to prepare the joints prior to sealing and include a plan to conduct high-strain dynamic pile testing in accordance with ASTM D4945 to assure that pile driving-induced stress in the steel sheeting do not result in damage to the steel sheeting.

F. Sheetpile Installation Contingency Measures:

For the northern portion of the barrier wall (i.e., Stations 0+00 to 3+93), if the efforts employed by the Contractor pursuant to Part 2.04 above (which includes different hammer sizes and vibratory frequencies and attempts to partially extract and then re-advance a given sheet) result in an installed depth of approximately 80% of the design depth, then no further installation activities need to be attempted, and the installation at that location shall be deemed complete. Subsurface NAPL has not been previously observed in the northern portion of the Site and the design depth is bedrock.

For the remaining portions of the barrier wall (i.e., between Stations 3+93to 11+52 [0+00]), best efforts will be used to achieve the design depth. If the steel sheeting cannot be installed to the design depth using the means and methods identified in the Contractor's Sheetpile Installation Plan (see Part 2.04(E) above), the Contractor shall notify the Owner (if present onsite) and/or the Engineer." Subsequently, the Contractor may participate in discussions with onsite personnel representing the Owner and NYSDEC regarding the potential implementation of one or more of the contingency measures identified below, and/or any Contractor-identified/Owner-approved alternate approaches (refer to Part 2.04, G below). The contingency measures or alternate approaches to be implemented (if any) will consider the specific circumstances of the installation (e.g., depth of refusal, location of sheetpile relative to design depth and nearby subsurface NAPL, measures that have already been implemented, and experience gained elsewhere within the site), and will be at the direction of the Owner. The Owner will coordinate with the NYSDEC prior to directing

the Contractor with regard implementation of contingency/alternative measures. The following contingency measures shall be considered.

- Pre-Trenching – If surface/near-surface obstructions are encountered and/or anticipated, the removal of materials (e.g., cobbles, boulders, concrete slabs) can be considered. Any such pre-trenching shall minimize the amount of materials to be removed, include provisions for managing the removed materials (e.g., limit stockpile volumes to 100 cubic yards [cy]), shall not create unsafe/unstable conditions, shall not result in disturbances to areas outside of the project limits, and shall not extend into the water table. Pre-trenching will likely be limited to the upper 5 feet (approximate) of the site or to the extent reasonably practicable considering the area where the pretrenching is to occur.

  Pre-Drilling – Pre-drilling using 6-inch diameter augers to confirm the depth of the sheetpile refusal, possibly address/remove the obstruction, and/or further assess the nature of the obstruction and provide additional information to assess other/further contingency measures. The pre-drilling will also be used to in an attempt to open the obstruction by drilling through it (e.g., using a tricone bit). The spacing of pre-drilling location(s) shall be field determined.

- Pre-Driving – Pre-driving using a small diameter steel spud or a steel H-pile driven in location(s) where sheetpile refusal has occurred. The spacing of the pre-driving locations shall be field determined.

- Off-Set Installation/Re-Alignment – If three consecutive sections of sheetpile meet refusal at depths less than the design depth, an off-set/re-aligned installation pattern can be considered.

In areas where the contingency measures are unable to achieve the design configuration, the remedial goal of the barrier wall can be achieved with the installation of appropriately located and installed passive NAPL recovery well(s), and inclusion of that well(s) in the future passive NAPL recovery program.

G. Alternate Installation Approaches

As a supplement to the contingency measures identified in 2.04, F above, and to fully represent and consider "best efforts" regarding attempts to achieve the barrier wall design configuration, the Contractor is encouraged to identify other potential alternate means and measures of sheetpile installation for review by the Owner. Such alternate approaches shall consider other potential sheetpile installation measures (i.e., measures not included in the approved *Sheetpile Installation Plan*) for installing sheeting in difficult subsurface conditions that the installer has used with prior success. To be considered as a potential alternate measure, any approach offered by the Contractor must be fully described, and include: 1) a detailed description of the alternate including cut-sheets (where applicable); 2) an explanation of how the potential alternate approach would be implemented at the site; 3) a summary of the alternate's successful application in similar environs (including references for independent confirmation); and 4) a discussion of its specific applicability to the project (e.g., the circumstances under which it may be considered for use, as well as its limitations). To be considered for possible implementation, any potential alternate approach must be pre-approved by the Owner. No field trials will be permitted until the Owner is satisfied that a potential alternative is a viable option.

MATERIALS AND PERFORMANCE – SECTION 02411

BARRIER WALL INSTALLATION

## PART 3 - PRODUCTS

### 3.01 MATERIALS AND EQUIPMENT

A. Steel Sheeting: Waterloo Barrier® WEZ95 in new condition manufactured from ASTM A572, Grade 50 steel by Canadian Metal Rolling Mills (CMRM). No coating will be required for the sheeting.

B. Sheeting Connections: Manufactured from ASTM A572, Grade 50 steel.

C. Joint Sealant: WBS 301 grout for Waterloo Barrier® steel sheeting, or alternate product compatible with site conditions and approved by the Waterloo Barrier® licensed installer.

D. Hammer

1. Crane-mounted, variable frequency vibratory hammer.
2. Crane-mounted diesel impact hammer.
3. Side-grip, low-overhead clearance, variable frequency vibratory hammer capable of low-energy driving.

E. Pre-Trenching: Provide equipment suitable for pre-trenching along the Barrier Wall alignment to a minimum depth of 20 feet.

F. Pre-Driving and Pre-Drilling: Maintain equipment onsite throughout the work to accomplish pre-driving and pre-drilling in accordance with the Contractor's approved *Sheetpile Installation Plan*.

G. A foot plate shall be welded to the base of each female joint of the sheetpile to prevent soil from entering the sealable joint as the sheetpile is driven into the ground. The Contractor will be responsible for all cutting of the sheetpiles and attachment of the footplates. The Contractor shall make the necessary arrangements to assure that attachment of the foot plates does not delay the project schedule.

H. Other equipment: Equipment contractor may need to support/implement any of the Owner-approved contingency or alternative mean of sheetpile installation.

## PART 4 - EXECUTION

### 4.01 PREPARATION FOR DRIVING

A. Determine piling layout and grade by survey.
B. Establish necessary lengths.
C. **Locate and protect all active** underground utilities, piping, structures, etc.
D. Contact and coordinate with the New York State Department of Transportation (NYSDOT), the New York State Canal Corporation (NYSCC), and CSX Transportation, Inc. (CSX).

### 4.02 INSTALLATION

A. Pile Driving:

MATERIALS AND PERFORMANCE – SECTION 02411

BARRIER WALL INSTALLATION

1. Install sheeting to the depths indicated in the Design Drawings and in accordance with the Contractor's approved *Sheetpile Installation Plan* and Owner-approved alternate measures.

2. Sheetpile alignment may be adjusted by Engineer to bypass areas of difficult driving. Blasting will not be allowed.

3. Contractor shall retain a specialty dynamic pile testing contractor to assure that piles are not damaged during installation. Pile testing shall be performed on sheetpiles selected by the Engineer prior to or during driving, and as necessary for the Contractor to assure the integrity of the sealed sheeting system and that the sheetpiles or joints do not become damaged. Sheetpiles that become excessively damaged and/or potentially unlocked from adjacent sheets will be rejected by the Engineer. Details regarding the pile monitoring and testing plan shall be provided in the *Sheetpile Installation Plan* submittal.

4. Working from the start location, the Contractor shall install the sheetpile with the smaller (male) joint leading and thread the larger (female) joint with attached foot plate onto the installed male joint to form the sealable cavity. The Contractor shall ensure that the enlarged female joint is not driven to an elevation lower that the previously installed male joint in order to prevent obstructions from entering the sealable cavity. The only exceptions to this will be when the pile length increases along the wall alignment.

5. Once the sheetpile has been installed, the Waterloo Barrier® representative shall confirm that the sealable cavity is open for the full length and free of obstructions. The Contractor shall remove obstructions and clear the sealable cavity to the base of the joint as directed by the Waterloo Barrier® representative. This work shall include providing the necessary labor, equipment, and materials to vibrate the sheetpiling while flushing the cavity of the problem joints and/or removing and replacing sheetpiling damaged during driving at no additional cost to the Owner.

B. Handling:

1. Lift in manner that shall not cause excessive bending stresses.

2. Do not damage sheeting during handling or installation.

3. The Contractor shall inspect each sheetpile joint to confirm acceptance of the sheet prior to driving. This acceptance shall be conveyed to the Engineer. Any damaged joints and/or sheetpiles will be rejected.

C. Location and Tolerances

1. Drive piles plumb within 1/5-inch per one foot vertical and in correct alignment to ensure proper interlocking along the entire sheeting length. The Contractor shall use suitable templates to ensure alignment and plumpness during driving.

2. Install sheeting to within 12 inches of the horizontal lines and dimensions indicated in the Design Drawings, or as otherwise located in the field by the Engineer.

3. Joints shall remain locked along the entire sheeting length, or they will be rejected. Joint inspection will be performed during interlock sealing.

4. Top of pile at elevation of cut-off shall be within 1 inch (25.4 millimeter [mm]) of the vertical alignment shown on the Design Drawings.

5. **Piles damaged or driven outside the above tolerances shall be replaced.** Any sheetpile ruptured in the interlock, suspected of having tip damage, or otherwise damaged during driving shall be immediately pulled and replaced.

6. The Contractor shall take necessary precautions to ensure adjacent piles do not penetrate deeper during pile installation.

7. Splicing may be required in areas of limited overhead clearance. Make splices in accordance with the splicing plan developed in the Sheetpile Installation Plan.

D. Joint Sealing

1. All sheetpile joints are to be sealed during installation. All joint sealing procedures must be acceptable to both the sheetpiling and sealant manufacturers.

2. After the sheetpiling has been installed to final depth, all sealable cavities shall be checked by probing and flushing of the joints with pressurized water to remove any loose material. Joint inspection and flushing shall be performed by the Contractor under the direction of the licensed installer. In addition, a video inspection shall be conducted by the Contractor on the first 30 sheetpile joints installed and then one sheetpile joint for every subsequent fifty installed. The inspection shall be performed by the Waterloo Barrier® representative using fiber-optic video inspection equipment that can be lowered to the bottom of the sealable cavity.

3. A tremie hose or tube for pressure injection of the sealant shall be inserted into the sealable cavity. When the tube has reached the bottom of the hole, sealant injection will begin. The hose shall be withdrawn progressively up the hole as the sealant fills the space below. Keep tremie nozzle at least 1 foot below the rising surface of sealant.

4. Joint sealing shall not be performed within 100 feet of the sheetpile installation operation until a satisfactory joint inspection is achieved and accepted by the Waterloo Barrier® representative.

4.03 RECORDS

A. Provide accurate as-built/record drawings for the complete barrier wall. For each sheetpile installed, the following information shall be included in addition to the information identified in Section 2.03, F, Sheetpile Installation Log:

1. Pile identification number.

2. Date and time of driving.

3. Model of hammer and energy rating.

4. Elevation of top and base of pile and ground surface elevation at pile location.

5. Length of sheetpile in the ground when driving is complete.

6. Rate of penetration in feet/minute for each 5-foot depth interval; rate of penetration in feet/minute for each 1-foot interval during difficult driving (i.e., when the rate is more than 5 minutes per foot).

7. Detailed remarks concerning alignment, obstructions, etc.

8. Plumbness record of each sheetpile installed shall be recorded in inches for an identified length of sheetpile.

9. Location and depth of each splice.

10. Video inspection record.

B. Mark identification number clearly visible on each sheetpile with a waterproof marking device, within 1 foot of the top, before driving is initiated.

C. Spray paint all sheetpiles rejected from the work for any reason, at the time of rejection, with the letter "X" within 3 feet (1 meter) of both ends.

D. Provide accurate interlock sealant installation records. Submitted records shall include the following information:

1. Joint identification number.
2. Date and time of sealing operation.
3. Confirmation that approved sealant was used.

4.05 REJECTION

If rejected from the work because of deviation from location, plumbness requirement, excessive bending, twisting, pulling out of interlock, or other reasons, the Contractor shall take suitable corrective action as approved by the Engineer and Owner. Suitable action includes extracting, furnishing, and driving of replacement sheetpiles and/or implementation of alternate methods approved by the Engineer and Owner to achieve deeper sheeting penetration, so that all sheetpiles installed meet the requirements of this Specification.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02414

# INSTALLATION OF NAPL PASSIVE RECOVERY WELLS AND WELL DECOMMISSIONING

## PART 1 - INTRODUCTION, PURPOSE, AND OBJECTIVE

This Specification sets forth various Contractor requirements related to the furnishing materials for and installation of passive nonaqueous phase liquid (NAPL) recovery wells along the internal perimeter of the subsurface barrier wall. As discussed in the *Remediation Work Plan* (RWP) (provided as an attachment to the *Contract Documents*), the overall intent of the barrier wall is to eliminate, to the extent practicable, the migration/discharge of subsurface NAPL from the Upland Area to the Mohawk River. Also, as discussed in the RWP and detailed in the Contract Documents, the barrier wall will be augmented with passive NAPL collection wells, installed at predetermined locations, as shown on the Design Drawings. These locations are approximately 50 feet apart along the southern and southern portion of the eastern barrier wall alignment. If, as discussed in Section 02411, titled Barrier Wall Installation, the design depth of the barrier wall is not achieved in a particular area, a passive NAPL recovery well may be installed in the area or areas where the design depth is not reached. The passive NAPL recovery wells installed in these areas may be:

- The proposed recovery wells installed at the "predetermined" location;
- A "predetermined" recovery well installed at a somewhat modified location; or
- A "supplemental" well installed in the area between a pair of "predetermined" recovery wells (which could be located at the "predetermined" location or a somewhat modified location).

This Specification provides details of the passive NAPL recovery well construction. The Owner will determine whether supplemental passive NAPL recovery wells will be installed and will provide the Contractor with information on the location for construction of the recovery wells following completion of sheeting installation. A discussion on the rationale for selecting the location of the recovery wells is provided in the RWP.

## PART 2 - GENERAL

### 2.01 DESCRIPTION

A. Work Specified

1. All labor, materials, equipment, surveys, permits, utility clearances, and services necessary for or incidental to the following:

   a. Construction of NAPL passive recovery wells in accordance with the Design Drawings and Technical Specifications.

   b. Testing of the wells for plumbness and straightness.

   c. Decommissioning of existing wells, as specified on the Design Drawings.

B. Related Work Specified Elsewhere

1. Section 01160 - Survey Control
2. Section 02411 - Barrier Wall Installation

MATERIALS AND PERFORMANCE – SECTION 02414

INSTALLATION OF NAPL PASSIVE RECOVERY WELLS AND WELL DECOMMISSIONING

2.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. New York State Department of Environmental Conservation (NYSDEC), *Groundwater Monitoring Well Decommissioning Procedures*, 1996

2.03 SUBMITTALS

Each of the submittals defined below are to be provided prior to mobilization:

A. The Contractor shall provide a *Health and Safety Plan* (HASP), prepared by a Certified Industrial Hygienist (CIH) that details the measures that will be taken to ensure the health and safety of workers and the general public at the Site while performing the work described herein. The plan must be developed in accordance with CFR 1910.120.

B. The Contractor shall provide a list of selected materials and manufacturers to the Engineer for review prior to procurement of the materials.

1. Acceptable Manufacturers: Leading manufacturers of well casing and screen materials and well grouting and sealing materials (e.g., Johnson Well Screens, Timco, Morie Sands, etc.).

C. The Contractor shall provide a detailed list of, at a minimum, five recent projects where grouted sumps for dense NAPL (DNAPL) monitoring and/or collection were installed. The list shall include a summary of the number, approximate depth and diameter of the grouted sump wells installed at each project, and a reference contact name and telephone number for each project.

2.04 QUALITY ASSURANCE/QUALITY CONTROL

A. Drilling and well installation must be performed by a drilling company that is regularly engaged in drilling and well construction. The Driller must be appropriately licensed to conduct the work.

B. Qualifications of Well Drillers/Installers: Must be experienced in installing monitoring wells and/or recovery wells with grouted sump for DNAPL monitoring and collection.

C. Installation Tolerances: The maximum permissible depth of installation tolerance shall be within 0.3 foot of the depth determined by the Engineer, as discussed below in subsection 4.2, and documented to the nearest 0.1 foot.

2.05 COORDINATION

A. Notify the Engineer at least 5 working days prior to beginning the work specified herein. This will not relieve the Contractor of responsibilities for performing the work in accordance with these Specifications.

MATERIALS AND PERFORMANCE – SECTION 02414

INSTALLATION OF NAPL PASSIVE RECOVERY WELLS AND WELL DECOMMISSIONING

PART 3 - PRODUCTS

3.01 MATERIALS AND EQUIPMENT

A. NAPL Passive Recovery Well Construction

| Well Type | Number of Wells* | Material | Diameter | Screen Length | Screen Slot | Sump |
|---|---|---|---|---|---|---|
| NAPL Passive Recovery Wells | 11 | Schedule 40 polyvinyl chloride (PVC) | 6-inch | Approximately 10 feet to 60 feet, depending on location. See Design Drawings for specified lengths and installed elevations. | 0.020-inch | 5-foot |

*Additional wells may be installed as discussed in the Introduction to this Specification.

B. Well Seals and Annular Pack

1. Filter Pack

a. The material used for the filter pack shall meet the specification for commercially available Morie No. 1 silica sand or an equivalent filter pack. The choke sand shall meet the specification for commercially available Morie No. 0 silica sand. The top and bottom depth of the sandpack and choke sand shall be measured using a weighted tape or other appropriate means and shall be accurate to 0.1 foot.

2. Bentonite Seal

a. The bentonite seal shall consist of pelletized Wyoming bentonite clay. The top of the bentonite seal shall be measured using a weighted tape or other appropriate means and shall be accurate to 0.1 foot. The bentonite shall be hydrated following installation.

3. Cement/Bentonite Grout

a. The cement/bentonite grout shall consist of Type I Portland cement, powdered bentonite, and potable water in the following proportions: One 94-pound bag of cement to 3.9 pounds powdered bentonite clay to 7.8 gallons water. Grout shall be placed from the bottom of the interval to be grouted using a tremie pipe. The tremie pipe shall remain full continuously from the start to the finish of the grouting procedure. The discharge end of the tremie pipe shall remain submerged in the grout until the zone to be grouted is sufficiently filled. Final grout levels shall be measured using appropriate means and shall be accurate to 0.1 foot.

4. Pea Stone

Pea stone shall consist of clean, washed pea stone.

C. Well Casings and Screens

1. Well casings, including the DNAPL-collection sumps, shall be constructed of 6-inch diameter, Schedule 40 PVC.

2. Well screens shall be constructed of 6-inch diameter, Schedule 40 PVC with 0.020-inch slot screen.

D. Well Caps and Curb Boxes

1. Well cap(s) shall be lockable J-Plug caps. Locks for well caps shall be No. 1 Master Lock, key number 2537.

2. Flush-mount protective steel casings shall be at least 24 inches in length and have a bolt-down cast iron lid.

E. Drilling Equipment

1. Hollow-stem augers shall be 8¼–inch inner diameter, 12¼-inch outer diameter.

## PART 4 - EXECUTION

### 4.01 PREPARATION FOR DRILLING

A. Determine well location(s).

B. Determine maximum necessary lengths of well materials (as defined on the Design Drawings).

C. Ensure all health and safety requirements are addressed, as detailed in the site-specific HASP.

### 4.02 INSTALLATION

A. Passive NAPL Recovery Well Construction

1. Wells shall be constructed in accordance with the Design Drawings and Technical Specifications. Elevation of the bottom and top of each screen interval is shown on the Design Drawings. Note that the depth of each boring will need to be at least 5 feet deeper than the base of the screen to accommodate placement of the 5-foot-long blind sump.

2. Since the wells are to be drilled in potentially impacted areas, soil cuttings and mud developed from drilling shall be collected and contained for appropriate disposal/treatment per the RWP and *Waste Handling Plan*.

MATERIALS AND PERFORMANCE – SECTION 02414

INSTALLATION OF NAPL PASSIVE RECOVERY WELLS AND WELL DECOMMISSIONING

3. Passive NAPL recovery well installation shall not be performed without the presence of an Owner/Engineer-provided geologist to observe well installation activities.

4. The Contractor shall use hollow-stem auger drilling techniques to advance the well boring to depth.

5. Well Sumps

   a. A 5-foot section PVC sump shall be installed at the bottom of each NAPL passive recovery well. The base of the sump shall be closed using an end plug attached to the sump using watertight threaded couplings. The sump will be attached to the base of the well screen using watertight threaded couplings. The annular space around the sump shall be grouted as defined below.

6. Well Screens

   The screens shall be set at the elevations defined on the Design Drawings. Screen lengths are all multiples of 5-foot lengths. The bottom elevations of the screens are equivalent to the elevation of the base of the barrier wall at the location of each recovery well. The top of the screen elevation extends above the "high" water table as defined by the water table elevation contours from November 18, 1999.

   Well screen sections shall be joined using watertight threaded couplings.

   When handling well casings and screens, the following guidelines shall apply:

   1) Lift in manner that will not cause excessive bending stresses.
   2) Do not damage well casing and screen while handling or installing.
   3) Replace or repair well casing and screen damaged during installation.

   A Morie No. 1 or equivalent sand pack will be installed to a depth of 2 feet above the top of the screen. An approximate thickness of 1 foot of bentonite pellets will be placed above the sand pack, and then a cement/bentonite grout will be installed above the bentonite pellets to grade.

7. Well Risers

   a. Solid risers shall extend from the top of the screens to grade.

   b. Riser lengths shall be joined to the well screen and to other riser lengths using watertight threaded couplings.

   c. Each well shall be capped with a lockable watertight inner cap and locked with the specified keyed-alike lock.

8. Protective Well Casings

   a. Each passive NAPL recovery well shall be protected with a flush-mount steel casing. Details of the protective casing and well completion are shown on the Design Drawings.

9. Filter Pack

   a. The well screens shall be packed with the filter pack in accordance with the directions provided by the onsite geologist and the Design Drawings.

10. Choke Sand

    a. The choke sand shall be placed above the filter pack as shown on the Design Drawings.

11. Bentonite Pellet

    a. A bentonite pellet seal shall be placed above the filter pack in each passive NAPL recovery well as shown on the Design Drawings. In those locations where the bentonite pellet seal is installed above the water table, hydration requirements for the bentonite will be met through the addition of 2 gallons of water to each 6-inch placement of pellets.

12. Cement Bentonite Grout

    Grout will be placed in two intervals: a lower interval in the annular space around the sump at the base of the well and an upper interval above the bentonite seal.

    a. The grout in the lower interval shall be placed, using a tremie pipe, around and below (as applicable) the sump and up to the base of the screened interval. Any grout that may enter the well during placement of the grout shall be immediately pumped out of the sump/well. The filter pack sand above the grout in the annular space around the sump shall not be placed until the grout has set (typically overnight).

    b. Grout shall be installed within the annular space above the bentonite seal using a tremie pipe to avoid penetrating the bentonite seal. The bottom of the tremie pipe will be designed to deflect flow to the sides of the borehole.

B. Location and Tolerances

1. NAPL recovery well locations will be determined in the field by the Engineer.

2. The maximum permissible depth of installation tolerance shall be within 0.3 foot, and documented to the nearest 0.1 foot.

3. Well Plumbness and Alignment

   a. The completed well shall be sufficiently plumb and straight.

   b. The well shall be tested for plumbness/alignment by the Driller. To assess plumbness/alignment, a 10-foot-long, 4-inch diameter steel (or equal) pipe shall be lowered/retrieved to/from the base of the well. If obstructions or misalignment of the well prevents the 10-foot-long pipe from reaching the total depth of the well, the well will need to be repaired by the Contractor at no cost to the Owner. If the well cannot be repaired, the well will be rejected by the Owner. The Contractor shall abandon the well in accordance with the specifications below and replace the well at no cost to the Owner.

C. Decontamination

1. All drilling equipment must be decontaminated using high-pressure water "steam cleaning" equipment before drilling onsite and before exiting the Site.

2. Following drilling at each location, the Contractor shall decontaminate, using the "steam cleaner," all down-hole and other wetted equipment prior to drilling at the next location.

4.03 DECOMMISSIONING

A. The existing monitoring and NAPL recovery wells slated for decommissioning as defined on the Design Drawings will be decommissioned following NYSDEC overdrilling and grouting guidelines for well abandonment.

4.04 RECORDS

A. The Contractor shall provide accurate records of each well installed. Submitted records will include the following information:

1. Well identification number.

2. Date and time of installation.

3. Installation method.

4. As-built construction details (e.g., casing and screen manufacturer and type, inner and outer diameter, length of screen, length of NAPL sump, etc.).

5. Depth of well in the ground when complete and depth intervals of all materials emplaced, including screen, sump, riser, sand pack, grout, and bentonite seal.

6. Survey of the well location and elevation of the top of the well casing by a surveyor licensed in New York State.

B. The Contractor shall provide accurate decommissioning records. Submitted records will include, but not be limited to, the following information:

1. Date abandoned.
2. Method of abandonment.
3. Quantity of sealant (grout) used for the well.
4. Whether well casing was removed, left in place, or partially left in place.

4.05 REJECTION

If work is rejected because of deviation from location, lack of hydraulic interconnection with soil materials, or other reasons, the Contractor shall take suitable corrective action at no additional cost to the Owner. Suitable action includes extracting, furnishing, and replacing wells, so that all wells installed meet the requirements of this Specification.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 02415

# IMPACTED MATERIAL HANDLING AND SOIL EXCAVATION PROCEDURES

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. The Contractor shall furnish all labor, materials, tools, and equipment and perform all operations necessary for the excavation of soil, as identified within the Technical Specifications and/or on the Design Drawings.

2. Excavation activities may encounter manufactured gas plant- (MGP-) impacted soils and debris containing polycyclic aromatic hydrocarbons (PAHs) and, potentially, nonaqueous phase liquid (NAPL).

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02202 - Rock and Debris Removal
3. Section 02203 - Site Grading
4. Section 02206 - Selected Fill
5. Section 02399 - Piping/Utility Abandonment
6. Section 02508 - Air Monitoring Program

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. United States Environmental Protection Agency (USEPA), including Title 40, Code of Federal Regulations (CFR).

B. Occupational Safety and Health Administration (OSHA), including Title 29, Code of Federal Regulations, and Parts 1910 and 1926, OSHA, U.S. Department of Labor.

C. State of New York Rules and Regulations, including 6 NYCRR Parts 360, 364, and 370 regarding disposal/treatment, transportation, and management of hazardous waste.

D. New York State Department of Environmental Conservation (NYSDEC) Technical Administrative Guidance Memorandum (TAGM) #4061 – *Management of Coal Tar Wastes and Coal Tar Contaminated Soil and Sediment from Former Manufactured Gas Plants (MGPs).*

E. Recommendations of the National Institute of Occupational Safety and Health (NIOSH).

F. Applicable guidelines of the New York State Department of Health (NYSDOH).

G. Transportation regulations, including U.S. Department of Transportation (USDOT) regulations, including Title 29 Parts 171 and 172 and New York State Department of Transportation (NYSDOT) rules and regulations.

H. Applicable federal, state, and local government regulations.

I. Whenever there is a conflict or overlap of the above reference, the most stringent provision shall be applicable.

MATERIALS AND PERFORMANCE – SECTION 02415

IMPACTED MATERIAL HANDLING AND SOIL EXCAVATION PROCEDURES

J. In the event that any requirement of this Section contradicts any such regulatory requirement, immediately notify the Owner of such conflict or contradiction. In such cases, the regulation or law shall apply.

K. Post all applicable regulations in a conspicuous place at the job site. Assure that the regulations are not altered, defaced, or visually obscured by other materials.

1.03 SUBMITTALS

A. All waste transporters hauling waste materials that require offsite disposal/treatment shall submit a copy of their current Waste Transportation Permit, obtained in accordance with 6 NYCRR Part 364. In addition, the Contractor shall provide two copies of the following items as they relate to the offsite transport and disposal/treatment of waste materials:

1. Bills of lading;
2. Chain of custody records;
3. Contracts; and
4. Trucking logs.

PART 2 - PRODUCT (NOT USED)

PART 3 - EXECUTION

3.01 SOIL EXCAVATION

A. Soil excavation activities shall be conducted using the excavation equipment (i.e., excavator, backhoe, etc.) and methods as determined by the Contractor and outlined in the Contractor's bid and required submittals.

B. The Contractor shall excavate soils to the horizontal and vertical limits at locations shown on the Design Drawings or as directed by the Engineer.

C. The Contractor is responsible for providing adequate vehicle/equipment access and egress to the excavation areas to facilitate the excavation of materials to the horizontal and vertical limits identified within the Technical Specifications and/or on the Design Drawings or as directed by the Engineer.

D. To the extent practicable, excavated materials will be incorporated into the liner subgrade fill within the limits of the barrier wall. Excavated materials that are unsuitable for use as subgrade material, as determined by the Engineer, will be transported offsite for disposal/ treatment.

3.02 MAINTENANCE OF UTILITIES TO BE RETAINED

A. The Contractor shall field verify the locations of all utilities (in service and out of service), which include but may not be limited to: water lines, gas piping, storm sewer piping, sanitary sewer piping, overhead and underground electrical lines/equipment/structures. The Contractor shall be responsible for reviewing the Design Drawings and, if necessary, using a locator service to field-delineate the location(s) of each utility. Once the locations of the utilities have been field delineated, the Contractor shall expose the utilities that are impacted by the excavation activities and, for those to be retained, install supports and/or bracing in accordance with the Contractor's submittal as reviewed by the Engineer, and as

necessary to temporarily support these utilities during the soil excavation and backfilling activities. During the excavation activities, the Contractor shall be responsible for maintaining the temporary support system until the excavation and backfilling activities are completed. If utilities are present at locations that will interfere with the implementation of soil excavation activities, the Contractor shall remove and/or relocate the utility in coordination with the appropriate utility company.

B. The Contractor shall relocate, remove, and/or abandon existing utilities as indicated on the Design Drawings and in accordance with Section 02399, titled Yard Piping/Utility Abandonment.

3.03 TEMPORARY ONSITE STAGING AREA(S)

A. The Contractor shall construct an onsite staging area(s) for material handling activities, including staging and characterization, followed by offsite transportation for disposal/treatment. The soil staging area(s) shall be constructed in accordance with the Design Drawings and the Contractor's submittal, which are subject to review by the Engineer. The soil staging areas shall be located and constructed as indicated on the Design Drawings and to meet the following requirements:

1. The staging area shall be sloped and equipped with a sump to collect liquids generated within the staging area. The Contractor shall pump liquids that accumulate within the sump to a temporary storage tank(s). The liquids shall then be transferred offsite for disposal/treatment.

2. A drainage material shall be installed over the liner to permit liquids within the staging area(s) to flow to the sump and to act as a protective layer between the liner and material placed within the staging area(s).

3. A berm shall be constructed at the perimeter of the staging area to contain liquid generated within the staging area and to mitigate the potential for surface water runoff to contact staged materials.

4. The staging area(s) shall be covered with a minimum 10-mil thick plastic cover, except while materials are actively being placed, mixed, stabilized, or removed. The cover shall be properly anchored to prevent uplift due to wind conditions and shall be maintained for the duration of staging activities. In addition, emission controls shall be employed, as necessary, when soil is being actively placed, mixed, stabilized, or removed.

5. The staging area shall be inspected daily and any noted deficiencies shall be promptly corrected. Compliance with the NYSDOH Generic Community Air Monitoring Plan (gCAMP) and emission controls must be maintained when any material is present in the staging area.

B. The placement of soil/sediment into the staging area shall not involve any equipment or procedures that may jeopardize the integrity of the underlying liner materials.

MATERIALS AND PERFORMANCE – SECTION 02415

IMPACTED MATERIAL HANDLING AND SOIL EXCAVATION PROCEDURES

3.04 DEBRIS PROCESSING/MATERIAL SEGREGATION

A. The potential exists for encountering concrete or brick foundation material, abandoned piping, and other debris at the Site. The Contractor shall be responsible for segregating debris into that which is suitable for use as liner subgrade fill and that which requires offsite disposal/treatment. Debris that is not suitable for offsite treatment due to size (e.g., concrete, cobbles/boulders, miscellaneous debris) shall be manipulated into a manageable size to render the materials suitable for offsite disposal/treatment (as determined by the offsite disposal/treatment facility).

B. The Contractor shall segregate materials as necessary during the excavation of soils for material handling activities including (if necessary): mixing, stabilizing, and characterizing as required to render the materials suitable for offsite disposal/treatment.

C. If free phase NAPL is encountered during the excavation activities, the NAPL shall be removed, segregated, and transferred to an appropriate container(s) (proposed by the Contractor and reviewed by the Engineer) for characterization (by the Contractor) to determine offsite disposal/treatment requirements in accordance with applicable regulations.

D. If soil containing NAPL, staining, sheen, or odors is encountered during the excavation activities, the soil will be handled as follows:

- Soils containing significant volumes of NAPL will be segregated for offsite transportation and disposal/treatment;
- Soils containing minimal volumes of NAPL, which would be incorporated into the soil volume when excavated, may be reused as backfill under the engineered cover. A determination as to whether the soil will be used as backfill will be based on a field review of the soil conditions by Niagara Mohawk's onsite representative;
- Soil exhibiting staining or sheening will be used for Site regrading below the engineered cover; and
- Soil exhibiting odors (and no staining) and soil exhibiting no characteristics of MGP-related oils or tars will be used onsite for regrading below the engineered cover.

3.05 DUST, VAPOR, AND ODOR CONTROL

A. Dust and vapor control activities shall be performed in accordance with Section 02508, titled Air Monitoring Program. Odor control activities shall be performed in accordance with the *Health and Safety Plan* (HASP).

B. The Contractor shall control dust and vapors that result from the remedial activities. The need to implement dust controls shall be based on the results of airborne particulate monitoring and/or visual observations. Dust monitoring activities shall be conducted within the worker breathing zone and at the Site perimeter in accordance with the HASP. The actual measures to be implemented to control dust shall be proposed within the Contractor's submittal in accordance Section 02508, titled Air Monitoring Program. Exceedence of allowable concentrations of dust within the worker breathing zone shall trigger implementation of dust monitoring at the downwind perimeter. Should the dust action level be exceeded at the downwind perimeter, work activities shall be discontinued and dust suppression activities shall be implemented. Work activities shall not resume until dust levels are below the action level.

MATERIALS AND PERFORMANCE – SECTION 02415

IMPACTED MATERIAL HANDLING AND SOIL EXCAVATION PROCEDURES

3.06 SOIL TESTING

A. All required analytical sampling necessary to facilitate offsite disposal/treatment of materials will be performed by the Contractor as required by the selected disposal/treatment facility. All sample analytical results must be provided to the Owner/Engineer for review.

3.07 TRANSPORTATION AND DISPOSAL/TREATMENT

A. The Contractor shall be responsible for the offsite transportation of waste material generated as a result of the excavation activities, which will not otherwise be incorporated for use as subgrade fill, to an appropriate offsite disposal/treatment facility as determined based on the matrix of the waste material and the results of characterization sampling.

B. The Contractor shall load soil (deemed suitable for offsite disposal/treatment) into lined roll-off containers and/or lined dump trailers for offsite transportation to the appropriate facility for disposal/treatment. The loading activities shall be conducted in accordance with the Contractor's submittal. Soil characterized as a characteristic hazardous waste, with the exception of benzene impacts or as otherwise stipulated in NYSDEC TAGM #4061, will be transported to a facility permitted to accept such waste material as identified by the Contractor. Other waste materials generated during the remedial activities will be transported offsite for disposal/treatment based on the results of characterization sampling.

C. The Contractor shall be responsible for properly containerizing, staging, and preparing waste material for offsite disposal/treatment. Each waste medium (e.g., soil, decontamination water, waste debris, PPE) shall be properly containerized via DOT approved 55-gallon drums, temporary tanks, lined and covered roll-off containers, lined and covered dump trailers, or lined and covered staging areas and properly labeled and staged with like materials.

D. The Contractor shall provide coordination of offsite transportation and disposal/treatment of excavated material and, at a minimum, shall be responsible for the following:

1. Provision/preparation of a Uniform Hazardous Waste Manifest or Bill of Lading, to be signed by the Engineer and the truck driver.

2. Preparation and submittal of a daily summary sheet that indicates the temporary stockpile area, analytical data, and at a minimum, the following information regarding each truck load:

   a. Load number (sequential);
   b. Uniform Hazardous Waste Manifest Number or Bill of Lading Number;
   c. Truck ID number (license plate number of the truck and/or trailer used);
   d. Gross weight;
   e. Tar weight;
   f. Net load weight;
   g. Material type (nonhazardous or hazardous); and
   h. Destination.

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02500

# DRAINAGE PIPING INSTALLATION

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Install underground drainage piping in compliance with this section of the Technical Specifications.

2. Piping shall be furnished and installed of the materials, sizes, and classes designated on the Design Drawings and as specified in this section for the specific pipe material, unless otherwise directed by the Engineer, and at the grades and locations shown on the Design Drawings.

3. This section also includes the installation of gas collection system piping and State Route 30 downspout extensions.

B. Related Work Specified Elsewhere

1. Section 01160 - Survey Control
2. Section 01720 - Project Record Drawings
3. Section 02201 - Earthwork
4. Section 02206 - Selected Fill
5. Section 02514 - Precast Concrete Manholes, Catch Basins, and Structures

### 1.02 SUBMITTALS

A. Manufacturer's cut sheets for all piping, joints, and connections.

B. Manufacturer's installation guidelines for the type of piping being installed.

C. Results of Contractor's exploratory investigations including, at a minimum, locations, elevations materials, and sizes of any existing utilities that will be impacted.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

A. All piping materials shall be in accordance with the Technical Specifications and Design Drawings.

## PART 3 – EXECUTION

### 3.01 PROTECTION OF EXISTING FACILITIES

A. The Contractor's responsibilities regarding the protection, maintenance, repair, and restoration of existing facilities are specified elsewhere in the Design Drawings and Technical Specifications.

B. The Contractor shall conduct his/her operations such that no interruptions to the existing utility systems shall occur. Where existing storm sewer systems are being replaced or interrupted, the Contractor shall maintain the flow conditions.

C. The Contractor shall maintain existing manholes, catch basins, and other utility structures not scheduled for replacement or modification in their pre-construction condition. Any material or debris entering same due to the Contractor's operation shall be promptly removed.

D. Staking

1. Prior to start of construction, the Contractor shall have staked or marked all underground utilities. Utilities include, but are not limited to, water, gas, electrical, telephone, cable, storm sewer, sanitary sewer, laterals, and services.

2. In the event such locations indicate a possible interference, or when needed to locate points of connection to existing facilities, the Contractor shall perform exploratory excavations to determine the utilities' locations and elevations. The Contractor shall provide the Engineer with the results of the exploratory excavations.

3. The Contractor shall allow the Engineer sufficient time to determine any changes required as a result of such exploratory excavations prior to start of construction.

3.02 LINES AND GRADES

A. Pipes shall be laid to the lines and grades shown on the Design Drawings and shall be straight between manholes and catch basins, except where specifically shown otherwise on the Design Drawings.

B. The grade of the storm sewer piping between manholes/catch basins and from pipe length to pipe length shall not vary from the design grade shown on the Design Drawings by more than 0.15 times the design grade, unless a change in grade has been ordered by the Engineer, in which case the same tolerance shall apply. In addition, invert elevations at any location shall not vary from the design elevations by more than 0.05 foot, unless a change in invert elevation has been ordered by the Engineer, in which case the same tolerance shall apply.

C. Any grade or invert elevation that exceeds these tolerances shall be corrected by and at the expense of the Contractor.

D. The method used to install the piping shall be consistent with standard practice of establishing line and grade and sufficiently accurate to ensure that the above requirements are met.

E. For manhole-to-manhole and catch basin-to-catch basin reaches, the Contractor shall use the laser beam method to establish line and grade. The Contractor shall check the grade of pipe at not more than 50-foot intervals by use of level instrument and tripod.

F. The Contractor shall furnish all labor, materials, surveying instruments and tools to establish and maintain all lines and grades. The Contractor shall have personnel on duty at all times who are qualified to set and check grades of sewers, manholes, and catch basins as they are installed.

DRAINAGE PIPING INSTALLATION

The responsibilities of the Owner to provide, and the Contractor to maintain, basic control points for line and grade are outlined in Section 01160, titled Survey Control.

G. The Contractor shall employ a land surveyor licensed in the State of New York to verify final rim and pipe invert elevations at manholes and catch basins of all storm sewer piping installed on this project and the length between manholes. This information shall be recorded on the record drawings to be delivered to the Engineer.

H. The Contractor shall also be responsible for verifying the lengths and locations of all gas collection system piping and the lengths, locations, and invert elevations of the State Route 30 bridge downspout extensions. This information shall be recorded on the Record Drawings.

3.03 TRENCH EXCAVATION

A. Trenches for underground piping shall be excavated and maintained as shown on the Design Drawings and specified in Section 02201, titled Earthwork.

B. As specified in this section, trench widths shall be held within the minimum and maximum limits shown on the Design Drawings.

C. If the Contractor uses a prefabricated, mobile shield in lieu of conventional sheeting and bracing in pipe trenches, the bottom of the shield shall be maintained as high as possible (preferably at or above the top of the pipe) so as to prevent disturbance of the pipe foundation material and to avoid forces which would tend to pull pipe joints apart when the shield is dragged forward.

D. Gouged openings or troughs left by the shield shall be filled with additional pipe foundation material and thoroughly compacted.

3.04 PIPE FOUNDATIONS

A. All pipes, fittings, and specials that are to be installed in the open trench excavation shall be properly bedded in, and uniformly supported on, pipe foundations of the various types specified herein and shown on the Design Drawings.

B. Trenches shall be excavated to the necessary depth and maintained in accordance with Section 02201, titled Earthwork, prior to installing the foundation.

C. Trenches shall be dewatered and all work performed in a dry trench.

D. Bedding material shall be spread and compacted in accordance with Section 02201, titled Earthwork, until the required total depth of bedding has been built up.

E. The Contractor shall perform his/her bedding operations with care to maintain line and grade.

1. Pipe shall be supported on a foundation as indicated on the Design Drawings or as otherwise directed by the Engineer.

2. The trench shall be excavated below the bottom of the pipe as shown on the Design Drawings.

3. Bedding shall be furnished, placed, and compacted in the trench for its full width such that the required minimum depth of material remains between pipe and undisturbed trench bottom, as shown on the Design Drawings.

4. Suitable holes or depressions shall be provided in the trench bottom to permit adequate bedding of bells, couplings, or similar projections.

5. The bedding material shall extend upward to the springline of pipe for concrete, steel, and ductile iron pipes, and to a point 12 inches over the top of plastic pipe.

6. If required on the Design Drawings or as directed by the Engineer, geotextile fabric material shall be used and installed in accordance with manufacturer's instructions. Geotextile fabric shall be a non-woven geotextile as defined in Section 02232, titled Geotextile Fabric.

## 3.05 INSPECTION OF PIPE BEFORE INSTALLATION

A. All pipe, fittings, and specials shall be carefully inspected in the field before lowering into the trench.

B. Cracked, broken, warped, out-of-round, damaged joints, or otherwise defective pipe, fittings or specials, as determined by the Engineer, shall not be installed. Any pipe or fitting which has received a blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed from the site.

C. Rejected pipe and fittings shall be clearly tagged in such a manner as not to deface or damage them, and then shall be removed from the job site by the Contractor at its own expense.

D. Care shall be taken in shipping, handling, and laying to avoid damaging the pipe and fittings. Extra care may be necessary during cold weather construction.

E. The pipe shall be cut in a neat and workmanlike manner without damage to the pipe. All pipe ends shall be cut square at right angles to the axis of the pipe, deburred and beveled. The chamfer shall be 15° and cut 1½-inches from the spigot end.

F. Pipe shall be handled and stored in accordance with manufacturer's requirements.

## 3.06 INSTALLATION OF PIPE

A. Installation of piping shall be in accordance with manufacturer's technical data and printed instructions.

B. All pipe, fittings, and specials shall be carefully lowered into the trench with ropes, slings, or other equipment designed or intended for the task.

C. Pipe that becomes cracked, broken, or otherwise damaged during or after installation shall be marked and removed from the job site by and at the expense of the Contractor.

D. The cutting of pipe, if required to make connections to new or existing work, shall be done with proper tools in accordance with the pipe manufacturer's requirements.

E. Ends of pipe which terminate at manholes, catch basins, or other structures shall be cut cleanly and trimmed to a neat, sheared edge which comes flush with the inside wall of the structure unless shown otherwise on the Design Drawings.

F. All pipes entering or leaving a structure shall have two joints within 4 feet from the wall of the structure.

G. The pipe, fittings, and specials shall be installed to the required line and grade, and shall be firmly bedded in the trench so that the pipe barrel is uniformly supported and cradled throughout its length, consistent with the requirements of the pipe foundation used.

H. Blocking will not be permitted under the pipe, except where the pipe is to be installed in concrete encasement or concrete cradle.

I. Holes and depressions in the pipe foundation shall be provided to receive bells, couplings, or similar projections to assure proper bedding of the pipe barrel.

J. When the pipe is in proper position, it shall be joined or coupled to the mating end of the previously laid pipe using the manufacturer's required assembly procedure.

K. The completed assembly of pipe sections shall form a sewer or drain with uniform slope unless indicated otherwise on the Design Drawings.

L. Manufactured pipe plugs or temporary bulkheads shall be placed in the open ends of sewer lines whenever pipe laying is stopped overnight, over weekends, or whenever dirt or debris could enter the pipeline during construction.

## 3.07 CONNECTIONS TO EXISTING PIPES

A. For all connections between existing sewer pipe and new sewer pipe installed under this Contract, connection shall be made using flexible rubber couplings, Fernco, Inc. Model 1056 series or equal, with stainless steel shear sleeves, Fernco, Inc. Model SR series or equal, and stainless steel clamps specially sized for the pipes involved. Alternative connections, as recommended by the manufacturer, may be submitted to Engineer for consideration.

## 3.08 CONNECTION TO EXISTING STRUCTURES

A. Where sewers or drains are to be connected to existing manholes, catch basins, or other existing structures, and where no stub or opening has been provided for the connection, the Contractor shall cut an opening of minimum diameter through the side wall of the structure for inserting the pipe, at the required location. After inserting the pipe, the annular space remaining outside the pipe shall be completely filled with an expanding joint sealer (activated oakum or compressed foam) and covered with non-shrinking watertight mortar and such joint made watertight so that leakage of water into the structure is prevented.

B. Unless indicated otherwise on the Design Drawings, the pipe shall be positioned so that the finished or trimmed end of the pipe is flush with the inside wall surface of the structure.

C. The mortar filler shall be struck off neatly to form a smooth, dense surface flush with the inside wall surface of the structure.

D. For polyvinyl chloride (PVC), polyethylene, or plastic pipe, the Contractor shall furnish and install a rubber donut or waterstop ring around the exterior of the pipe or provide a manhole adaptor to make a watertight manhole connection as manufactured by Fernco, Inc. Type "CMA" adaptor, or approved equal.

E. For large diameter PVC pipe applications, use custom clamp-around steel/rubber waterstop ring as provided by Fernco, Inc., or approved equal.

F. Benchwalls in existing structures shall be altered to form a new trough so that the new connection will enter the existing flow channel at a 45° angle in the direction of flow, or as shown on the Design Drawings.

G. Benchwalls shall be extended upwards to the top of pipes or as shown on the Design Drawings.

H. In making connections to existing manholes or structures, care shall be taken to avoid damage to the manhole or structure and to avoid allowing debris to enter the pipelines.

I. Any damage resulting from the Contractor's operations shall be repaired by the Contractor at its own expense.

## 3.09 SERVICE CONNECTIONS, SEWER LATERALS, AND CLEANOUTS

A. When shown on the Design Drawings, specified, or otherwise ordered by the Engineer, service connections, sewer laterals, and cleanouts shall be furnished and installed to the extent shown and/or ordered by the Engineer.

B. It is the responsibility of the Contractor to verify locations, material, type, and size of all sewer laterals and cleanouts during construction.

C. After pipe installation, trenches shall not be backfilled until the installed location of the pipe has been measured and recorded by the Contractor on the daily construction record drawings.

D. Prior to backfilling, the Contractor shall verify the depth and elevation of the invert of the end of the pipe.

E. This information and other pertinent data shall be recorded on the daily construction record drawings by the Contractor.

## 3.10 FINAL INSPECTION

A. Each section of installed sewer or drain between manholes, catch basins, or structures must be inspected by the Contractor and Engineer, before final acceptance.

MATERIALS AND PERFORMANCE - SECTION 02500

DRAINAGE PIPING INSTALLATION

B. The pipe and fittings shall be true to both line and grade, shall show no leaks, shall show no obstruction to flow, shall have no projections of connecting pipe into the line, shall be free from cracks and protruding joint materials, and shall contain no deposits of dirt, debris, or other material which will in any way reduce the full cross sectional area of the pipe. Refer to the subsection 3.02 of this Specification, titled Lines and Grades, for allowable tolerances.

C. Any section of sewer, or portions thereof, which does not comply with the inspection criteria defined above, as determined by the Engineer, shall be promptly corrected or repaired by the Contractor at its own expense.

D. Pipe that is cracked or collapsed shall be dug up and replaced with new pipe. Pipe that is out of line or grade shall be dug up and re-laid to the correct line and grade.

E. Deposits of dirt and debris shall be flushed with water through to the downstream manhole and removed by the Contractor.

F. At points of leakage, the pipe shall be dug up and replaced or repaired with approved repair clamp couplings (stainless steel Type 316 with stainless steel bolts and nuts or cast iron coupling with stainless steel bolts and nuts), or other approved method as recommended by the pipe manufacturer, so as to permanently stop the leak.

G. All manholes and catch basins shall be watertight. All joints and precast wall sections, between cast iron frame and brick, and between brick units themselves shall be neat, continuous, and flush with the adjacent surfaces. Dirt and debris shall be removed from all manholes and catch basins.

## 3.11 PIPE SCHEDULE

| Identity | Size | Pipe Material/ Class or Schedule | Joints |
|---|---|---|---|
| Storm Sewer | 8"Ø - 36"Ø | High-density polyethylene (HDPE) (Corrugated exterior, smooth interior, single-wall pipe) | Push-on |
| Gas Collection | 6"Ø | Perforated PVC (Schedule 35 min.) | Solvent Weld |
| Gas Vent | 6"Ø | Solid PVC (Schedule 40 min.) | Solvent Weld |
| State Route 30 Bridge Downspout Extension | TBD (Match Existing) | TBD (Match Existing) | TBD (Match Existing) |

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02501

# UNDERGROUND PRESSURE PIPING INSTALLATION

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Furnish labor, materials, equipment, tools, and services required for the installation of underground pressure piping.

2. Piping shall be furnished and installed of the materials and sizes and at elevations and locations shown on the Design Drawings and/or as designated in these Technical Specifications.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02206 - Selected Fill
3. Section 02500 - Sewage and Drainage Piping Installation
4. Section 02510 - Water Distribution System
5. Section 02675 - Pressure and Leakage Testing

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. American Water Works Association (AWWA). The following AWWA standard is referred to in this Technical Specification and is to be considered a part of this specification:

C600 Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

B. American National Standards Institute (ANSI)/AWWA. The following ANSI/AWWA standards are referred to in this Technical Specification and are to be considered a part of this specification:

A21.50/C150 American National Standard for the Thickness Design of Ductile-Iron Pipe

A21.51/C151 American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water

A21.50/C105 American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems

### 1.03 SUBMITTALS

A. Manufacturers' technical data for piping, joints, connections, valves, and any other required appurtenances.

MATERIALS AND PERFORMANCE - SECTION 02501

UNDERGROUND PRESSURE PIPING INSTALLATION

PART 2 - PRODUCTS

2.01 MATERIALS

A. All piping materials shall be in accordance with the appropriate section of these Technical Specifications.

2.02 METALLIC LOCATOR TAPE

A. Locator tape is intended to allow for future locating of buried utilities and shall be required to be installed for all buried non-metallic utilities and as shown on the Design Drawings. Tape shall be of metallic material with a corrosion resistant coating, and be a minimum of ¼-inch wide. Tape shall be installed along the full length of the pipe and in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION

A. Trenches for underground pressure piping shall be excavated and maintained as shown on the Design Drawings and specified in Section 02201, titled Earthwork.

B. As specified in this section, trench widths shall be held within the minimum and maximum limits shown on the Design Drawings.

C. If the Contractor uses a prefabricated, mobile shield in lieu of conventional sheeting and bracing in pipe trenches, the bottom of the shield shall be maintained as high as possible (preferably at or above the top of the pipe) so as to prevent disturbance of the pipe foundation material and to avoid forces which would tend to pull pipe joints apart when the shield is dragged forward.

D. Gouged openings or troughs left by the shield shall be filled with additional pipe foundation material and thoroughly compacted.

3.02 PIPE FOUNDATIONS

A. Requirements for pressure pipe foundations shall be the same as those provided in Section 02500, titled Sewage and Drainage Piping Installation, unless otherwise noted on the Design Drawings.

3.03 INSPECTION OF PIPE BEFORE INSTALLATION

A. **All pipe, fittings, and specials shall be carefully** inspected in the field before lowering into the trench.

B. Cracked, broken, warped, out-of-round, damaged joints, or otherwise defective pipe, fittings or specials, as determined by the Engineer, shall not be installed. Any pipe or fitting which has received a blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed from the Site.

C. Rejected pipe and fittings shall be clearly tagged in such a manner as not to deface or damage them, and then shall be removed from the Site by and at the expense of the Contractor.

D. Care shall be taken in shipping, handling, and laying to avoid damaging the pipe and fittings. Extra care may be necessary during cold weather construction.

E. The pipe shall be cut in a neat and workmanlike manner without damage to the pipe. All pipe ends shall be cut square at right angles to the axis of the pipe, deburred and beveled. The chamfer shall be 15° and cut 1½ inches from the spigot end.

F. Pipe shall be handled and stored in accordance with manufacturer's requirements.

3.04 PIPE INSTALLATION

A. Proper and suitable tools and appliances for convenient handling and laying of pipe and fittings shall be used. Care shall be taken to prevent entrance of dirt or foreign matter, and to prevent damage of pipe lining and coating. All pipe shall be carefully examined for defects and no piece shall be laid which is known to be defective. If any defective piece should be discovered after having been laid, it shall be removed and replaced with a sound one in a satisfactory manner, by the Contractor, to the lines, grade and depth shown on the Design Drawings.

B. Pipe and fittings shall be laid on stable foundations, free from standing water, and trimmed to the shape of the pipe to be installed. Stones two inches or larger shall be removed from the bearing surface of the pipe foundation. At the joints, enough depth and width shall be provided to permit the pipe layer to reach entirely around the pipe so that the joints may be made in a proper manner. When laid in tunnels, pipes shall be blocked in such a manner as to take the weight off the bells. Pipe laid in normal trench excavation shall not be laid on wood blocking. Mechanical type joints shall be tightened within the AWWA recommended torque range.

C. The following sources shall be reviewed by the Contractor for installation guidelines and requirements:

| Pipe Material | Sources |
|---|---|
| Ductile Iron Pipe | AWWA C600; Specifications; Design Drawings; Manufacturer's recommendations |

D. Unless otherwise shown on the Design Drawings, the minimum total finished cover over the top of the pipe barrel of all pressure pipe shall be 4½ feet.

E. Installation of Ductile Iron Pipe

1. Ductile iron pipe shall be installed in accordance with the applicable revisions of AWWA C600, and the pipe manufacturer's recommendations.

2. Polyethylene encasement for ductile iron pipe shall be provided and installed in accordance with AWWA C105/ANSI A21.50 for all ductile iron pipe.

3. All ductile iron pipe and fittings shall be handled with padded slings or other appropriate equipment. The use of cables, hooks, or chains will not be permitted.

4. Couplings shall be installed in accordance with the manufacturer's instructions. Coupling and bolts shall be completely coated with a bitumastic seal coat.

5. Install concrete thrust blocks where indicated on the Design Drawings. Thrust block installation shall be in accordance with the Design Drawings, unless otherwise directed by the Engineer.

6. Push-on joint locking gasket and mechanical joint retainer type restraints shall be installed where indicated on the Design Drawings and in accordance with manufacturer's recommendations.

## 3.05 TEMPORARY PLUGGING

A. At all times when pipe laying is not actually in progress, the open ends of the pipes shall be closed temporarily with pipe plugs or by other means such that there is no possibility of any water or foreign material entering the line. If water is in the trench when work is resumed, the plugs shall not be removed until all possibility of water entering the pipe has passed.

## 3.06 PIPELINE STERILIZATION

A. At the conclusion of the pipe installation, the Contractor shall sterilize all pipe and fittings connected to and forming part of a potable water distribution system as described in Section 02510, titled Water Distribution System.

## 3.07 TESTING

A. All testing for pressure pipes shall be in accordance with Section 02675, titled Pressure and Leakage Testing.

B. All testing for water distribution system piping shall be in accordance with Section 02510, titled Water Distribution System.

## 3.08 PIPE SCHEDULE

| Identity | Size | Pipe Material/ Class or Sched. | Joints |
|---|---|---|---|
| Potable Water | 8"Ø | Ductile Iron Pipe (DIP)/ AWWA C150/C151 | Restrained/Push-on MJ |

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02508

## AIR MONITORING PROGRAM

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. The air monitoring program specified herein shall be conducted throughout the performance of construction activities associated with remedial action implementation.

2. The Contractor shall provide all labor, materials, and equipment necessary to implement an air monitoring program as specified herein and in conjunction with the minimum requirements of the Contractor's *Health and Safety Plan.*

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork

C. Definitions

1. Breathing Zone is defined as the worker breathing zone for worker health and safety.

2. Perimeter of the Site is defined as the outer limits of the area impacted by construction activities including exclusion, contamination reduction, and support zones. General Limits of the Site Perimeter are defined on the Design Drawings as the Limits of Construction.

3. Work Zone is generally defined as the area where intrusive construction activities take place.

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. New York State Department of Health (NYSDOH) Generic Community Air Monitoring Program

B. New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) 4031 - *Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites*

C. Other appropriate federal, state, and local air monitoring requirements

### 1.03 SUBMITTALS

A. Submit a detailed plan for the specified requirements of the air monitoring program.

B. Submit a detailed site plan showing locations of the community air monitoring stations and windsock.

MATERIALS AND PERFORMANCE - SECTION 02508

AIR MONITORING PROGRAM

C. Submit a detailed response plan that includes procedures for response to an exceedence of action levels as required by NYSDOH.

D. Submit detailed manufacturer's specifications for air monitoring equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 OBJECTIVES

A. The objectives of the air monitoring program are:

1. Provide for the measurement of the level of particulates in the breathing zone and at the downwind site perimeter to facilitate the implementation of adequate measures (if necessary) to control dust generated as a result of construction activities, such that dust levels do not exceed action levels as presented herein or in the Contractor's *Health and Safety Plan*.

2. Provide for the measurement of total organic vapor (TOV) levels in the breathing zone and at the downwind site perimeter to facilitate the implementation of adequate measures (if necessary) to control TOV levels generated as a result of construction activities, such that TOV levels do not exceed action levels as presented herein or in the Contractor's *Health and Safety Plan*.

3.02 EQUIPMENT

A. Air monitoring equipment shall include, but not be limited to the following equipment:

1. Real-time monitoring for total organic vapors shall be performed by a flame ionization detector (FID) or a photoionization detector (PID), such as the Rae Systems VRAE detector, or approved equal. The equipment shall be capable of continuous recording to allow for calculating 15-minute running average concentrations for comparison to specified criteria.

2. A real-time aerosol monitor shall be used to measure total particulates. The monitor shall be a MIE MiniRAM, or approved equal. The meter shall be capable of measuring concentrations in the size range of less .01 to 10 microns with a sensitivity down to 0.001 $mg/m^3$ and capable of continuous recording to allow for integrating over a period of 15 minutes for comparison to specified criteria.

3. Community air monitoring stations shall include analytical instruments to measure particulate matter (TSI Dust Track or equivalent) and volatile organic compounds (VOCs) (MiniRAE 2000 or equivalent). The equipment shall be capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes and record readings. Each air monitoring station shall include an audible and visual alarm system capable of indicating an exceedence of established airborne particulate or TOV action levels. Data from each monitoring station shall be transmitted continuously, via communications cable, to an onsite data logger and computer system.

4. A windsock shall be installed in a prominent location at the Site.

3.03 INSTALLATION

A. Air monitoring system components shall be installed by the manufacturer or an authorized representative. The perimeter air monitoring stations must be enclosed. The enclosures must be weather-tight and must provide proper operating conditions for monitoring equipment. It is the Contractor's responsibility to provide electrical power to each perimeter monitoring station as necessary. The perimeter air monitoring stations must contain an onboard backup battery and data logger to allow a minimum of 48 hours of continuous recording in the event the primary power source is interrupted.

B. A centralized computer control system shall be provided to continuously upload data generated from the perimeter air monitoring stations. The continuous collected data shall be stored in a report file database and will be archived to the central computer and to a removable disk daily. This data will be stored at a secure offsite location.

C. The Contractor shall protect against the vandalism at each air monitoring station.

3.04 REPORTING

A. The Contractor shall maintain a written copy of real-time air monitoring results for each workday, by 10:00 a.m. the following workday (to be available for State [NYSDEC and NYSDOH] personnel or the Engineer for review at any time). Written documentation shall include an appropriately scaled map of the work area depicting sample locations, wind direction, and other pertinent meteorological data, date, time, instrumentation readings, calibration, applicable standards, and engineering controls implemented (if necessary).

B. The Contractor shall prepare a summary of real-time community air monitoring results on a weekly basis. Following review by the Owner and Engineer, weekly real-time community air monitoring results shall be submitted to a NYSDEC-selected representative on a disk in a format that is acceptable to the agencies.

3.05 MONITORING REQUIREMENTS

A. The monitoring requirements and action levels set forth in the Contractor's *Health and Safety Plan* shall be established for work zone and perimeter monitoring of organic vapors, odors, and particulates. If the action levels are attained at the perimeter of the work zone, then work will cease until engineering controls bring levels down to acceptable limits. These levels are general and shall be used as minimum action levels. The Contractor shall develop site-specific perimeter monitoring action levels based on contaminants found in the work areas.

In the event that as a result of action level exceedences, the Response Plan is implemented, appropriate agencies must be notified. The following agencies shall be notified:

1. NYSDEC; and
2. NYSDOH.

MATERIALS AND PERFORMANCE - SECTION 02508

AIR MONITORING PROGRAM

B. The Contractor shall have onsite and available for immediate use at anytime, engineering controls for dust and odors. This shall include, but is not limited to, polyethylene sheeting for covering of sidewalls and bottom of excavation areas, and odor suppressant foams such as Bio-Solve, or approved equal.

C. Personnel Exposure Air Monitoring shall be performed in accordance with the requirements of the Contractor's *Health and Safety Plan.*

D. Real-time organics and particulate monitoring shall be performed on a continuous basis during the performance of intrusive construction activities including, but not limited to, all material excavation and excavated material loading/handling activities.

E. Community air monitoring shall be performed using air mobile or portable monitoring stations placed at locations upwind of the work zone (Exclusion Zone) and locations at the downwind perimeter of the work zone (Exclusion Zone) to provide for adequate coverage downwind of the work zone. Locations of community air monitoring stations may require adjustment based upon changes in wind direction. Anticipated air monitoring station locations are indicated on the Design Drawings. The air monitoring stations shall include, but not be limited to:

1. Provide continuous real-time community air quality monitoring data for particulate matter and VOCs; and

2. Document all required air data.

3.06 QUALITY ASSURANCE

A. A qualified technician shall be provided to calibrate and operate specified equipment.

B. All direct-reading instrumentation calibrations shall be conducted under the approximate environmental conditions in which the instrument will be used. Instruments must be calibrated before and after use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibration, including the standard used for calibration, must be documented on a calibration log.

C. All air monitoring equipment shall be maintained and calibrated in general accordance with specific manufacturers' procedures. The PID/FID shall be calibrated against a 10-part per million (ppm) (isobutylene) standard. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturers' procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

D. If an instrument is found to be inoperative or suspected of giving erroneous readings, the Contractor is responsible for immediately removing the instrument from service and obtaining a replacement unit. At a minimum, the Contractor shall have a spare PID/FID onsite at all times that is available for use in the event of equipment failure.

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02510

## WATER DISTRIBUTION SYSTEM

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Requirements for, and installation of, all piping, valves, and appurtenances necessary for potable water distribution systems.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02206 - Selected Fill
3. Section 02501 - Underground Pressure Piping Installation
4. Section 02675 - Pressure and Leakage Testing

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. American National Standards Institute (ANSI) and American Water Works Association (AWWA). The following ANSI/AWWA standards are referred to in this Technical Specification and are to be considered a part of this specification:

C509 Resilient-Seated Gate Valves for Water-Supply Service

C550 Protective Epoxy Interior Coatings for Valves and Hydrants

C651 Standard for Disinfecting Water Mains

B. ASTM International (ASTM). The following ASTM specification is referred to in this Technical Specification and is to be considered a part of this specification:

D2000 Standard Classification System for Rubber Products in Automotive Applications

C. National Sanitation Foundation (NSF)

### 1.03 SUBMITTALS

A. Detailed shop drawings for all materials set forth in Part 2 of this Section shall be submitted prior to procurement.

B. Certified copies of the manufacturers' affidavits stating that all materials were manufactured and tested in accordance with applicable provisions.

C. Manufacturers' technical data.

MATERIALS AND PERFORMANCE - SECTION 02510

WATER DISTRIBUTION SYSTEM

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

B. All piping, valves, and appurtenances shall be delivered, stored, and handled in accordance with the manufacturers' instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following are acceptable manufacturers of gate valves:

1. Mueller Company A-2360
2. Kennedy Valve
3. Approved Equal

B. The following are acceptable manufacturers of valve boxes:

1. Clow F-2454 (with F-2490 cover)
2. Approved Equal

2.02 PIPE

A. All potable water distribution system piping shall be ductile iron pipe (DIP) as shown on the Design Drawings and specified herein.

2.03 GATE VALVES FOR BURIED SERVICE, 2½-INCH THROUGH 12-INCH

A. Buried in-line gate valves shall be resilient-seated in conformance with ANSI/AWWA C509.

B. Gate valves shall have an iron body, a non-rising manganese bronze stem, and a triple o-ring seal stuffing box. Body and bonnet bolts shall be Type 304 stainless steel.

C. Gate valves shall be furnished with a standard 2-inch square operating nut and shall open right.

D. Ends shall be either flanged or mechanical joint as shown on the Design Drawings.

E. Resilient wedge shall be constructed from cast iron that is fully encapsulated in molded rubber conforming to ASTM D2000.

F. All interior and exterior iron surfaces of the gate valve shall be coated with manufacturer-applied, 10-mil thick fusion epoxy coating in conformance with AWWA C550. Coating shall be NSF-certified.

G. Gate valves shall be rated for a maximum working pressure of 250 pounds per square inch (psi).

MATERIALS AND PERFORMANCE - SECTION 02510

WATER DISTRIBUTION SYSTEM

H. Gate valves shall be provided with extension stem operators such that operating nut shall be 3 inches below valve box cover. Extension stem operators shall be Mueller A-26441, or equal.

2.04 VALVE BOXES

A. Boxes shall be cast iron screw-type with 5¼-inch inside diameter.

B. All box covers shall have the word "WATER" casted into them.

2.05 FINISHES

A. All interior and exterior iron surfaces of gate valves shall be coated with manufacturer-applied 10-mil thick fusion epoxy coating in conformance with AWWA C550. Coating shall be ANSI/NSF 61 certified.

B. Exterior of valve boxes shall be coated with a bitumastic seal coat.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ductile Iron Pipe

1. All DIP for water distribution systems shall be installed in accordance with Section 02501, titled Underground Pressure Piping Installation.

2. All joints for potable water piping shall be mechanically restrained. Refer to the Design Drawings and Technical Specification Section 02501, titled Underground Pressure Piping Installation, for restraint requirements.

B. Gate Valve and Valve Box

1. Install valve on cement block support so that valve is supported independently of pipeline.

2. Install buried gate valve in accordance with manufacturer's recommendations and as specified herein.

3. Place and compact Type "E" granular fill around valve up to base of valve box. Refer to Section 02206, titled Selected Fill.

4. Center and plumb valve box over operating nut. Set box cover flush with finished grade.

C. Final Adjustments

1. Adjust all hydrants, valve boxes, curb boxes, manhole covers, and other facilities to finished grade, as required.

MATERIALS AND PERFORMANCE - SECTION 02510

WATER DISTRIBUTION SYSTEM

3.02 FIELD TESTS AND INSPECTIONS

A. All testing and flushing shall be in accordance with the applicable standards referenced in this Section and Section 02675, titled Pressure and Leakage Testing. Provide a minimum 72 hours notice to the Engineer prior to testing. The Engineer must be present during testing for the test to be considered valid.

3.03 STERILIZATION

A. All pipe and fittings connected to and forming part of the potable water distribution system shall be sterilized in full accordance with both the requirements of AWWA C651, and the New York State (or Montgomery County) Department of Health. Methods used shall be acceptable to the Engineer. The continuous feed method shall be used for chlorine application.

B. All new piping shall be filled with not less than 50 milligrams per liter (mg/L) or more than 75 mg/L available chlorine and retained in the main for not less than 24 hours. During this time, all valves and hydrants in the section treated shall be operated to disinfect these appurtenances. At the end of this 24-hour period, the treated water shall contain no less than 25 mg/L available chlorine throughout the length of the main. All chlorine introduced into the system shall be totally dissolved. The introduction of solid hypochlorite directly into the system shall be prohibited.

C. Sterilization tests shall be repeated as often as necessary until the minimum residual chlorine content of 25 mg/L at the end of the disinfection period has been reached. The chlorine solution shall be thoroughly flushed out prior to placing the new sections of main in service. The Contractor is cautioned that the spent chlorine solution must be disposed of in a manner acceptable to the Owner, in an area where its effects will not be detrimental to animal, plant, or aquatic life.

D. After final flushing and before the water main is replaced in service, a water sample or samples from the end of each main shall be collected and analyzed for total coliform, in accordance with local and/or State (or County) health department procedures. Analysis shall be performed by health department approved laboratories. If health department drinking water standards for total coliform are not met, the sterilization procedures and coliform testing shall be repeated. The Contractor shall bear all necessary costs of coliform testing.

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02514

# PRECAST CONCRETE MANHOLES, CATCH BASINS, AND STRUCTURES

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. The Contractor shall furnish and install precast concrete manholes, catch basins, and structures of the type(s) shown on the Design Drawings and as specified herein. The Work shall include the following:

   a. Required inlet and outlet pipe connections for new and/or existing sewers, frames and covers, masonry, concrete, reinforcing steel, special pipe fittings, precast units, and all other materials, tools, and equipment necessary to produce complete manholes.

   b. Manholes, catch basins, and structures shall be watertight.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02206 - Selected Fill
3. Section 02500 - Drainage Piping Installation

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specifications are referred to in this Technical Specification and are to be considered a part of this specification:

| | |
|---|---|
| A48/A48M | Standard Specification for Gray Iron Castings |
| A536 | Standard Specification for Ductile Iron Castings |
| C62 | Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale) |
| C90 | Standard Specification for Loadbearing Concrete Masonry Units |
| C144 | Standard Specification for Aggregate for Masonry Mortar |
| C150 | Standard Specification for Portland Cement |
| C207 | Standard Specification for Hydrated Lime for Masonry Purposes |
| C443 | Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets |
| C478 | Standard Specification for Precast Reinforced Concrete Manhole Sections |
| D4101 | Standard Specification for Polypropylene Injection and Extrusion Materials |

MATERIALS AND PERFORMANCE - SECTION 02514

PRECAST CONCRETE MANHOLES, CATCH BASINS, AND STRUCTURES

B. Occupational Safety and Health Administration (OSHA)

C. American Association of State Highway and Transportation Officials (AASHTO). The following AASHTO specification is referred to in this Technical Specification and is to be considered a part of this specification:

199 **Standard Specification for Precast Reinforced Concrete Manhole Sections**

D. New York State Department of Transportation (NYSDOT)

1.03 SUBMITTALS

A. At a minimum, the Contractor shall submit the following to the Engineer for review prior to ordering:

1. Shop drawings and details of all precast concrete units, including typical design, reinforcing, and manufacturing details of precast concrete bases; and a schedule of all materials, catch basins, and structures with type, size, location, number, and dimensions. Shop drawings shall also clearly indicate proposed elevations to which manholes/catch basins will be installed and sizes, locations, and elevations of penetrations.

2. Manufacturer's certification.

3. Pipe to manhole/catch basin structure joint details.

4. Mix design for any non-shrink grouts and description of intended use.

5. Shop drawing of manhole steps, including attachment details if not integrally cast with manhole/catch basins/structure.

6. Shop drawings of manhole/catch basin frames and covers/grates.

1.05 QUALITY ASSURANCE

A. Only precast reinforced concrete sections made in a plant currently approved by NYSDOT for manufacture of concrete pipe shall be used to construct manholes.

B. The manufacturer shall certify that all precast concrete manhole sections furnished to this project conform to the requirements of the Design Documents and conform to ASTM C478, except as modified and/or supplemented in this section of the Technical Specifications.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The following are acceptable manufacturers:

1. Jefferson Concrete Corporation
2. Binghamton PreCast & Supply Corporation
3. Kistner Precast Concrete Products, Inc.
4. The Fort Miller Company, Inc.

5. Precast Concrete Sales Company
6. Approved equal

2.02 PRECAST CONCRETE BASES

A. Bases shall be precast concrete. Their design and fabrication shall conform to the following.

1. The general requirements of this Section.
2. The provisions of ASTM C478.
3. The basic dimensions shown on the Design Drawings.

B. The horizontal joint at the top of the base shall be compatible with that of the precast wall sections.

C. The precast bases shall be uniformly supported on a compacted level foundation bedding as shown on the Design Drawings.

1. The foundation bedding shall bear on sound undisturbed earth, lined with woven geotextile.

2. The minimum depth of the foundation bedding shall be as shown on the Design Drawings.

3. Minimum dimensions of the foundation bedding shall be the outside edge of the base plus 1 foot.

D. The precast bases shall be manufactured with openings in the wall to receive the ends of the pipe, and shall be accurately set to conform to line and grade of the pipe.

1. Openings shall be precast or machine cored.

2. All connections between manholes/catch basins/structures and pipes shall be made using watertight flexible rubber sleeves and as shown on the Design Drawings.

3. The flexible rubber sleeves shall be installed in accordance with the manufacturer's recommendations.

4. Where sleeve sizes are not commercially available due to either the size of the pipe to be connected or due to the outside diameter of the pipe not allowing a proper sleeve fit, the Contractor shall connect the pipe to the manhole opening using an electrometric waterstop gasket.

5. At catch basins and at manholes connecting to existing sewers the pipe shall be accurately positioned in the openings, properly secured against movement, and the remaining annular space between the pipe wall and the base completely packed with Anti-Hydro "Axpandcretes," Masterflow 713 by Master Builders Technologies, or Five Star Grout by U.S. Grout Corporation, or approved equal.

6. Before the grout has set, the Contractor shall recheck invert elevations of the ends of the pipe, and perform any adjustments which are necessary to establish the required line and grade of the sewer.

E. Manhole bases shall conform to the details shown on the Design Drawings.

F. All precast concrete bases shall be free from cracks, damaged joints, exposed reinforcing, aggregate pockets, spalls, and dimensional distortions or other irregularities. Any rejected units shall be tagged and removed from the job site immediately.

2.03 PRECAST CONCRETE WALLS AND MANHOLE TOPS

A. Precast Concrete Walls

1. The total height of precast wall required for each manhole/catch basin shall be determined in the field.

2. The vertical distance between the top of the assembled precast units and the bottom of the installed cast iron manhole frame shall be a minimum of 4 inches and a maximum of 12 inches to allow for masonry work or precast concrete grade rings.

B. Precast Reinforced Concrete Tops

1. Precast reinforced concrete tops for manholes and catch basins shall be manufactured in accordance with ASTM C478 and sufficient to withstand H-20 wheel loadings.

2. Openings shall be eccentric and the proper diameter to receive the frame specified.

C. Precast Catch Basins

1. The catch basins shall be furnished with knock-out panels as necessary to accommodate the number of pipes to be connected to the unit.

D. All precast units shall be laid up plumb and level.

E. Minimum longitudinal and circumferential reinforcing steel shall be in conformance with ASTM C478. All units shall withstand H-20 surface wheel loadings.

F. Joints

1. Unless shown otherwise on the Design Drawings, all tongue-and-groove (or male and female) joints in the precast wall, including the joint at the top of the base, shall be constructed using the "Snap-On" Type "0"-ring gasket.

2. All joints shall conform to ASTM C443; except that joint taper shall not exceed 3½°.

3. The precast sections shall be provided with a special groove, cast into the male end, to receive and hold the gasket in position during joint assembly.

4. After joint assembly, the gap between sections shall be packed on the inside and outside with Anti-Hydro "Axpandcretes," Masterflow 713 by Master Builders Technologies; or Five Star Grout by U.S. Grout Corporation, or approved equal, and shall be troweled smooth so that no projections remain on the inside.

5. There shall be concrete to concrete bearing between the various sections, and the gasket shall not support the weight of the section.

G. All precast concrete sections shall be free from cracks, damaged joints, exposed reinforcing, aggregate pockets, spalls, dimensional distortions, or other irregularities. Any rejected units shall be tagged and removed from the job site immediately.

2.04 MASONRY WORK AND GRADE RINGS

A. The manhole/catch basin frame shall be supported and adjusted to finished grade using solid, brick masonry as shown on the Design Drawings. Precast concrete grade rings may be utilized, in lieu of brick, to support and adjust manhole frames. Grade rings shall conform to ASTM C478, and shall be carefully set in a full bed of mortar.

B. Materials shall conform to the following requirements:

| Item | ASTM | Remarks |
|---|---|---|
| Brick | C62 | Grade "SW" |
| Concrete Block | C90 | Grade "U-1" |
| Portland Cement | C150 | Type I or III |
| Sand | C144 | --- |
| Lime | C207 | Type "N" |
| Water | --- | Clear and free from all deleterious materials. |
| Mortar Mix | C207 | Type "M" (min. 2500 psi strength)<br>1 part cement<br>¼ part hydrated lime<br>3 parts sand |

C. Construction

1. Brick shall be wetted just prior to being laid.

2. Brick shall be full mortar bed, and mortar for the bed shall be spread to a uniform thickness (not furrowed).

3. All interior joints shall be filled solidly before laying the next course; and all vertical joints shall be shoved tight.

4. All brick is to be laid true to lines, with both sides plumb. Bed joints shall be ⅜-inch to ½-inch thick.

5. Mortar on inside and outside joints shall be struck off flush with wall surface and joints shall be so planned that courses will come level with and conform to the overall dimensions required.

6. The interior and exterior face of the brick shall be finished smooth with mortar.

D. Weather Conditions

1. No masonry work shall be done during heavy rains, when the temperature is below 40°F, or when a satisfactory job cannot be accomplished.

2. The Contractor shall protect the work with coverings (e.g., plastic envelopes, etc.) and shall maintain the air temperature within these coverings at a minimum of 45°F for a period of 3 days after the masonry has been laid.

## 2.05 BENCH WALLS

A. Flow Channels

1. The flow channels in each manhole/catch basin shall be carefully shaped following the details on the Design Drawings.

2. Flow channels shall match the inverts and size of pipes which connect to the manhole/catch basin, creating a channel of gradual slope and curvature, assuring an uninterrupted flow through the manhole/catch basin.

3. The inverts of these channels shall be constructed of half sewer pipe sections or concrete.

4. Short sections of half sewer pipe may be cut and used to form the channel for bends.

5. The channel wall shall be extended to the top of the highest pipe entering the manhole/catch basin, forming the bench wall. Refer to Design Drawings for details.

6. The bench surface itself shall extend to the manhole/catch basin walls, pitching slightly toward the flow channel.

B. Minimum concrete Class "C" shall be used for bench walls and all exposed surfaces shall receive a steel-troweled finish. Horizontal surfaces shall then be brush finished.

C. Class "C" concrete shall have the following characteristics.

| | | |
|---|---|---|
| 1. | Comprehensive Strength at 28 Days (pounds per square inch [psi]) | 2,500 |
| 2. | Maximum Net Water to Cement Ratio by Weight | 0.71 |
| 3. | Minimum Cement per Yard of Concrete (pounds [lbs]) | 423 |
| 4. | Consistency Range in Slump (inches) | 3 to 6 |

D. Class "C" concrete shall use Type II low alkali cement per ASTM C150.

## 2.06 FRAMES AND COVERS/GRATES

A. The Contractor shall furnish and install new frames and covers on all new manholes/catch basins.

B. Manhole and catch basin frames and covers/grates shall be of similar make and model to existing frames and covers/grates in Phase I Area (i.e., park area to the east of the Site).

MATERIALS AND PERFORMANCE - SECTION 02514

PRECAST CONCRETE MANHOLES, CATCH BASINS, AND STRUCTURES

C. Material

1. Shall be gray cast iron conforming to ASTM A48, Class 30; or shall be ductile cast iron conforming to ASTM A536, Grade 60-40-18.

D. Castings

1. Shall be manufactured true to pattern and shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion, or other defects. Components shall fit together in a satisfactory manner.

E. Frames and covers shall be heavy duty, non-penetrating pickhole type of non-rocking design, or shall have machined bearing surfaces to prevent rocking and rattling under traffic loads. Covers shall have cast in, 1½-inch wide, raised letters. Storm manholes shall have the words "STORM SEWER" cast in the covers.

F. Finish

1. Shall be smooth and well-cleaned by shot-blasting or by other approved method.

2. All surfaces shall be clean and free from rust, scale, grease, oil, or other impurities prior to application of one shop coat of asphalt paint.

G. Frames shall be firmly seated in full bed of mortar and be positioned to conform to the adjacent finished grade or to the specific elevation shown on the Design Drawings.

H. Frames to be set parallel to surface slopes. Covers shall seat uniformly in any position in the frame without rocking.

2.07 STEPS

A. Steps shall be furnished for all manholes. Steps shall be copolymer polypropylene steel reinforced as manufactured by M.A. Industries, Inc. or approved equal conforming to ASTM D4101, ASTM C478, AASHTO - 199 and OSHA STD. 1-1.9. Steps shall be cast integrally with precast structure or attached utilizing other methods as approved by the Engineer.

All steps shall have a serrated non-slip surface of minimum 12-inch width and shall be placed as shown on the Design Drawings. All steps shall be installed in vertical alignment spaced 12 inches on center, placed over the largest bench wall within the manhole unless otherwise shown on the Design Drawings.

2.08 WATERPROOFING

A. The Contractor shall furnish manhole waterproofing over the entire exterior surface that will be below finished grade.

B. The waterproofing shall not mar or interfere with the specified exterior finish for these structures.

C. Waterproofing shall be accomplished prior to structure installation for precast sections and prior to backfill for those structures cast in place.

D. Waterproofing shall consist of a two-coat application of Permaquik as manufactured by Permagile, Vandex, Xypex, or approved equal, and shall be applied according to the manufacturer's specification.

- END OF SECTION -

# MATERIALS AND PERFORMANCE - SECTION 02675

# PRESSURE AND LEAKAGE TESTING

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Pressure and leakage testing requirements for all underground pressure pipes installed under this Contract.

B. Related Work Specified Elsewhere

1. Section 02501 - Underground Pressure Piping Installation
2. Section 02510 - Water Distribution System

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. American Water Works Association (AWWA). The following AWWA standard is referred to in this Technical Specification and is to be considered a part of this specification:

C600 Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

B. National Fire Protection Association (NFPA)

### 1.03 SUBMITTALS

A. For each test, a completed Tabulation Sheet (Attachment A) shall be submitted.

B. Proof of testing as required by County, State, or Federal agencies and this section shall be submitted.

## PART 2 - PRODUCTS

### 2.01 WATER SUPPLY

A. Water supplied for flushing and testing shall be clean, clear, and from potable sources acceptable to the Engineer.

B. All water necessary for flushing and testing shall be furnished and disposed of in accordance with applicable rules and regulations.

## PART 3 - EXECUTION

### 3.01 TEST REQUIREMENTS

A. All pressure piping shall be tested in accordance with AWWA C600. The following procedure shall be used:

1. All newly laid pipe or any valves section thereof shall be subjected to a hydrostatic pressure 50% in excess of the working pressure at any point in the section being tested, but in no case less than 50 pounds per square inch (psi) for a period of 2 hours.

2. The Contractor shall accomplish the required tests on the pipeline by individually testing each component section of the installed main. The maximum length of section permitted to be tested at any one time will be approximately 1 mile, and normally will be less.

B. Test Pressure Restrictions

1. The test pressure shall not be less than 50 psi at the highest point along the test section.

2. The test pressures shall not exceed pipe or thrust restraint design pressures.

3. The test pressures shall be of at least 2-hour duration and not vary by more than +5 psi.

4. The test pressures shall not exceed twice the rated pressure of the valves when the pressure boundary of the test section includes closed gate valves.

C. Leakage Test

1. All leakage tests shall be conducted concurrently with the pressure test.

2. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure throughout the duration of the test after the pipe has been filled with water to the test pressure.

3. The rate of leakage shall not exceed 11.65 gallons per day, per mile of pipe, per inch of nominal pipe diameter based on a test pressure of 150 psi. To calculate allowable leakage in gallons per hour (gph) for other test pressures, refer to Table 6 of AWWA C600.

3.02 FIELD MEASUREMENTS

A. The length of the test section shall be measured.
B. The quantity of water used to maintain test pressure during test period shall be measured.
C. All measurements required to complete the Tabulation Sheet shall be measured and recorded.

3.03 COORDINATION

A. 48-hour notice shall be provided to the Engineer, County's Fire Coordinator Office Representative, and the local water department when water for flushing and testing is required.

B. Owner of existing water system shall operate all valves and hydrants unless Contractor has been authorized by owner to operate water systems, valves, and hydrants.

3.04 PREPARATION

A. The Contractor shall supply all plugs, pumps, weirs, gauges, etc., necessary to conduct the tests, including means to accurately measure the quantity of water used to maintain test pressure during the test period.

B. All piping systems shall be flushed with water prior to testing.

# MATERIALS AND PERFORMANCE - SECTION 02675

## PRESSURE AND LEAKAGE TESTING

3.05 TESTING

A. Pressure and leakage tests shall be conducted on all pressure piping.

B. The Engineer, County Fire Coordinator Office Representative, and the local water department shall be notified of the test at least 48-hours in advance.

C. All test results shall be recorded on the Tabulation Sheet (Attachment A).

D. Each valved section of pipe shall be slowly filled with water. The specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe.

E. Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.

F. Any exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves that are discovered following the pressure test shall be repaired or replaced with sound material as directed by the Engineer, and the test shall be repeated.

G. All visible leaks, regardless of the amount, shall be repaired.

H. If the section being tested fails to pass the pressure or leakage test, the source or sources of leakage shall be determined by and at the expense of the Contractor, and the Contractor shall permanently repair or replace all defective materials and/or workmanship. The extent and type of repair as well as results shall be subject to the approval of the Engineer. The completed pipe installation shall then be retested and required to meet the pressure and leakage requirements of this test.

I. Testing and retesting shall be completed prior to final paving.

J. The use of sealants, applied from outside or inside of pipe, is not acceptable.

- END OF SECTION -
(ATTACHMENT A FOLLOWS)

## ATTACHMENT A

## FLUSHING AND TESTING OF PRESSURE PIPES
## TABULATION SHEET

Job No. _____ Location _____

Contract No. _____ Contractor _____

Project _____

Contractor's Representative _____ Observed by _____

FLUSHING

Date _____ Weather _____ Temperature _____

Section Flushed _____ ft. of _____-inch diameter pipe

Line Flushed _____ hrs. _____ min. @ _____gal/min

Line Flushed Through _____

PRESSURE AND LEAKAGE TESTING

Date _____ Weather _____ Temperature _____

Section Tested _____

_____ ft. of _____-inch diameter _____ pipe in _____-ft. laying lengths

Time Started _____ Time Finished _____ Elapsed Time _____

Test Pressure: Start _____ psi Finish _____ psi

Water to Make up Initial Pressure _____ **gallons**

Allowable leakage, as calculated _____ gallons

_____ gallons (allowable leakage from AWWA C600 or Technical Provisions Section _____)

Pass _____ Fail _____

$$L = \frac{SD\sqrt{P}}{133{,}200^*}$$

L = Allowable leakage in gallons/hour
S = Length of pipe tested (linear feet)
D = Nominal diameter of pipe (inches)
P = Average pressure during test, psi

*Refer to C600 for additional allowance leakage against closed metal-seated valves.

# MATERIALS AND PERFORMANCE - SECTION 02711

# GALVANIZED CHAIN LINK FENCE

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. Installation of complete fence enclosure system as shown on the Design Drawings and as specified herein.

B. Related Work Specified Elsewhere

1. Section 02209 - Clearing

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specifications are referred to in this Technical Specification and are to be considered a part of this specification:

| | |
|---|---|
| A53/A53M | Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| A123/A123M | Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| A392 | Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric |
| F567 | Standard Practice for Installation of Chain-Link Fence |

### 1.03 SUBMITTALS

A. Samples of fabric, wires, ties, and post sections, if other than specified.

B. Shop drawings showing details of fence height, size of post, rails, braces, gates, fabric, accessories, footing depth, and grounding equipment.

C. Site plan showing proposed fence layout with all post and gate locations indicated.

D. Copies of the manufacturer's certification.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Structural and roll-formed shapes may be used in lieu of pipe sections. The structural or roll-formed shapes shall have a bending strength greater than the pipe section when measured under a 6 foot cantilever load and be galvanized in accordance with ASTM A123/A123M.

# MATERIALS AND PERFORMANCE - SECTION 02711

## GALVANIZED CHAIN LINK FENCE

B. Posts, Rails, and Braces

1. Schedule 40, steel pipe, galvanized in accordance with ASTM A53/A53M.

2. Dimensions and Weights (Minimum):

| | Outside Diameter (inches) | Weight/Foot (pounds) |
|---|---|---|
| End, Corner, and Pull Posts | 2.875 | 5.79 |
| Line Posts (Heavy Duty) | 2.375 | 3.65 |
| Top Rails and Braces | 1.66 | 2.27 |
| Gate Posts: | | |
| Leaves 6 feet Wide or Less | 2.875 | 5.79 |
| Leaves Over 6 feet, Including 13 feet Wide | 4.00 | 9.11 |
| Leaves Over 13 feet Wide | As shown on Design Drawings | |

C. Chain Link Fabric

1. One piece 9 gauge steel wire fabric, width as shown on the Design Drawings, 2-inch mesh galvanized after weaving in accordance with ASTM A392, Class 2.

2. 8 feet high when installed.

D. Accessories

1. Stretcher bars shall be a minimum of ½-inch x ¾-inch steel and attached to posts with heavy steel bands.

2. Tension wire shall be 7 gauge galvanized coil spring steel.

E. Gates

1. Gates shall be of the type shown on the Design Drawings.

2. Welded fabrication shall be of not less than 1.90-inch O.D. schedule 40 steel pipe.

   a. Braces and minimum ⅜-inch diameter trusses to provide rigidity without sag or twist.

   b. Galvanized after fabrication in accordance with ASTM A53/A53M.

3. Locking devices, latches, stops, and other hardware as required for a complete operating gate.

   a. Gates may be operated from either side.

   b. Padlock shall be a high security padlock with precision 5-pin tumbler mechanism, 2-inch laminated steel case with resilient bumper, 7/16-inch diameter case hardened allow steel shackle with dual steel levers that lock each shackle leg independently. The padlock shall be cadmium rust-proofed and shall be furnished with six like keys. Padlock shall be as manufactured by Master Lock Company or approved equal.

4. Fabric of gates shall be the same as chain link fence.

F. Miscellaneous

1. Concrete for footings shall be minimum 3,000 pounds per square inch (psi) (at 28 days) mix.

2. Wire ties or clips shall be a minimum of 6 gauge.

   a. Hog rings may be used to tie fabric to tension wire.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. General

1. Installation shall be in accordance with ASTM F567 unless otherwise modified.

B. Posts

1. Space line posts equidistant at intervals not exceeding 10 feet.

2. Post holes shall be of a diameter and depth shown on the Design Drawings.

3. Set plumb and to alignment in concrete base to a depth of:

   a. 36 inches for line post.
   b. 42 inches for pull, corner, and gate posts.
   c. Greater if shown on Design Drawings or recommended by fence manufacturer or local building code.

4. Crown concrete 2 inches above finish grade to shed water.

5. Concrete shall cure a minimum of 72 hours before further work is done on post.

MATERIALS AND PERFORMANCE - SECTION 02711

GALVANIZED CHAIN LINK FENCE

C. Braces

1. Provide at all ends, gate, and in both tangents at pull and corner posts.

D. Top Rails and Tension Wire

1. **Attach toprail securely** to each gate, corner, pull, and end post.

   a. **Support at each intermediate post to form a continuous** brace from end to end.

2. Bottom tension wire shall be taut and 6 inches above finished grade.

E. Fabric

1. Tighten to provide a smooth uniform appearance free from sags.

2. Attach to terminal post using stretcher bars with tension bands to maximum 14 inch intervals or other approved method.

3. Install fabric 2 inches above finished grade.

4. Fasten to line post at intervals not exceeding 14 inches.

5. Fasten to top rail, braces, and tension wire at intervals not exceeding 24 inches.

F. Gates

1. Install true to opening, plumb, and to open as shown on the Design Drawings.

2. Adjust hardware for smooth operation.

G. The area shall be left neat and free of any debris caused by the erection of the fence.

- END OF SECTION -

# MATERIALS AND PERFORMANCE – SECTION 03002

## REINFORCED CONCRETE PILE CAP

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Work Specified

1. All labor, materials, services, and equipment necessary for furnishing and installing a reinforced concrete pile cap on the barrier wall steel sheetpile.

B. Related Work Specified Elsewhere

1. Section 02201 - Earthwork
2. Section 02411 - Barrier Wall Installation

### 1.02 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. ASTM International (ASTM). The following ASTM specifications are referred to in these Technical Specifications and are to be considered a part of these specifications:

| | |
|---|---|
| A615 | Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
| C31 | Standard Practice for Making and Curing Concrete Test Specimens in the Field |
| C33 | Standard Specification for Concrete Aggregates |
| C39 | Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens |
| C94 | Standard Specification for Ready-Mixed Concrete |
| C109 | Standard Test Method for Compressive Strength of Hydraulic Cement Mortars |
| C143 | Standard Test Method for Slump of Hydraulic Cement Concrete |
| C150 | Standard Specification for Portland Cement |
| C173 | Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method |
| C191 | Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle |
| C231 | Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method |
| C260 | Standard Specification for Air-Entraining Admixtures for Concrete |

C494 Standard Specification for Chemical Admixtures for Concrete

C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures

B. American Concrete Institute (ACI). The following codes, standards, and recommendations of the ACI are intended to specify minimum standards of performance.

| | |
|---|---|
| ACI 211.1 | Standard Practice for Selecting Proportions for Normal and Heavyweight Concrete |
| ACI 301 | Specifications for Structural Concrete |
| ACI 304R | Guide for Measuring, Mixing, Transporting, and Placing Concrete |
| ACI 305R | Hot Weather Concreting |
| ACI 306R | Cold Weather Concreting |
| ACI 318 | Building Code Requirements for Structural Concrete |
| ACI 347R | Guide to Formwork for Concrete |

C. Army Corps of Engineers Specification (CRD). The following specification is referred to in this Technical Specification and is to be considered a part of this specification:

CRD 588 Precision Grout (CRD-C 621)

D. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.

E. Federal Specifications (FS).

F. American Plywood Association (APA).

G. In each case the latest revision shall apply.

1.03 SUBMITTALS

A. Concrete Mix Design

1. The concrete mix design submittal shall include, at minimum, the following data:

a. Basis of design in accordance with ACI 318-89, Section 5.3 - Proportioning on the Basis of Field Experience and/or Trial Mixtures.

b. Indicate the amounts of all ingredients including cement, fine and coarse aggregates, water, air content, and admixtures, with weight of aggregates stated in a saturated surface dry condition.

c. Concrete slump.

d. Manufacturer's technical data and Material Safety Data Sheets (MSDS) for all admixtures and cement.

e. Sieve analysis of fine and coarse aggregates.

B. Shop drawings showing all steel reinforcement, chairs, joint locations, embedded items, and accessories.

C. Mill test certificates for steel reinforcement.

D. Samples of embedded items, joint filler material, waterstops, sealants, backing rods, and perimeter rigid insulation.

E. Manufacturer's literature for all products.

F. Test results of field and lab testing of concrete as they become available.

G. Curing methods to be employed to keep concrete moist.

H. Certification that admixtures used in same concrete mix are compatible with each other and the aggregates.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All damaged or contaminated materials shall be rejected and removed from the Site by the Contractor at no additional cost to the Owner.

## PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150, Type II

B. Fine Aggregate: Natural Sand Meeting ASTM C33

C. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33, Size 57.

D. Water: Potable, clean, and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

E. Admixtures

1. Water Reducing Admixture: ASTM C494, Type A. Proportioning and mixing shall be in accordance with Manufacturer's recommendations.

2. Water Reducing, Retarding Admixture: Shall comply with ASTM C494, Type D. Proportioning and mixing shall be in accordance with Manufacturer's recommendations.

MATERIALS AND PERFORMANCE – SECTION 03002

REINFORCED CONCRETE PILE CAP

3. Non-Chloride Accelerator: Shall comply with ASTM C494, Type C or E. Proportioning and mixing shall be in accordance with Manufacturer's recommendations.

4. Air Entraining Admixture: Shall comply with ASTM C260. Proportioning and mixing shall be in accordance with Manufacturer's recommendations.

5. Calcium Chloride: Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.

F. Bonding Compound: Polyvinyl acetate, rewettable type.

G. Bars: Deformed bars of new billet steel conforming to ASTM A615, Grade 60.

H. High-Density polyethylene (HDPE) Rondel: GSE Polylock or approved equal.

I. Tie Wire: FS QQW461G, annealed steel, black, 16 gauge minimum.

J. Pre-Cast Concrete Bar Supports: Bar supports shall conform to CRSI - Manual of Standard Practice for pre-cast bar supports.

K. Formwork (Conform to ACI 347R)

1. No formwork or form facing material which has a permanent set in it shall be used in the work.

2. All forms to be constructed of wood or plywood.

3. Forms shall be free from roughness and imperfections, substantially watertight, and adequately braced and tied to prevent motion when concrete is placed. No wooden spacers will be allowed in the concrete.

4. All exposed edges of the finished concrete shall be chamfered ¾-inch.

L. Form Ties

1. Ties shall be left in place and equipped with swaged washers (water stops) or other approved devices to prevent seepage of moisture along the tie.

2. Depth of breakback: minimum 1 inch.

M. Form Coatings

1. Non-staining

2. Compatible with subsequent finishing and bonding requirements.

MATERIALS AND PERFORMANCE – SECTION 03002

REINFORCED CONCRETE PILE CAP

N. Non-Shrink Grout

1. All grout shall be non-metallic, non-shrink, non-gas forming preblended, and ready-for-use requiring only the addition of water.

   a. Grout shall contain no metals nor rust or corrosion promoting agents, or gypsums.

   b. The addition of set control agents or water reducers will not be allowed.

2. Grout shall conform to the following properties:

| Property | Test Method | Requirements |
|---|---|---|
| Shrinkage Below Placement Volume | ASTM C827 | 0 |
| Drying Shrinkage | CRD 588-76 | 0 |
| Expansion | CRD 588-76 Maximum | 0.40% |
| Compressive Strength<br>24 Hours<br>7 Days | ASTM C109 | 3,000 pounds per square inch (psi) Minimum |
| Initial Set Time | ASTM C191 | Minimum 45 Minutes |
| Pull-Out Strength | #5 Bar Grouted 6 Inches Deep in $^{7}/_{8}$-Inch Diameter Hole in Saturated Surface Dried Concrete | 10,000 pounds |

O. Perimeter Insulation

1. Extruded Polystyrene Insulation

   a. Closed-cell, expanded polystyrene board complying with FS-HH-I-524, Type II, Class "B".

   b. Compressive strength - 30 psi.

   c. Maximum water absorption - 0.10%.

   d. Maximum water vapor transmission - 1.0 perm-inch.

   e. Thermal conductivity (k value) at 75°F - 0.20 per inch thickness.

   f. Integrally formed skin.

2. Styrofoam Insulation

   a. "Styrofoam SM" as manufactured by the Dow Chemical Company.

   b. Molded Styropor® (2.0 pounds per cubit foot [pcf] density) as manufactured by BASF.

c. Adjusted thicknesses shall be provided when a material having a different thermal conductivity value is approved for use.

2.02 CONCRETE MIX DESIGN

A. All mix designs shall be proportioned in accordance with ACI 318-89, Section 5.3 "Proportioning on the Basis of Field Experience and/or Trial Mixtures". If trial batches are used, they shall be established by an approved commercial testing laboratory, employed by the Contractor, and approved by the Engineer.

B. Method of proportioning shall conform to ACI 211.1.

C. All concrete shall have a minimum 28-day compressive strength of 3,500 psi.

D. All concrete shall contain a water-reducing admixture.

E. All concrete shall be air-entrained and have an air content of 4.5 to 7.5%.

F. Slump: Concrete without high range water reducing admixture - 3 inches maximum.

G. Rate of Hardening

1. Concrete mixes shall be designed to produce the following rates of hardening:

a. General Concrete

Ambient temperatures 50°F to 85°F -- Normal rate of hardening.
Ambient temperatures over 80°F -- Retarded rate of hardening.
Ambient temperature under 50°F -- Accelerated rate of hardening.

H. The mix design must not be changed except as approved by the Engineer to maintain quality control.

PART 3 - EXECUTION

3.01 CONCRETE

A. Batching: ACI 304R

B. Mixing, Transporting and Discharging: ASTM C94

C. Placing: ACI 304R

D. Cold Weather Concrete: ACI 306R (below 40°F)

MATERIALS AND PERFORMANCE – SECTION 03002

REINFORCED CONCRETE PILE CAP

E. Hot Weather Concrete: ACI 305R (above 80°F)

1. Formed Surfaces

a. Rubbed until all marks are obliterated and a uniformly smooth finish is obtained.

b. If, upon removing the forms, any voids or honeycomb are found, such faults shall be corrected immediately at the Contractor's expense.

2. Curing

a. Maintain all concrete in a moist condition for the duration of curing specified using methods that will insure complete and continuous saturation.

F. Field Testing and Inspection

1. The Contractor shall provide facilities necessary to obtain and handle representative samples of materials to be tested and furnish all necessary cooperation and assistance.

2. The testing laboratory shall be responsible to the Owner for the field control of all concrete and may reject batches for high slump, uncontrolled air entrainment, or delays.

3. Field Test Cylinders: During the progress of the work, a set of six 6-inch by 12-inch cylinders shall be made for each 50 yards of concrete placed, or fraction thereof placed each day.

a. For each set of six cylinders, two shall be tested at 7 days and two shall be tested at 28 days.

b. In the case of questionable or unsatisfactory test results, the remaining two cylinders shall be tested at 40 days or as directed by the Owner/Engineer.

c. Each cylinder shall be properly labeled with an identifying mark.

d. The making and curing of test cylinders shall be in accordance with ASTM C31.

e. Cylinders shall be tested in accordance with ASTM C39.

f. Making, pickup and curing of the cylinders shall be the responsibility of the testing laboratory, but the Contractor shall cooperate in protecting the cylinders and in notifying the testing laboratory of scheduled pours.

4. Slump Tests: ASTM C143.

5. Air Content Test: ASTM C173 or C231

6. Criteria for Acceptance: ACI 318, Section 5.6.

7. Written reports shall be submitted to the Owner/Engineer.

8. Repair of defective areas shall conform to ACI 301, Chapter 9, except that a bonding compound shall be used.

3.02 REINFORCEMENT

A. Conform to the CRSI Manual of Standard Practice.

B. Bending shall be done accurately, without the use of heat, and in conformance with ACI 318. Bars having cracks or splits at the bends shall be rejected.

C. All steel shall be free from loose rust, scale, grease, oil, dirt, or other materials which impair the bond with concrete.

D. All steel reinforcement and welded wire mesh shall be accurately positioned and strongly secured by tie wires or clips at intersections, and supported by pre-cast concrete chairs. Pulling steel reinforcement and/or welded wire mesh into place will not be allowed.

3.03 FORMWORK

A. The Contractor shall be responsible for designing and constructing suitable and adequate falsework, centering, and formwork in conformance with ACI 347R.

B. Plywood: Conform to tables for form design in APA Form V345-72. Deflection of form facing material between supports: Not over 0.0025 x span.

C. Forms shall be designed so that the finished concrete will conform to the shape, true to line, and the proper dimensions as called for on the Design Drawings.

D. The design of forms shall take into account the effect of vibrations of concrete as it is placed.

E. The forms shall be substantial, unyielding, and constructed mortar tight and of sufficient rigidity to prevent distortion due to the pressures of concrete and other loads incidental to the construction operations.

- END OF SECTION -