From: Keith Bogatch <KBogatch@BrwnCald.com>
Sent: Friday, November 13, 2020 1:58 PM
To: Spellman, John (DEC)
Cc: Stucker, Steven P.; Adam Gutta; Adam Sherman
Subject: Oswego (West Utica Street) Former MGP Site - Operable Unit 2: Final Feasibility Study

John,

On behalf of Steve Stucker of National Grid, this email serves to submit the final version of the Feasibility Study (FS) for Operable Unit 2 (OU-2) of the Oswego (West Utica Street) Former MGP Site. Due to the size of the PDF file (11 Mb), I have included a link below for you to access and download the files from Brown and Caldwell's OneDrive. If you should have any problem accessing or downloading the file, please give me a call and I can arrange for it to be placed on a flash drive and forwarded to your attention. If you can receive a 11 Mb file at this email address, please let me know and I will reply with the file attached.

If you should have any questions or comments, please do not hesitate to contact Steve Stucker or me at your earliest convenience.

Here's a OneDrive link to the Feasibility Study: Feasibility_Study_Report_OU2_November_2020.pdf.

Regards,

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Feasibility Study Report
Oswego (West Utica Street) Former
Manufactured Gas Plan (MGP) Site-
Operable Unit 2 (OU2)
Oswego, Oswego County, New York
Site No. 738049

Prepared for
Niagara Mohawk Power Corporation d/b/a
National Grid
Syracuse, New York
November 2020

Feasibility Study Report
Oswego (West Utica Street) Former Manufactured Gas Plant (MGP) Site – Operable Unit 2 (OU2)
Oswego, Oswego County, New York
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Prepared for
Niagara Mohawk Power Corporation d/b/a National Grid
300 Erie Boulevard West
Syracuse, New York 13202

November 2020

Project Number: 154224.200

New York Statement Professional Engineer Certification:

I, Adam Sherman, certify that I am currently a NYS registered professional engineer and that this Feasibility Study was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER approved work plan and any DER-approved modifications.

STATE OF NEW YORK
ADAM RICHARD SHERMAN
087306
LICENSED PROFESSIONAL ENGINEER

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Table of Contents

Appendices

List of Tables

List of Figures

List of Abbreviations

AACE	Association for the Advancement of Cost Engineering
BC	Brown and Caldwell Associates
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylene, and Xylene
cm/sec	Centimeters per Second
COC	Constituents of Concern
CP	Commissioner Policy
d/b/a	Doing Business As
DER	Division of Environmental Remediation
DNAPL	Dense Non-Aqueous Phase Liquid
EC	Engineering control
FS	Feasibility Study
FWRIA	Fish and Wildlife Resource Impact Analysis
GRA	General Response Actions
HHEA	Human Heath Exposure Assessment
IC	Institutional Control
ISS	In Situ Solidification
kcf	Kilo (Thousand) Cubic Feet
Kh	Horizontal Hydraulic Conductivity
LDR	Land Disposal Restriction
MGP	Manufactured Gas Plant
MNA	Monitored Natural Attenuation
MTBE	Methyl tert-butyl ether
NMPC	Niagara Mohawk Power Corporation
NPDES	National Pollutant Discharge Elimination System
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NAPL	Non-Aqueous Phase Liquid
OGLC	Oswego Gas Light Company
OU1	Operable Unit No. 1
OU2	Operable Unit No. 2
O&M	Operation and Maintenance
PAHs	Polyaromatic hydrocarbons
PRR	Periodic Review Reports
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RDR	Remedial Design Report

RI	Remedial Investigation
RIR	Remedial Investigation Report
SCG	Standards, Criteria and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SRI	Supplemental Remedial Investigation
TOGS	Technical and Operations Guidance Series
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VCO	Voluntary Consent Order
μg/L	Micrograms per Liter

Section 1

Introduction

This Feasibility Study (FS) Report has been prepared by Brown and Caldwell Associates (BC) on behalf of Niagara Mohawk Power Corporation (NMPC), doing business as (d/b/a) National Grid (herein referred to as National Grid) to document the remedy recommendation process that was completed to address environmental impacts at Operable Unit No. 2 (OU2) of the Oswego (West Utica Street) Former Manufactured Gas Plant (MGP) Site. Remediation activities including investigations, alternatives analysis, remedy selection, remedial design, and remedy implementation, pertaining to Operable Unit No. 1 (OU1) are being addressed separately. Throughout this report, the term "Site" is used to indicate the total area of the Oswego (West Utica Street) Former MGP Site (incorporating OU1 and OU2), while the individual operable units are referred to separately as OU1 and OU2.

In a letter dated December 10, 2010, the New York State Department of Environmental Conservation (NYSDEC) provided the following determination of the operable units, which are both considered part of NYSDEC Site No. 738049:

- **OU1:** soil, bedrock, groundwater, and soil vapor beneath the five parcels that encompass the original MGP footprint area.
- **OU2:** soil, bedrock, groundwater, and soil vapor beneath West Third Street, West Fourth Street, West Utica Street, and a portion of the land south of West Utica Street.

The OU1 remedy addresses the source of the Site-wide groundwater impacts. The OU1 remedial design has been completed and is documented in a document entitled "Remedial Design Report (100% Submission), Oswego (West Utica Street) Former MGP Site, Oswego, New York" (100% RDR) prepared by BC and dated November 18, 2018 (BC, November 2018). The 100% RDR was approved by the NYSDEC via letter dated November 6, 2018. Remedial construction associated with OU1 is anticipated to occur in 2020.

Remedial activities at the Site, including completion of this OU2 FS, are being performed in accordance with the Order on Consent and Administrative Settlement (Index No. CO 7-20180629-27) between the NYSDEC and Niagara Mohawk Power Corporation, d/b/a National Grid, dated July 13, 2018. This Order replaces the initial Voluntary Consent Order (VCO, Index No. D0 0001 0011 dated January 2002) between the two parties which expired when the NYSDEC's Operable Unit No. 1 (OU1) was terminated.

National Grid initiated a remedial investigation (RI) in 2011 to characterize the nature and extent of MGP-related impacts at the Site. In February 2019, the RI Report (RIR), entitled "Remedial Investigation Report; Oswego (West Utica St.) Former MGP Site – Operable Unit 2; NYSDEC Site #738049; Oswego, New York" (BC, February 2019, was submitted to the NYSDEC. The RIR was subsequently approved in a letter from the NYSDEC dated May 20, 2019. The preparation of an FS represents the next step in the remediation process. Using information and data from previous investigations, including the RI, and in accordance with the substantive portions of Title 6 of the New York Codes of Rules and Regulations (NYCRR) Part 375 for remedial action selection and the "Division of Environmental Remediation, DER-10, Technical Guidance for Site Investigation and Remediation" (DER-10) dated May 2010, this FS report documents the decision-making process for the evaluation and recommendation of an OU2 remedy and includes the following:

- Identification of the goals of the remedial program.
- Definition of the nature and extent of contamination to be addressed.

- Identification of the remedial action objectives (RAOs) for OU2.
- Identification and screening of remedial technologies and development of remedial action alternatives.
- Initial screening and detailed analysis of remedial action alternatives, including the evaluation of the use of institutional and engineering controls.
- Selection of a recommended remedy.

1.1 Report Organization

The FS Report is organized as follow, which is consistent with DER-10 requirements:

- **Section 1:** Introduction
- **Section 2:** Site Description and History
- **Section 3:** Summary of Remedial Investigation and Exposure Assessment
- **Section 4:** Remedial Goals and Remedial Action Objectives
- **Section 5:** General Response Actions
- **Section 6:** Identification and Screening of Technologies
- **Section 7:** Development and Analysis of Alternatives
- **Section 8:** Recommended Remedy
- **Section 9:** References

Section 2

Site Description and History

This section provides a summary description of the Oswego (West Utica Street) Former MGP Site, the history of the former MGP operations, activities conducted at the Site, and the regulatory history associated with the Site. Additional details regarding these topics are provided in the OU2 RIR.

2.1 Site Setting

The former MGP facility was located on the northern side of West Utica Street between West Third and West Fourth Streets in the City of Oswego, Oswego County, New York (refer to Figure 1), on land that is currently divided into five parcels which comprise OU1. None of the five properties are owned by National Grid. The five parcels are identified by the City of Oswego Assessors Office as Lots 5-10, 5-11, and 5-12 on Assessors Office's Map 128.070 and Lots 4-11 and 4-11.01 on Assessors Office's Map 128.062. According to the City of Oswego Assessors Office's records, Lots 128.070-5-10 and 128.070-5-12 are owned by Tracy L. Kells of Oswego, New York. Lot 128.070-5-11 is owned by Joseph Malone of Oswego, New York. Lot 128.062-4-11 is owned by the Dialysis Clinic, Inc. of Nashville, Tennessee. Lot 128.062 4-11.01 is owned by Ontario Lakeside Medical Associates of Oswego, New York. Per the City of Oswego's Assessment Department, the five parcels mentioned above fall within the area classified as B 1 Zoning for neighborhood business/commercial use. OU1 is abutted to the north-northwest by the remaining portions of Lots 128.062-4-11 and 128.062-4-11.01; to the west-southwest by West Fourth Street; to the south-southeast by West Utica Street; and to the east-northeast by West Third Street. The general layout of the five parcels comprising OU1 is depicted on a Site Plan (refer to Figure 2).

OU1 is generally covered with buildings and asphalt pavement. The buildings located in the southwestern portion of the OU1 are currently vacant and were most recently occupied by City Electric, a wholesale electrical parts distributor. These buildings are located adjacent to each other and form an L-shaped structure located on Lots 128.070-5-12 and 128.070-5-10. A small unpaved area is located in the western portion of Lot 128.070-5-10. The western and northern portions of OU1 consists of paved parking lots for the Ontario Lakeside Medical Associates building and a dialysis clinic (Dialysis Clinic, Inc.), which are situated on Lots 128.062-4-11.01 and 128.062-4-11, respectively. The eastern portion of OU1 (i.e., Lot 128.070-5-11) is occupied by an automobile repair shop referred to as "The Car Shop". The area of Lot 128.070-5-11 that is not covered with the repair shop building is paved. A slight circular ridge in the asphalt pavement indicates the position of the walls of a former 100 Kilo (thousand) cubic feet (kcf) gas holder which remains in the subsurface of this parcel.

OU2 includes areas outside of the original MGP footprint. Specifically, OU2 includes subsurface media beneath West Third Street, West Fourth Street and West Utica Street, and a portion of the land south of West Utica Street (Lot 128.071-1-02 owned and occupied by NBT Bank). During the OU2 investigative activities, the OU2 area was expanded to include Lot 128.070-5-09 located west of West Fourth Street and owned by Stewarts Shops Corp. This was done as part of the RI activities to adequately characterize the nature and extent of MGP-related impacts.

OU2 is abutted to the west-southwest by West Fifth Street; to the east-northeast and south-southeast by residences; to the north-northeast by the parcels that comprise OU1; to the south-southwest by a parking lot for a medical building; and to the south-southeast by an unoccupied lot. OU2 is predominantly covered with asphalt pavement (areas including West Third Street, West Fourth Street, West Utica Street and the Stewart's Shops property) aside from the maintained landscaped area covered with grass on a portion of the property owned by NBT Bank (refer to Figure 2). Per the City of Oswego Zoning Map, the areas that constitute OU2 are classified as B 1 Zoning for neighborhood business/commercial use; these areas are surrounded by properties classified as R-3 for residential use.

The topography of the Site is generally flat with a slight general decline from the north to the south. Based on a review of the United States Geological Survey (USGS) 7.5 Minute Series Oswego West Quadrangle Topographic Map, the Site is located in an elevated area situated along the western bank of the Oswego River. The Oswego River is located approximately 1,000 feet east-northeast of the former MGP facility; the ground surface elevation in the area of the Site is approximately 55 feet above the level of the adjacent part of the Oswego River. Lake Ontario is located approximately three-quarters of a mile north of the Site.

2.2 Site Background and History

Available historical information, including historical maps of the City of Oswego and a series of eight Sanborn® Fire Insurance Maps dating from 1890 to 1972, were reviewed to determine the development and decommissioning of the former MGP structures associated with the Site. The following is a summary of the history of operations at the former MGP facility based on this review.

Based on a review of available historical information, the former Oswego (West Utica Street) MGP utilized the coal carbonization process to produce gas which did not use petroleum feed stock. No information has been identified to indicate that the carbureted water gas process was used at the facility. Remnants of former MGP structures, including the base of two gas holders, are currently present in the subsurface. These include a 40 kcf holder located on the Ontario Lakeside Medical Associates property (northwest portion of OU1) and a 100 kcf holder on The Car Shop property (southeast portion of OU1). Typical MGP operations produced byproducts including coal tar, spent purifier waste, coal slag, cinders, and ash.

The original MGP was apparently built by the Oswego Gas Light Company (OGLC) according to the available historical information. According to the "Landmarks of Oswego County, New York", which was published by D. Mason & Company Publishers in 1895, the OGLC was organized on March 23, 1852 and began producing gas in the fall of 1852. The "New Topographical Atlas of Oswego County, New York", published by C. K. Stone in 1867, shows the original plant. This atlas indicates the plant included the smaller of the two gas holders (i.e., the 40 kcf gas holder) shown on Figure 2.

According to the "Landmarks of Oswego County, New York", the plant was enlarged in 1869. The plant enlargement was apparently preceded by the purchasing of parcels that comprise current Lots 128.070 5-10 and 128.070-5-12 between 1866 and 1869.

The first "Brown's Directory of American Gas Companies", which was published in 1887, indicated the OGLC manufactured coal gas (i.e., gas produced by the coal gasification process). Later Brown's directories indicated that the OGLC also produced electricity after 1889. This was supported by the "Landmarks of Oswego County, New York", which indicated that the OGLC purchased the stock and plant of the Home Electric Light Company on January 1, 1888.

As shown on the 1890 Sanborn® Map, a typical arrangement of MGP structures existed at the Site, including a retort, a 100 kcf gas holder, a 40 kcf gas holder, an office, a coal bin, and several support structures. Between 1924, the date of the last Sanborn® Map that shows the former MGP, and 1890, little change occurred in the MGP structures. The changes to the structures that did occur during this period of time included the enlargement of the retort house and the removal of a portion of the electric light plant. The 1924 Sanborn® Map does not indicate that the plant produced electricity at that time. Figure 2 shows the structures associated with the MGP that were indicated on the 1924 Sanborn® Map.

The available records indicate that the OGLC was sold to the Peoples Gas & Electric Company in 1900 but gas plant operations continued under this entity until the 1930s. According to the available records, sometime in the 1930s, gas manufacturing at the Site ceased after a gas main was laid from Syracuse to Oswego that supplied a mixture of natural gas and manufactured gas to Oswego.

During the operation of the MGP, the uses of the surrounding area were not significantly different from the present uses of these areas. The areas to the east and northwest were primarily residential with the exception of the building now occupied by Ontario Lakeside Medical Associates, which was apparently built in 1920 according to the City of Oswego Assessors Office's records.

Sometime in the late 1930s or 1940s, the former MGP was demolished and the property sold. By 1947, according to the City of Oswego Assessors Office's records, the portion of the building now occupied by City Electric located along West Utica Street was constructed. Later Sanborn® Maps indicate that this building was used as a warehouse for beverage distributors until the 1990s. The building formerly occupied by the Sons of Italy was constructed in 1960 and used as a social organization lodge until 2009. This building was razed in 2014 for the subsequent construction of the Dialysis Clinic, Inc. building, which is currently occupied and operating. The available Sanborn® Maps indicate that the existing automobile repair shop was built sometime between 1960 and 1972. This building was originally used as a car wash.

The areas to the southeast and southwest along West Utica Street, which include the properties investigated as part of the OU2 RI, were commercial or industrial. Former businesses of note were the oil storage and refinery facilities that existed on the property currently occupied by NBT Bank and the property west of the bank, across West Third Street. Based on a review of Sanborn® Fire Insurance Maps spanning the period from 1890 to 1924, several firms including Acme Oil Co., Standard Oil Co., Oswego Oil Co., and Peoples Oil & Fuel Co. maintained and operated oil storage and refinery facilities on these properties. Of note, these oil facilities were present on these properties during a time period that coincided with the former MGP operations. In addition, based on a review of historic maps obtained for the Site, railroad operations were active south of the Site along West Utica Street and areas to the south from approximately 1867 to 1960.

The above discussion of the review of the historical City of Oswego maps and Sanborn® Fire Insurance Maps was previously presented in the "Remedial Investigation Report, Oswego (West Utica St.) Former MGP Site, Operable Unit No. 1" (OU1 RIR) (BC, April 2011, Revised August 2011) and is also presented in the "Phase IA Cultural Resources Investigation" (Panamerican Consultants, Inc., September 2010), which was performed as a component of the OU1 RI activities. Additions to the site background and history were made, as appropriate, to incorporate background and history associated with OU2. Approximate locations of the former MGP structures based on the 1924 Sanborn® Map are depicted on Figure 2.

2.3 Regulatory History of the OU2

Remedial investigation activities at the Site were conducted under the January 2002 VCO (Index No. D0 0001 0011). As indicated previously, the VCO was discontinued when the NYSDEC disbanded the Voluntary Cleanup Program and was replaced with the Order on Consent and Administrative Settlement (Index No. CO 7-20180629-27) between the NYSDEC and Niagara Mohawk Power Corporation, d/b/a National Grid, dated July 13, 2018. Therefore, even though the investigative activities were conducted under the 2002 VCO, the OU2 RIR (BC, February 2019) was submitted under the 2018 Order.

The regulatory history for OU2, from the point of establishing the separate OUs, is provided below. Refer to the 100% RDR (BC, November 2018) for the regulatory history associated with OU1. As indicated previously, the OU1 remedial design is complete, approved by the NYSDEC, and remedial construction is anticipated to occur in 2020.

- **December 10, 2010:** Letter from the NYSDEC providing determination to separate the Oswego (West Utica Street) Former MGP Site into two separate operable units [on-site (OU1) and off-site (OU2) impacts] and requesting preparation of a RIR for OU1 and a RI Work Plan for OU2.
- **April 2011:** Submitted RI Work Plan for OU2 to NYSDEC.
- **June 2011:** RI Work Plan approved by NYSDEC.
- **August 2011:** Submitted RI Work Plan Addendum to NYSDEC.
- **August 2011 through September 2014:** Property access negotiations.
- **September 2014 through April 2015:** Implemented RI Work Plan.
- **August 2015:** Submitted RI Data Summary Report to NYSDEC.
- **May 2016:** Received comments on and approval of the August 2015 RI Data Summary Report from NYSDEC. Report included a recommendation to conduct additional investigation activities.
- **July 2016:** Submitted Supplemental RI (SRI) Work Plan to NYSDEC.
- **August 2016:** SRI Work Plan approved by NYSDEC.
- **October 2016 through November 2017:** Implemented SRI Work Plan.
- **April 2018:** Submitted SRI Data Summary Report to NYSDEC. The cover letter that accompanied the submittal provided a conclusion that indicated that the nature and extent of MGP-related impacts at the Site have been adequately characterized for the purpose of the RI and a recommendation to prepare a final RIR.
- **June 2018:** Received comments on the April 2018 SRI Data Summary Report from NYSDEC.
- **June 2018:** Submitted response to comments letter to NYSDEC, providing an alternate approach to the NYSDEC's proposed modification to the text of the April 2018 Data Summary Report.
- **July 2018:** Received e-mail from the NYSDEC providing concurrence that the RI data collection is complete and requesting preparation of draft final RIR.
- **February 2019:** Submitted RIR to NYSDEC.
- **May 2019:** RIR approved by NYSDEC.

2.4 Summary of the OU1 Remedy

Impacts noted within OU1 have been determined to be the source of the groundwater impacts extending onto OU2. The remedial action to be conducted at OU1 is anticipated to result in an improvement to the groundwater quality at OU2. For that reason, an abbreviated discussion of the OU1 remedy is provided in this section of the FS. The main elements of the remedy are shown on Figure 3. The full description of the OU1 remedy can be found in the 100% RDR (BC, November 2018). The NYSDEC-approved OU1 remedy includes the following elements:

In Situ Solidification (ISS): ISS of contaminant source areas, including "grossly contaminated media", as defined in 6 NYCRR Part 375-1.2(au). The ISS is intended to encapsulate the accessible source material within a low-permeability matrix, significantly reducing the flux of the NAPL and impacted groundwater into the shallow and deep bedrock from the source area. The ISS areas include the former northern (40,000 cubic foot) gas holder to a depth of approximately 22 feet below ground surface (bgs) or the top of bedrock, the parking lot located to the west of the building formerly occupied by City Electric to a depth of approximately 15 feet bgs or the top of bedrock, and the former tar tanks to a depth of approximately 15 feet bgs or top of bedrock. Approximately 6,600 cubic yards of soil will be treated via ISS.

Source material is suspected to be present underneath the former the buildings located in the southwestern corner of OU1 (formerly occupied by City Electric). This material is inaccessible by ISS and will be addressed through the engineering and institutional controls as detailed in a Site Management Plan (SMP).

Non-aqueous phase liquid (NAPL) Recovery Wells: NAPL recovery wells will be installed to provide for the periodic assessment, measurement and removal of accumulated NAPL that cannot be excavated or solidified due to the presence of utilities. The wells will be placed west and north of the east-west portion of the buildings located in the southwestern corner of OU1 and formerly occupied by City Electric, as well as west of the north-south portion of the building. Recovered NAPL will be transported for treatment or disposal off-site. The operation of the NAPL recovery wells will continue until the NYSDEC has determined that continued operation is technically impracticable or not feasible.

Institutional Controls (ICs) and Engineering Controls (ECs): ECs will consist of maintaining the existing cover, construction of new site cover, as well as site cover monitoring. ICs will be in the form of an Environmental Easement that will 1) require the remedial party or site owner to complete and submit to the Department a periodic certification of ICs/ECs in accordance with Part 375-1.8(h)(3), 2) allow the use and development of the controlled property for commercial and industrial uses or as defined by Part 375-1.8(g), though land use is subject to local zoning laws, 3) restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or County Department of Health (DOH), and 4) require compliance with the NYSDEC-approved SMP.

Site Management Plan: An SMP, which includes the following:

- An IC/EC Plan that identifies all use restrictions and engineering controls for the Site and details the steps and media-specific requirements necessary to ensure the ICs/ECs to remain in place and effective.
- A Monitoring Plan to assess the performance and effectiveness of the remedy, including the impact that source remediation measures (i.e., ISS and NAPL recovery) conducted on OU1 have on OU2 groundwater quality.

Section 3

Summary of Remedial Investigation and Exposure Assessment

This section provides a summary of the stratigraphy and nature of subsurface materials, hydrostratigraphy, groundwater flow, and the nature and extent of contamination at OU2. This summary is based on data and information collected during the activities documented in the OU2 RIR (BC, February 2019). Relevant figures from the RI are provided for reference in Appendix A of this FS Report.

3.1 Summary of Site Investigations

Two separate phases of investigative activities were conducted at the Site pursuant to the January 2002/July 2018 Orders. The initial phase of work was conducted in 2014 and 2015. The findings from the 2014/2015 field work indicated the presence of constituents in the subsurface associated with former MGP operations as well as from other potential sources. Based on these findings, it was determined that SRI activities were required to adequately characterize the nature and extent of subsurface impacts at OU2. SRI field activities were performed in 2016 and 2017. These activities were summarized in the OU2 RIR, which was approved by letter from the NYSDEC dated May 20, 2019. The OU2 RIR provided a comprehensive evaluation of the RI findings for the Site. Characterization of the nature and extent of impacts attributable to former MGP operations is considered complete for the purposes of the RI.

3.2 Stratigraphy, Hydrostratigraphy, and Groundwater Flow

The following describes the stratigraphy of the subsurface conditions beneath the Site, including the characteristics of the overburden, bedrock and the nature and occurrence of groundwater flow in these intervals.

3.2.1 Overburden

The following presents a summary of the pertinent characteristics of the overburden at the Site. A detailed description is included in the OU2 RIR. Pertinent RIR figures referred to in this FS are also included in Appendix A.

- The overburden at the Site generally consists of several feet of fill material overlying glacial till deposits. Locally, thin deposits of silt and clay or sand and silt are positioned above the till. Generally, the density and competency of the till increases with depth, although this is locally variable. Refer to Figures 4 through 7 of the OU2 RIR (provided in Appendix A) (hydrogeologic cross-sections A-A', B-B', C-C', D-D', and E-E') for a depiction of the subsurface stratigraphy for the Site.
- A layer of fill material overlies the entire Site and surrounding areas. The fill is composed of various materials including sand, gravel, cinders, coal and demolition debris (e.g., brick and concrete). Finer grained material (silt and clay), where present in the fill, is typically not the predominant component. The fill varies in thickness from approximately 6 to 12 feet within the properties comprising OU2.

- The water table in the OU2 area is positioned between approximately 7 and 14 feet bgs as illustrated on geologic cross-sections A-A’ through E-E’, presented as Figures 4 through 7 of the OU2 RIR (provided in Appendix A). Typically, only a thin interval of the lowermost fill is saturated, with most of the saturated overburden being till. Locally the water table in positioned in the till and the fill is not saturated. The saturated thickness of the overburden deposits in OU2 is typically about 3 to 7 feet.
- The estimated geometric mean of the horizontal hydraulic conductivity (Kh) of the till [4.5 x 10^{-5} centimeters per second (cm/sec)] is approximately one order of magnitude lower than that of the fill deposits (1.5 x 10^{-3} cm/sec); the lower Kh of the till is related to it more poorly sorted mixture of fine-grained and coarse-grained materials, as well as the greater density and degree of cementation of the till matrix relative to the fill. Kh estimates from individual well locations range over two to three orders of magnitude for the fill and till, respectively.
- The saturated overburden deposits at the Site can be considered as one water-bearing zone despite the contrast in hydraulic conductivity of the overburden deposits due to the minimal difference in the groundwater elevations between the shallower and deeper overburden materials (i.e., a low vertical hydraulic gradient),
- Overburden groundwater flows generally from north to south across OU1 toward West Utica Street with components of flow to the south-southwest and to the east. Much of the groundwater flow likely discharges to the sewers (and/or associated coarse bedding material) beneath West Utica Street, West Fourth Street, and West Third Street. However, a component of flow from the southwestern part of the Site flows past West Utica Street; this component likely discharges to the buried former railroad trench and tunnel system located just south of West Utica Street (refer to Figures 8 and 9 of the OU2 RIR provided in Appendix A). Overburden groundwater on either side of the buried trench and tunnel system flows towards it, indicating the system is an area of overburden groundwater discharge.
- There is a slight downward component of groundwater flow from the overburden to the underlying bedrock except in the vicinity of the buried railroad trench.

3.2.2 Bedrock

The following presents a summary of the pertinent characteristics of the bedrock at the Site. A detailed description is included in the OU2 RIR.

- The bedrock unit directly beneath the Site, the Oswego Sandstone, can generally be described as a well cemented, medium bedded, fine- to medium grained sandstone, with occasional thin layers of shale, mudstone or siltstone, and zones where flat clasts of mudstone are abundant (i.e., rip-up clasts/clay galls).
- Fracture types that have been observed in nearby Oswego Sandstone outcrops, and in the bedrock core from the Site include:
  - nearly-flat to very shallow dipping bedding plane parallel fractures
  - near-vertical, approximately northwest striking fractures
  - near-vertical, approximately east-northeast striking fractures, small-scale faults, and an echelon fracture zones

Because of the relatively low permeability of the unfractured rock matrix, fractures, if open and relatively extensive, have the potential to impart the greatest influence on groundwater flow, the migration of dissolved-phase constituents, and the distribution and migration of dense non-aqueous phase liquid (DNAPL) in bedrock. Of these fracture types, the bedding parallel fractures tend to be the most continuous open fracture set.

- A water-bearing fracture zone occurs within the shallow bedrock (upper ±20 feet below the top of rock) that is controlled to a large degree by approximately horizontal open bedding plane fractures. The geometric mean of the Kh estimates in the shallow bedrock water-bearing zone, is 8.3×10^{-5} cm/sec; Kh estimates from individual wells range from 4.0×10^{-3} to 1.8×10^{-6} cm/sec.
- Groundwater flow in the shallow bedrock water-bearing zone generally flows from north to south across OU1. Downgradient of OU1, the flow direction in the vicinity of West Fourth Street shifts to the southeast toward the buried railroad trench and tunnel system located just south of West Utica Street (refer to Figures 10 and 11 of the OU2 RIR, provided in Appendix A). Shallow bedrock groundwater on either side of the buried trench and tunnel system flows towards it, indicating the system is an area of shallow bedrock groundwater discharge.
- The permeability of the intermediate bedrock interval (from ±20 to ±50 below the top of bedrock) below the shallow bedrock water-bearing zone is relatively low; no substantial water-bearing fractures were identified in this interval. Groundwater flow in this interval is directed primarily downward. This intermediate unit is an aquitard between the shallow and deep bedrock water-bearing zones.
- A laterally continuous water-bearing zone exists beneath the intermediate bedrock aquitard at a depth of approximately 120 to 133 feet bgs (approximately 75 to 88 feet below the shallow bedrock water-bearing zone). This deeper water-bearing zone is controlled by open, near-horizontal bedding plane fractures. The geometric mean of the Kh estimates for the deep bedrock water bearing zone is 7.0×10^{-4} cm/sec and the Kh estimates from individual wells range from 2.2×10^{-2} to 1.8×10^{-5} cm/sec.
- Groundwater flow in the deep bedrock water bearing zone is generally to the east northeast, towards the Oswego River and Lake Ontario (refer to Figures 12 and 13 of the OU2 RIR, provided in Appendix A). Groundwater in the deep bedrock water-bearing zone likely discharges to the Oswego River adjacent to or downstream from the Site, and/or to Lake Ontario.

3.3 Nature and Extent of Contamination

This section presents a summary of the nature and extent of the contamination as fully described in the OU2 RIR. Relevant figures from the OU2 RIR are provided in Appendix A of this report. Figure 2 of the OU2 RIR (provided in Appendix A) depicts the investigative locations (wells, borings, test pits, sampling locations, etc.) referenced below.

3.3.1 Extent of NAPL/Tar

Discussed below are the findings with regard to the general distribution of NAPL/tar at the Site.

3.3.1.1 NAPL/Tar in Overburden Deposits

- The extent of NAPL/tar in the overburden was delineated and shown to be limited to areas within OU1. Data collected during OU2 RI activities supports this conclusion (refer to Figure 30 of the OU2 RIR, provided in Appendix A).

3.3.1.2 NAPL/Tar in Bedrock

- NAPL/tar was observed in rock core samples at five bedrock well locations (MW-122R, MW-130R, MW 131R1, MW-131R2, and MW-142R) throughout the course of the OU1 and OU2 RI activities (refer to Figure 31 of the OU2 RIR, provided in Appendix A). NAPL/tar was observed along near horizontal fracture surfaces in the shallow bedrock (upper ±20 feet below the top of rock). NAPL/tar was not encountered below the shallow bedrock with the exception of some indications in core in the uppermost part of the intermediate bedrock interval in the area of the 40 kcf gas holder (MW-130R).

- NAPL/tar was observed to have entered two of the wells screened in the shallow bedrock, MW-121R (on OU1) and MW-131R1 (on OU2). At these locations, equipment lowered into the well (e.g., threaded rod, bailer, oil/water interface probe, sampling pump, etc.) were partially coated with NAPL/tar upon retrieval from the well.
- The findings from the OU2 RI provided additional data that adequately defined the lateral and vertical extent of NAPL/tar in bedrock for the purposes of the RI.

3.3.2 Groundwater Quality

The following summarizes the findings with regard to constituent concentrations in overburden and bedrock groundwater at OU2. Groundwater quality data are summarized on Figures 32 through 41 of the OU2 RIR (provided in Appendix A) for overburden and bedrock. The constituent concentrations were compared to the New York State Class GA Groundwater Quality Criteria (i.e., the 6 NYCRR Part 703 Standards and guidance values from the Division of Water Technical and Operational Guidance Series [TOGS] 1.1.1).

3.3.2.1 Overburden Groundwater Quality

- Constituent concentrations in overburden groundwater were measured at levels above the NYS Class GA Groundwater Quality Criteria for one or more constituents in samples from overburden wells located on OU2.
- Generally, the most prevalent organic constituents detected at levels above the Class GA criteria in overburden groundwater were benzene, toluene, ethylbenzene and isomers of xylene (BTEX) and naphthalene. BTEX compounds, naphthalene, and other polycyclic aromatic hydrocarbons (PAHs) are contributed by NAPL related to the former MGP located within OU1, although these compounds may also be contributed by other sources/operations on-site. For example, the elevated benzene concentrations in groundwater in the eastern part of the Site are not clearly related to former MGP operations based on a lack of substantial MGP source material (i.e., NAPL/tar), the predominance of benzene relative to other BTEX compounds, and the presence of methyl tert-butyl ether (MTBE), which is not associated with MGP impacts (refer to Figures 32 and 38 of the OU2 RIR, provided in Appendix A).
- On OU2, BTEX compounds and naphthalene were not detected with the exception of well MW-116, located downgradient of the southwest corner of the Site. This is the area where overburden groundwater is not completely captured by the sewer system under West Utica Street, but rather some of the groundwater from the Site flows past the sewer and toward the south. Constituent concentrations in overburden groundwater in proximity to off-site occupied buildings are very low or non-detect, and thus there is no identified exposure pathway for Site constituents to humans via vapor intrusion in OU2.
- Although total cyanide was frequently detected in overburden groundwater at concentrations above the Class GA criterion within OU1, concentrations of total cyanide in off-site overburden groundwater, downgradient of OU1 are below the Class GA criterion (refer to Figures 33 and 37 of the OU2 RIR, provided in Appendix A).

3.3.2.2 Bedrock Groundwater Quality

- Constituent concentrations in bedrock groundwater were measured at levels above the NYS Class GA Groundwater Quality Criteria for one or more constituents in samples from several of the bedrock wells located on the properties that constitute OU1 and several of the bedrock wells located on the adjacent, off-site properties associated with OU2.
- Generally, the most prevalent organic constituents detected at levels above the Class GA criteria in bedrock groundwater were BTEX compounds and naphthalene. BTEX compounds, naphthalene, and

other PAHs are contributed by NAPL related to the former MGP, although these compounds may also be contributed by other sources/operations on-site. For example, the elevated benzene concentrations in groundwater in the eastern part of OU1, and in the off-site area to the south, are not clearly related to former MGP operations based on a lack of substantial MGP source material (i.e., NAPL/tar), the predominance of benzene relative to other BTEX compounds, and the presence of MTBE, which is not associated with MGP impacts (refer to Figure 34 of the OU2 RIR, provided in Appendix A).

- The findings with regard to bedrock groundwater quality conditions are summarized below.
  - **Shallow Bedrock Water-Bearing Zone** – Dissolved-phase impacts related to the former MGP in the shallow bedrock water-bearing zone migrate from the area where NAPL has been identified in the bedrock to the south and is captured by the buried railroad trench. The northern and western extents of MGP-related dissolved-phase impacts in shallow bedrock groundwater have been adequately delineated for the purposes of the RI.

    There is a source (or sources) of dissolved-phase constituents other than the former MGP contributing impacts to the shallow bedrock water-bearing zone and further evaluation of the lateral extent of these impacts (i.e., concentrations of benzene above Class GA criteria) is not warranted. For the purposes of the RI, given the understanding of groundwater flow based on thorough characterization and the distribution of MGP-related compounds (e.g., naphthalene) that are less likely to be greatly affected by non-MGP sources, the lateral extent of dissolved-phase MGP-related impacts in the shallow bedrock water-bearing zone have been adequately characterized (as illustrated on the isoconcentration maps presented as Figures 39 through 41 of the OU2 RIR, provided in Appendix A).
  - **Intermediate Bedrock Interval** - Elevated concentrations of BTEX compounds, naphthalene, and cyanide were detected in the upper part of the intermediate bedrock interval (MW 130R), directly below the shallow bedrock water-bearing zone, in the area adjacent to the northern (40 kcf) gas holder. At the two intermediate bedrock wells located south of the Site (MW-128R2 and MW-131R2) benzene was detected at relatively high concentrations in the upper part of the intermediate bedrock interval; in this area the benzene concentration is greater than in the overlying shallow bedrock water-bearing zone. There is some uncertainty as to the source of the elevated benzene in the intermediate bedrock at these off-site locations; i.e. it may not be entirely attributable to the former MGP.
  - **Deep Bedrock Water-Bearing Zone** - Dissolved-phase BTEX compounds, MTBE, and PAHs (primarily naphthalene) were detected at concentrations above the Class GA criteria in samples collected from on-site deep bedrock well MW-123RD; total cyanide was also detected, but at concentrations below the Class GA criterion (refer to Figures 34 and 35 of the OU2 RIR, provided in Appendix A). Benzene was detected at concentrations above the Class GA criterion in side-gradient well MW-146RD. Given the presence of benzene in MW-146RD, and the presence of MTBE in on-site deep bedrock well MW-123RD, there are sources other than the MGP that contribute dissolved phase impacts to the deep bedrock water-bearing zone.

    A mass flux assessment indicates that the discharge of the constituents detected in the deep bedrock water-bearing zone to the Oswego River does not impact surface water quality in the river. Based upon this, and due to other sources contributing dissolved-phase constituents to groundwater in the deep bedrock water-bearing zone, further evaluation of the lateral extent of dissolved-phase benzene concentrations within this zone is not warranted.

3.3.3 Evaluation of Potential Impacts to River from Site Constituents in Groundwater

To assess the potential for MGP-related constituents in groundwater to impact surface water quality in the Oswego River, an evaluation was conducted to estimate the rate at which a mass of Site related constituents dissolved in groundwater may be contributed (i.e., the mass flux) to the surface water in the Oswego River via multiple discharge pathways including: 1) the mass flux to the West Utica Street storm sewer from overburden groundwater, then directly to the river; 2) the mass flux to the trench and tunnel system from overburden and shallow bedrock groundwater, then directly to the river; and 3) the mass flux to the river from deep bedrock groundwater. The estimates indicate that the potential discharge of Site related constituents in overburden and bedrock groundwater to the Oswego River do not significantly impact surface water quality in the river, as the total estimated concentration of benzene in the Oswego River proximal to the Site during low-flow conditions would be 0.081 micrograms per liter (µg/L), which is more than two orders below the applicable surface water standards and guidance values for benzene.

3.3.4 Soil Vapor

Constituent concentrations in overburden groundwater in proximity to off-site occupied buildings are very low or non-detect, and thus a soil vapor evaluation was not necessary for assessing the exposure pathway for Site constituents to humans via vapor intrusion in OU2. Moreover, the soil vapor evaluation conducted as part of the OU1 RI indicated that vapors originating from subsurface, Site-related impacts are not impacting on-site buildings.

3.3.5 Human Health Exposure Assessment

The qualitative human health exposure assessment (HHEA) indicated there are potentially completed exposure pathways for MGP-related constituents in groundwater to potential current and future receptors. Potential for exposure to Site-related constituents exists via routes of dermal contact, inhalation of vapors volatilizing from the groundwater, accidental ingestion for potential receptors involved with excavation work (utility worker and future construction worker), ingestion of fish from the Oswego River by recreational fishermen and ingestion of water supply from Lake Ontario.

However, based on the understanding of OU2 conditions (e.g., Site-related constituent concentrations in overburden groundwater proximal to occupied buildings on OU2 are very low or non-detect and estimated Site-related benzene concentrations in the river are well below applicable surface water standards and guidelines), none of these pathways are expected to result in unacceptable exposure to potential receptors.

3.3.6 Fish and Wildlife Resources Impact Analysis

The Fish and Wildlife Resources Impact Analysis (FWRIA) indicates that no potential risk to wildlife resources exists from the presence of MGP-related constituents in environmental media on the properties that constitute OU2.

The Site vicinity offers moderate to low habitat value to wildlife since the Site consists of a partially vegetated lot and the surrounding areas are mostly commercial and residential developed areas. The extent of NAPL/tar in the overburden was delineated and shown to be limited to areas within OU1. Also, as discussed in Section 3.3.3, discharge of Site-related dissolved-phase constituents in groundwater does not impact surface water quality in the Oswego River near the Site.

Section 4

Remedial Goals and Remedial Action Objectives

This section identifies potentially applicable Standards, Criteria, and Guidance (SCGs) and presents the Remedial Action Goals and Remedial Action Objectives (RAOs) for the Site.

4.1 Identification of Standards, Criteria, and Guidance

The following federal, state, and local SCGs are considered potentially applicable to the remediation.

4.1.1 Federal SCGs

Potentially applicable federal SCGs include the following:

- **Laws, Policy and Guidance for Federal Superfund:** provides a listing of federal rules, regulations and guidance for the Superfund.
- **National Contingency Plan:** provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.
- **Waste Cleanup and Risk Assessment:** human health risk assessments.
- **9 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response:** health and safety.

4.1.2 State SCGs

Potentially applicable state SCGs include the following:

- **Division of Environmental Remediation SCGs:**
  - **NYSDEC Remediation Guidance and Policy Documents:** this includes but is not limited to Commissioner Policy (CP) documents CP-43: Groundwater Monitoring Well Decommissioning Policy and CP-51: Soil Cleanup Guidance Policy and DER series documents DER-4: Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment, DER-10: Technical Guidance for Site Investigation and Remediation, and DER-31: Green Remediation.
  - **6 NYCRR Part 364 - Waste Transporters:** establishes requirements, including permitting requirements, for waste transporters.
  - **6 NYCRR Part 370-374 and 376 - Hazardous Waste:** establishes requirements for management of hazardous waste and Land Disposal Restrictions (LDRs).
  - **6 NYCRR Part 375 - Environmental Remediation Programs:** establishes requirements for environmental remediation programs in New York State, including the Part 375 Soil Cleanup Objectives (SCOs).
- **Division of Materials Management SCGs:**
  - **6 NYCRR Part 360 - Solid Waste Management Facilities:** establishes solid waste management facility requirements. May be applicable for on-site consolidation of excavated soil.

- **Division of Water SCGs:**
  - **Technical and Operational Guidance Series:** includes a listing of guidance including TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
  - **6 NYCRR Part 702.15:** empowers NYSDEC to apply and enforce guidance where there is no promulgated standard.
  - **6 NYCRR Part 700-706 - NYSDEC Water Quality Regulations for Surface Waters and Groundwater:** includes 700 - Definitions, Samples and Tests; 701 - Classifications Surface Waters and Groundwaters; 702 - Derivation and Use of Standards and Guidance Values; 703 - Surface Water and Groundwater Quality Standards and Groundwater Effluent Standards.
  - **6 NYCRR Part 750-757 - Implementation of National Pollutant Discharge Elimination System (NPDES) Program in NYS:** regulations regarding the SPDES program.
- **Division of Environmental Permits SCGs:**
  - **DEC Permits Guidance:** listing of guidance for permits.
  - **6 NYCRR Part 621 - Uniform Procedures:** permit processing requirements.
- **Division of Air Resources SCGs:**
  - **Air Guidance and Policy Documents:** includes a listing of guidance including Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants.
  - **6 NYCRR Parts 200, 201, 211, 212, 257:** establishes requirements for air discharges, including required permitting and standards.
- **NYS Department of Health SCGs:**
  - **Generic Community Air Monitoring Plan:** provides requirements and action levels for community air monitoring.
  - **Guidance for Evaluating Soil Vapor Intrusion in New York:** for use in exposure assessments for vapor intrusion.
  - **Chemicals in Sports Fish and Game:** advisories of eating sportfish and game due to chemicals at levels of concern.
- **NYS Department of State SCGs:**
  - **Consistency Reviews:** guidance to insure federal and state "actions" in coastal areas are consistent with Coastal Management Program.
  - **State Coastal Policies:** policies regarding development in coastal areas.
  - **Part 600 - Department of State, Waterfront Revitalization and Coastal Resources Act:** includes Lakes Erie and Ontario, the St. Lawrence and Niagara Rivers, the Hudson River south of the federal dam at Troy, the East River, the Harlem River, the Kill Van Kull and Arthur Kill, Long Island Sound, and the Atlantic Ocean, etc.

4.1.3 Local SCGs

Potentially applicable local SCGs include the following:

- Local codes and ordinances in the City of Oswego.
- Local permits from the City of Oswego.

4.2 Remedial Goals

In accordance with 6 NYCRR Part 375-2.8(a), the goal for site remediation is to "…restore that site to pre-disposal conditions, to the extent feasible. At a minimum, the remedy selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by contaminants disposed at the site through the proper application of scientific and engineering principles."

4.3 Target Remediation Area

Based on the results of the RI findings, which are summarized in Section 3, MGP-related impacts in OU2 include sporadic observations of NAPL in bedrock and dissolved-phase contamination (primarily BTEX, naphthalene, and cyanide) in overburden and bedrock groundwater (including both shallow, intermediate, and deep bedrock). Soil, sediment, surface water, or soil vapor are not media of concern for OU-2.

Impacts to the overburden within OU2 were found to be very limited. As discussed in Section 3.3.1, NAPL/tar in the overburden was shown to be limited to areas within OU1. As discussed in Section 3.3.2, MGP-related constituents were not detected in overburden groundwater on OU2 with the exception of well MW-116, where BTEX compounds and naphthalene were detected above NYS Class GA Groundwater Quality Criteria.

Within bedrock, NAPL impacts were encountered within OU-2 at three bedrock locations, MW-131R1, MW-131R2, and MW-142R. NAPL was not observed in the intermediate or deep bedrock zones. Within bedrock groundwater, MGP-related constituents at concentrations above NYS Class GA Groundwater Quality Criteria extend from the OU1 area onto OU2. Dissolved-phase impacts in shallow bedrock migrate to the south (i.e., from OU1 to OU2) and are captured by a buried railroad trench.

The MGP-related groundwater impacts observed in OU2 overburden and bedrock groundwater are the result of NAPL/tar impacts within the overburden deposits beneath OU1 and the NAPL/tar in the shallow bedrock observed at both OU1 and OU2.

4.4 Remedial Action Objectives

As discussed in Section 2.4, the remedial actions to be implemented at OU1 are anticipated to address the source of the OU2 groundwater impacts. Based on this and the characteristics and locations of the MGP-related impacts within OU2 (refer to Section 4.3), the RAOs for OU2 are as follows:

- Groundwater RAOs for Public Health Protection
  - Prevent ingestion of groundwater with MGP-related constituent concentrations exceeding drinking water standards.
  - Prevent contact with, or inhalation of volatiles, from groundwater impacted with MGP-related constituents.
- Groundwater RAOs for Environmental Protection
  - Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
  - Prevent the discharge of contaminants to surface water.
  - Remove the source of ground or surface water contamination.

Section 5

General Response Actions

This section presents the development and screening of the General Response Actions (GRAs) to address the noted OU2 groundwater impacts. The GRAs are then developed and screened based on the potential to satisfy the RAOs established in Section 4.4. The screening process is summarized in Table 1.

5.1 No Action

The No Action GRA does not include any active remedial activities activity such as maintenance, monitoring, or establishment of institutional controls and would not achieve the Site RAOs. No Action is, however, retained to serve as the basis for comparison to other alternatives and in order to comply with DER-10 Section 4.4(b)3i.

5.2 Institutional Controls

ICs, typically in the form of Deed Restrictions or Environmental Easements, are commonly applied to properties where constituents of concern (COCs) will remain at concentrations greater than the SCGs. ICs would: (1) serve as notice of remaining impacts, (2) identify activity and use restrictions in impacted areas, and (3) require long-term monitoring and maintenance of engineering controls. For OU2, groundwater is not being used for consumption and is unlikely to be used in this manner in the future considering the City of Oswego provides a public water supply and NYS plumbing code (Section 602.3) requires use of public water supply when available. Therefore, imposition of ICs would not provide additional benefits to control groundwater exposure.

5.3 Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) relies on naturally occurring processes to reduce the mass of COCs or control their mobility and/or migration. Groundwater monitoring is conducted to confirm the effectiveness of this approach.

As discussed in Section 2.4, the implementation of the OU1 remedy will address the primary source of the groundwater impacts. As a result, following OU1 remedial action, OU2 groundwater quality is expected to gradually improve through natural attenuation. Therefore, MNA is considered to be a viable approach and has been retained for further consideration.

5.4 Removal

The removal GRA considers groundwater extraction for the purpose of hydraulic containment of impacted groundwater and NAPL recovery for the purpose of potential source removal/reduction.

5.4.1 Groundwater Removal (Hydraulic Containment)

Groundwater removal is performed in order to achieve hydraulic containment, which includes the extraction of impacted groundwater in order to reduce or eliminate migration. It can be combined with physical barriers (e.g., surface caps or subsurface vertical barriers) to reduce the amount of groundwater that needs to be extracted. It must be applied in conjunction with ex situ treatment and discharge of the treated water or with off-site treatment/disposal.

COCs present in OU2 groundwater are not impacting potential human or environmental receptors. In addition, groundwater quality within OU2 is anticipated to improve through implementation of the OU1 remedy, which addresses the primary source of groundwater impacts. While possible, hydraulic containment would not provide additional levels of protectiveness to human health or the environment at OU2. Therefore, the GRA of hydraulic containment has been eliminated from further consideration.

5.4.2 NAPL Removal (NAPL Recovery)

NAPL removal involves the physical removal of NAPL from the subsurface through NAPL recovery wells. It requires that the recovered NAPL be containerized and disposed off-site.

The OU1 remedy is anticipated to address the majority of the NAPL impacts identified at the Site. The physical removal of NAPL (if encountered) from within the OU2 area can be an effective means of improving groundwater quality, augmenting the effect of the OU1 remedy. Therefore, NAPL removal has been retained for further consideration.

5.5 In Situ Treatment

In situ treatment of NAPL and impacted groundwater can be accomplished through various methods, including physical encapsulation (solidification/stabilization), thermal treatment, bioremediation, and chemical oxidation.

Encapsulation approaches are not feasible in bedrock where the majority of the OU2 impacts are situated. Biological or chemical in situ treatments are generally not effective in bedrock where NAPL may be present. Thermal treatment may be effective but would require the installation of a vapor recovery system over the footprint of the treatment area, which would be impractical considering the large size of the plume, the presence of numerous residential properties and public areas, and the small unsaturated thickness in the area. For these reasons, the in situ treatment GRA has been eliminated from further consideration.

5.6 Ex Situ Treatment

Ex situ treatment involves on-site treatment of impacted materials following their removal, primarily through physical, chemical, or biological processes. At OU2, ex situ treatment would only be applicable for the treatment of groundwater extracted as part of hydraulic containment. Hydraulic containment has been eliminated as part of the GRA screening process; therefore, ex situ treatment is not carrier further in the analysis.

5.7 Off-Site Treatment/Disposal

This approach involves the transportation and treatment/disposal of the impacted materials at an off-site permitted facility, following their removal from the Site. This may include hazardous waste or non-hazardous waste treatment/disposal facilities, based on waste characterization.

At OU2, off-site treatment/disposal would only apply to the recovered groundwater or NAPL. Off-site treatment/disposal of groundwater is not considered further because groundwater extraction is not carried forward as a result of eliminating the GRA of hydraulic containment. Off-site treatment/disposal of NAPL has been retained since it would be required with the NAPL removal GRA, which was retained.

Section 6

Identification and Screening of Technologies

This section presents the identification and screening of the remedial technologies. The outcome of this process is the establishment of the list of remedial technologies that will be used to assemble the remedial alternatives for the site.

6.1 Identification of Technologies

Potentially applicable remedial technologies associated with each of the GRAs retained after the screening presented in Section 5 were identified based on their applicability and documented effectiveness for the media of concern and COCs. The applicable candidate remedial technologies are presented in Table 2.

6.2 Screening of Technologies

The technologies were evaluated and screened based on their applicability to be implemented based on the Site-specific conditions. A summary of the results of the screening process is presented in Table 2. Based on the screening, the technologies listed below were retained to be used in assembling of the remedial alternatives. Refer to Table 2 for comments justifying the retention or elimination of a remedial technology.

The technologies retained from the screening are as follows:

- **No Action:** retained to serve as a basis for comparison of other alternatives and in order to comply with DER-10 Section 4.4(b)3i.
- **MNA:** includes periodic sampling/analysis of groundwater samples obtained from monitoring wells located within and around the plume for MGP-related constituents and periodic evaluation of groundwater conditions.
- **NAPL Recovery:** includes monitoring and recovery of NAPL, if encountered, utilizing recovery wells screened in areas where NAPL was encountered during the RI.
- **Off-Site Treatment/Disposal:** includes treatment/disposal of waste material (e.g., recovered NAPL) at an off-site permitted facility.

Section 7

Development of Alternatives

This section presents the development and analysis of remedial alternatives to address the groundwater impacts at OU2. Following development of the alternatives, a detailed analysis is performed, where the alternatives are evaluated against the prescribed criteria specified in 6 NYCRR Subpart 375-2.8(c)(2)(i) and in general accordance with Section 4.3(a) of DER-10.

7.1 Development of Alternatives

The remedial technologies retained after the technology screening have been assembled into a range of potential remedial alternatives for further evaluation, which are described in the following sub-sections.

7.1.1 Alternative 1 – No Action

Under the No Action alternative, no remediation would be performed at the Site. This alternative is included in the analysis to serve as a base line for comparison with other remedial alternatives.

7.1.2 Alternative 2 –MNA

Alternative 2 involves the implementation of an MNA program, which would include monitoring the anticipated improvement of the groundwater quality following the implementation of the OU1 remedial action. The OU1 remedial activities are anticipated to be conducted in 2020.

The MNA program would utilize existing monitoring wells located within and around the identified MGP-related groundwater impacts. Periodic groundwater sampling would be conducted, and samples would be analyzed for MGP-related constituents. The monitoring well network, monitoring frequency, and parameters would be proposed in a Remedial Design (RD)/Remedial Action (RA) documents as outlined in DER-10. The RD/RA documents will include monitoring plans which will be incorporated into the SMP for the Site. Results from the monitoring program would be reported to the NYSDEC in Periodic Review Reports (PRR). During implementation of the MNA program, the number of monitoring wells to be sampled and frequency of the collection of samples may be modified based on the trends in the analytical results when compared to previous monitoring events and as approved by the NYSDEC.

7.1.3 Alternative 3 – NAPL Recovery with Off-Site Treatment/Disposal and MNA

Alternative 3 consists of physical removal of NAPL by means of recovery, followed by off-site treatment/disposal, and implementation of an MNA program for groundwater.

This alternative would require the installation of NAPL recovery wells in the shallow bedrock for periodic NAPL gauging and recovery. Liquids extracted as part of the periodic NAPL recovery would be containerized in drums and transported off-site for treatment/disposal at a permitted facility.

The MNA program would be similar to that described previously for Alternative 2 (refer to Section 7.1.2).

Section 8

Analysis of Alternatives

This section presents the analysis of the remedial alternatives. It includes the presentation of the evaluation criteria and the analysis of the individual alternatives against the evaluation criteria. The analysis is summarized in Table 3.

8.1 Evaluation Criteria

The evaluation of each remedial alternative considers the following eight criteria as prescribed in DER-10:

1. Overall Protectiveness of Public Health and the Environment
2. Compliance with SCGs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility, or Volume
5. Short-Term Impacts and Effectiveness
6. Implementability
7. Cost Effectiveness
8. Land Use

Per DER-10, a ninth criterion of Community Acceptance will be evaluated after the public review of the remedy selection process; therefore, it is not included in this report. Detailed descriptions of the evaluation criteria are provided below:

Overall Protectiveness of Public Health and the Environment: This criterion is an evaluation of the ability of each alternative to protect public health and the environment. It includes the evaluation of the ability of each alternative to eliminate, reduce or control through removal, treatment, containment, engineering controls or institutional controls any existing or potential human exposures or environmental impacts identified by the RI. This criterion also evaluates the ability of each alternative to achieve each of the RAOs. The overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with SCGs. Per DER-10 Section 4.2(a)1i, this criterion, along with the criterion of "Compliance with SCGs" is a threshold criterion, which must be satisfied in order for an alternative to be considered for selection.

Compliance with SCGs: This threshold criterion is an evaluation of the ability of each alternative to comply with SCGs and determines whether a remedy will meet applicable environmental laws, regulations, standards, and guidance. For those SCGs that are not met, an evaluation of the impacts of each and whether waivers are necessary is performed. Applicable SCGs for the Site were identified in Section 4.1.

Long-Term Effectiveness and Permanence: This criterion evaluates the long-term effectiveness of the remedy after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated:

- The magnitude of the remaining risks (i.e., will there be any significant threats, exposure pathways, or risks to the community and environment).

- The adequacy of the engineering and institutional controls intended to limit the risk.
- The reliability of these controls.
- The ability of the remedy to continue to meet RAOs in the future.

Reduction of Toxicity, Mobility, and Volume: This criterion evaluates the ability of each alternative to reduce the toxicity, mobility or volume of Site contamination. The evaluation focuses on the following specific factors:

- The quantity of impacted materials that will be reduced, destroyed or treated.
- The degree of expected reduction in toxicity, mobility, or volume.
- The degree to which the treatment will be irreversible.
- The type and quantity of treatment residuals that will remain following treatment.

Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the Site.

Short-Term Impact and Effectiveness: This criterion evaluates the potential short-term adverse impacts and risks of each alternative upon the community, the workers, and the environment during construction and/or implementation. The evaluation includes consideration as to how adverse impacts and health risks to the community or workers, if any, at the Site will be controlled, and the effectiveness of the controls. Further, this criterion considers engineering controls that will be used to mitigate short-term impacts (e.g., traffic control plans, dust/odor control measures). The length of time needed to implement the alternative and achieve the RAOs is estimated and included in the evaluation.

Implementability: This criterion evaluates the technical and administrative feasibility of implementing each alternative. Technical feasibility includes the difficulties associated with the construction and monitoring the effectiveness of the remedy. Administrative feasibility includes the availability of the necessary personnel and material along with potential difficulties in obtaining specific operating approvals, access for construction, permits, etc. for remedy implementation. This criterion also considers the reliability and viability of engineering and institutional controls implemented as part of an alternative (if any).

Cost Effectiveness: This criterion includes an evaluation of the cost (capital, operation, maintenance, and monitoring costs) of each alternative and an assessment as to whether the cost is proportional to the overall effectiveness of the alternative. These costs are developed and presented on a present worth basis for comparison purposes. The estimated costs are considered Class 4 Cost Estimates prepared in accordance with Association for the Advancement of Cost Engineering (AACE) guidelines with an expected accuracy of -30% to +50%, which is consistent with United States Environmental Protection Agency's (USEPA's) RI/FS Guidance (USEPA, 1988). A contingency of 10% was applied to address unforeseen costs and account for uncertainty. Present worth costs are estimated using a discount factor of 3%. The estimates for each alternative are presented in Appendix B.

Land Use: This criterion includes an evaluation of the current, intended and reasonably anticipated future use of the Site and its surroundings, as it relates to the alternative or remedy, when unrestricted levels would not be achieved.

8.2 Individual Analysis of Alternatives

In this section, the alternatives identified and developed in Section 7.1 are individually analyzed with respect to the evaluation criteria. A summary of the analysis is provided in Table 3. Cost estimates are included in Appendix B.

8.2.1 Alternative 1 – No Action

Overall Protectiveness of Public Health and the Environment: Current conditions within OU-2 are protective of public health and the environment, as COCs are not impacting potential human or environmental receptors. In addition, after completion of the OU1 remedy, MGP-related impacts are anticipated to further attenuate at OU2 and improve upon current conditions. However, since this alternative does not include a monitoring program, there would be no mechanism for assessing the potential changes in the groundwater quality within OU2 that may affect human or environmental exposure under future conditions.

Compliance with SCGs: Alternative 1 would not comply with SCGs since the alternative would not involve any remediation or monitoring of the groundwater that does not comply with applicable SCGs.

Long-Term Effectiveness and Permanence: As discussed, under current conditions, noted groundwater impacts within OU2 are not impacting potential human or environmental receptors. The conditions are anticipated to improve following implementation of the OU1 remedy. Therefore, Alternative 1 is anticipated to meet the OU2 RAOs in the long-term. However, since Alternative 1 does not include a monitoring program, its effectiveness cannot be confirmed.

Reduction of Toxicity, Mobility, or Volume: Alternative 1 relies on natural attenuation to reduce the toxicity, mobility, and volume of MGP-related constituents, which is anticipated to be effective following OU1 remedy implementation.

Short-Term Impact and Effectiveness: No short-term impacts would be realized through the implementation of Alternative 1 since no remedial construction would be performed.

Implementability: Alternative 1 does not require implementation of any remedial components and is therefore considered technically and administratively feasible to implement.

Cost Effectiveness: There are no costs associated with Alternative 1, however, the alternative is not considered cost effective as it would not confirm long-term protectiveness or attainment of RAOs.

Land Use: OU2 is located in an urban setting and it includes both commercial and residential areas (refer to Section 2.1), as well as City streets. Future uses of the properties encompassing OU2 are likely to remain the same. Current and future land use at OU2 are not anticipated to be impacted by Alternative 1.

8.2.2 Alternative 2 – MNA

Overall Protectiveness of Public Health and the Environment: Current conditions within OU-2 are protective of public health and the environment, as COCs are not impacting potential human or environmental receptors. In addition, after completion of the OU1 remedy, MGP-related impacts are anticipated to further attenuate at OU2 and improve upon current conditions. Alternative 2 includes a groundwater monitoring program, which provides a long-term means of assessing the groundwater conditions and exposure potential under future scenarios.

Compliance with SCGs: Alternative 2 would comply with SCGs through a combination of monitoring, data evaluation, and reporting.

Long-Term Effectiveness and Permanence: As discussed, under current conditions, noted groundwater impacts within OU2 are not impacting potential human or environmental receptors. The conditions are anticipated to improve following implementation of the OU1 remedy. Therefore, Alternative 2 is anticipated to meet the OU2 RAOs in the long-term. Alternative 2 includes a monitoring program, which would allow for the long-term evaluation of the effectiveness of the alternative.

Reduction of Toxicity, Mobility, or Volume: Alternative 2 relies on natural attenuation to reduce the toxicity, mobility, and volume of MGP-related constituents, which is anticipated to be effective following OU1 remedy implementation.

Short-Term Impact and Effectiveness: Alternative 2 involves a minor amount of short-term impacts due to the performance of periodic groundwater sampling on non-owned properties. These short-term impacts are anticipated to be relatively minor and can be managed through the adherence to standard protocols and a Site-specific Health and Safety Plan.

Implementability: Alternative 2 relies on standard groundwater monitoring activities and is, therefore, considered technically feasible to implement. The alternative is also considered administratively feasible as necessary personnel and materials are readily available and permits or other approvals are not anticipated to be an issue. Obtaining access agreements is not anticipated to be an issue as they have been successfully obtained for the implementation of the RI activities.

Cost Effectiveness: For Alternative 2, capital costs are limited to RD/RA document and SMP preparation. The annual costs consist of implementing the monitoring, evaluation, and reporting associated with the MNA program. A 30-year present worth of the alternative is estimated at $1,683,000.

Land Use: OU2 is located in an urban setting and includes both commercial and residential areas, as well as City streets. Future uses of the properties encompassing OU2 are likely to remain the same. Current and future land use at OU2 are not anticipated to be impacted by Alternative 2.

8.2.3 Alternative 3 – NAPL Recovery with Off-Site Treatment/Disposal and MNA

Overall Protectiveness of Public Health and the Environment: Current conditions within OU-2 are protective of public health and the environment, as COCs are not impacting potential human or environmental receptors. In addition, the conditions are anticipated to improve following implementation of the OU1 remedy. The NAPL monitoring and recovery component of Alternative 3 will reduce the volume of NAPL, which may further enhance natural groundwater restoration in OU2. Alternative 3 also includes a groundwater monitoring program, which provides a long-term means of assessing the groundwater conditions and exposure potential under future scenarios.

Compliance with SCGs: Alternative 3 would comply with SCGs through a combination of monitoring, NAPL recovery (as needed), data evaluation, and reporting.

Long-Term Effectiveness and Permanence: As discussed, under current conditions, noted groundwater impacts within OU2 are not impacting potential human or environmental receptors. The conditions are anticipated to improve following implementation of the OU1 remedy. The effectiveness of Alternative 3 is further enhanced by the NAPL monitoring and recovery component. Therefore, Alternative 3 is anticipated to meet the OU2 RAOs in the long-term. Alternative 3 includes a monitoring program, which would allow for the long-term evaluation of the effectiveness of the alternative.

Reduction of Toxicity, Mobility, or Volume: Alternative 3 relies on natural attenuation to reduce the toxicity, mobility, and volume of MGP-related constructions, which is anticipated to be effective following OU1 remedy implementation. Additional reduction in NAPL volume may be provided by the NAPL monitoring, removal, and disposal component of the remedy.

Short-Term Impact and Effectiveness: Alternative 3 would result in some short-term impacts associated with recovery well installation, NAPL monitoring/recovery, and groundwater sampling on non-owned properties. These short-term impacts are anticipated to be relatively minor and can be managed through the adherence to standard protocols and a Site-specific Health and Safety Plan.

Implementability: Alternative 3 relies on standard remedial technologies associated with well installations, NAPL monitoring/recovery, and groundwater monitoring and is, therefore, considered to be technically feasible. The alternative is also considered administratively feasible as necessary personnel and materials are available and approvals/access are not anticipated to be an issue. Obtaining access agreements is not anticipated to be an issue as they have been successfully obtained for the implementation of the RI activities.

Cost Effectiveness: For Alternative 3, the capital costs include installation of the NAPL recovery wells and preparation of RD/RA documents and an SMP. The annual costs consist of implementing the NAPL monitoring/recovery program and MNA program. A 30-year present worth of the alternative is estimated at $1,762,000.

Land Use: OU2 is located in an urban setting and it includes both commercial and residential areas, as well as City streets. Future uses of the properties encompassing OU2 are likely to remain the same. Current and future land use at OU2 are not anticipated to be impacted by Alternative 3.

8.3 Comparative Analysis of Alternatives

This section presents the comparison of the relative performance of each remedial alternative using the eight evaluation criteria presented in Section 7.2.1. Comparisons are conducted in a qualitative manner and identify substantive advantages and disadvantages between the alternatives. A summary discussion of the evaluation criterion is included in the following subsections. A tabulation of the evaluation has been prepared and is included on Table 3. The alternative that satisfies each criterion to the highest degree is discussed first and the remaining alternatives are discussed thereafter in order of the degree to which they satisfy the criterion.

8.3.1 Overall Protectiveness of the Public Health and the Environment

Current conditions within OU-2 are protective of public health and the environment as COCs are not impacting potential human or environmental receptors. In addition, after completion of the OU1 remedy, MGP-related impacts are anticipated to further attenuate at OU2 and improve upon current conditions. Therefore, all three alternatives are protective of public health and environment. Alternatives 2 and 3 include monitoring of the groundwater quality which provides the long-term means of assessing the groundwater conditions and exposure potential under future scenarios. Alternative 3 provides a slightly higher level of overall protectiveness of public health and environment as it also includes monitoring and recovery of NAPL in the OU2 area. Alternative 1 does not provide this groundwater monitoring; therefore, Alternative 1 is less protective of public health and the environment than Alternatives 2 and 3.

8.3.2 Compliance with SCGs

Alternatives 2 and 3 would both comply with applicable SCGs through a combination of monitoring, NAPL recovery (Alternative 3), data evaluation, and reporting. Alternative 1 would not comply with SCGs since the alternative would not involve any remediation or monitoring to address groundwater that does not comply with applicable SCGs.

8.3.3 Long-Term Effectiveness and Permanence

Under current conditions, COCs in OU2 groundwater are not impacting potential human or environmental receptors. Conditions are anticipated to improve following implementation of the OU1 remedy. Therefore, all three alternatives are anticipated to meet the OU2 RAOs in the long-term. Alternatives 2 and 3 include a monitoring program, which would allow for the long-term monitoring and confirmation of the effectiveness of the alternative. The long-term effectiveness of Alternative 3 will be further enhanced, compared to Alternative 2, through the additional component of NAPL monitoring and recovery. Alternative 1 does not include a monitoring program to confirm long-term effectiveness.

8.3.4 Reduction of Toxicity, Mobility, and Volume

Alternatives 3 offers the highest degree of reduction in toxicity, mobility, and volume of MGP-related impacts as it includes monitoring and removal of NAPL in addition to natural attenuation of groundwater impacts. Alternatives 1 and 2 rely solely on natural attenuation of groundwater impacts, which is anticipated to be effective following OU1 remedy implementation.

8.3.5 Short-term Impact and Effectiveness

No short-term impacts would be realized through the implementation of Alternative 1 since no on-site activities or construction would be performed. Alternative 2 involves a minor amount of impacts as it includes periodic groundwater sampling. Alternative 3 would result in more short-term impacts as, in addition to the groundwater sampling, it includes the installation of NAPL recovery wells and periodic NAPL monitoring/recovery. The short-term impacts associated with Alternatives 2 and 3 are anticipated to be relatively minor and can be managed through the adherence to standard protocols and a Site-specific Health and Safety Plan.

8.3.6 Implementability

Alternative 1 does not require implementation of any remedial components and is therefore considered technically and administratively feasible. Alternatives 2 and 3 are technically feasible to implement with readily available and conventional construction methods that can be obtained from a wide variety of vendors. Alternatives 2 and 3 are also administratively feasible as necessary personnel and materials are available and approvals/access are not anticipated to be an issue. Obtaining access agreements for Alternatives 2 and 3 is not anticipated to be an issue as they have been successfully obtained for the implementation of the RI activities.

8.3.7 Cost Effectiveness

Alternative 2 is considered the most cost effective alternative as it would satisfy the threshold criteria (overall protection of public health and the environment and compliance with SCGs), achieve the RAOs, and would allow for continued use of the Site that is consistent with current Site use.

Alternative 3 is also considered cost effective for the same reasons as Alternative 2, however, its overall cost is higher than Alternative 2.

Although there are no costs associated with Alternative 1, it is not considered cost effective as it would not confirm long-term protectiveness or attainment of RAOs.

8.3.8 Land Use

The land use at OU2 would not be impacted by implementation of any of the three remedial alternatives.

Section 9

Recommended Remedy

Based on the results of the analysis of the alternatives against the eight evaluation criteria prescribed in DER-10, Alternative 3 (NAPL Recovery with Off-Site Treatment/Disposal and MNA) is the recommended alternative for the Site. This section presents the recommend remedy, including the remedy description and rationale behind the remedy selection, as well as the evaluation of the ECs and ICs associated with the proposed remedy.

9.1 Remedy Description

A conceptual layout of Alternative 3 is depicted on Figure 4 and includes the following components:

- Implementation of periodic NAPL monitoring and recovery at designated NAPL recovery wells.
- Transportation and treatment/disposal of NAPL at a permitted off-site facility.
- Implementation of an MNA program for groundwater.

The NAPL monitoring/recovery program (e.g., well network and monitoring/recovery frequency) and MNA program (e.g., monitoring well network, monitoring frequency, and parameters) will be proposed in an RD/RA document (prepared subsequent to the FS). The approved plans will be incorporated into the Operation and Maintenance (O&M) Plan and Monitoring Plan components of the SMP for the Site. Results from the monitoring program would be reported to the NYSDEC in PRR. During implementation of the NAPL monitoring/recovery and MNA programs, the plans may be modified based on the results from initial operations/monitoring and as approved by the NYSDEC.

If groundwater monitoring indicates a change in conditions that could potentially lead to a completed exposure pathway or if natural attenuation is not proceeding at a satisfactory rate towards the objective of attaining the NYS Class GA Groundwater Quality Criteria for MGP-related constituents, National Grid would coordinate with the NYSDEC to determine if supplemental remediation measures (i.e., contingency actions) may be necessary to further address OU2 groundwater. Supplemental measures could consist of further evaluation of potentially completed exposure pathway(s), some combination of engineering or institutional controls to address potentially completed exposure pathway(s), or a remediation approach to supplement natural attenuation (e.g., in situ chemical oxidation, in situ enhanced bioremediation). If deemed necessary, an evaluation would be conducted in accordance with DER-10, including consideration of evaluation criteria established in 6 NYCRR Part 375-1.8(f) (i.e., Overall Protectiveness of Public Health and the Environment, Compliance with SCGs, Long-Term Effectiveness and Permanence, Reduction of Toxicity, Mobility, or Volume, Short-Term Impacts and Effectiveness, Implementability, Cost Effectiveness, Community Acceptance, and Land Use considerations). The evaluation would take into account the results from groundwater monitoring, Site conditions at the time of the evaluation, and technical practicability considerations with respect to remediating bedrock groundwater considering the presence of NAPL. Based on the results of the evaluation, supplemental remedial measures may be recommended.

It is premature to identify supplemental and/or contingency remedial measures at this time. It will take multiple years of monitoring to understand the effects that OU1 remediation has on OU2 groundwater. Site conditions are anticipated to change over that time. Any supplemental/contingency remedial measures for OU2 would be based on the results from groundwater monitoring and Site conditions at the time of the evaluation.

9.2 Rationale

There are currently no human or environmental receptors being impacted by COCs within OU2 and conditions are anticipated to improve following implementation of the OU1 remedy, which is anticipated to address the primary source impacting OU2 groundwater. Therefore, all three alternatives are anticipated to meet the OU2 RAOs in the long-term. Unlike Alternative 1, Alternatives 2 and 3 include a monitoring program, which would allow for the long-term monitoring and confirmation of the effectiveness of the natural attenuation of OU2 groundwater. Compared to Alternative 2, Alternative 3 offers the additional benefit of potential NAPL volume reduction through the NAPL monitoring and recovery component, which may further enhance the natural attenuation and restoration of OU2 groundwater.

9.3 Evaluation of the Engineering and Institutional Controls

The recommended remedy for OU2 does not include ECs or ICs. ICs for the restriction of groundwater use are not necessary since OU2 groundwater is not being used for consumption and is unlikely to be used in this manner in the future considering the City of Oswego provides a public water supply and NYS plumbing code (Section 602.3) requires use of public water supply when available.

Section 10

References

AACE International, February 2020, AACE International Recommended Practice No. 107R-19, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries.

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New York State Department of Environmental Conservation, May 2010. DER-10 / Technical Guidance for Site Investigation and Remediation. DEC Program Policy.

Panamerican Consultants, Inc. September 2010. Phase IA Cultural Resources Investigation at National Grid's Former Manufactured Gas Plant Site, West Utica Street, City of Oswego, Oswego County, New York.

United States Environmental Protection Agency, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.

Tables

TABLE 1
IDENTIFICATION AND SCREENING OF GENERAL RESPONSE ACTIONS
OSWEGO (WEST UTICA STREET) FORMER MANUFACTURED GAS PLANT SITE – OU2
OSWEGO, NEW YORK

General Response Action	Description	Retained or Eliminated	Basis/Comments
No Action	Does not include any proposed remedial activity such as maintenance, monitoring, or establishment of institutional controls.	Retained	• Serves as a basis for comparison of other alternatives. A no action alternative is required in order to comply with DER-10 Section 4.4(b)3i.
Institutional Controls (ICs)	Establishment of institutional controls such as a Deed Restriction or Environmental Easement to: (1) serve as notice of remaining impacts, (2) identify activity and use restrictions in impacted areas, and (3) require long-term monitoring and maintenance of engineering controls, if any.	Eliminated	• The impacted groundwater is not being used for potable water and is unlikely to be used in the future considering that the City of Oswego provides a public water supply and NYS plumbing code (Section 602.3) requires use of public water supply when available. Therefore, imposition of ICs would not provide additional benefits regarding controlling public exposure to the impacted groundwater.
Monitored Natural Attenuation (MNA)	MNA relies on naturally occurring processes to reduce the constituents of concern (COC) mass or control the mobility/migration of COCs. Groundwater monitoring is conducted to confirm the effectiveness of natural attenuation.	Retained	• Following implementation of the OU1 remedy, which addresses the primary source of OU2 groundwater impacts, OU2 groundwater quality is expected to gradually improve through natural attenuation.
Removal (Groundwater)	Removal of groundwater may be performed in order to achieve hydraulic containment of the impacted groundwater to reduce or eliminate migration. It can be combined with physical barriers (surface caps or subsurface vertical barriers) to reduce the amount of groundwater that needs to be extracted. It must be applied in conjunction with ex situ treatment and discharge of the treated water or off-site treatment/disposal.	Eliminated	• Although groundwater removal (primarily through groundwater extraction via wells) to achieve hydraulic containment is feasible, it would not provide any additional level of protectiveness to human health or the environment. Under current conditions, COCs present in OU2 groundwater are not impacting human or environmental receptors and the current conditions will be improved through implementation of the OU1 remedy, which will address the primary source of groundwater impacts.
Removal (NAPL)	Physical removal of NAPL by means of recovery (e.g., bailing, pumping, vacuum extraction, etc.). Requires combination with off-site disposal.	Retained	• The OU1 remedy will address the majority of NAPL impacts, however, removal of NAPL through the use of recovery wells could be an effective means of potentially reducing remaining NAPL, which would improve groundwater quality.
In Situ Treatment	In situ treatment of impacted groundwater and NAPL through various methods, including physical encapsulation (e.g., solidification/stabilization), thermal treatment, bioremediation, and chemical oxidation.	Eliminated	• Encapsulation approaches are not feasible in bedrock, where the majority of the OU2 impacts are situated. • In situ biological or chemical treatment is typically not effective in bedrock where NAPL may be present. • Thermal treatment could be effective; however, it requires that a vapor recovery system be installed over the footprint of the treatment area. This would not be practical considering the large size of the plume, the presence of numerous residential properties and public areas, and the small unsaturated thickness in the area.

TABLE 1
IDENTIFICATION AND SCREENING OF GENERAL RESPONSE ACTIONS
OSWEGO (WEST UTICA STREET) FORMER MANUFACTURED GAS PLANT SITE – OU2
OSWEGO, NEW YORK

General Response Action	Description	Retained or Eliminated	Basis/Comments
Ex Situ Treatment	On-site treatment of groundwater following removal primarily through physical, chemical, or biological processes or stabilization/solidification.	Eliminated	• On-site ex situ treatment could be applicable for the treatment of extracted groundwater. However, since groundwater removal was eliminated (see above), on-site ex situ treatment has been eliminated.
Off-Site Treatment/ Disposal	Transportation of recovered groundwater and/or NAPL to a an off-site, permitted facility for treatment/disposal.	Retained	• Off-site treatment/disposal has been retained since it would be the method of waste management for an alternative involving NAPL removal.

TABLE 2
IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
OSWEGO (WEST UTICA STREET) FORMER MANUFACTURED GAS PLANT SITE – OU2
OSWEGO, NEW YORK

General Response Action	Candidate Technology	Retained or Eliminated	Basis/Comments
No Action	No Action	Retained	• Serves as a basis for comparison to other alternatives. A no action alternative is required in order to comply with DER-10 Section 4.4(b)3i.
MNA	MNA	Retained	• An MNA program would include periodic sampling/analysis of groundwater from monitoring wells located within and downgradient of the plume for MGP-related constituents and periodic evaluation of groundwater conditions. • Implementation of the OU1 remedy is expected to address the primary source of the OU2 groundwater impacts resulting in the gradual improvement of the groundwater quality within OU2. MNA has been retained as a potential remedial component.
Removal (NAPL)	NAPL Recovery	Retained	• Subsurface NAPL observed during the RI was predominantly non-mobile; however, mobile NAPL has been observed entering two shallow bedrock monitoring wells: MW-121R (located on OU1) and MW-131R1 (located on OU2). NAPL recovery wells may be installed these areas to monitor and extract the recoverable portion of the NAPL.
Off-Site Treatment/ Disposal	Off-Site Treatment/ Disposal	Retained	• Treatment/disposal at an off-site permitted facility is applicable for the treatment/disposal of NAPL, which may be removed from NAPL recovery wells.

TABLE 3

REMEDIAL ALTERNATIVES EVALUATION SUMMARY

OSWEGO (WEST UTICA STREET) FORMER MGP SITE – OU2

OSWEGO, NEW YORK

Evaluation Criteria	ALTERNATIVE 1 No Action	ALTERNATIVE 2 MNA	ALTERNATIVE 3 NAPL Recovery with Off-Site Treatment/Disposal and MNA
Overall Protectiveness of Public Health and the Environment	• OU1 remedy would address primary source of OU2 impacts. • OU2 impacts are expected to naturally attenuate. • Protective of public health and the environment under current conditions, as human or environmental receptors are not impacted. • The alternative does not include monitoring which would be necessary to confirm the effectiveness of the OU1 remedy, OU2 natural attenuation and protectiveness under future conditions.	• OU1 remedy would address primary source of OU2 impacts. • OU2 impacts are expected to naturally attenuate. • Protective of public health and the environment under current conditions, as human or environmental receptors are not impacted. • Includes a groundwater monitoring program, providing the means of assessing future groundwater conditions and resulting exposure potential.	• OU1 remedy would address primary source of OU2 impacts. • OU2 impacts are expected to naturally attenuate. • Alternative 3 also includes NAPL monitoring and recovery in the OU2 area, which will further enhance source mitigation. • Protective of public health and the environment under current conditions, as human or environmental receptors are not impacted. • Includes a groundwater monitoring program, providing the means of assessing future groundwater conditions and resulting exposure potential.
Compliance with SCGs	• Does not comply with SCGs since the alternative does not involve any remediation or monitoring to address groundwater that does not comply with applicable SCGs.	• Complies with SCGs through a combination of monitoring, data evaluation and assessment of MNA, and reporting.	• Complies with SCGs through a combination of monitoring, NAPL recovery (if necessary), data evaluation and assessment of MNA, and reporting.
Long-Term Effectiveness and Permanence	• COCs are not currently impacting human or environmental receptors. • OU2 groundwater conditions are anticipated to improve following the implementation of the OU1 remedy. • RAOs are anticipated to be achieved long-term. • No monitoring program so the effectiveness of the alternative cannot be confirmed.	• COCs are not currently impacting human or environmental receptors. • OU2 groundwater conditions are anticipated to improve following the implementation of the OU1 remedy • RAOs are anticipated to be achieved long-term. • The monitoring program will allow for the long-term assessment of the effectiveness of this alternative.	• COCs are not currently impacting human or environmental receptors. • OU2 groundwater conditions are anticipated to improve following the implementation of the OU1 remedy • RAOs are anticipated to be achieved long-term. • The monitoring program will allow for the long-term assessment of the effectiveness of this alternative. • Alternative 3 includes NAPL monitoring and recovery, which may further reduce NAPL volume.
Reduction of Toxicity, Mobility, or Volume	• OU1 remedy will reduce mobility and volume of the primary source impacting OU2 groundwater. • Relies on natural attenuation to further reduce toxicity, mobility, and volume of COCs in OU2 groundwater.	• OU1 remedy will reduce mobility and volume of the primary source impacting OU2 groundwater. • Relies on natural attenuation to further reduce toxicity, mobility, and volume of COCs in OU2 groundwater.	• OU1 remedy will reduce mobility and volume of the primary source impacting OU2 groundwater. • Additional NAPL volume reduction may be achieved through monitoring and NAPL recovery. • Relies on natural attenuation to further reduce toxicity, mobility, and volume of COCs in OU2 groundwater.

TABLE 3
REMEDIAL ALTERNATIVES EVALUATION SUMMARY
OSWEGO (WEST UTICA STREET) FORMER MGP SITE – OU2
OSWEGO, NEW YORK

Evaluation Criteria	ALTERNATIVE 1 No Action	ALTERNATIVE 2 MNA	ALTERNATIVE 3 NAPL Recovery with Off-Site Treatment/Disposal and MNA
Short-Term Impact and Effectiveness	• Does not include implementation of any remediation, therefore, would not have short-term impacts	• Short-term impacts related to implementing periodic groundwater monitoring on non-owned properties. • Impacts are anticipated to be minimal. • Impacts are controlled using standard procedures and adherence to a Site-Specific Health and Safety Plan. • Monitoring is anticipated to occur for up to 30 years.	• Short-term impacts related to recovery well installation, periodic NAPL recovery, and groundwater sampling on non-owned properties. • Impacts are anticipated to be minimal. • Impacts are controlled using standard procedures and adherence to a Site-Specific Health and Safety Plan. • Monitoring and recovery are anticipated to occur for up to 30 years.
Implementability	• This alternative does not require implementation of any remedial components.	• Technically feasible since the alternative relies on standard technologies (groundwater sampling and analysis). • Administratively feasible since the necessary personnel and materials are readily available and approvals/access agreements are not anticipated to be an issue as they were not during RI activities.	• Technically feasible since the alternative relies on standard technologies (groundwater sampling and analysis, well installation, NAPL recovery). • Administratively feasible since the necessary personnel and materials are readily available and approvals/access agreements are not anticipated to be an issue as they were not during RI activities.
Cost Effectiveness	• No cost (see cost tables). • The alternative would not confirm long-term protectiveness or attainment of RAOs; therefore, the alternative is not cost-effective.	• Low cost (see cost tables). • Would achieve RAOs with minimal impact to future operation and uses. The alternative is considered to be highly cost effective.	• Low cost (see cost tables). • Would achieve RAOs with minimal impact to future operation and uses. The alternative is considered to be cost effective.
Land Use	• No impact on current or future Site use.	• No impact on current or future Site use.	• No impact on current of future Site use.

Figures

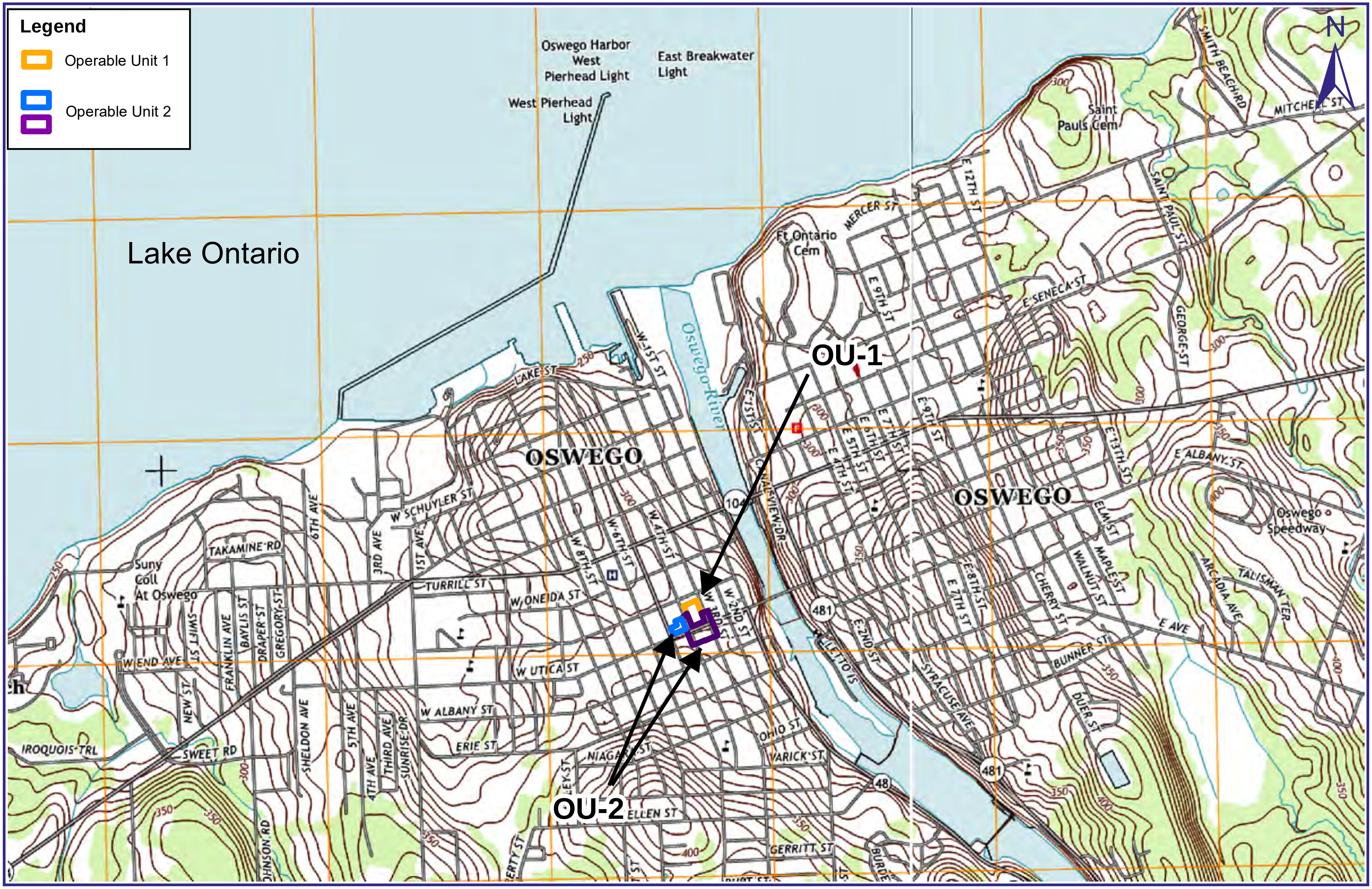


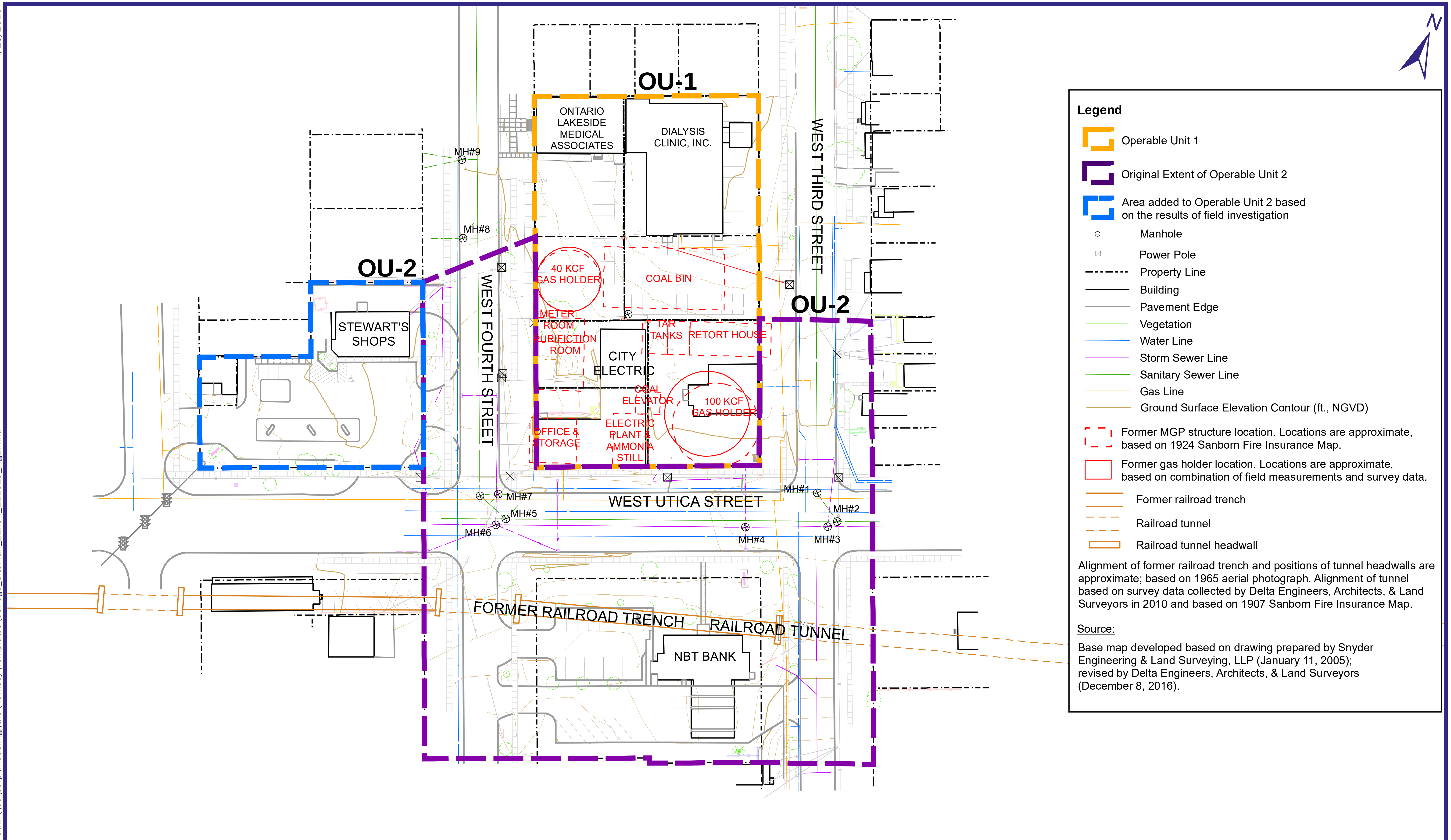
FIGURE 1
SITE LOCATION
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK

Source: USGS 7.5 Minute Topographic Maps
Oswego West Quadrangle (2013)
Oswego East Quadrangle (2013)

0 1,000 2,000
Feet

Brown AND Caldwell

4/28/2020
Path: \\bc\corp\Modeling\GIS\Ramsey\Templates\Oswego_Site_Loc_121619_Fig1.mxd
Author: asantiago

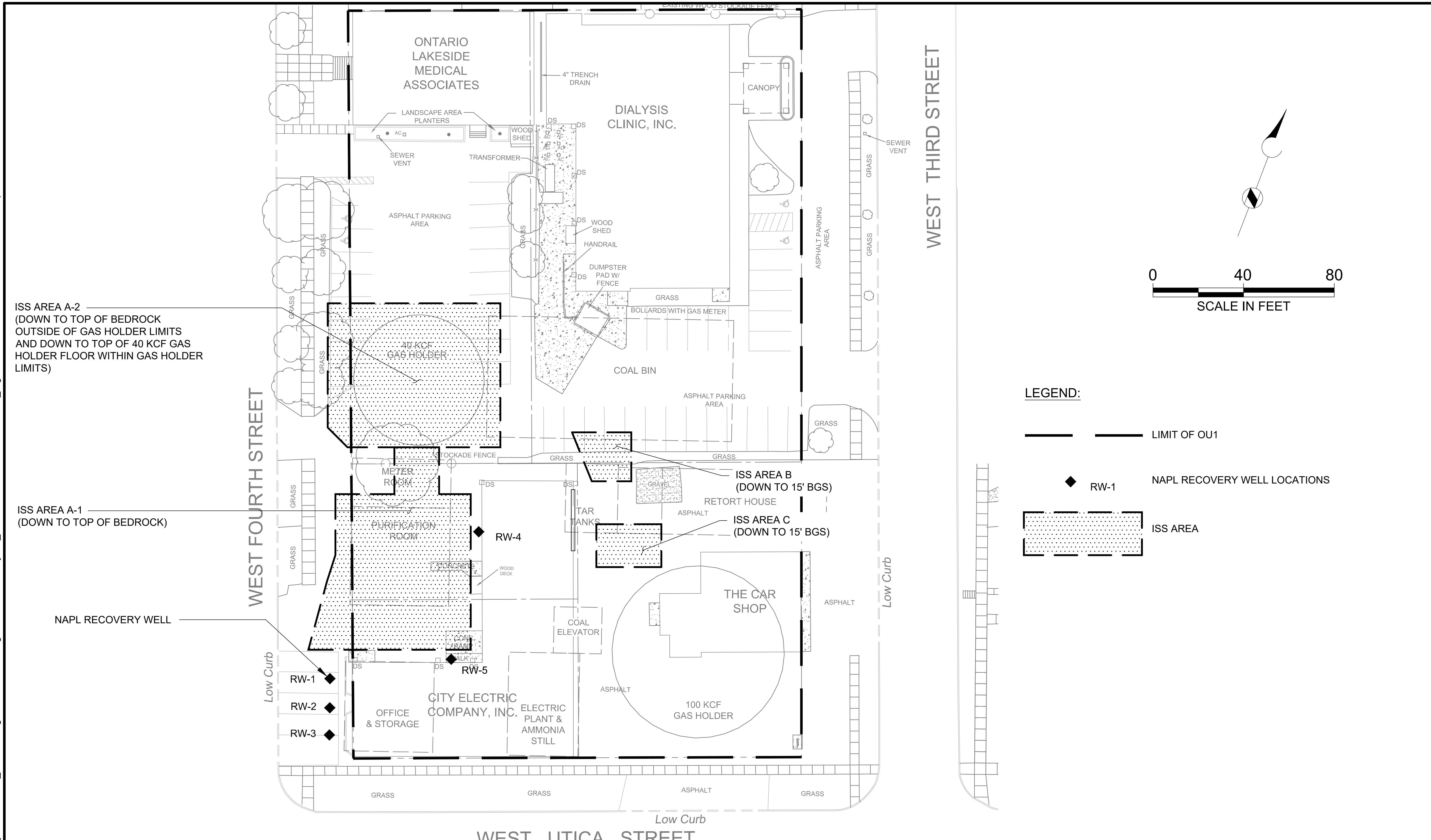


4/29/2020

Author: asantiago Path: \\bc\corp\Modeling\GIS\Ramsey\Templates\Oswego_SitePlan_22x34_121619_Fig2.mxd

Brown AND Caldwell

FIGURE 2
SITE PLAN
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK



Brown AND Caldwell

SCALE: 1" = 40'

154244

DATE: April 29, 2020

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

OU1 REMEDY

FIGURE
3

Path: \\bcusrfp01\projects\National_Grid\Oswego\154224 - Oswego - OU2 Alt. Analysis_CAD\2-SHEETS\C-CIVIL\RDR_Figures File Name: FIG-3 Plot Date: April 29, 2020 1:02 PM Cadd User: Alan Santiago

LEGEND:

LIMIT OF OU1

LIMIT OF OU2

MONITORING WELL

EXTENT OF DISSOLVED-PHASE NAPHTHALENE CONCENTRATIONS IN OVERBURDEN GROUNDWATER - 10 µg/L ISOCONCENTRATION CONTOUR.

EXTENT OF DISSOLVED-PHASE NAPHTHALENE CONCENTRATIONS IN SHALLOW BEDROCK GROUNDWATER - 10 µg/L ISOCONCENTRATION CONTOUR.

EXTENT OF DISSOLVED-PHASE NAPHTHALENE CONCENTRATIONS IN DEEP BEDROCK GROUNDWATER - 10 µg/L ISOCONCENTRATION CONTOUR.

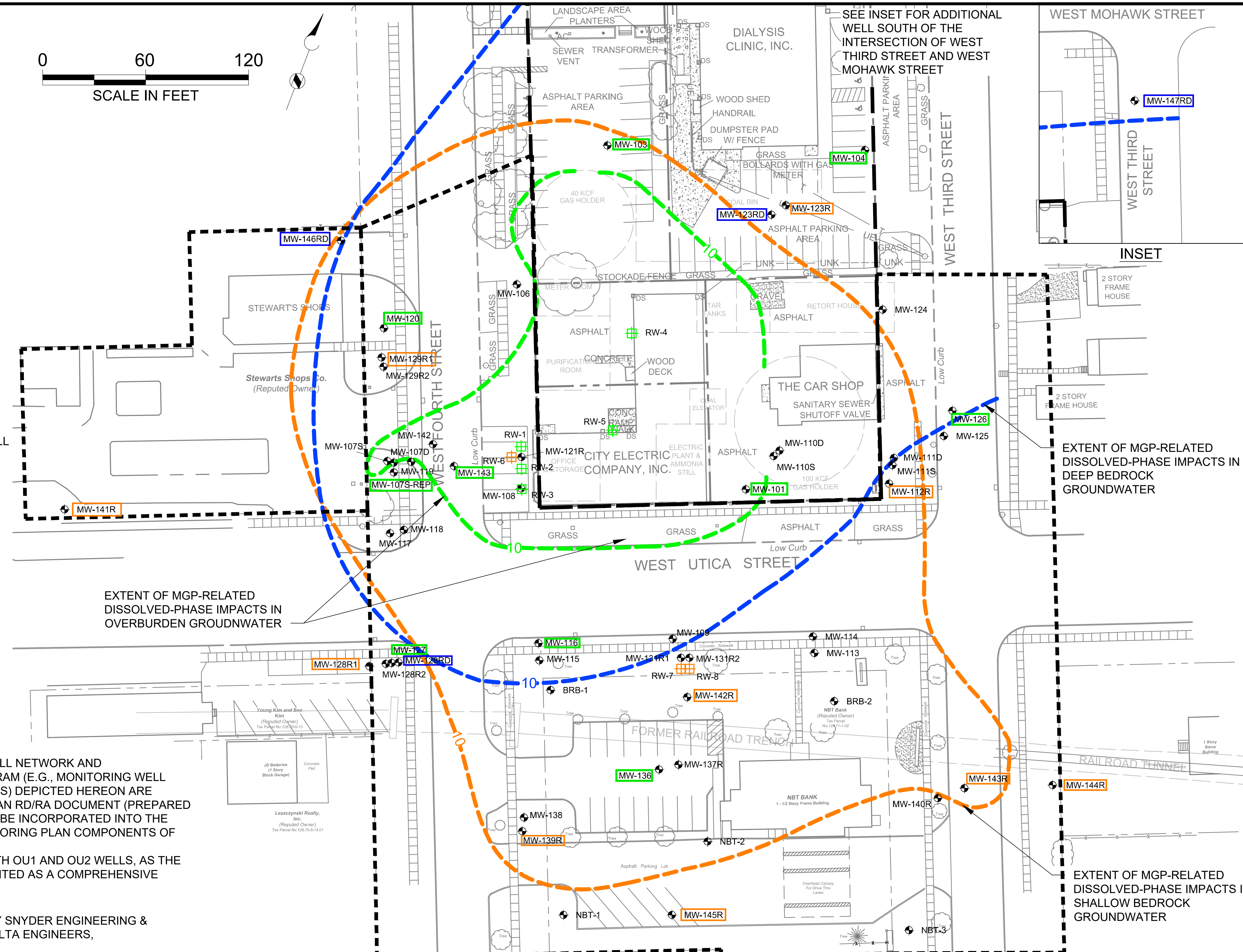
MW-118 DENOTES OVERBURDEN MONITORING WELL INITIALLY INCLUDED IN MNA PROGRAM

MW-141R DENOTES SHALLOW BEDROCK MONITORING WELL INITIALLY INCLUDED IN MNA PROGRAM

MW-123RD DENOTES DEEP BEDROCK MONITORING WELL INITIALLY INCLUDED IN MNA PROGRAM

SHALLOW BEDROCK NAPL RECOVERY WELL (TO BE INSTALLED AS PART OF OU2 REMEDIATION)

OVERBURDEN NAPL RECOVERY WELL (TO BE INSTALLED AS PART OF OU1 REMEDIATION)



NOTES:

1. THE NAPL MONITORING/RECOVERY PROGRAM (E.G., WELL NETWORK AND MONITORING/RECOVERY FREQUENCY) AND MNA PROGRAM (E.G., MONITORING WELL NETWORK, MONITORING FREQUENCY, AND PARAMETERS) DEPICTED HEREON ARE CONCEPTUAL. THE PROGRAMS WILL BE PROPOSED IN AN RD/RA DOCUMENT (PREPARED SUBSEQUENT TO THE FS). THE APPROVED PLANS WILL BE INCORPORATED INTO THE OPERATION AND MAINTENANCE (O&M) PLAN AND MONITORING PLAN COMPONENTS OF THE SITE MANAGEMENT PLAN (SMP) FOR THE SITE.
2. THE WELL NETWORK DEPICTED HEREON INCLUDES BOTH OU1 AND OU2 WELLS, AS THE O&M AND MONITORING PROGRAM WOULD BE IMPLEMENTED AS A COMPREHENSIVE SITE-WIDE PROGRAM.

SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005); REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 8, 2016).

Brown AND Caldwell

SCALE: 1" = 60'

154224

DATE: 11/10/2020

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

OU2 RECOMMENDED REMEDY:
ALTERNATIVE 3 - NAPL RECOVERY WITH OFF-SITE TREATMENT/DISPOSAL AND MNA

4

Path: \\bcusrfp01\projects\National_Grid\Oswego\154224 - Oswego - OU2 Alt. Analysis_CAD\2-SHEETS\C-CIVIL\RDR_Figures File Name: FIG-4 Plot Date: November 13, 2020 11:02 AM Cadd User: Alan S

Appendix A: Figures from the February 2019 Operable Unit 2 Remedial Investigation Report

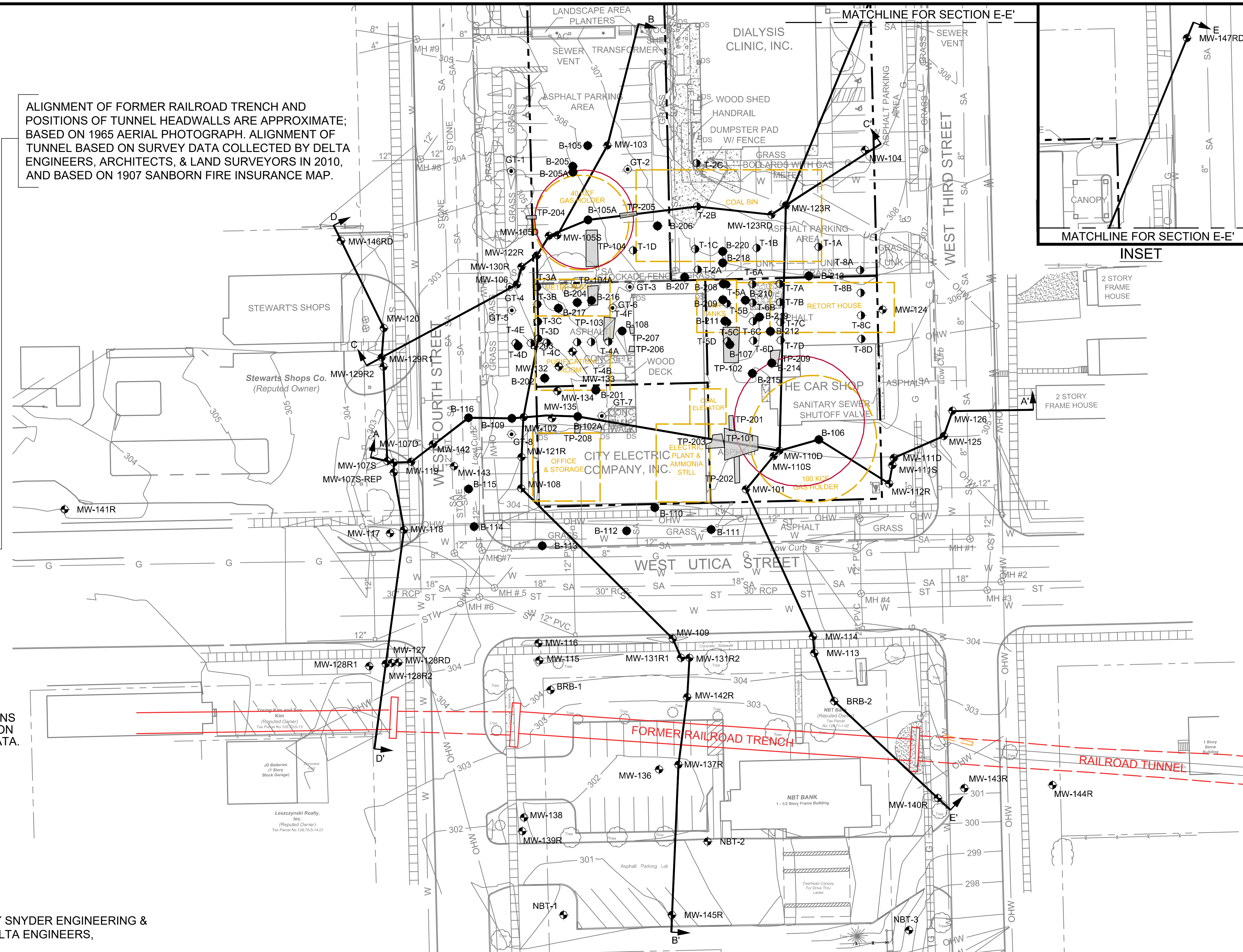
Path: P:\National_Grid\Oswego\149792_NG_Oswego -OU2 SRI_CAD\2-SHEETS\B-GEOTECHNICAL File Name: Figure-2(Site_Plan) Plot Date: January 22, 2019 11:34 AM Cadd User: Robert Near

0 60 120
SCALE IN FEET

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

LEGEND:

- MONITORING WELL
- TRANSECT BORING LOCATION
- SOIL BORING
- GEOTECHNICAL BORING
- TP-102 TEST PIT
- MANHOLE
- POWER POLE
- W WATER LINE
- G GAS LINE
- SA SANITARY SEWER
- ST STORM SEWER
- UE UNDERGROUND ELECTRIC LINE
- PROPERTY LINE
- 305 GROUND SURFACE ELEVATION CONTOUR (FT., NGVD) CONTOUR INTERVAL = 1 FT.
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL
- FORMER MGP STRUCTURE LOCATION. LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- A A' GEOLOGIC CROSS-SECTION ALIGNMENT



SOURCE:
BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005); REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 8, 2016).

Brown AND Caldwell	SCALE: 1" = 60' 152555.100 DATE: January 16, 2019	NATIONAL GRID OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2 OSWEGO, NEW YORK	FIGURE 2 SITE PLAN	FIGURE 2

P:\NATIONAL_GRID\OSWEGO\149792_NG_OSWEGO -OU2 SRI_CAD\2-SHEETS\B-GEOTECHNICAL\FIGURE 4 (CROSS-SECTIONS A-A' & B-B')-R1.DWG 01/16/2019 12:47:22PM By:rnear XREFS: SECTIONS Layout: 34X22

MW-107D	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	**1.5**	**513**	ND	ND	ND
PAHs	ND	ND	1.7	**233**	ND	ND	ND
TCN	62	62	166	ND	12	6.7 J	ND

MW-107S-REP	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**12**	ND	ND	ND
PAHs	**57**	**17**	2	2
TCN	ND	49	92 J	97

MW-119	Nov-08	Apr-09	Dec-10	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND	ND	ND
PAHs	ND	ND	0.28	ND	ND	ND
TCN	65	36	25.9	46	23 J	31

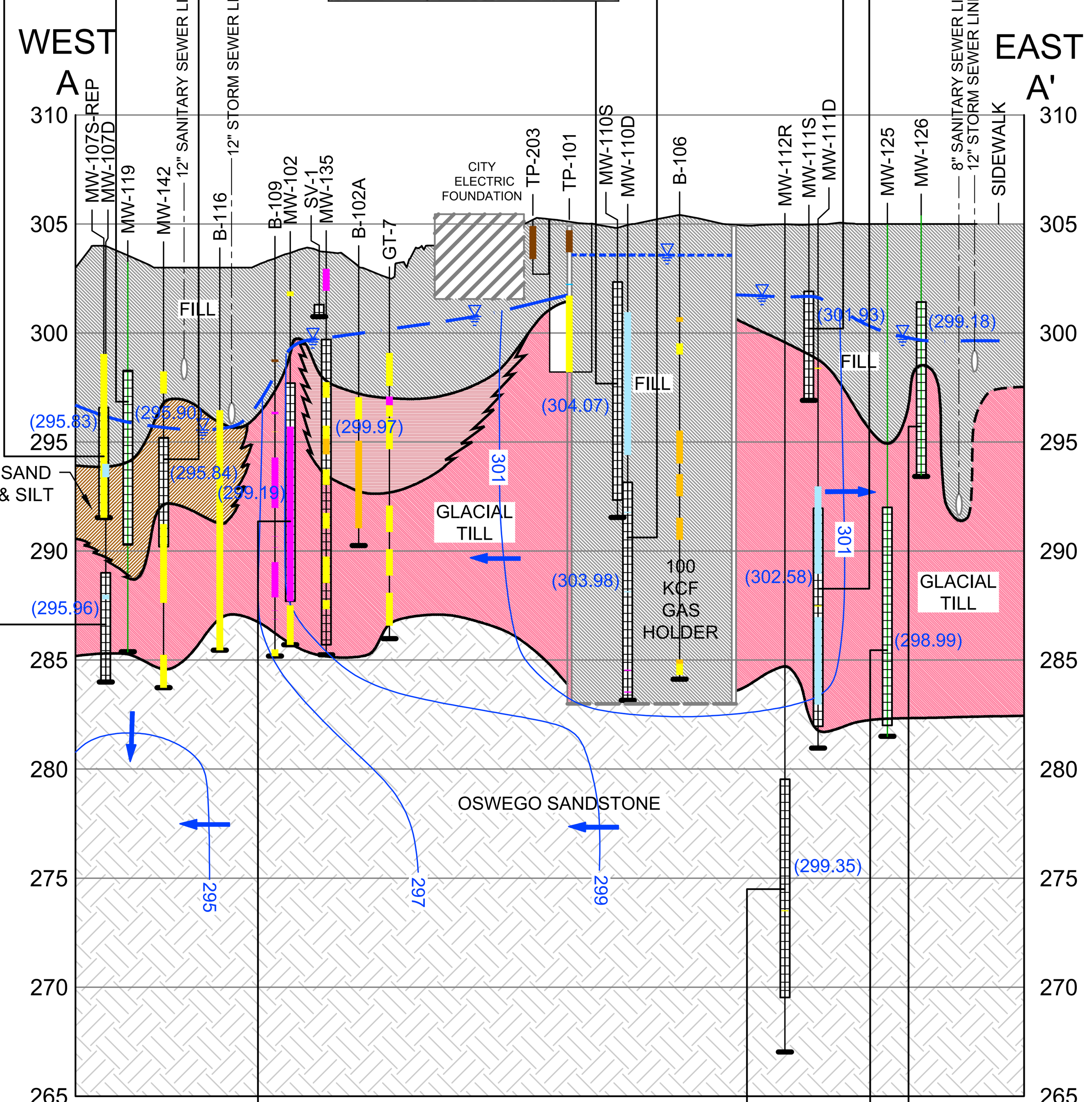
MW-142	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**2457**	**288**	**13**	**175**
PAHs	**4337**	**450**	**43**	**142**
TCN	6.7 J	67	44 J	120

MW-111D	Nov-08	Apr-09	Dec-10
BTEX	**26602**	**17272**	**26000**
PAHs	**21**	**27**	2.1
TCN	188	115	174

MW-111S	Nov-08	Apr-09	Dec-10
BTEX	ND	ND	ND
PAHs	ND	ND	ND
TCN	23.6	42	38.1

MW-110D	Nov-08	Apr-09	Dec-10
BTEX	**6.1**	**6.9**	**1.7**
PAHs	34	34	25
TCN	61.9	**248**	**224**

MW-110S	Nov-08 *	Apr-09	Dec-10
BTEX	**3.5**	**9**	**2.6**
PAHs	18	34	27
TCN	118	**204**	189



CROSS-SECTION A-A'

MW-102	Nov-08	Apr-09	Dec-10	Nov-17
BTEX	NS	NS	NS	NS
PAHs	NS	NS	NS	NS
TCN	NS	NS	NS	NS

MW-112R	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17 *
BTEX	**9660**	**5321**	**10110**	**14000**	**10000**	**10110**	**9830**
PAHs	**92**	**120**	**270**	**180**	**160**	0.18 J	**110**
TCN	75	87	121	90	91	140	100

MW-125	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15 *	Jul-17	Nov-17
BTEX	**3.7**	**3.7**	ND	ND	ND	ND	ND
PAHs	ND	ND	ND	ND	ND	0.38	ND
TCN	14.5	19	28.7	28.7	10	12	12

MW-126	Dec-10	Dec-14	Apr-15	Jul-17 *	Nov-17
BTEX	ND	ND	ND	ND	ND
PAHs	ND	**2.1**	ND	**1.8**	ND
TCN	10.8	8.2 J	ND	7.7 J	6.5 J

MW-105D	Nov-08	Apr-09	Dec-10
BTEX	**31300**	**26900**	NS
PAHs	**9470**	**7920**	NS
TCN	**320**	**270**	NS

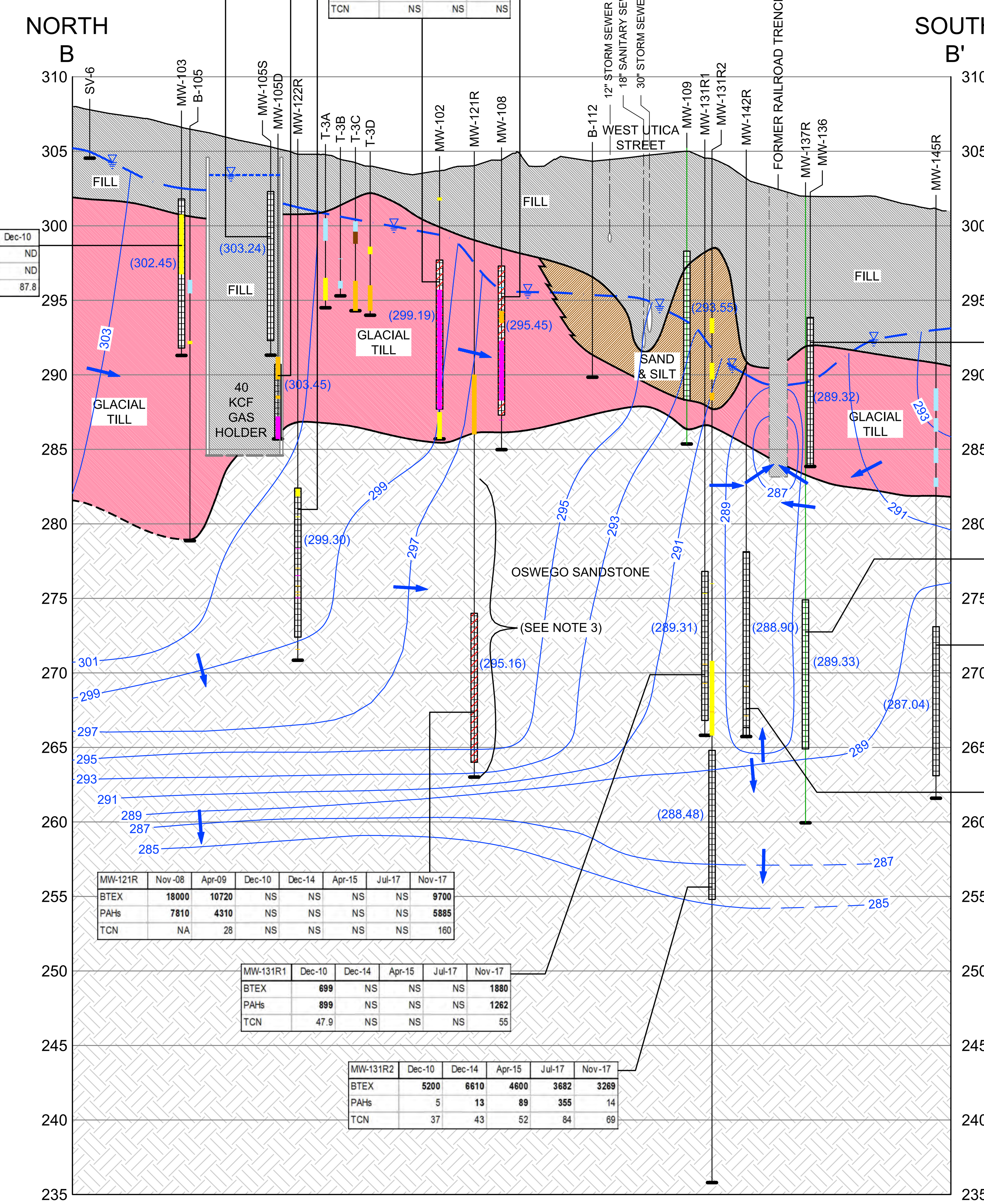
MW-105S	Nov-08	Apr-09	Dec-10
BTEX	**9.7**	**3.2**	ND
PAHs	2.7	ND	ND
TCN	18.8	ND	9.5J

MW-122R	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**9670**	**6190**	**10470**	**11900**	**9090**	**8450**	**7600**
PAHs	**6227**	**4210**	**4842**	**4619**	**3962**	**2427**	**3040**
TCN	**3110**	**662 J**	**5330**	**470**	**560**	**750**	**880**

MW-108	Nov-08	Apr-09	Dec-10
BTEX	**7690**	**1897**	NS
PAHs	**10468**	**5040**	NS
TCN	**317**	**268 J**	NS

MW-102	Nov-08	Apr-09	Dec-10
BTEX	NS	NS	NS
PAHs	NS	NS	NS
TCN	NS	NS	NS

MW-103	Nov-08	Apr-09	Dec-10
BTEX	ND	ND	ND
PAHs	ND	ND	ND
TCN	56.2	98	87.8



CROSS-SECTION B-B'

MW-136	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND
PAHs	ND	0.84 J	ND	ND
TCN	90	6.1 J	8.7 J	9.5 J

MW-137R	Dec-14	Apr-15 *	Jul-17	Nov-17 *
BTEX	**3405**	**4090**	**4650**	**4105**
PAHs	**321**	**975**	**1205**	**1907**
TCN	96	42	54 J	63

MW-145R	Jul-17	Nov-17
BTEX	**120**	**250**
PAHs	ND	ND
TCN	ND	ND

MW-142R	Jul-17	Nov-17
BTEX	**10040**	**11400**
PAHs	**7811**	**7314**
TCN	120	140

MW-121R	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**18000**	**10720**	NS	NS	NS	NS	**9700**
PAHs	**7810**	**4310**	NS	NS	NS	NS	**5885**
TCN	NA	28	NS	NS	NS	NS	160

MW-131R1	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**699**	NS	NS	NS	**1880**
PAHs	**899**	NS	NS	NS	**1262**
TCN	47.9	NS	NS	NS	55

MW-131R2	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**5200**	**6610**	**4600**	**3682**	**3269**
PAHs	5	**13**	**89**	**355**	14
TCN	37	43	52	84	69

0 60 120
SCALE IN FEET
HORIZONTAL

0 6 12
SCALE IN FEET
VERTICAL
10x VERTICAL EXAGGERATION

LEGEND:

MW-111S — MONITORING WELL / SOIL BORING / TEST PIT IDENTIFICATION AND APPROXIMATE LOCATION

GENERALIZED GROUND SURFACE

WELL SCREEN INTERVAL

SUMP

TOTAL DEPTH OF BOREHOLE

NAPL OBSERVED WITHIN WELL CASING DURING OCTOBER 2017 GAUGING EVENT

FILL

SILT & CLAY

SAND & SILT

GLACIAL TILL

BEDROCK

MW-111D	Nov-08	Apr-09	Dec-10
BTEX	**26602**	**17272**	**26000**
PAHs	**21**	**27**	2.1
TCN	188	115	174

GROUNDWATER QUALITY DATA. VALUES REPORTED IN MICROGRAMS PER LITER (ug/L). BOLD VALUE INDICATES THAT ONE OR MORE CONSTITUENTS ARE ABOVE CLASS GA CRITERIA.

WATER TABLE, 10/30/17

WATER LEVEL IN GAS HOLDER, 10/30/17

EQUIPOTENTIAL LINE
(DASHED WHERE INFERRED)

GENERALIZED DIRECTION OF GROUNDWATER FLOW
(IN PLANE OF CROSS-SECTION)

(NM) NOT MEASURED

(301.49) GROUNDWATER ELEVATION, 10/30/17

VISUAL/OLFACTORY IMPACTS (SEE NOTE 2):

- TAR SATURATED
- COATED MATERIAL, LENSES
- HARDENED TAR
- BLEBS, GLOBS, SHEEN
- STAINING, ODOR
- PETROLEUM IMPACTS SATURATION & SHEENS
- PETROLEUM IMPACTS STAINING & ODORS
- NO OBSERVED IMPACTS

ABBREVIATIONS:

BTEX	BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE ISOMERS
PAHs	POLYCYCLIC AROMATIC HYDROCARBONS
TCN	TOTAL CYANIDE
NS	NOT SAMPLED DUE TO NAPL PRESENCE
ND	NOT DETECTED
J	ESTIMATED CONCENTRATION
*	TABLE LISTS HIGHEST CONCENTRATION FROM ORIGINAL AND DUPLICATE SAMPLE

NOTES:

1. CROSS-SECTIONS DO NOT DEPICT ALL IDENTIFIED SUBSURFACE UTILITIES. POSITIONS OF DEPICTED SEWERS ARE ESTIMATED AND APPROXIMATE.
2. NYSDEC's STANDARD COLORS AND ASSOCIATED DESCRIPTORS FOR REPORTING MGP IMPACTS WERE USED TO DEPICT INTERVALS WHERE IMPACTS WERE OBSERVED.
3. UPON REMOVAL OF PUMP AND WATER LEVEL PROBE FOLLOWING COMPLETION OF WATER LEVEL RECOVERY TEST, NAPL WAS OBSERVED COATING BOTTOM FIVE FEET OF PUMP TUBING AND WATER LEVEL PROBE. NAPL OBSERVATIONS IN THE ROCK CORE SAMPLES NOT APPARENT UPON EXAMINATION. BRACKETED INTERVAL (21 - 41' BGS) IS REPRESENTATIVE OF OPEN ROCK INTERVAL AT TIME OF NAPL OBSERVATION. ACTUAL DEPTH OF NAPL OBSERVATION IS UNKNOWN.

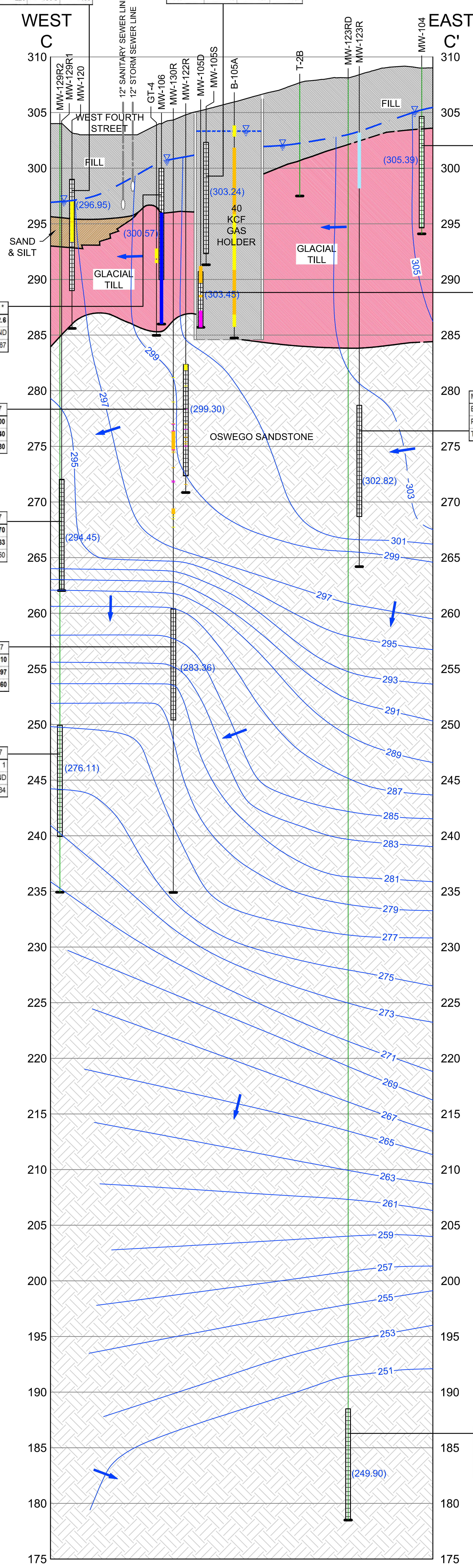
FIGURE 4
HYDROGEOLOGIC CROSS-SECTIONS A-A' & B-B'

NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

DATE 12/2018

PROJECT NUMBER 152555.100

Brown AND Caldwell
UPPER SADDLE RIVER
NEW JERSEY



CROSS-SECTION C-C'

0 60 120
SCALE IN FEET
HORIZONTAL

0 6 12
SCALE IN FEET
VERTICAL

10x VERTICAL EXAGGERATION

MW-120	Nov-08 *	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND	ND	ND	ND
PAHs	ND	ND	**0.28**	ND	ND	ND	ND
TCN	174	93	**245**	ND	**220**	150 J	130

MW-105S	Nov-08	Apr-09	Dec-10
BTEX	**9.7**	**3.2**	ND
PAHs	2.7	ND	ND
TCN	19	ND	9.5J

MW-104	Nov-08	Apr-09	Dec-10
BTEX	ND	ND	ND
PAHs	ND	ND	ND
TCN	ND	ND	ND

MW-106	Nov-08	Apr-09	Dec-10 *
BTEX	**4.3**	**1.9**	**2.6**
PAHs	ND	ND	ND
TCN	174	59	167

MW-105D	Nov-08	Apr-09	Dec-10	Jul-14 *
BTEX	**31300**	**26900**	NS	**20090**
PAHs	**9470**	**7920**	NS	**9216**
TCN	**320**	**270**	NS	**288**

MW-122R	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**9670**	**6190**	**10470**	**11900**	**9090**	**8450**	**7600**
PAHs	**6227**	**4210**	**4842**	**4619**	**3962**	**2427**	**3040**
TCN	**3110**	**662 J**	**5330**	**470**	**560**	**750**	**880**

MW-123R	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	1.3	ND	ND	ND	ND	ND	ND
PAHs	2	ND	**2.4**	**1.5**	ND	**0.65**	ND
TCN	ND	ND	ND	ND	ND	ND	ND

MW-129R1	Dec-10 *	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**47100**	**38230**	**22910**	**20730**	**22670**
PAHs	**2570**	**2956**	**1532**	**170**	**2163**
TCN	174	**250**	160	140	150

MW-130R	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**14880**	**33090**	**22970**	**14310**	**14010**
PAHs	**1153**	**4688**	**4021**	**3324**	**1397**
TCN	195	**310**	**290**	**240**	**260**

MW-129R2	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**158**	**78**	**186**	0.5 J	1
PAHs	2.9	ND	1.1 J	ND	ND
TCN	14.9	60	50	34	34

MW-123RD	Dec-14	Apr-15	Jul-17	Oct-17
BTEX	**5966**	**3647**	**4471**	**4160**
PAHs	**552**	**285**	**331**	**488**
TCN	77	53	64 J	49

LEGEND:

MW-111S — MONITORING WELL / SOIL BORING / TEST PROBE IDENTIFICATION AND APPROXIMATE LOCATION

GENERALIZED GROUND SURFACE

WELL SCREEN INTERVAL

SUMP

TOTAL DEPTH OF BOREHOLE

FILL

SAND & SILT

GLACIAL TILL

BEDROCK

MW-106	Nov-08	Apr-09	Dec-10 *
BTEX	**4.3**	**1.9**	**2.6**
PAHs	ND	ND	ND
TCN	174	59	167

GROUNDWATER QUALITY DATA. VALUES REPORTED IN MICROGRAMS PER LITER (ug/L). BOLD VALUE INDICATES THAT ONE OR MORE CONSTITUENTS ARE ABOVE CLASS GA CRITERIA.

WATER TABLE, 10/30/17

WATER LEVEL IN GAS HOLDER, 10/30/17

EQUIPOTENTIAL LINE (DASHED WHERE INFERRED)

GENERALIZED DIRECTION OF GROUNDWATER FLOW (IN PLANE OF CROSS-SECTION)

(295.21) GROUNDWATER ELEVATION, 10/30/17

VISUAL/OLFACTORY IMPACTS (SEE NOTE 2)

COATED MATERIAL, LENSES

HARDENED TAR

BLEBS, GLOBS, SHEEN

STAINING, ODOR

PETROLEUM IMPACTS SATURATION & SHEENS

PETROLEUM IMPACTS STAINING & ODORS

NO OBSERVED IMPACTS

ABBREVIATIONS:

BTEX	BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE ISOMERS
PAHs	POLYCYCLIC AROMATIC HYDROCARBONS
TCN	TOTAL CYANIDE
J	ESTIMATED CONCENTRATION
*	TABLE LISTS HIGHEST CONCENTRATION FROM ORIGINAL AND DUPLICATE SAMPLE

NOTES:

1. CROSS-SECTIONS DO NOT DEPICT ALL IDENTIFIED SUBSURFACE UTILITIES. POSITIONS OF DEPICTED SEWERS ARE ESTIMATED AND APPROXIMATE.
2. NYSDEC's STANDARD COLORS AND ASSOCIATED DESCRIPTORS FOR REPORTING MGP IMPACTS WERE USED TO DEPICT INTERVALS WHERE IMPACTS WERE OBSERVED.

FIGURE 5
HYDROGEOLOGIC CROSS-SECTION C-C'

NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

DATE	PROJECT NUMBER
12/2018	152555.100

Brown AND Caldwell
UPPER SADDLE RIVER
NEW JERSEY

MW-107S-REP	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**12**	ND	ND	ND
PAHs	**57**	**17**	2	2
TCN	ND	49	92 J	97

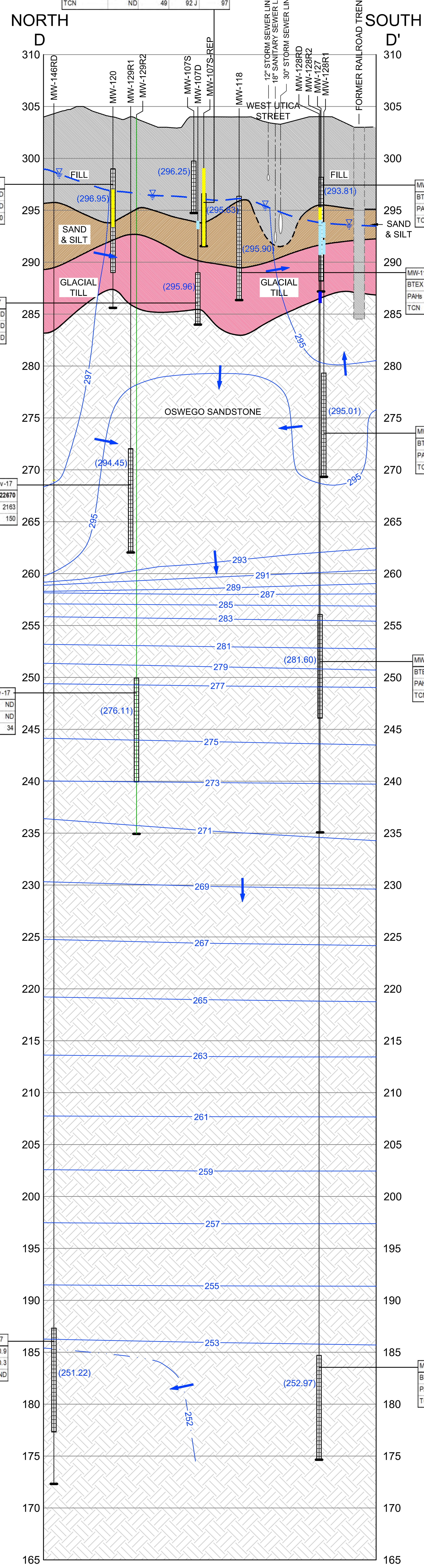
MW-120	Nov-08 *	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND	ND	ND	ND
PAHs	ND	ND	**0.28**	ND	ND	ND	ND
TCN	174	93	**245**	ND	**220**	150 J	130

MW-107D	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	**1.5**	**513**	ND	ND	ND
PAHs	ND	ND	1.7	**233**	ND	ND	ND
TCN	62	62	166	ND	12	6.7 J	ND

MW-129R1	Dec-10 *	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**47100**	**38230**	**22910**	**20730**	**22670**
PAHs	**2570**	**2956**	**1532**	170	2163
TCN	174	**250**	160	140	150

MW-129R2	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**158**	**78**	**186**	ND	ND
PAHs	2.9	ND	1.1 J	ND	ND
TCN	14.9	60	50	34	34

MW-146RD	Jul-17	Nov-17
BTEX	**12**	0.9
PAHs	ND	0.3
TCN	ND	ND



MW-127	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND	ND
PAHs	ND	ND	0.85 J	0.96	ND
TCN	4.8J	ND	ND	7.7 J	5.6 J

MW-118	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND	ND	ND	ND
PAHs	3	ND	0.28	ND	ND	ND	ND
TCN	172	**269**	183	ND	130	110 J	110

MW-128R1	Dec-10	Dec-14 *	Apr-15	Jul-17	Nov-17
BTEX	**22**	2.1	ND	ND	ND
PAHs	ND	ND	0.81 J	ND	ND
TCN	11	11 J	38	17	11

MW-128R2	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**8138**	**539**	**640**	**424**	**1310**
PAHs	7	**1.9**	2.5 J	**13**	**3.1**
TCN	5.7J	ND	20	26	33

MW-128RD	Dec-14 *	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND
PAHs	ND	ND	0.14	0.25
TCN	130 J	ND	ND	ND

CROSS-SECTION D-D'

0 60 120
SCALE IN FEET
HORIZONTAL

0 6 12
SCALE IN FEET
VERTICAL

10x VERTICAL EXAGGERATION

LEGEND:

MW-111S — MONITORING WELL / SOIL BORING / TEST PROBE IDENTIFICATION AND APPROXIMATE LOCATION

GENERALIZED GROUND SURFACE

WELL SCREEN INTERVAL

SUMP

TOTAL DEPTH OF BOREHOLE

FILL

SAND & SILT

GLACIAL TILL

BEDROCK

MW-128RD	Dec-14 *	Apr-15	Jul-17	Nov-17
BTEX	ND	ND	ND	ND
PAHs	ND	ND	0.14	0.25
TCN	130 J	ND	ND	ND

GROUNDWATER QUALITY DATA. VALUES REPORTED IN MICROGRAMS PER LITER (ug/L). BOLD VALUE INDICATES THAT ONE OR MORE CONSTITUENTS ARE ABOVE CLASS GA CRITERIA.

WATER TABLE, 10/30/17

WATER LEVEL IN GAS HOLDER, 10/30/17

EQUIPOTENTIAL LINE (DASHED WHERE INFERRED)

SUPPLEMENTAL EQUIPOTENTIAL LINE

GENERALIZED DIRECTION OF GROUNDWATER FLOW (IN PLANE OF CROSS-SECTION)

(295.21) GROUNDWATER ELEVATION, 10/30/17

VISUAL/OLFACTORY IMPACTS (SEE NOTE 2)

COATED MATERIAL, LENSES

HARDENED TAR

BLEBS, GLOBS, SHEEN

STAINING, ODOR

PETROLEUM IMPACTS SATURATION & SHEENS

PETROLEUM IMPACTS STAINING & ODORS

NO OBSERVED IMPACTS

ABBREVIATIONS:

BTEX	BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE ISOMERS
PAHs	POLYCYCLIC AROMATIC HYDROCARBONS
TCN	TOTAL CYANIDE
ND	NOT DETECTED
J	ESTIMATED CONCENTRATION
*	TABLE LISTS HIGHEST CONCENTRATION FROM ORIGINAL AND DUPLICATE SAMPLE

NOTES:

1. CROSS-SECTIONS DO NOT DEPICT ALL IDENTIFIED SUBSURFACE UTILITIES. POSITIONS OF DEPICTED SEWERS ARE ESTIMATED AND APPROXIMATE.
2. NYSDEC's STANDARD COLORS AND ASSOCIATED DESCRIPTORS FOR REPORTING MGP IMPACTS WERE USED TO DEPICT INTERVALS WHERE IMPACTS WERE OBSERVED.

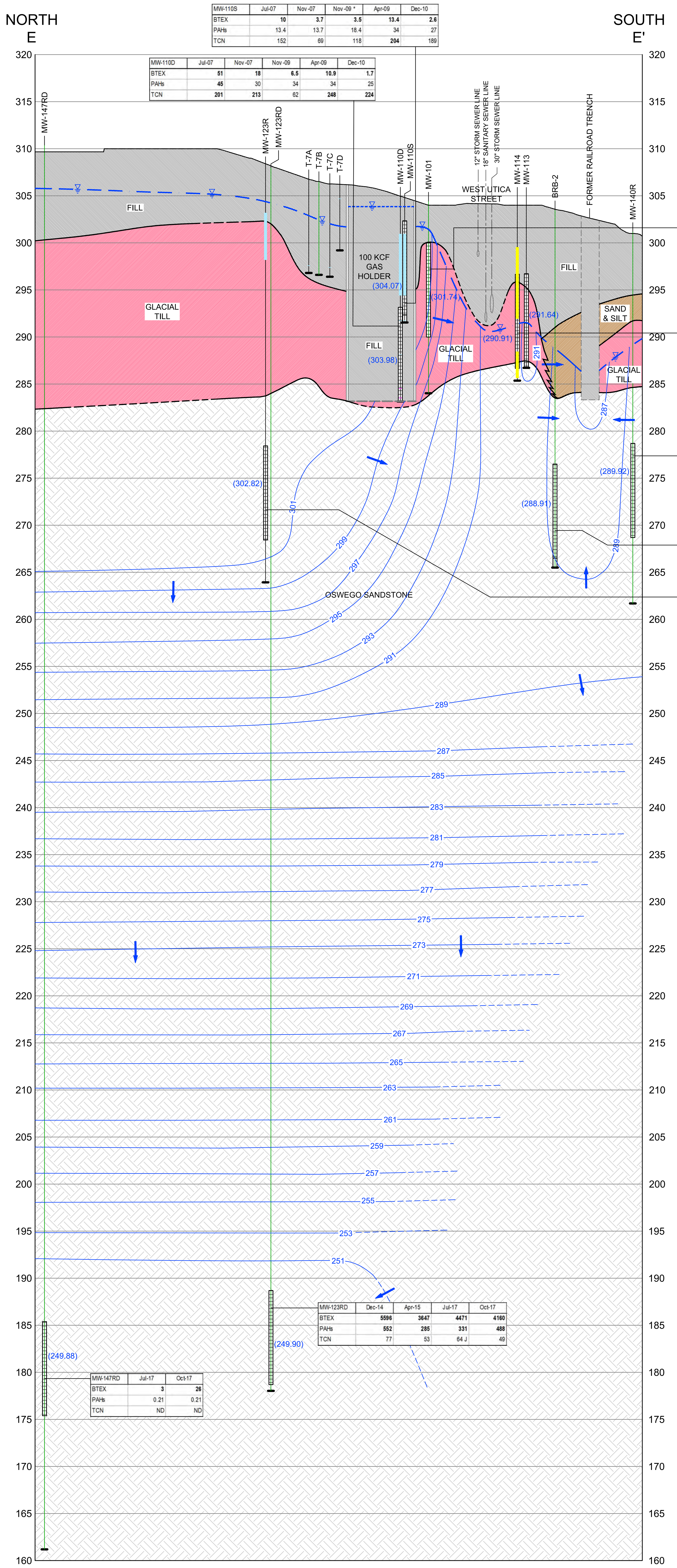
FIGURE 6
HYDROGEOLOGIC
CROSS-SECTION D-D'

NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

DATE: 12/2018

PROJECT NUMBER: 152555.100

Brown AND Caldwell
UPPER SADDLE RIVER
NEW JERSEY



MW-110S	Jul-07	Nov-07	Nov-09 *	Apr-09	Dec-10
BTEX	**10**	**3.7**	**3.5**	**13.4**	**2.6**
PAHs	13.4	13.7	18.4	34	27
TCN	152	69	118	**204**	189

MW-110D	Jul-07	Nov-07	Nov-09	Apr-09	Dec-10
BTEX	**51**	**18**	**6.5**	**10.9**	**1.7**
PAHs	**45**	30	34	34	25
TCN	**201**	**213**	62	**248**	**224**

MW-101	Dec-04	Jul-07	Nov-07 *	Nov-08	'Apr-09 *	Dec-10
BTEX	**11790**	**10293**	**7786**	**7026**	**286**	**5200**
PAHs	**329**	2.6	**85**	**243**	**150**	**59**
TCN	**537**	**557**	**303**	**2180**	**2980**	**1920**

MW-114	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	0.32	ND	ND	ND	ND	ND	ND
PAHs	9.8	11.9	7.3	5.5	3.2	4.4	0.93
TCN	22.7	19	14.6	19	9.8 J	17 J	7.1 J

MW-140R	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**700**	**815**	**360**	**260**
PAHs	**248**	**39**	**17**	**16**
TCN	57	32	6.3 J	ND

BRB-2	Jul-17	Nov-17
BTEX	**7610**	**9680**
PAHs	**160**	**131**
TCN	200	180

MW-123R	Nov-08	Apr-09	Dec-10	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**1.25**	ND	ND	ND	**ND**	ND	ND
PAHs	**2**	ND	ND	**1.5**	ND	**0.65**	ND
TCN	ND	ND	ND	ND	ND	ND	ND

MW-123RD	Dec-14	Apr-15	Jul-17	Oct-17
BTEX	**5596**	**3647**	**4471**	**4160**
PAHs	**552**	**285**	**331**	**488**
TCN	77	53	64 J	49

MW-147RD	Jul-17	Oct-17
BTEX	**3**	**26**
PAHs	0.21	0.21
TCN	ND	ND

CROSS-SECTION E-E'

0 60 120
SCALE IN FEET
HORIZONTAL

0 6 12
SCALE IN FEET
VERTICAL

10x VERTICAL EXAGGERATION

LEGEND:

MW-118 — MONITORING WELL / SOIL BORING / TEST PROBE IDENTIFICATION AND APPROXIMATE LOCATION

GENERALIZED GROUND SURFACE

WELL SCREEN INTERVAL

SUMP

TOTAL DEPTH OF BOREHOLE

FILL

SAND & SILT

GLACIAL TILL

BEDROCK

MW-140R	Dec-14	Apr-15	Jul-17	Nov-17
BTEX	**700**	**815**	**360**	**260**
PAHs	**248**	**39**	**17**	**16**
TCN	57	32	6.3 J	ND

GROUNDWATER QUALITY DATA. VALUES REPORTED IN MICROGRAMS PER LITER (ug/L). BOLD VALUE INDICATES THAT ONE OR MORE CONSTITUENTS ARE ABOVE CLASS GA CRITERIA.

WATER TABLE, 10/30/17

WATER LEVEL IN GAS HOLDER, 10/30/17

EQUIPOTENTIAL LINE

GENERALIZED DIRECTION OF GROUNDWATER FLOW (IN PLANE OF CROSS-SECTION)

(293.21) GROUNDWATER ELEVATION, 10/30/17

VISUAL/OLFACTORY IMPACTS (SEE NOTE 2)

COATED MATERIAL, LENSES

STAINING, ODOR

PETROLEUM IMPACTS STAINING & ODORS

NO OBSERVED IMPACTS

ABBREVIATIONS:

BTEX	BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE ISOMERS
PAHs	POLYCYCLIC AROMATIC HYDROCARBONS
TCN	TOTAL CYANIDE
ND	NOT DETECTED
J	ESTIMATED CONCENTRATION
*	TABLE LISTS HIGHEST CONCENTRATION FROM ORIGINAL AND DUPLICATE SAMPLE

NOTES:

1. CROSS-SECTIONS DO NOT DEPICT ALL IDENTIFIED SUBSURFACE UTILITIES. POSITIONS OF DEPICTED SEWERS ARE ESTIMATED AND APPROXIMATE.
2. NYSDEC's STANDARD COLORS AND ASSOCIATED DESCRIPTORS FOR REPORTING MGP IMPACTS WERE USED TO DEPICT INTERVALS WHERE IMPACTS WERE OBSERVED.

FIGURE 7
HYDROGEOLOGIC CROSS-SECTION E-E'

NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

DATE	PROJECT NUMBER
12/2018	152555.100

Brown AND Caldwell
UPPER SADDLE RIVER
NEW JERSEY

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: FIG-8-WATR-TAB-CONT-(July-10-2017) Plot Date: January 16, 2019 1:24 PM Cadd User: Robert Near

0 60 120
SCALE IN FEET

SOURCE:

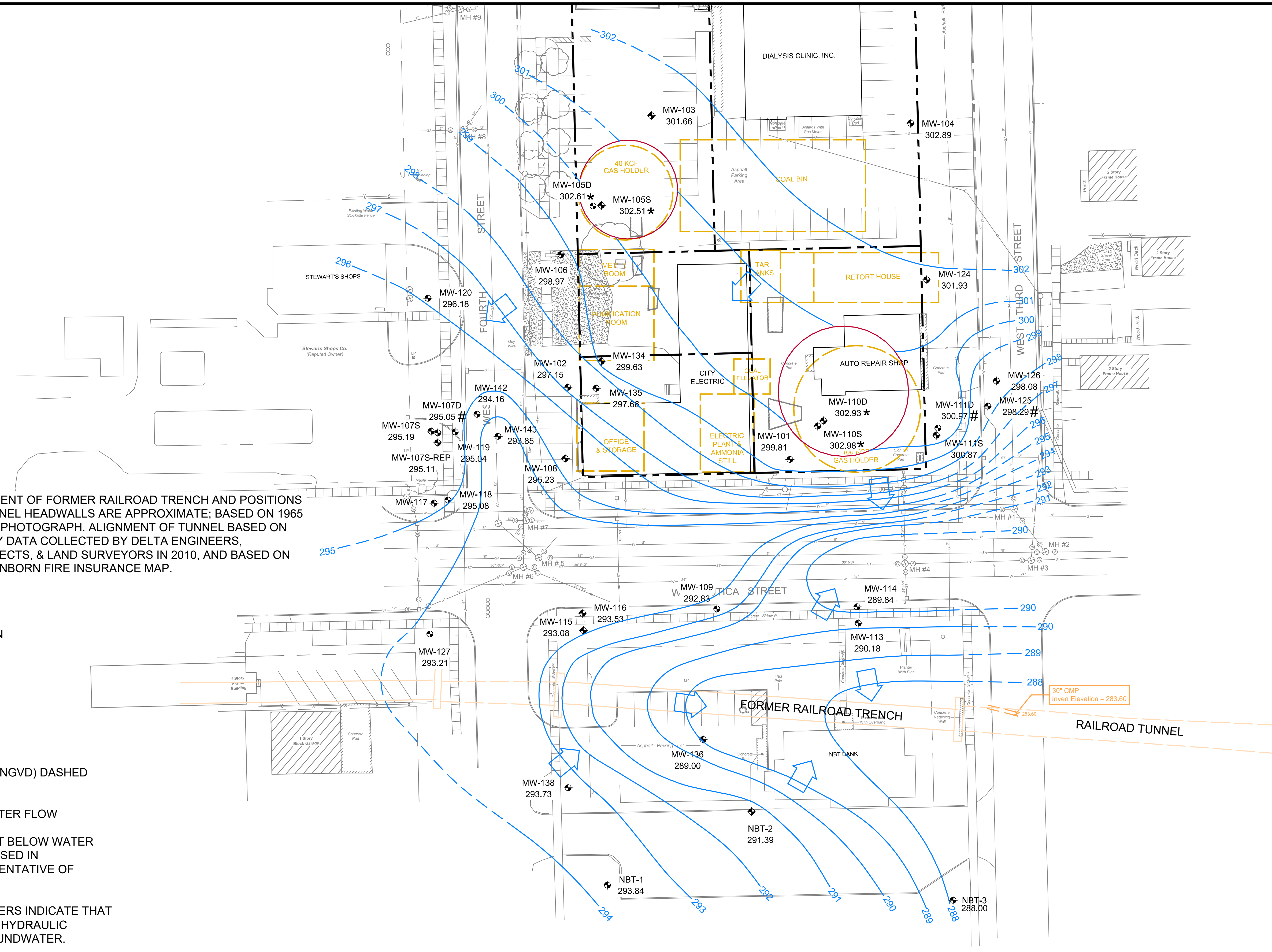
BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- WATER LINE
- GAS LINE
- SANITARY SEWER
- STORM SEWER
- UNDERGROUND ELECTRIC LINE
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL
- PROPERTY LINE

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 297.66 WATER TABLE ELEVATION (FT., NGVD)
- 293 WATER TABLE ELEVATION CONTOUR (FT., NGVD) DASHED WHERE INFERRED
- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- # WELL SCREEN POSITIONED SEVERAL FEET BELOW WATER TABLE. POSTED WATER ELEVATION NOT USED IN CONTOURING; DATA MAY NOT BE REPRESENTATIVE OF WATER TABLE CONDITIONS.
- * DATA FROM WELLS IN FORMER GAS HOLDERS INDICATE THAT WATER IN HOLDERS HAVE NO OR LIMITED HYDRAULIC CONNECTIVITY WITH SURROUNDING GROUNDWATER.



Brown AND Caldwell	SCALE: 1" = 60' 149792.003 DATE: January 16, 2019	NATIONAL GRID OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2 OSWEGO, NEW YORK WATER TABLE CONTOUR MAP JULY 10, 2017	FIGURE 8

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: FIG-9-WATR-TAB-CONT-(Oct-30-2017) Plot Date: January 16, 2019 1:26 PM Cadd User: Robert Near

0 60 120

SCALE IN FEET

SOURCE:

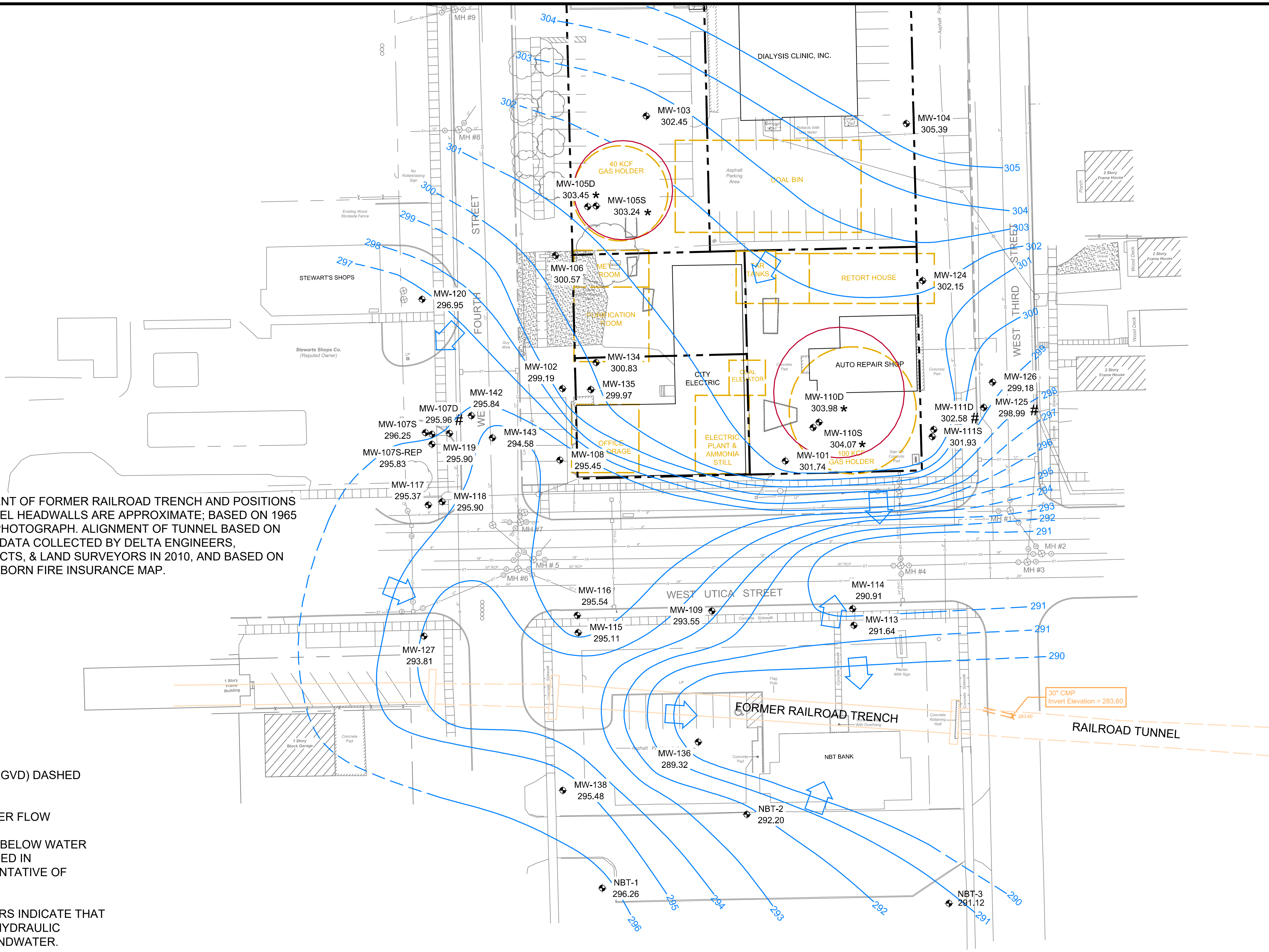
BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- WATER LINE
- GAS LINE
- SANITARY SEWER
- STORM SEWER
- UNDERGROUND ELECTRIC LINE
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL
- PROPERTY LINE

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 299.97 WATER TABLE ELEVATION (FT., NGVD)
- 292 WATER TABLE ELEVATION CONTOUR (FT., NGVD) DASHED WHERE INFERRED
- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- # WELL SCREEN POSITIONED SEVERAL FEET BELOW WATER TABLE. POSTED WATER ELEVATION NOT USED IN CONTOURING; DATA MAY NOT BE REPRESENTATIVE OF WATER TABLE CONDITIONS.
- * DATA FROM WELLS IN FORMER GAS HOLDERS INDICATE THAT WATER IN HOLDERS HAVE NO OR LIMITED HYDRAULIC CONNECTIVITY WITH SURROUNDING GROUNDWATER.



SCALE: 1" = 60'

149792.003

DATE: January 16, 2019

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

WATER TABLE CONTOUR MAP
OCTOBER 30, 2017

FIGURE 9

0 60 120
SCALE IN FEET

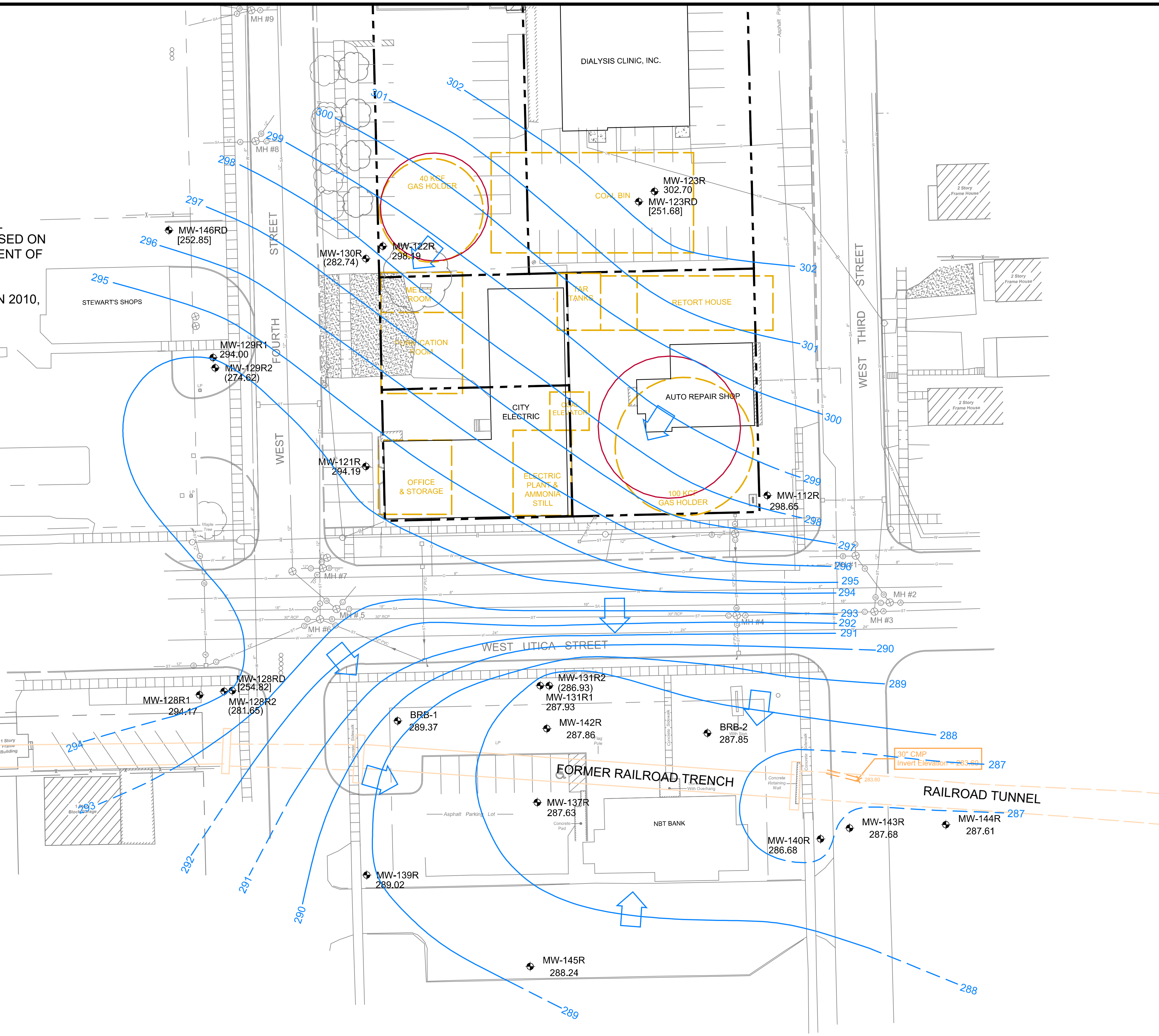
SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- WATER LINE
- GAS LINE
- SANITARY SEWER
- STORM SEWER
- UNDERGROUND ELECTRIC LINE
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL
- PROPERTY LINE
- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 298.65 GROUNDWATER ELEVATION (FT.,NGVD)-SHALLOW BEDROCK
- (298.65) GROUNDWATER ELEVATION (FT., NGVD) - INTERMEDIATE BEDROCK INTERVAL, NOT USED FOR DEVELOPING POTENTIOMETRIC SURFACE CONTOURS
- [298.65] GROUNDWATER ELEVATION (FT., NGVD) - DEEP BEDROCK WATER-BEARING ZONE, NOT USED FOR DEVELOPLING POTENTIOMETRIC SURFACE CONTOURS
- 290 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT., NGVD) FOR SHALLOW BEDROCK. DASHED WHERE INFERRED
- GENERALIZED DIRECTION OF GROUNDWATER FLOW



SCALE: 1" = 60'
149792.003
DATE: January 16, 2019

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

SHALLOW BEDROCK GROUNDWATER POTENTIOMETRIC SURFACE MAP
JULY 10, 2017

FIGURE
10

Brown AND Caldwell

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: FIG-10-SHAW-BEDRK-GW-(July-10-2017) Plot Date: January 16, 2019 1:29 PM Cadd User: Robert Near

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours   File Name: FIG-11-SHAW-BEDRK-GW-(Oct-30-2017)   Plot Date: January 16, 2019 1:32 PM   Cadd User: Robert Near

SOURCE:

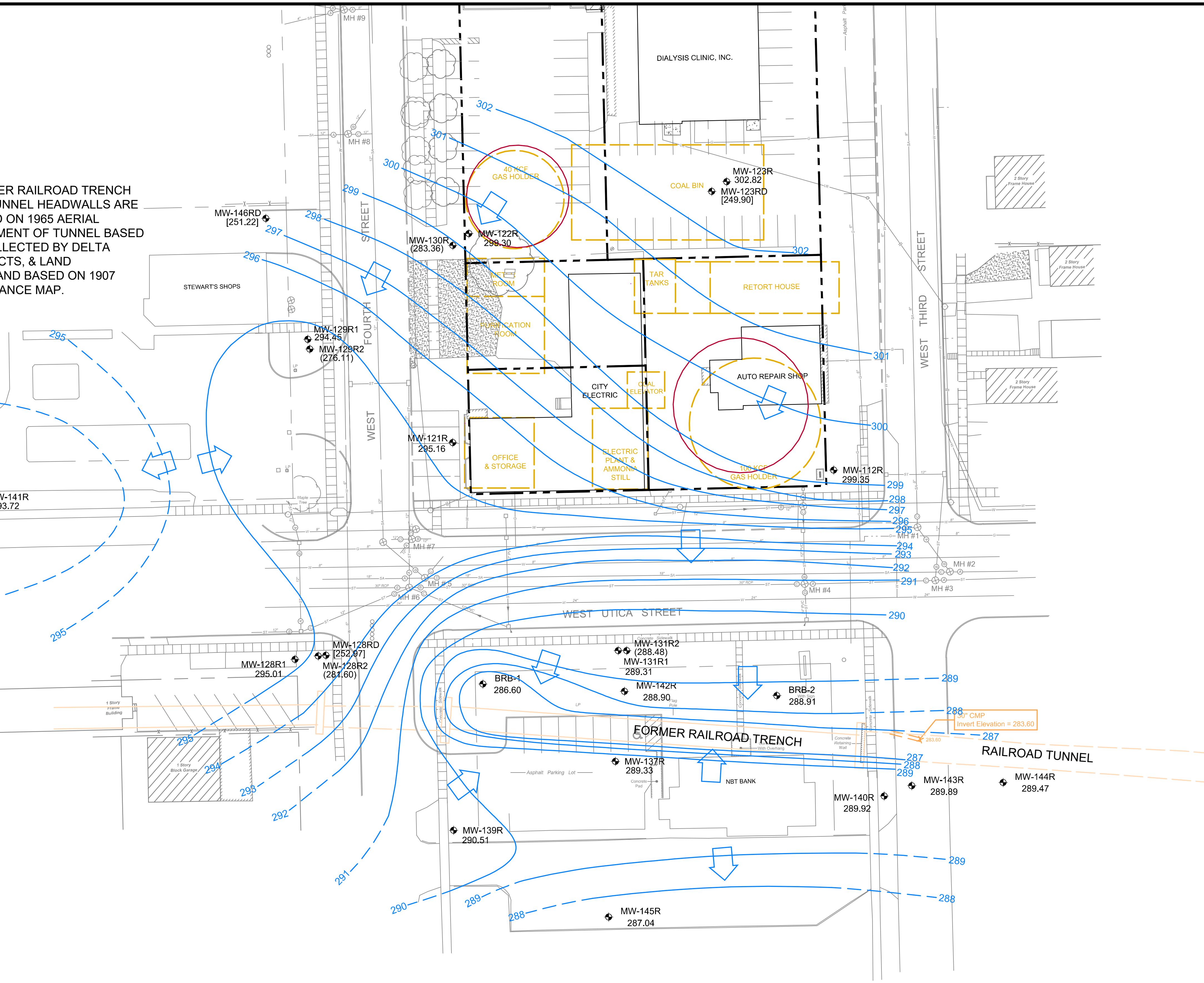
BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- WATER LINE
- GAS LINE
- SANITARY SEWER
- STORM SEWER
- UNDERGROUND ELECTRIC LINE
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL
- PROPERTY LINE

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 299.35 GROUNDWATER ELEVATION (FT.,NGVD)-SHALLOW BEDROCK
- (298.65) GROUNDWATER ELEVATION (FT., NGVD) - INTERMEDIATE BEDROCK INTERVAL, NOT USED FOR DEVELOPING POTENTIOMETRIC SURFACE CONTOURS
- [298.65] GROUNDWATER ELEVATION (FT., NGVD) - DEEP BEDROCK WATER-BEARING ZONE, NOT USED FOR DEVELOPLING POTENTIOMETRIC SURFACE CONTOURS
- 290 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT., NGVD) FOR SHALLOW BEDROCK. DASHED WHERE INFERRED
- GENERALIZED DIRECTION OF GROUNDWATER FLOW



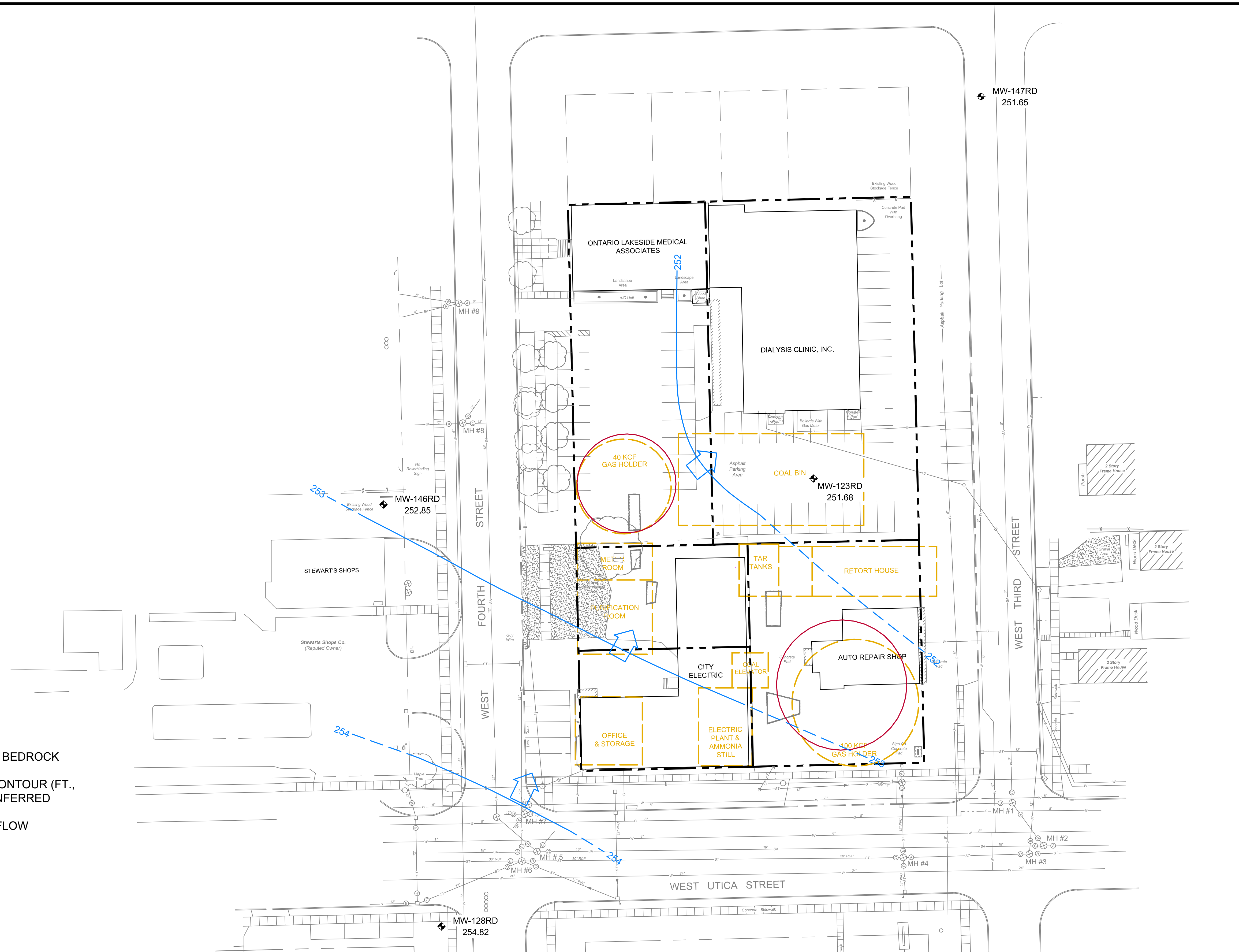
0 60 120

SCALE IN FEET

Brown AND Caldwell	SCALE: 1" = 60' 149792.003 DATE: January 16, 2019	NATIONAL GRID OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2 OSWEGO, NEW YORK	SHALLOW BEDROCK GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 30, 2017	FIGURE 11

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: FIG-12-DEEP-BEDRK-GW-(July-10-2017) Plot Date: January 16, 2019 1:34 PM Cadd User: Robert Near

0 60 120
SCALE IN FEET



SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- W — WATER LINE
- G — GAS LINE
- SA — SANITARY SEWER
- ST — STORM SEWER
- UE — UNDERGROUND ELECTRIC LINE
- PROPERTY LINE
- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 251.68 GROUNDWATER ELEVATION (FT., NGVD) - DEEP BEDROCK
- 253 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT., NGVD) FOR DEEP BEDROCK. DASHED WHERE INFERRED
- GENERALIZED DIRECTION OF GROUNDWATER FLOW

Brown AND Caldwell

SCALE: 1" = 60'

149792.003

DATE: January 16, 2019

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

DEEP BEDROCK GROUNDWATER POTENTIOMETRIC SURFACE MAP JULY 10, 2017

FIGURE

12

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours   File Name: FIG-13-DEEP-BEDRK-GW-(October-30-2017)   Plot Date: January 16, 2019 1:37 PM   Cadd User: Robert Near

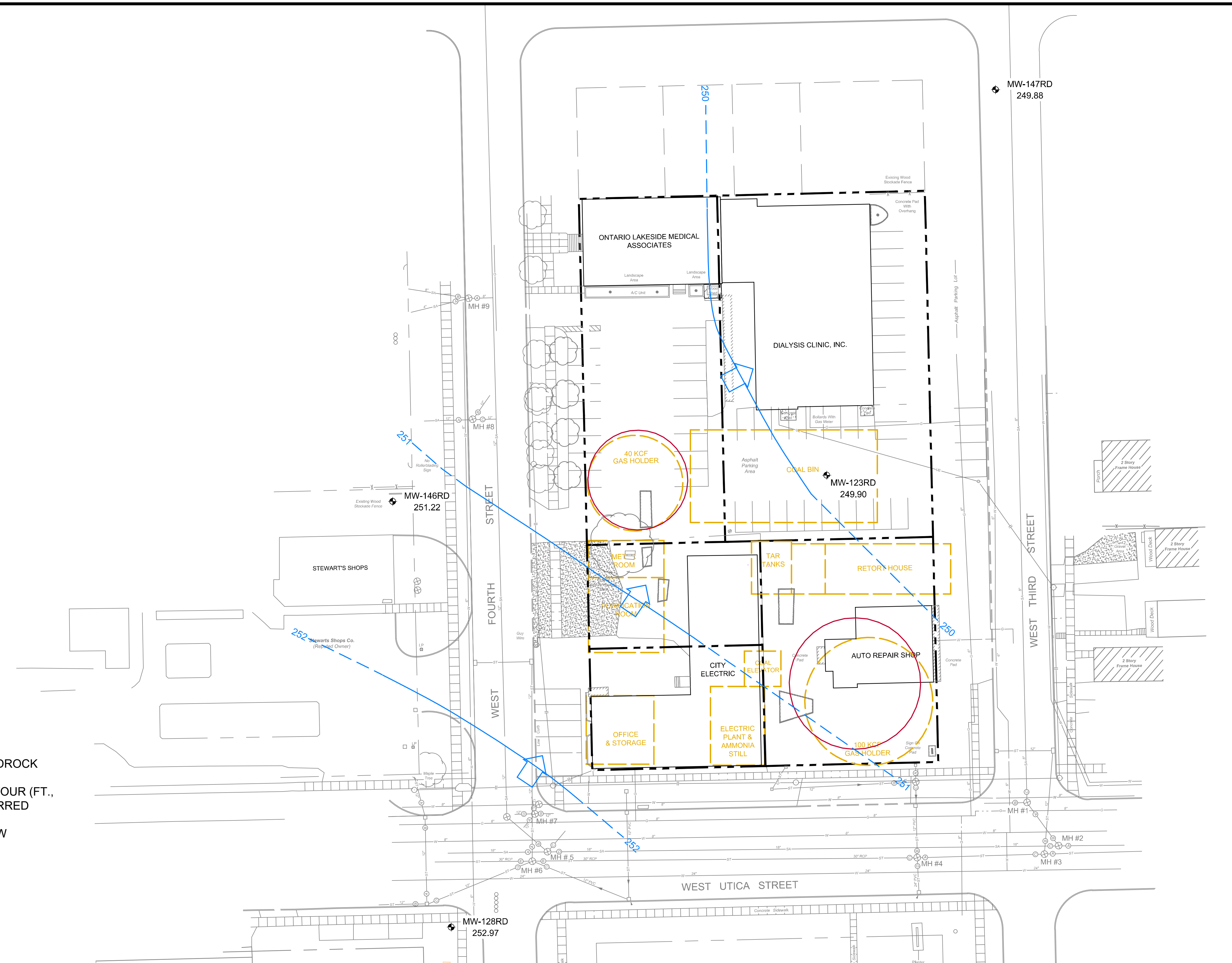
0   60   120
SCALE IN FEET

SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- W — WATER LINE
- G — GAS LINE
- SA — SANITARY SEWER
- ST — STORM SEWER
- UE — UNDERGROUND ELECTRIC LINE
- PROPERTY LINE
- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 249.90 — GROUNDWATER ELEVATION (FT., NGVD) - DEEP BEDROCK
- 251 — GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT., NGVD) FOR DEEP BEDROCK. DASHED WHERE INFERRED
- GENERALIZED DIRECTION OF GROUNDWATER FLOW



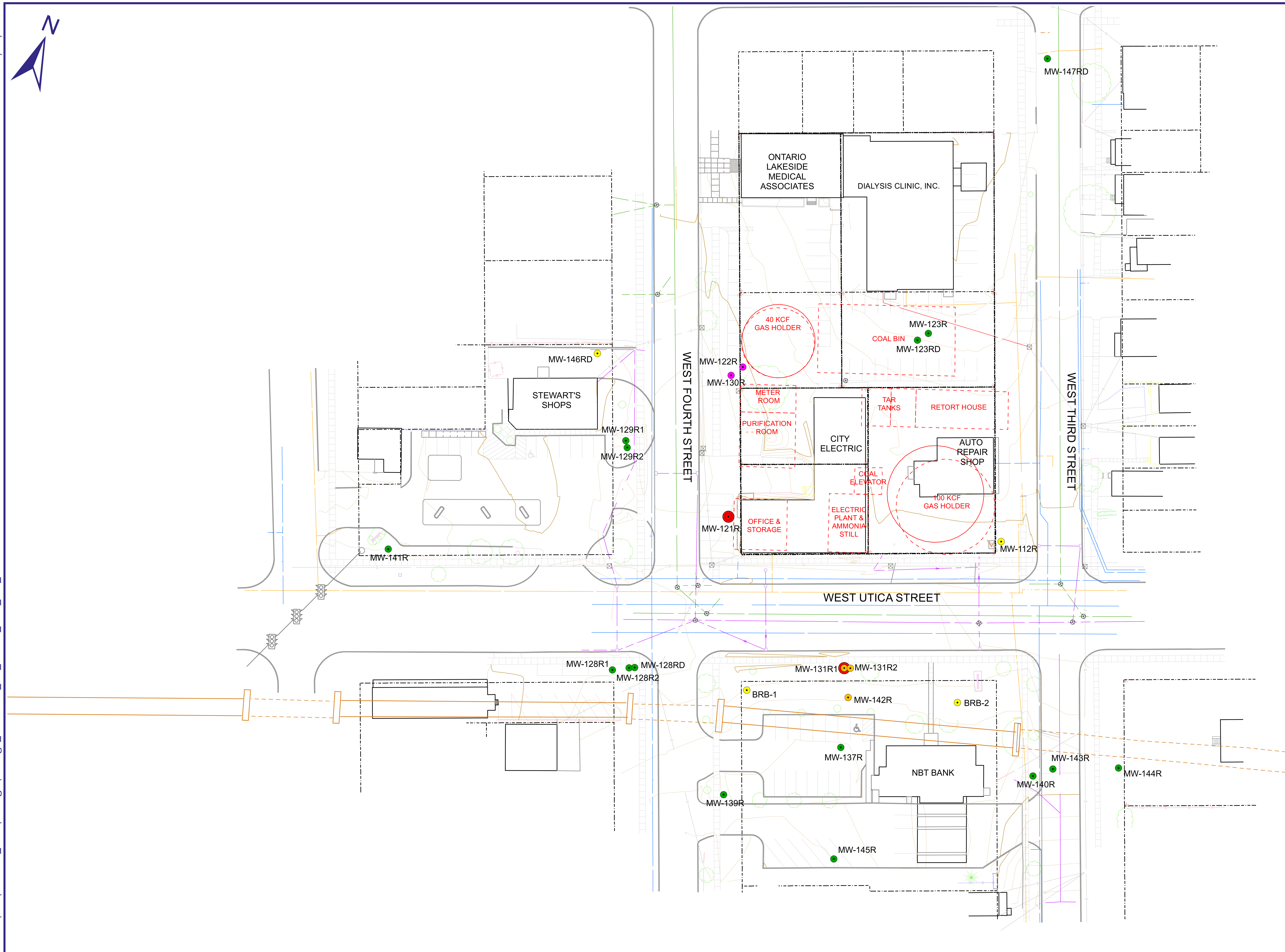
Brown AND Caldwell	SCALE: 1" = 60' 149792.003 DATE: January 16, 2019	NATIONAL GRID OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2 OSWEGO, NEW YORK	DEEP BEDROCK GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 30, 2017

FIGURE
13

FIGURE 30
VISUAL/OLFACTORY OBSERVATIONS: OVERBURDEN
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK

Brown AND Caldwell

1/17/2019



Legend

Visual/Olfactory Impacts (See Notes 1 and 2):

- No Observed Impacts
- Staining, Odor
- Blebs, Globs, Sheen
- Coated Material, Lenses
- Tar Saturated
- NAPL/Tar observed in bedrock monitoring well during gauging events

Notes:
1) Refer to Table 5 for descriptions and depth intervals of visual/olfactory observations.
2) NYSDEC's standard colors and associated descriptors for reporting MGP impacts were used to depict locations where impacts were observed.

- Manhole
- Power Pole
- Property Line
- Building
- Pavement Edge
- Vegetation
- Water Line
- Storm Sewer Line
- Sanitary Sewer Line
- Gas Line
- Former MGP structure location. Locations are approximate, based on 1924 Sanborn Fire Insurance Map.
- Former gas holder location. Locations are approximate, based on combination of field measurements and survey data.
- Former railroad trench
- Railroad tunnel
- Railroad tunnel headwall

(Alignment of former railroad trench and positions of tunnel headwalls are approximate; based on 1965 aerial photograph. Alignment of tunnel based on survey data collected by Delta Engineers, Architects, & Land Surveyors in 2010).

Source:

Base map developed based on drawing prepared by Snyder Engineering & Land Surveying, LLP (January 11, 2005); revised by Delta Engineers, Architects, & Land Surveyors (December 8, 2016).

Author: BFTaylor Path: P:\GIS\National_Grid\Oswego\Oswego_VisOlfObs_BR_22x34_OU2_SRI_DSR.mxd

Brown AND Caldwell

FIGURE 31
VISUAL/OLFACTORY OBSERVATIONS: BEDROCK
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK

0 40 80
Feet

1/18/2019

Author: BFTaylor Path: P:\GIS\National_Grid\Oswego\Oswego_GWQ_OB_BTEX_MTBE_OU2_RI_Rpt.mxd

Brown AND Caldwell

FIGURE 32
BTEX AND MTBE CONCENTRATIONS IN OVERBURDEN GROUNDWATER
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK

0 40 80
Feet

1/17/2019

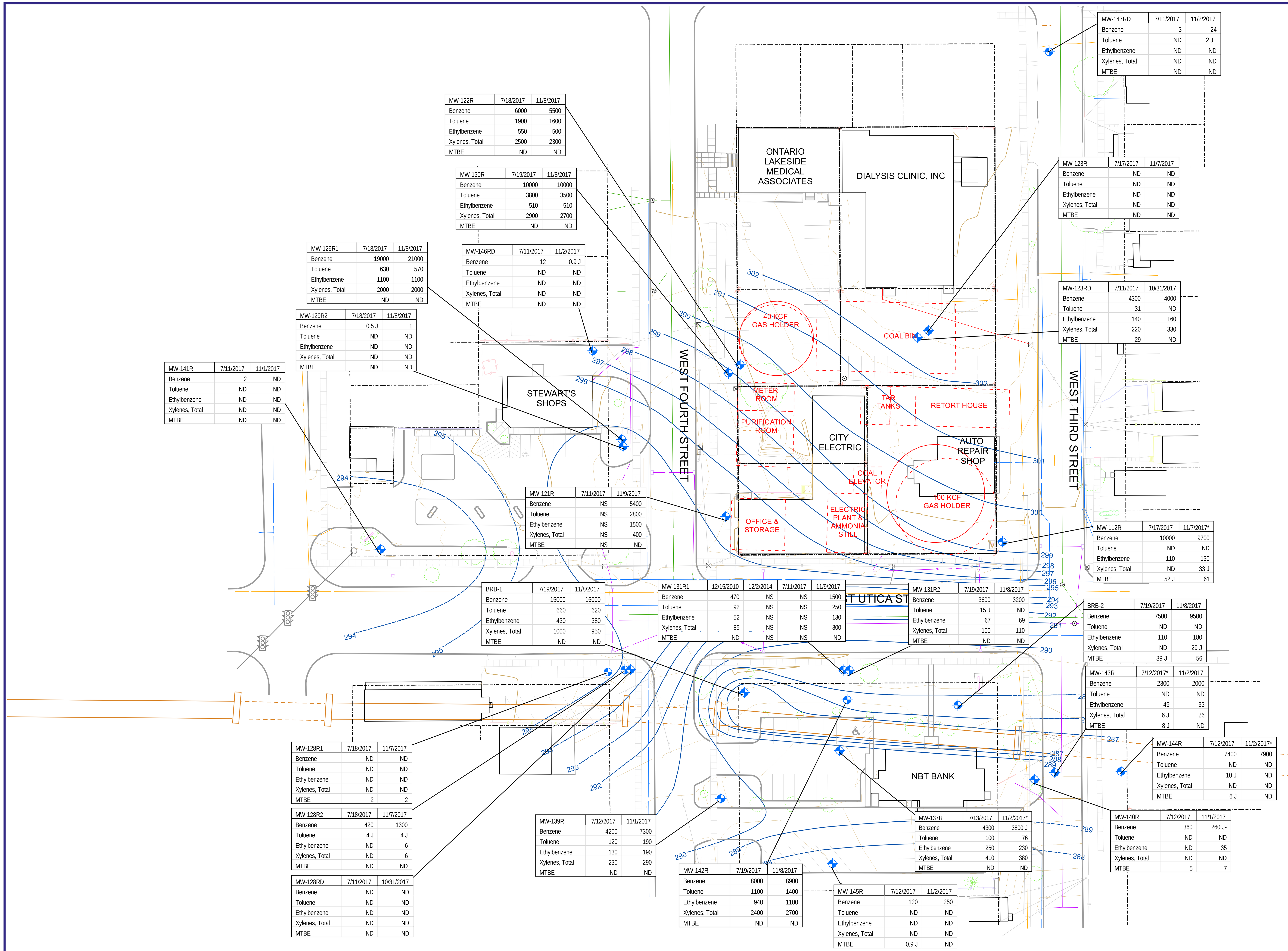
Author: BFTaylor Path: P:\GIS\National_Grid\Oswego\Oswego_GWQ_OB_Naphth_CN_OU2_RI_Rpt.mxd

Brown AND Caldwell

FIGURE 33
NAPHTHALENE AND CYANIDE CONCENTRATIONS IN OVERBURDEN GROUNDWATER
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK

0 40 80
Feet

1/17/2019



Legend

- Monitoring Well
- Manhole
- Power Pole
- Property Line
- Building
- Pavement Edge
- Vegetation
- Water Line
- Storm Sewer Line
- Sanitary Sewer Line
- Gas Line
- 290 Groundwater potentiometric surface contour for shallow bedrock (ft. NGVD) - 10/30/17
- Generalized direction of groundwater flow (10/30/17)
- Former MGP structure location. Locations are approximate, based on 1924 Sanborn Fire Insurance Map.
- Former gas holder location. Locations are approximate, based on combination of field measurements and survey data.
- Former railroad trench
- Railroad tunnel
- Railroad tunnel headwall

(Alignment of former railroad trench and positions of tunnel headwalls are approximate; based on 1965 aerial photograph. Alignment of tunnel based on survey data collected by Delta Engineers, Architects, & Land Surveyors in 2010 and based on 1907 Sanborn Fire Insurance Map)

Explanation of terms and abbreviations:
BTEX - Benzene, toluene, ethylbenzene, and isomers of xylene
MTBE - Methyl tertiary butyl ether
ND - Not Detected
NS - Not Sampled. NAPL observed in well during gauging activities.
NAPL - Non-aqueous phase liquid
J - Estimated concentration
J+ - Estimated concentration. Reported value may be biased high.
J- - Estimated concentration. Reported value may be biased low.

Bold Value - Indicates constituent concentration above Class GA Criterion.

Results reported in micrograms per liter (μg/L)

* - Table lists the highest concentration from original and duplicate sample.

Note:
Constituent box plots present 2017 groundwater quality data or most recent data available for locations not sampled in 2017.

Source:
Base map developed based on drawing prepared by Snyder Engineering & Land Surveying, LLP (January 11, 2005); revised by Delta Engineers, Architects, & Land Surveyors (December 8, 2016).

Author: BFTaylor Path: P:\GIS\National_Grid\Oswego\Oswego_GWQ_BR_BTEX_MTBE_OU2_RI_Rpt.mxd

Brown AND Caldwell

FIGURE 34
BTEX AND MTBE CONCENTRATIONS IN BEDROCK GROUNDWATER
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK

0 40 80
Feet

1/17/2019

Author: BFTaylor Path: P:\GIS\National_Grid\Oswego\Oswego_GWQ_BR_Naphth_CN_OU2_RI_Rpt.mxd

Brown AND Caldwell

FIGURE 35
NAPHTHALENE AND CYANIDE CONCENTRATIONS IN BEDROCK GROUNDWATER
NATIONAL GRID
OSWEGO (WEST UTICA ST.) FORMER MGP SITE - OPERABLE UNIT 2, OSWEGO, NEW YORK

0 40 80
Feet

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: Naphalene Concentration In Overburden Groundwater Plot Date: January 17, 2019 7:28 AM Cadd User: Robert Near

SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- W — WATER LINE
- G — GAS LINE
- SA — SANITARY SEWER
- ST — STORM SEWER
- UE — UNDERGROUND ELECTRIC LINE
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

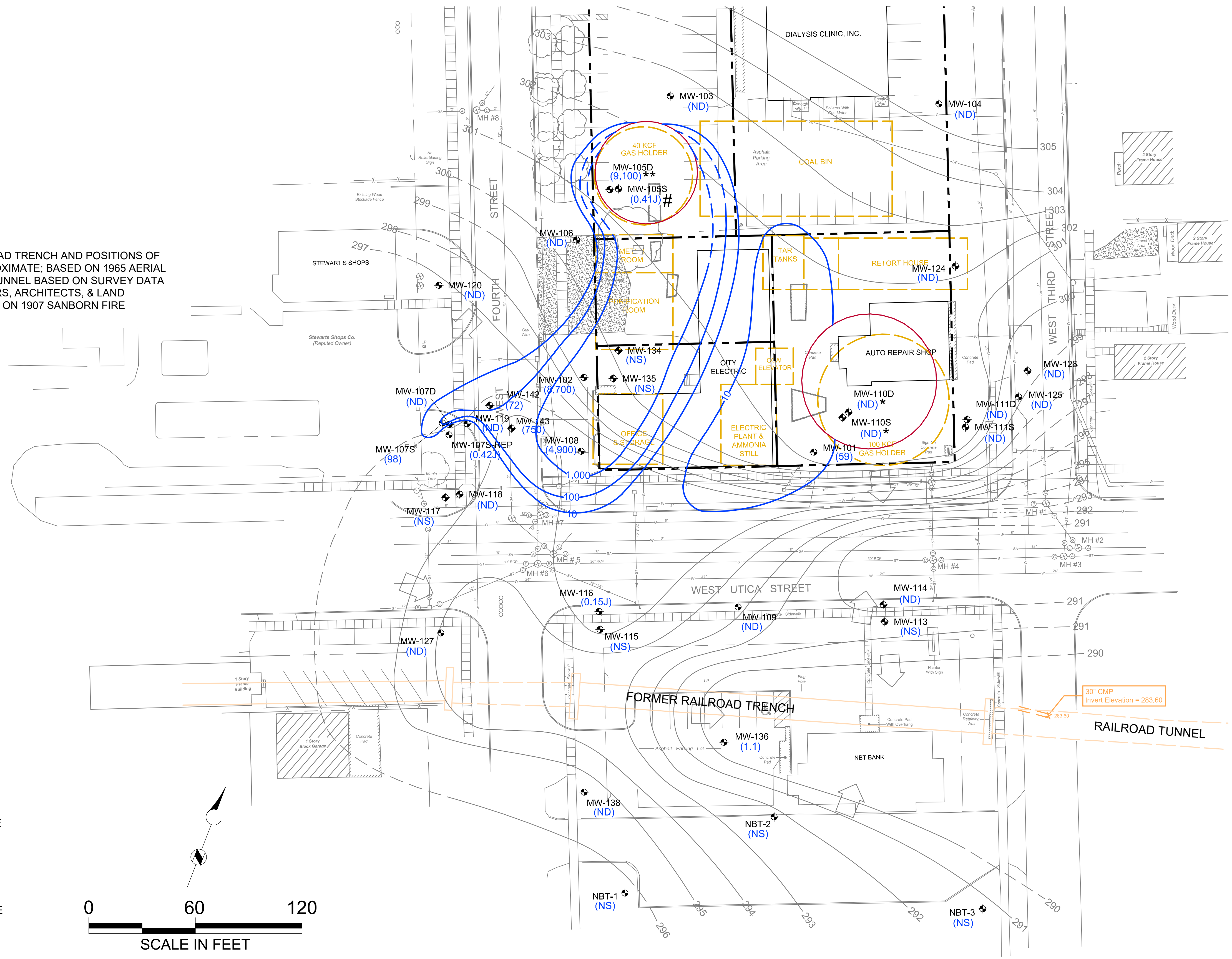
- PROPERTY LINE
- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 292 — WATER TABLE ELEVATION CONTOUR (FT., NGVD) - 10/30/17
- GENERALIZED DIRECTION OF GROUNDWATER FLOW - 10/30/17
- (8,700) NAPHTHALENE CONCENTRATION IN OVERBURDEN GROUNDWATER (µg/L) - NOVEMBER 2017 DATA OR MOST RECENT DATA AVAILABLE FOR LOCATIONS NOT SAMPLED DURING OU2 RI ACTIVITIES.
- 100 — ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED). LOGARITHMIC CONTOUR INTERVAL (µg/L).
- ND NOT DETECTED
- NS NOT SAMPLED
- J ESTIMATED CONCENTRATION

NOTE:
GENERALIZED ISOCONCENTRATION CONTOURS ARE BASED ON MOST RECENT DATA AVAILABLE AND THUS ARE NOT REPRESENTATIVE OF CONDITIONS AT ANY ONE TIME.

* VALUE POSTED NOT USED FOR DEVELOPING ISOCONCENTRATION CONTOURS. WATER LEVELS MEASURED IN WELLS IN FORMER GAS HOLDER INDICATE THAT WATER IN HOLDER HAS NO OR LIMITED HYDRAULIC CONNECTIVITY WITH SURROUNDING GROUNDWATER.

** ALTHOUGH WATER LEVEL DATA FROM WELLS IN FORMER GAS HOLDER INDICATE THAT WATER IN HOLDER HAS LIMITED HYDRAULIC CONNECTIVITY WITH SURROUNDING GROUNDWATER, DISSOLVED-PHASE CONSTITUENT CONCENTRATIONS DOWNGRADIENT FROM HOLDER INDICATE THAT IMPACTS IN HOLDER MAY BE A CONTRIBUTING SOURCE OF THE SAME.

\# NAPHTHALENE WAS NOT DETECTED OR WAS DETECTED AT SIGNIFICANTLY LOWER CONCENTRATIONS IN SHALLOW OVERBURDEN GROUNDWATER RELATIVE TO DEEPER OVERBURDEN GROUNDWATER AT SAME LOCATION AND THUS, DATA FROM DEEP OVERBURDEN GROUNDWATER AT LOCATION (I.E., DATA FROM WELL WITH "D" SUFFIX) WAS USED FOR GENERATING GENERALIZED ISOCONCENTRATION CONTOURS.



Brown AND Caldwell

SCALE: 1" = 60'

152555.100

DATE: January 17, 2019

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

NAPHTHALENE CONCENTRATIONS IN OVERBURDEN GROUNDWATER

FIGURE

36

SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

MONITORING WELL

MANHOLE

POWER POLE

WATER LINE

GAS LINE

SANITARY SEWER

STORM SEWER

UNDERGROUND ELECTRIC LINE

FORMER RAILROAD TRENCH

RAILROAD TUNNEL

RAILROAD TUNNEL HEADWALL

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

PROPERTY LINE

FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.

FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.

292 WATER TABLE ELEVATION CONTOUR (FT., NGVD) - 10/30/17

GENERALIZED DIRECTION OF GROUNDWATER FLOW - 10/30/17

(288) CYANIDE CONCENTRATION IN OVERBURDEN GROUNDWATER (µg/L) - NOVEMBER 2017 DATA OR MOST RECENT DATA AVAILABLE FOR LOCATIONS NOT SAMPLED DURING OU2 RI ACTIVITIES.

200 ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED). LOGARITHMIC CONTOUR INTERVAL (µg/L).

ND NOT DETECTED

NS NOT SAMPLED

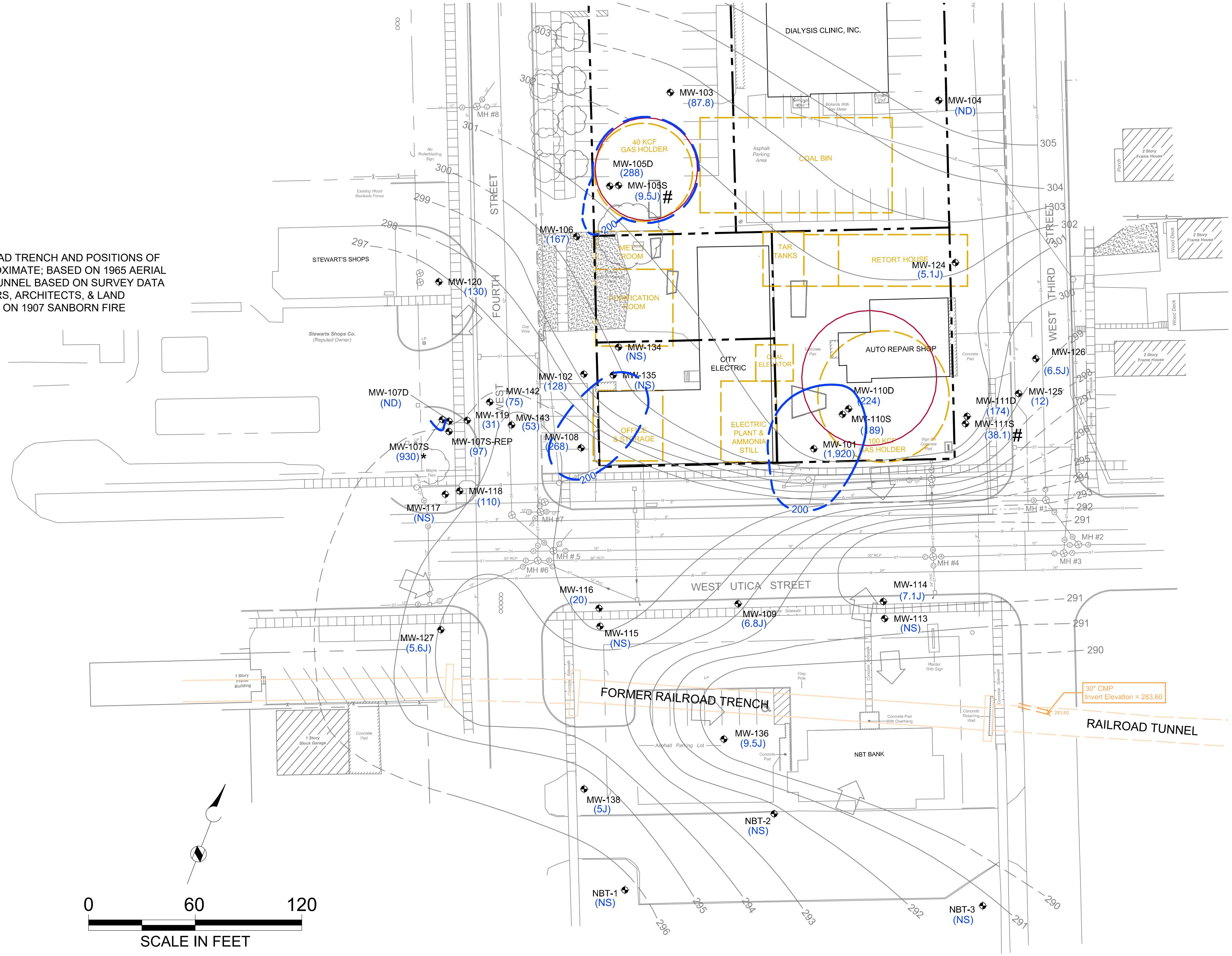
J ESTIMATED CONCENTRATION

NOTE:

GENERALIZED ISOCONCENTRATION CONTOURS ARE BASED ON MOST RECENT DATA AVAILABLE AND THUS ARE NOT REPRESENTATIVE OF CONDITIONS AT ANY ONE TIME.

CYANIDE WAS DETECTED AT LOWER CONCENTRATIONS IN SHALLOW OVERBURDEN GROUNDWATER RELATIVE TO DEEPER OVERBURDEN GROUNDWATER AT SAME LOCATION AND THUS, DATA FROM DEEP OVERBURDEN GROUNDWATER AT LOCATION (I.E., DATA FROM WELL WITH "D" SUFFIX) WAS USED FOR GENERATING ISOCONCENTRATION CONTOURS.

* INSUFFICIENT WATER COLUMN HEIGHT TO PERFORM LOW FLOW PURGING AND SAMPLING TECHNIQUES. WELL PURGED AND SAMPLED USING BAILER, RESULTING IN INCREASED TURBIDITY IN COLLECTED SAMPLES, WHICH CAN BIAS SAMPLE RESULTS TOWARD HIGHER CONCENTRATIONS. REFER TO CYANIDE CONCENTRATION POSTED FOR MW-107S-REP FOR REPRESENTATIVE CYANIDE CONCENTRATIONS IN OVERBURDEN GROUNDWATER IN THIS AREA.



Brown AND Caldwell

SCALE: 1" = 60'

152555.100

DATE: January 17, 2019

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

CYANIDE CONCENTRATIONS IN OVERBURDEN GROUNDWATER

FIGURE

37

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: Cyanide Concentrations In Overburden Groundwater Plot Date: January 17, 2019 8:27 AM Cadd User: Robert Near

SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- WATER LINE
- GAS LINE
- SANITARY SEWER
- STORM SEWER
- UNDERGROUND ELECTRIC LINE
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

- PROPERTY LINE
- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 292 WATER TABLE ELEVATION CONTOUR (FT., NGVD) - 10/30/17
- GENERALIZED DIRECTION OF GROUNDWATER FLOW 10/30/17
- (520) BENZENE CONCENTRATION IN OVERBURDEN GROUNDWATER (µg/L) - NOVEMBER 2017 DATA OR MOST RECENT DATA AVAILABLE FOR LOCATIONS NOT SAMPLED DURING OU2 RI ACTIVITIES
- 100 ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED). LOGARITHMIC CONTOUR INTERVAL (µg/L).
- (ND) NOT DETECTED
- (NS) NOT SAMPLED
- J ESTIMATED CONCENTRATION

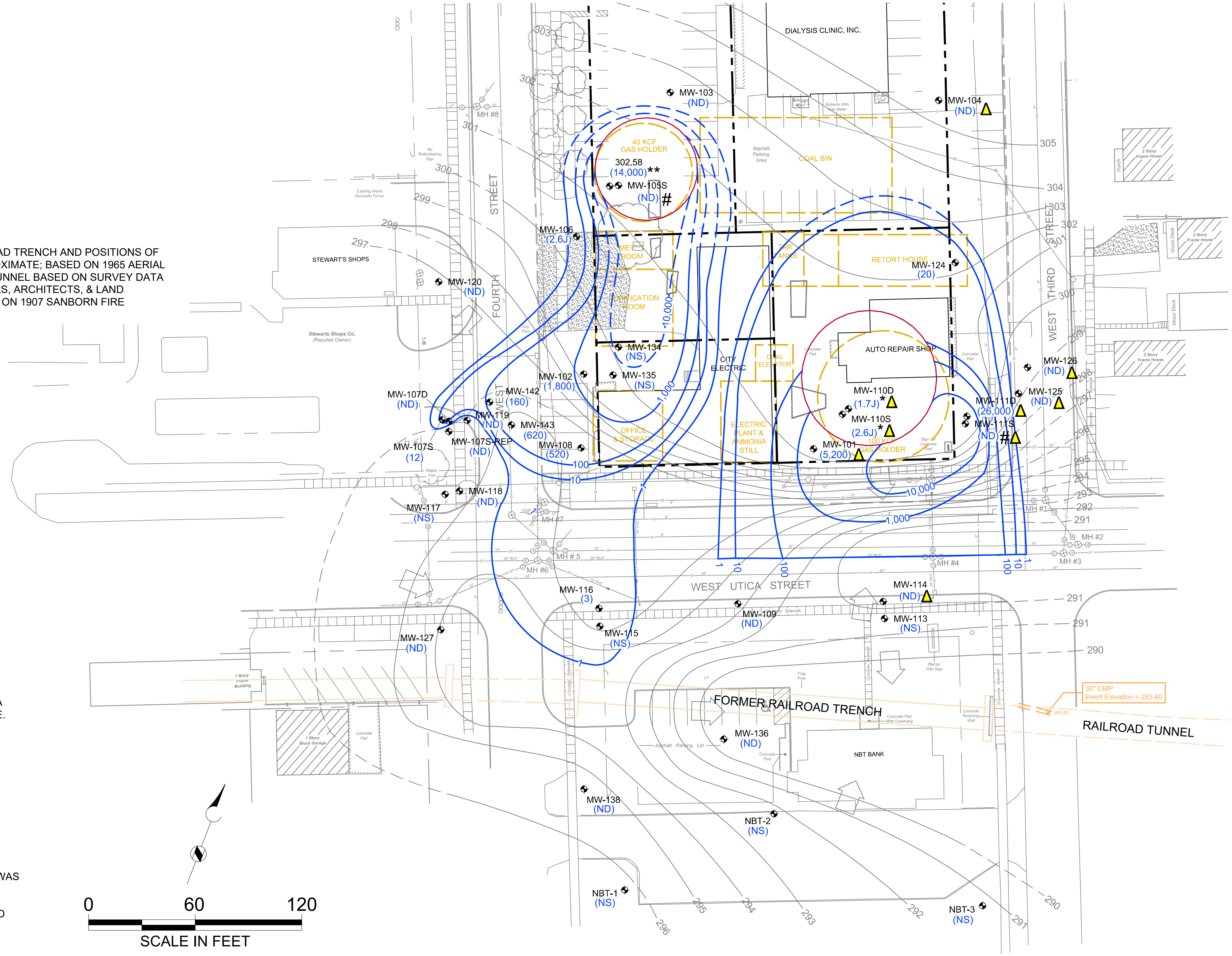
NOTE:
GENERALIZED ISOCONCENTRATION CONTOURS ARE BASED ON MOST RECENT DATA AVAILABLE AND THUS ARE NOT REPRESENTATIVE OF CONDITIONS AT ANY ONE TIME.

* VALUE POSTED NOT USED FOR DEVELOPING ISOCONCENTRATION CONTOURS. WATER LEVELS MEASURED IN WELLS IN FORMER GAS HOLDER INDICATE THAT WATER IN HOLDER HAS NO OR LIMITED HYDRAULIC CONNECTIVITY WITH SURROUNDING GROUNDWATER.

** ALTHOUGH WATER LEVEL DATA FROM WELLS IN FORMER GAS HOLDER INDICATE THAT WATER IN HOLDER HAS LIMITED HYDRAULIC CONNECTIVITY WITH SURROUNDING GROUNDWATER, DISSOLVED-PHASE CONSTITUENT CONCENTRATIONS DOWNGRADIENT FROM HOLDER INDICATE THAT IMPACTS IN HOLDER MAY BE A CONTRIBUTING SOURCE OF THE SAME.

\# BENZENE WAS NOT DETECTED IN SHALLOW OVERBURDEN GROUNDWATER BUT WAS DETECTED AT RELATIVELY HIGH CONCENTRATIONS IN DEEPER OVERBURDEN GROUNDWATER AT SAME LOCATION AND THUS, DATA FROM DEEP OVERBURDEN GROUNDWATER AT LOCATION (I.E., DATA FROM WELL WITH "D" SUFFIX) WAS USED FOR GENERATING ISOCONCENTRATION CONTOURS.

△ METHYL TERT-BUTYL ETHER (MTBE) DETECTED AT LOCATION



Brown AND Caldwell

SCALE: 1" = 60'

152555.100

DATE: January 22, 2019

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

BENZENE CONCENTRATIONS IN OVERBURDEN GROUNDWATER

FIGURE
38

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: Benzene Concentrations In Overburden Groundwater Plot Date: January 22, 2019 11:09 AM Cadd User: Robert Near

SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

MONITORING WELL

MANHOLE

POWER POLE

WATER LINE

GAS LINE

SANITARY SEWER

STORM SEWER

UNDERGROUND ELECTRIC LINE

FORMER RAILROAD TRENCH

RAILROAD TUNNEL

RAILROAD TUNNEL HEADWALL

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

PROPERTY LINE

FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.

FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.

290 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT., NGVD) FOR SHALLOW BEDROCK - 10/30/17

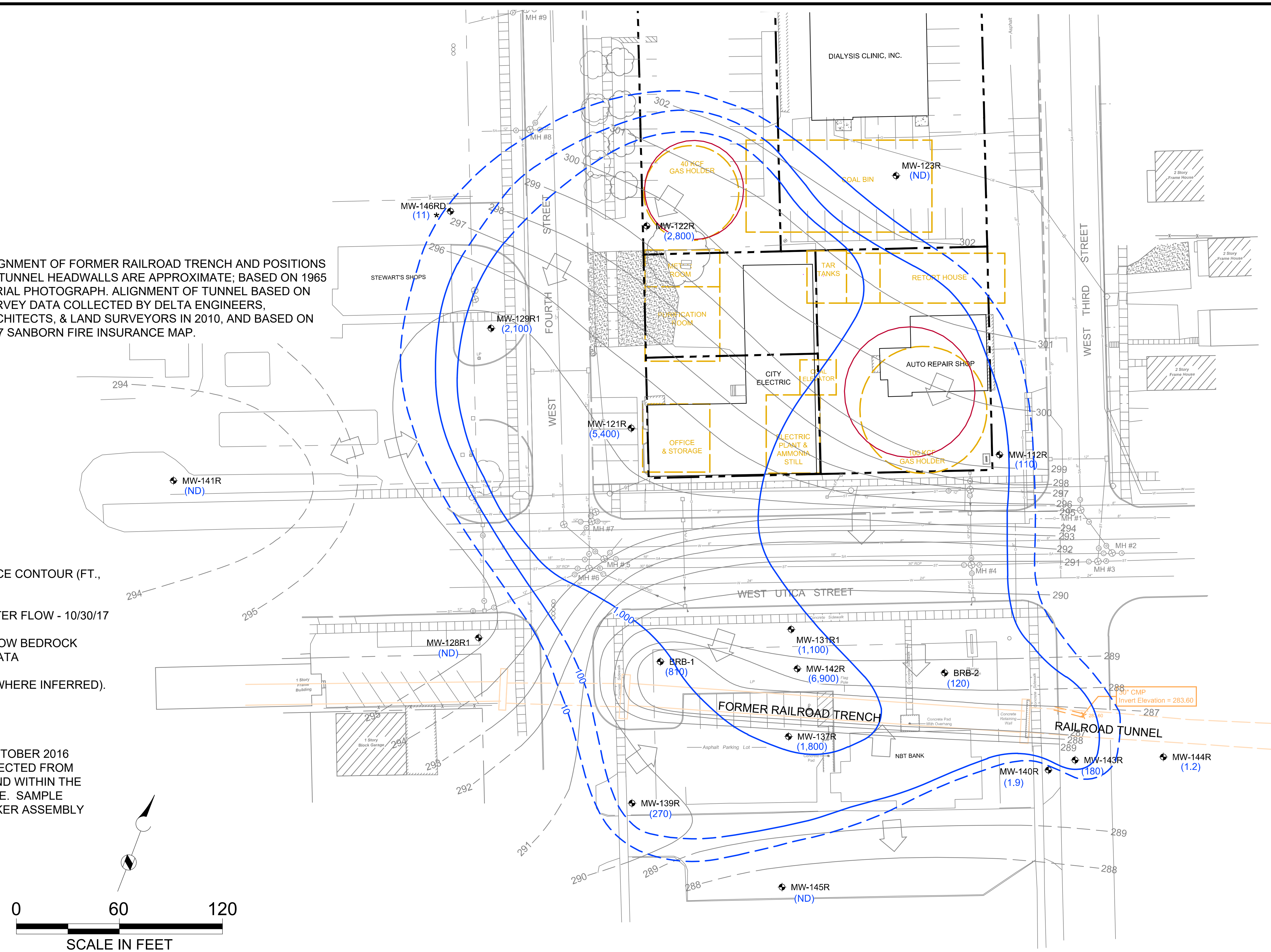
GENERALIZED DIRECTION OF GROUNDWATER FLOW - 10/30/17

(2,800) NAPHTHALENE CONCENTRATION IN SHALLOW BEDROCK GROUNDWATER (μg/L) - NOVEMBER 2017 DATA

100 ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED). LOGARITHMIC CONTOUR INTERVAL (μg/L).

* NAPHTHALENE CONCENTRATION FROM OCTOBER 2016 BOREHOLE GROUNDWATER SAMPLE COLLECTED FROM 32.5-42 FEET BELOW GROUND SURFACE AND WITHIN THE SHALLOW BEDROCK WATER-BEARING ZONE. SAMPLE COLLECTED DURING DRILLING USING PACKER ASSEMBLY AND SUBMERSIBLE PUMP.

ND NOT DETECTED



Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: Naphthalene Concentrations In Shallow Bedrock Groundwater Plot Date: January 17, 2019 8:34 AM Cadd User: Robert Near

Brown AND Caldwell

SCALE: 1" = 60'

152555.100

DATE: December 4, 2018

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

NAPHTHALENE CONCENTRATIONS IN SHALLOW BEDROCK GROUNDWATER

FIGURE

39

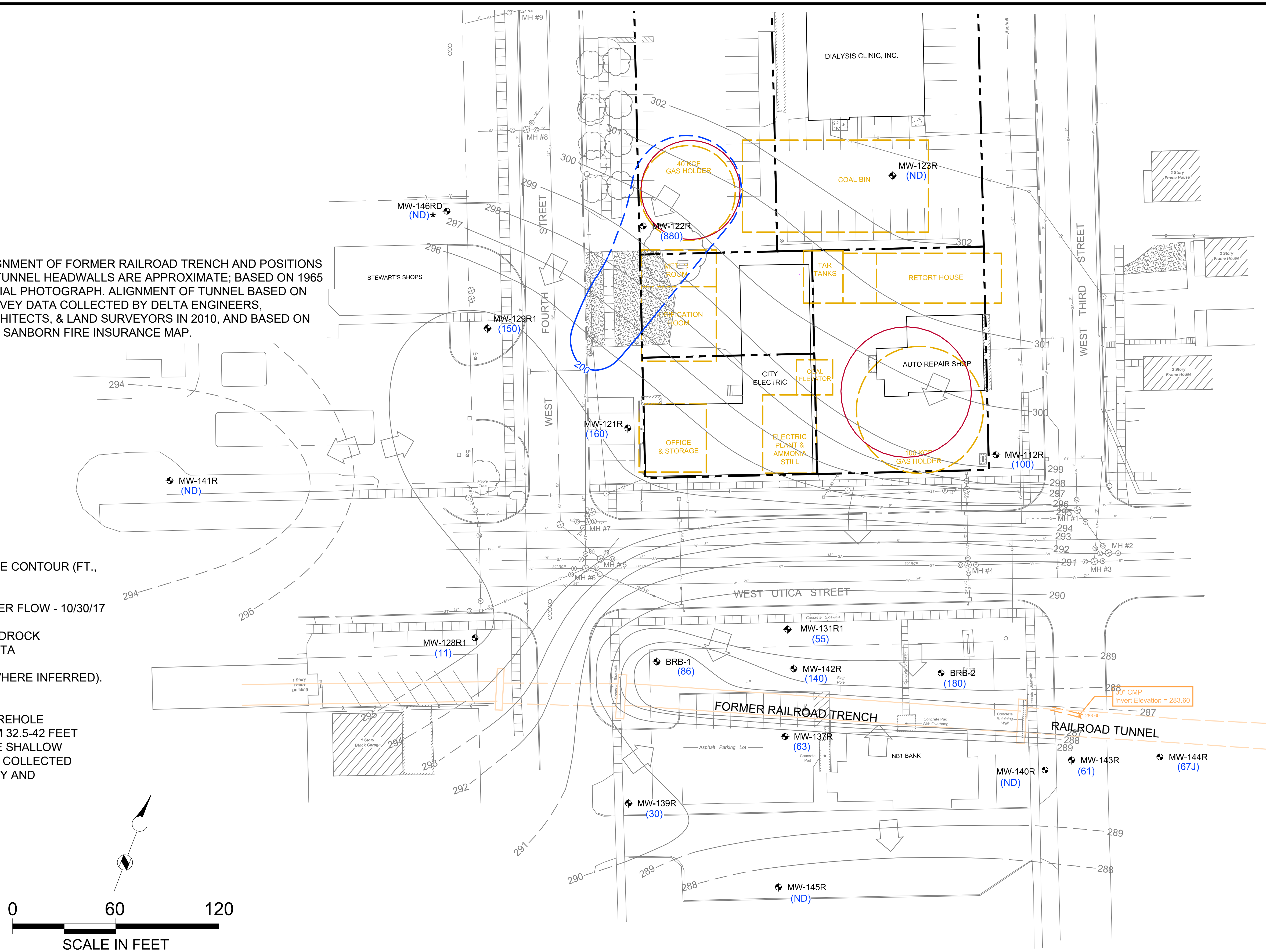
SOURCE:

BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

	MONITORING WELL
	MANHOLE
	POWER POLE
W	WATER LINE
G	GAS LINE
SA	SANITARY SEWER
ST	STORM SEWER
UE	UNDERGROUND ELECTRIC LINE
	FORMER RAILROAD TRENCH
	RAILROAD TUNNEL
	RAILROAD TUNNEL HEADWALL
	PROPERTY LINE
	FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
	FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
290	GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT., NGVD) FOR SHALLOW BEDROCK - 10/13/17
	GENERALIZED DIRECTION OF GROUNDWATER FLOW - 10/30/17
(150)	CYANIDE CONCENTRATION IN SHALLOW BEDROCK GROUNDWATER (µg/L) - NOVEMBER 2017 DATA
200	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED). LOGARITHMIC CONTOUR INTERVAL (µg/L).
*	CYANIDE RESULT FROM OCTOBER 2016 BOREHOLE GROUNDWATER SAMPLE COLLECTED FROM 32.5-42 FEET BELOW GROUND SURFACE AND WITHIN THE SHALLOW BEDROCK WATER-BEARING ZONE. SAMPLE COLLECTED DURING DRILLING USING PACKER ASSEMBLY AND SUBMERSIBLE PUMP.
ND	NOT DETECTED
J	ESTIMATED CONCENTRATION

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.



Brown AND Caldwell

SCALE: 1" = 60'

152555.100

DATE: December 4, 2018

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

CYANIDE CONCENTRATIONS IN SHALLOW BEDROCK GROUNDWATER

FIGURE
40

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: Cyanide Concentrations In Shallow Bedrock Groundwater Plot Date: January 17, 2019 9:13 AM Cadd User: Robert Near

SOURCE:

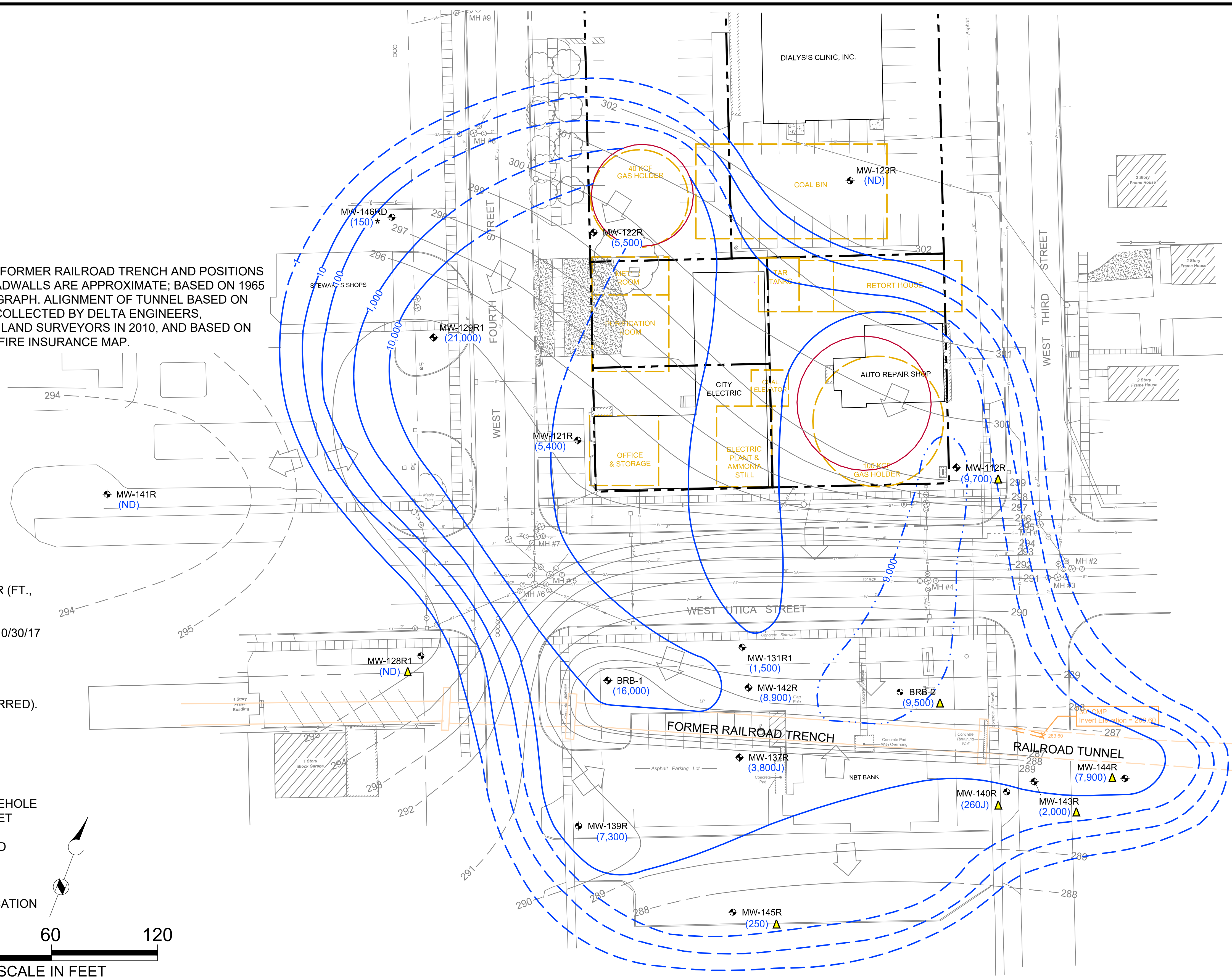
BASE MAP DEVELOPED BASED ON DRAWING PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP (JANUARY 11, 2005) REVISED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS (DECEMBER 18, 2016).

LEGEND:

- MONITORING WELL
- MANHOLE
- POWER POLE
- WATER LINE
- GAS LINE
- SANITARY SEWER
- STORM SEWER
- UNDERGROUND ELECTRIC LINE
- FORMER RAILROAD TRENCH
- RAILROAD TUNNEL
- RAILROAD TUNNEL HEADWALL
- PROPERTY LINE

ALIGNMENT OF FORMER RAILROAD TRENCH AND POSITIONS OF TUNNEL HEADWALLS ARE APPROXIMATE; BASED ON 1965 AERIAL PHOTOGRAPH. ALIGNMENT OF TUNNEL BASED ON SURVEY DATA COLLECTED BY DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS IN 2010, AND BASED ON 1907 SANBORN FIRE INSURANCE MAP.

- FORMER MGP STRUCTURE LOCATION LOCATIONS ARE APPROXIMATE, BASED ON 1924 SANBORN FIRE INSURANCE MAP.
- FORMER GAS HOLDER LOCATION. LOCATIONS ARE APPROXIMATE. BASED ON COMBINATION OF FIELD MEASUREMENTS AND SURVEY DATA.
- 290 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT., NGVD) FOR SHALLOW BEDROCK - 10/30/17
- GENERALIZED DIRECTION OF GROUNDWATER FLOW - 10/30/17
- (5,500) BENZENE CONCENTRATION IN SHALLOW BEDROCK GROUNDWATER (µg/L) - NOVEMBER 2017 DATA
- 100 ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED). LOGARITHMIC CONTOUR INTERVAL (µg/L).
- 9,000 SUPPLEMENTAL ISOCONCENTRATION CONTOUR
- * BENZENE CONCENTRATION FROM OCTOBER 2016 BOREHOLE GROUNDWATER SAMPLE COLLECTED FROM 32.5-42 FEET BELOW GROUND SURFACE AND WITHIN THE SHALLOW BEDROCK WATER-BEARING ZONE. SAMPLE COLLECTED DURING DRILLING USING PACKER ASSEMBLY AND SUBMERSIBLE PUMP.
- METHYL TERT-BUTYL ETHER (MTBE) DETECTED AT LOCATION
- J ESTIMATED CONCENTRATION
- ND NOT DETECTED



SCALE: 1" = 60'

152555.100

DATE: December 4, 2018

NATIONAL GRID
OSWEGO (WEST UTICA ST.)
FORMER MGP SITE - OPERABLE UNIT 2
OSWEGO, NEW YORK

BENZENE CONCENTRATIONS IN SHALLOW BEDROCK GROUNDWATER

FIGURE 41

Brown AND Caldwell

Path: P:\DRAFTING\NATIONAL_GRID\NIMO_OSWEGO\Quarterly_GW_Contours File Name: Benzene Concentrations In Shallow Bedrock Groundwater Plot Date: January 22, 2019 8:19 AM Cadd User: Robert Near

Appendix B: Cost Estimates for the Remedial Alternatives

Oswego (West Utica Street) Former MGP Site
Oswego, New York
Feasibility Study
May 2020

Cost Estimate Summary

	Alternative	Capital Cost	Annual O&M Cost		Present Worth (30 years, 3%)
1	No Action	$0	$0		$0
2	Monitored Natural Attenuation	$44,000	$128,000 $70,000	(Years 1 - 5) (Years 6 - 30)	$1,683,000
3	NAPL Recovery with Off-Site Treatment/Disposal and Monitored Natural Attenuation	$107,000	$142,000 $129,000 $70,000	(Year 1) (Years 2 - 5) (Years 6 - 30)	$1,762,000

We have provided herein our opinion of probable costs. Client understands that construction cost estimates, financial analyses and feasibility projections are subject to many influences including, but not limited to, price of labor and materials, unknown or latent conditions of existing equipment or structures, and time or quality of performance by third parties. Further, such influences may not be precisely forecasted and are beyond the control of Brown and Caldwell Associates (BC) and actual costs incurred may vary substantially from the estimates prepared by BC. BC does not warrant or guarantee the accuracy of construction or development cost estimates.

General Notes and Assumptions:

1. Estimate is based on the conceptual plans described in the May 2020 Feasibility Study Report for OU2 of the Oswego (West Utica Street) Former MGP Site
2. Estimates are based on BC experience and vendor/contractor cost information, including contractor bids, for similar projects. Costs are in 2020 dollars.
3. This is a Class 4 estimate in accordance with the Association for the Advancement of Cost Engineering International (AACE) Recommended Practive 107R-19. Typically, engineering is from 1% to 15% complete. The target expected accuracy for Class 4 estimates typically range from -30% to +50%.
4. Present worth based on extending the annual costs over the operating period using a 3% discount factor. Per the EPA Guidance, "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", July 2000 (EPA 540-R-00-002), for Federal facility sites being cleaned up using Superfund authority, it is generally appropriate to apply the real discount rates found in Appendix C of OMB Circular A-94. Per the Office of Management and Budget (https://www.whitehouse.gov/wp-content/uploads/2019/12/M-20-07.pdf), the real discount rate as of November 2019 is 2.4% for a 30-year period.

Oswego (West Utica Street) Former MGP Site
Oswego, New York
Feasibility Study
May 2020

Alternative 2 - Monitored Natural Attenuation

Item		Cost Component	Quantity	Units		Unit Costs	Line Item Costs
		CONSTRUCTION CAPITAL COST					
		No Construction					$0
						SUBTOTAL:	$0
		CONTINGENCY: (20% of subtotal capital cost)	10	%		$0	$0
						TOTAL CONSTRUCTION CAPITAL COST:	$0
		ENGINEERING, PERMITTING, AND DOCUMENTATION CAPITAL COST					
1		ENGINEERING, PERMITTING, AND CONSTRUCTION MANAGEMENT					
	a	Remedial Design/Remedial Action Workplan	1	LS	$	20,000	$20,000
	b	Site Management Plan	1	LS	$	20,000	$20,000
						SUBTOTAL:	$40,000
		CONTINGENCY: (% of subtotal capital cost)	10	%		$4,000	$4,000
						TOTAL ENGINEERING, PERMITTING, AND DOCUMENTATION CAPITAL COST:	$44,000
						TOTAL CAPITAL COST:	**$44,000**
		ANNUAL O&M COST					
2		O&M (Years 1 through 5)					
	a	Groundwater Monitoring	2	EVENT	$	35,900	$71,800
	b	Data Evaluation and Reporting	2	EVENT	$	13,100	$26,200
	c	Waste Management	1	LS	$	2,600	$2,600
	d	Periodic Review Report (Annual)	1	LS		$15,000	$15,000
						SUBTOTAL:	$115,600
		CONTINGENCY: (% of O&M annual cost)	10	%		$11,560	$11,560
						TOTAL ANNUAL O&M COST (Years 1 through 5):	**$128,000**
3		O&M (Years 6 through 30)					
	a	Groundwater Monitoring	1	EVENT	$	33,400	$33,400
	b	Data Evaluation and Reporting	1	EVENT	$	13,100	$13,100
	c	Waste Management	1	LS	$	1,300	$1,300
	d	Periodic Review Report (Annual)	1	LS		$15,000	$15,000
						SUBTOTAL:	$62,800
		CONTINGENCY: (% of O&M annual cost)	10	%		$6,280	$6,280
						TOTAL ANNUAL O&M COST (Years 6 through 30):	**$70,000**

Oswego (West Utica Street) Former MGP Site
Oswego, New York
Feasibility Study
May 2020

Alternative 2 - Monitored Natural Attenuation

Item	Cost Component	Quantity	Units	Unit Costs	Line Item Costs
	TOTAL PRESENT WORTH				
		Yearly Interest Rate	**Number Years**	**O&M Present Worth**	**Total Present Worth**
	Capital Costs				$44,000
	O&M Cost (Years 1 through 5)	3%	5	$587,000	$587,000
	O&M Cost (Years 6 through 30)	3%	25	$1,052,000	$1,052,000
				TOTAL PRESENT WORTH:	**$1,683,000**

Notes:
1. Refer to notes below Cost Estimate Summary table.
2. Estimate assumes each monitoring event includes sampling of 29 wells (41 total samples including QA/QC samples) and lab analysis of BTEX, MTBE, PAHs, and total cyanide. Assumes a 2-person field crew for one week per event. Assumes semiannual monitoring for 5 years and annual monitoring thereafter.

Oswego (West Utica Street) Former MGP Site
Oswego, New York
Feasibility Study
May 2020

Alternative 3 - NAPL Recovery with Off-Site Treatment/Disposal and Monitored Natural Attenuation

Item		Cost Component	Quantity	Units		Unit Costs	Line Item Costs
	CONSTRUCTION CAPITAL COST						
1	Installation of NAPL Recovery Wells		3	EACH	$	15,000	$45,000
						SUBTOTAL:	$45,000
	CONTINGENCY: (20% of subtotal capital cost)		10	%		$5,000	$5,000
						TOTAL CONSTRUCTION CAPITAL COST:	$50,000
	ENGINEERING, PERMITTING, AND DOCUMENTATION CAPITAL COST						
2	ENGINEERING, PERMITTING, AND CONSTRUCTION MANAGEMENT						
	a	Remedial Design/Remedial Action Workplan	1	LS	$	20,000	$20,000
	b	Site Management Plan	1	LS	$	20,000	$20,000
	c	Well Installation Oversight	1	LS	$	12,000	$12,000
						SUBTOTAL:	$52,000
	CONTINGENCY: (% of subtotal capital cost)		10	%		$5,000	$5,000
						TOTAL ENGINEERING, PERMITTING, AND DOCUMENTATION CAPITAL COST:	$57,000
						TOTAL CAPITAL COST:	**$107,000**
	ANNUAL O&M COST						
3	O&M (Year 1)						
	a	Groundwater Monitoring and NAPL Gauging/Recovery	2	EVENT	$	35,900	$71,800
	b	Additional NAPL Gauging/Recovery Events	2	EVENT	$	5,000	$10,000
	c	Data Evaluation and Reporting	2	EVENT	$	13,100	$26,200
	d	Waste Management	1	LS	$	5,200	$5,200
	e	Periodic Review Report (Annual)	1	LS		$15,000	$15,000
						SUBTOTAL:	$128,200
	CONTINGENCY: (% of O&M annual cost)		10	%		$12,820	$12,820
						TOTAL ANNUAL O&M COST (Year 1):	**$142,000**
4	O&M (Years 2 through 5)						
	a	Groundwater Monitoring and NAPL Gauging/Recovery	2	EVENT	$	35,900	$71,800
	b	Data Evaluation and Reporting	2	EVENT	$	13,100	$26,200
	c	Waste Management	1	LS	$	3,600	$3,600
	d	Periodic Review Report (Annual)	1	LS		$15,000	$15,000
						SUBTOTAL:	$116,600
	CONTINGENCY: (% of O&M annual cost)		10	%		$11,660	$11,660
						TOTAL ANNUAL O&M COST (Years 2 through 5):	**$129,000**
5	O&M (Years 6 through 30)						
	a	Groundwater Monitoring and NAPL Gauging/Recovery	1	EVENT	$	33,400	$33,400
	b	Data Evaluation and Reporting	1	EVENT	$	13,100	$13,100
	c	Waste Management	1	LS	$	1,800	$1,800
	d	Periodic Review Report (Annual)	1	LS		$15,000	$15,000
						SUBTOTAL:	$63,300
	CONTINGENCY: (% of O&M annual cost)		10	%		$6,330	$6,330
						TOTAL ANNUAL O&M COST (Years 6 through 30):	**$70,000**

Oswego (West Utica Street) Former MGP Site
Oswego, New York
Feasibility Study
May 2020

Alternative 3 - NAPL Recovery with Off-Site Treatment/Disposal and Monitored Natural Attenuation

Item	Cost Component	Quantity	Units	Unit Costs	Line Item Costs
	TOTAL PRESENT WORTH				
		Yearly Interest Rate	**Number Years**	**O&M Present Worth**	**Total Present Worth**
	Capital Costs				$107,000
	O&M Cost (Year 1)	3%	1	$138,000	$138,000
	O&M Cost (Years 2 through 5)	3%	4	$465,000	$465,000
	O&M Cost (Years 6 through 30)	3%	25	$1,052,000	$1,052,000
				TOTAL PRESENT WORTH:	**$1,762,000**

Notes:
1. Refer to notes below Cost Estimate Summary table.
2. Estimate assumes each monitoring event includes sampling of 29 wells (41 total samples including QA/QC samples) and lab analysis of BTEX, MTBE, PAHs, and total cyanide. Assumes a 2-person field crew for one week per event. Assumes semiannual monitoring for 5 years and annual monitoring thereafter.
3. NAPL gauging/recovery assumes a quarterly frequency for the first year, semiannual for years 2 through 5, and annual thereafters. Assumes one drum of waste will be generated per NAPL recovery event.