PROPOSED REMEDIAL ACTION PLAN

Old Erie Canal -Village of Clyde Section
State Superfund Project
Clyde, Wayne County
Site No. 859015
February 2013

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy proposed by this Proposed Remedial Action Plan (PRAP). The disposal of hazardous wastes at this site, as more fully described in Section 6 of this document, has contaminated various environmental media. The proposed remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred remedy.

The New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375. This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all PRAPs. This is an opportunity for public participation in the remedy selection process. The public is encouraged to review the reports and documents, which are available at the following repository:

Clyde Savannah Public Library
204 Glasgow Street
CLYDE, NY 14433
Phone: (315) 923 - 7767

A public comment period has been set from:

2/28/2013 to 3/30/2013

A public meeting is scheduled for the following date:

3/19/2013 at 7:00 PM

Public meeting location:

Village of Clyde
6 South Park Street
Clyde NY 14433
Phone: (315) 923-3971

At the meeting, the findings of the remedial investigation (RI) and the feasibility study (FS) will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP.

Written comments may also be sent through 3/30/2013 to:

Matthew Gillette
NYS Department of Environmental Conservation
Division of Environmental Remediation
6274 East Avon-Lima Road
Avon, NY 14414
mpgillet@gw.dec.state.ny.us

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP based on new information or public comments. Therefore, the public is encouraged to review and comment on the proposed remedy identified herein. Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location:
The Old Erie Canal site is located at 124 Columbia Street in a residential section of the Village of Clyde, Town of Galen, Wayne County. The site is approximately 0.25 miles west of the intersection of Columbia Street and State Route 414.

Site Features:
The approximately 10 acre site includes the Parker Hannifin property, which contains the manufacturing building, and adjacent parcels to the west and southwest. The properties to the west/southwest are an open area that includes a filled-in section of the former Erie Canal and a section that was utilized as a barge turnaround. The site is bounded to the north by Columbia Street and residential properties, to the east by a commercial property, and to the west by residential properties. The adjacent residential properties are on public water. An active rail line and the New York State Barge Canal border the site to the south. A drainage channel passes to the west of the manufacturing building and eventually drains to the Barge Canal.

Current Zoning/Use:
The site is currently zoned industrial. Parker Hannifin manufacturing operations are currently active. The former barge turnaround area is undeveloped.

Historic Use:
Manufacturing operations have occurred at the site since the early 1800s. Glass manufacturing dominated Site operations into the early 1930s. The Acme Electric Company (Acme Electric) purchased the property in 1941 for production of transformers. The current facility was built in 1941. Acme Electric manufactured electrical equipment, transistors, radar components and transformer components for use by the United States Navy during World War II. These manufacturing activities are thought to have generated some chlorinated solvents (volatile organic compounds – VOCs), spent stripping solutions, plating bath sludges, polychlorinated biphenyl (PCB) capacitors, and paint sludges.

General Electric (GE) purchased the facility in 1945 for the manufacture of electrical equipment, including fluorescent light ballasts, rectifiers, transistors, and diodes. Parker Hannifin purchased the facility from GE in 1965 initially for the manufacture of automobile air conditioning systems. Historical GE and Parker Hannifin manufacturing processes included the use of VOC degreasers as well as miscellaneous metal fabricating activities which would also utilize VOCs. The manufacturing facility currently manufactures gas turbine fuel systems.

The Old Erie Canal was excavated through the southern portion of the site between 1817 and 1825. Initially, the canal was 40 feet wide and 4 feet deep. Between 1836 and 1862, the canal was enlarged to a width of 70 feet and a depth of 7 feet. The enlarged canal included the former Barge Turnaround located in the southwestern portion of the Site. The present day Barge Canal was constructed beginning in 1908 utilizing a portion of the Clyde River south of the site. The portion of the Old Erie Canal adjacent to the Site was abandoned in 1917.

The Old Erie Canal and former Barge Turnaround were used as historical disposal/fill sites. In the Village of Clyde, local contractors reportedly used the abandoned canal for the disposal of construction and demolition debris. The section of the Old Erie Canal along the southern portion of the Parker Hannifin property was reportedly filled by Parker Hannifin between 1968 and 1979.

The Village of Clyde sanitary sewer system historically discharged to a septic tank located at the confluence of the former Barge Turnaround and the Old Erie Canal. Waste was discharged from the septic tank to a catch basin located in the unfilled portion of the Old Erie Canal and, ultimately, to the Clyde River. The Village abandoned and subsequently demolished the septic tank as part of sanitary sewer system improvements completed between 1968 and 1972.

Site Geology and Hydrogeology:
Groundwater flow in the area is generally to the south. There are overburden and bedrock groundwater aquifers present. Groundwater has been measured at depths ranging from 2 to 10 feet below the ground surface. Bedrock is encountered approximately 25 feet below ground surface. This is overlain by a layer of glacial till 10 to 20 feet thick. This till is overlain by layers of sand and gravel. A layer of fill material comprises the uppermost layer and is of greater depth in the barge turnaround section.

A site location map is attached as Figure 1.

SECTION 4: <u>LAND USE AND PHYSICAL SETTING</u>

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to industrial use as described in Part 375-1.8(g) are/is being evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the investigation to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: <u>ENFORCEMENT STATUS</u>

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

Parker Hannifin Corporation

General Electric Corporation

The Department and the Parker Hannifin Corporation and the General Electric Corporation entered into a Consent Order (# B8-0533-98-06) on February 2, 2002. The Order obligates the responsible parties to implement a Remedial Investigation/Feasibility Study only. After the remedy is selected, the Department will approach the PRPs to implement the selected remedy.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

The analytical data collected on this site includes data for:

- air
- groundwater
- surface water
- soil
- soil vapor
- indoor air

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

TRICHLOROETHENE (TCE)
ARSENIC
BENZ(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO[K]FLUORANTHENE
CHRYSENE
FLUORANTHENE
INDENO(1,2,3-CD)PYRENE
CADMIUM
DICHLOROETHYLENE
VINYL CHLORIDE
TOLUENE
XYLENE (MIXED)
DIBENZ[A,H]ANTHRACENE

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil
- soil vapor intrusion
- indoor air

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

The following IRM(s) has/have been completed at this site based on conditions observed during the RI.

Storm Sewer Closures
The results of storm water sampling (Figure 5) conducted during the RI, revealed the presence of volatile organic compounds (VOCs) in storm water discharging to catch basin CB-3 and in two upgradient manholes (MH-3A and MH-3B). . Based on the results of the storm water sampling and subsequent evaluations of the site storm sewers, an IRM was completed in November 2003 consisting of:

• Decommissioning of storm sewer lines 3 and 4 by filling them with flowable fill. Flowable fills contains much less cement and higher proportions of fly ash and water than concrete, and they can be excavated if necessary.

- Decommissioning of manholes MH-3A and MH-3B and catch basins CB-3E and CB-3 by filling them with concrete.
- Installation of concrete water-stops on abandoned storm sewer lines 3 and 4, to minimize potential migration of groundwater along the sewer trenches. The water-stops are concrete barriers installed within the drainage system.
- Re-grading and paving a portion of the parking lot behind the manufacturing building to direct surface water away from the locations of the abandoned catch basins and storm sewer lines.

Off-site Soil Vapor Intrusion Mitigation

As a result of soil vapor intrusion investigations, mitigation measures were implemented at an off-site residence based on the levels of VOCs in the soil vapor samples collected near the structure and the corresponding indoor air levels at that structure.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OU 01.

Nature and Extent of Contamination:

Based upon investigations conducted to date, the primary contaminants of concern at the site include chlorinated volatile organic compounds (CVOCs) in soil, groundwater, and soil vapor. Semi-volatile organic compounds and metals have been identified as contaminants of concern in on-site soils. CVOC contamination attributable to the site has been found in the basement sump water, soil vapor, and indoor air of adjacent off-site properties.

Groundwater:

Concentrations of trichloroethene (TCE) up to 580,000 parts per billion (ppb), cis-1,2-dichloroethene up to 180,000 ppb , and vinyl chloride up to 73,200 ppb were detected on-site. The highest concentrations of CVOCs in groundwater were detected at a location under the manufacturing building and in overburden and bedrock groundwater from monitoring wells installed within the barge turn-around area.

Soil:

CVOCs were detected at concentrations up to 130,000 ppb in sub-surface soil samples collected from beneath the manufacturing building. Surface soil samples collected from the drainage swale located to the west and southwest of the manufacturing building contained semi-volatile organic compounds, arsenic, and cadmium above 6 NYCRR Part 375 soil cleanup objectives for industrial use.

Soil Vapor (on-site):
Sub-slab soil vapor samples collected from beneath the manufacturing building detected elevated levels of CVOCs. TCE was detected at concentrations up to 75,000 micrograms per cubic meter (ug/m3).

Soil Vapor (off-site):
Soil vapor intrusion sampling was conducted at eight structures located to the north of the facility, across Columbia Street. Based on the concentrations of site-related chemical detected in soil vapor samples collected near one structure and the corresponding indoor air levels at that structure, a sub-slab depressurization system was recommended and installed. In addition, no further action was recommended for the remaining seven (7) homes evaluated.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

People are not drinking contaminated groundwater associated with the site because the area is served by a public water supply that is not affected by this contamination. Access to the site is not restricted and people who enter the site may directly contact contaminants in the soil by digging or otherwise disturbing the soil. Volatile organic compounds in the groundwater may move into the soil vapor (air between soil particles), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Environmental sampling has identified impacts associated with soil vapor intrusion to one on-site and one off-site building and actions have been taken to address those impacts.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water 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.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

SECTION 7: SUMMARY OF THE PROPOSED REMEDY

To be selected, the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 6.5. Potential remedial alternatives for the Site were identified, screened and evaluated in the FS report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit B. Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit C.

The basis for the Department's proposed remedy is set forth at Exhibit D.

The estimated present worth cost to implement the remedy is $1,700,000. The cost to construct the remedy is estimated to be $740,000 and the estimated average annual cost is $44,000.

The elements of the proposed remedy, depicted in Figure 7, are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principals and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

a) Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
b) Reducing direct and indirect greenhouse gas and other emissions;
c) Increasing energy efficiency and minimizing use of non-renewable energy;
d) Conserving and efficiently managing resources and materials;
e) Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
f) Maximizing habitat value and creating habitat when possible
Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
g) Integrating the remedy with the end use where possible and encouraging green and sustainable re-development

2. Groundwater contamination will be addressed by utilizing Enhanced Biodegradation.

Enhanced Bioremediation
In-situ enhanced biodegradation will be employed to treat chlorinated volatile organic compounds at three locations under the southern section of the manufacturing building, outside the southern end of the manufacturing building, and within the former barge turnaround area. Specific injection locations will be determined during the remedial design. The biological breakdown of contaminants through anaerobic reductive dechlorination will be enhanced by injecting a solution of sodium lactate and soybean oil, or similar materials into the subsurface to promote microbe growth. The method and depth of injection will be determined during the remedial design. Groundwater will be monitored for site related contamination and also for natural attenuation indicators which will provide an understanding of the biological activity breaking down the contamination. It is anticipated that contamination will decrease by a magnitude deemed acceptable to NYSDEC within a reasonable period of time (5 to 10 years). Groundwater monitoring will be performed as needed, and additional active remediation will be proposed if it appears that biodegradation processes alone will not address the contamination. The contingency remedial action will depend on the information collected, and will be detailed further during the remedial design.

3. Surface soil that exceeds 6 NYCRR Part 375 soil cleanup objectives for industrial use in the drainage swale at the south end of the site would be addressed by construction of a soil cover over approximately 0.1 acres, to prevent exposure to contaminated soils. The cover will be a minimum thickness of one foot and consist of clean soil underlain by a demarcation layer to delineate the cover soil from the subsurface soil. The top six inches of soil must be of sufficient quality to support vegetation. The site building currently serves as a site cover. This site cover will be maintained to allow for industrial use of the site. Any site redevelopment will maintain a

site cover, which may consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable SCOs. Where a soil cover is required it will be a minimum of one foot of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d). The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d).

4. Indoor air/sub-slab soil vapor will be addressed by the installation of a sub-slab vapor depressurization system in the manufacturing building on-site.

5. Institutional Control
Imposition of an institutional control in the form of an environmental easement for the controlled property that:

> a)requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).
> b) allows the use and development of the controlled property for industrial use as defined by Part 375-1.8(g), though land use is subject to local zoning laws;
> c) restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH or County DOH;
> d) prohibits agriculture or vegetable gardens on the controlled property; and
> e) requires compliance with the Department approved Site Management Plan;

6) Site Management Plan
Since the remedy results in contamination remaining at the site that does not allow for unrestricted use, a Site Management Plan is required, which includes the following:

> a) an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

The Environmental Easement discussed in Paragraph 5 above.

Engineering Controls:
The soil cover discussed in Paragraph 3, the existing sub-slab depressurization system installed off-site, and the sub-slab depressurization system discussed in Paragraph 4 above.

This plan includes, but may not be limited to:

> a) Soil Management Plan which details the provisions for management of future excavations in areas of remaining contamination;

b) descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;

c) a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion.

d) provisions for the management and inspection of the identified engineering controls;

e) maintaining site access controls and Department notification; and

f) the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls;

g) a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

1) monitoring of groundwater and surface water to assess the performance and effectiveness of the remedy;
2) a schedule of monitoring and frequency of submittals to the Department; and
3) monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required pursuant to item 3 above.

h) an Operation and Maintenance Plan to ensure continued operation, maintenance, monitoring, inspection, and reporting of for any mechanical or physical components of the remedy. The plan includes, but is not limited to:

1) compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
2) maintaining site access controls and Department notification; and
3) providing the Department access to the site and O&M records.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation for all environmental media that were evaluated. As described in Section 6.1.2, samples were collected from various environmental media to characterize the nature and extent of contamination.

For each medium, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The contaminants are arranged into four categories; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/ polychlorinated biphenyls (PCBs), and inorganics (metals and cyanide). For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil, if applicable, the Restricted Use SCGs identified in Section 6.1.1 are also presented.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the site and are impacting groundwater and soil vapor.

Wastes are defined in 6 NYCRR Part 375-1.2 (aw) and include solid, industrial and/or hazardous wastes. Source Areas are defined in 6 NYCRR Part 375 (au). Source areas are areas of concern at a site were substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium.

Waste and Source areas were identified at the site in the former barge turnaround area, and under the manufacturing building. Groundwater contamination with chlorinated solvents has been associated with the historic manufacturing operations on site and disposal of waste materials. This contamination is also associated with the chlorinated solvent contamination found in soil vapor under the manufacturing building and within off-site soil vapor.

Groundwater

Groundwater samples were collected from overburden and bedrock monitoring wells at a depth of 2 to 10 feet below the ground surface. The samples were collected to assess groundwater conditions on and off-site. The results indicate that contamination in groundwater at the site exceeds the SCGs for volatile organic compounds and metals

Table 1 – Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
1,1,2-Trichloroethane	ND – 6.5 J[c]	1	1 of 212
1,1-Dichloroethane	ND – 28	5	2 of 212
1,1-Dichloroethene	ND – 210	5	13 of 212
Benzene	ND – 23 J	1	6 of 212
Chloroform	ND – 14	7	1of 212
cis-1,2-Dichloroethene	ND – 240,000	5	95 of 212
Ethylbenzene	ND – 360	5	6 of 212
Methylene chloride	ND – 1,200 J	5	5 of 212
Tetrachloroethene	ND – 17.3 J	5	5 of 212
Toluene	ND – 24,900	5	34 of 212
trans-1,2-Dichloroethene	ND – 478 J	5	28 of 212
Trichloroethene	ND – 580,000 J	5	53 of 212
Vinyl chloride	ND – 73,200	2	95 of 212
Xylenes (total)	ND – 1,600	5	22 of 212
SVOCs			
2-Methylphenol	ND – 13	1	1 of 18
4-Methylphenol	ND - 66	1	1 of 18
Naphthalene	ND – 30 J	10	3 of 72
Phenol	ND – 5 J	1	1 of 18
bis(2-Ethylhexyl)phthalate	ND – 9 J	5	1 of 18
Metals			
Antimony [d]	ND – 3.6	3	1 of 18
Iron	19.7 J – 59,500 J	300	27 of 35
Magnesium	8,300 J – 110,000 J	35,000	8 of 19
Manganese	31.8 J – 3,970 J	300	23 of 35
Sodium	1,310 J – 568,000	20,000	14 of 43
Pesticides/PCBs			
None			

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b- SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).
c – A "J" value indicates that the detected concentration was estimated by the laboratory.
d - Chemical compound was detected at background sample location MW-8S.

The primary groundwater contaminants are trichloroethene, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride, as well benzene, toluene, and xylene (BTX) associated with the historic manufacturing operations on site and disposal of waste materials within the former barge turnaround. As noted on Figures 3, 4 and 6, the primary groundwater contamination occurs mainly in two locations on the site: in the former barge turnaround and under the manufacturing building.

The inorganic (metal compounds) contaminant of concern (Antimony) found in groundwater was only slightly above standards and was also found in upgradient monitoring wells and are considered to represent site background conditions. Therefore, the metal compounds found in groundwater are not considered site specific contaminants of concern.

Based on the findings of the RI, the disposal of hazardous waste has resulted in the contamination of groundwater. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: trichloroethene, cis-1,2-dichloroethene, and vinyl chloride.

Soil

Subsurface soil samples were collected at the site during the RI. Surface soil samples were collected from a depth of 0-2 inches to assess direct human exposure. Subsurface soil samples were collected from a depth of 4 - 16 feet to assess soil contamination impacts to groundwater. The results indicate that soils at the site exceed the 6NYCRRR Part 375 unrestricted use soil cleanup objective (SCO) for volatile and semi-volatile organic compounds and metals.
See Table 2.

Table 2 - Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Industrial Use SCG[c] (ppm)	Frequency Exceeding Restricted Use SCG	Protection of Groundwater SCG[d] (ppm)	Frequency Exceeding Restricted SCG
VOCs							
Acetone	ND – 0.63 J	0.05	9 of 19	1,000	0 of 19	0.05	9 of 19
cis-1,2-Dichloroethene	ND – 10 J	0.25	8 of 19	1,000	0 of 19	0.25	8 of 19
Methyl Ethyl Ketone	ND – 0.15 J	0.12	6 of 19	1,000	0 of 19	0.12	6 of 19
Methylene Chloride	ND – 0.2	0.05	7 of 19	1,000	0 of 19	0.05	7 of 19
Toluene	ND – 4.3	0.7	4 of 19	1,000	0 of 19	0.7	4 of 19
Trichloroethene	ND – 130 J	0.47	9 of 19	400	0 of 19	0.47	9 of 19
Vinyl Chloride	ND – 0.56 J	0.02	10 of 19	27	0 of 19	0.02	10 of 19
SVOCs							
None							
Metals							
Lead	4.3 – 1,480	63	1 of 8	3,900	0 of 8	450	1 of 8
Pesticides/PCBs							
None							

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Industrial Use.
d - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Groundwater.

Please note that the Feasibility Study refers to the soil samples collected from the drainage swale along the south of the site as “surface soil” due to the intermittent flow in the swales. This PRAP refers to these samples as “soils” but has provided a separate discussion below.

Subsurface soil contamination identified during the RI/FS include; acetone, cis-1,2-Dichloroethene, methyl ethyl ketone, methylene chloride, toluene, trichloroethene (TCE), vinyl chloride, and lead.

Acetone, methyl ethyl ketone, methylene chloride, toluene, and tricloroethene are industrial solvents possibly related to former manufacturing activities at the site. These compounds were detected both in the vicinity of the manufacturing building and the former barge turnaround at concentrations that exceed the unrestricted SCOs, but less than the restricted use SCO for industrial use. TCE was detected at its highest concentrations at sample location SSB-7 which is located under the manufacturing building. Cis-1,2-Dichloroethene and vinyl chloride most likely occur as a result of the degradation of TCE.

An elevated lead concentration was detected at sample location GP-25 which is located within the former barge turnaround. The maximum concentration detected does not exceed the Part 375-6.8 restricted use soil cleanup objectives for industrial use. Additional samples analyzed for lead within the former barge turnaround did not identify elevated levels of lead. In addition, groundwater evaluations did not identify lead in this area.

Based on the findings of the RI, the disposal of hazardous waste has resulted in the contamination of sub-surface soil. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: trichloroethene, cis-dichloroethene, and vinyl chloride.

Surface Water

Surface water samples were collected from the drainage swale to the south of the site that is within the boundaries of the Old Erie Canal channel. See Table 3 and Figure 5 for the sampling results. Surface water results identified contaminants above the 6NYCRR Part 703 surface water standards.

Table 3 - Surface Water

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
Tetrachloroethene	ND – 8.7 J	1	2 of 12
Trichloroethene	ND – 120	40	3 of 12
SVOCs			
Benzo(a)pyrene	ND – 4 J	0.0012	3 of 8
Metals			
Aluminum	54.2 - 1950	100	5 of 8
Lead	ND – 53	8	2 of 8
Pesticides/PCBs			
None			

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b-SCG: Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1) and 6 NYCRR Part 703: Surface Water and Groundwater Quality Standards.

Surface water contamination identified during the RI was addressed during the IRM described in Section 6.2. Tetrachloroethene and trichloroethene contamination identified in surface water was assumed to be the result of site related contamination infiltrating the storm sewer system discharging to the drainage channel where surface water was sampled. The highest concentrations of these contaminants were identified at the outlet of the former six inch drainage pipe discharging storm water from the site into the drainage channel. The SVOC contamination (benzo(a)pyrene) identified in surface water were also identified in surface soil in the same vicinity. The contamination is assumed to be the result of surface soil transport by surface water. The surface soil remedy will address the potential transport of soil at sampling locations with the highest concentrations. The metals detected in surface water (aluminum and lead) were also detected in surface soil both upstream and downstream of site in drainage channel. These contaminants are not addressed in the remedy as these contaminants are not considered site-related contaminants of concern.

Soils (Drainage Swale)

Surface soil samples collected during the RI from the drainage swale along the south of the site contain compounds above SCGs both upstream (see Table 5) and downstream (see Table 4) of the site. The upstream levels detected are typical of urban locations. Therefore, the upstream levels were used to delineate areas to be addressed during remediation. See Figure 5.

Surface soil contamination identified in this area during the RI will be addressed in the remedy selection process.

Table 4 - Soils (Drainage Swale)

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Industrial Use SCG[c] (ppm)	Frequency Exceeding Restricted SCG
VOCs					
Vinyl Chloride	ND – 0.120 J	0.02	1 of 10	27	0 of 10
SVOCs					
Benzo(a)anthracene	ND – 88 J	1	7 of 10	11	3 of 10
Benzo(a)pyrene	0.33 J – 97 J	1	6 of 10	1.1	6 of 10
Benzo(b)fluoranthene	0.4 J – 130 J	1	8 of 10	11	4 of 10
Benzo(k)fluoranthene	0.34 J – 78 J	0.8	7 of 10	110	0 of 10
Chrysene	0.36 J – 100 J	1	7 of 10	110	0 of 10
Dibenz(a,h)anthracene	ND – 16 J	0.33	4 of 10	1.1	4 of 10
Fluoranthene	0.6 J – 230 J	100	2 of 10	1,000	0 of 10
Indeno(1,2,3-cd)pyrene	ND – 38 J	0.5	7 of 10	11	3 of 10
Phenanthrene	ND – 120 J	100	1 of 10	1,000	0 of 10
Pyrene	0.45 J – 140 J	100	1 of 10	1,000	0 of 10
Metals					
Arsenic	7.9J – 113 J	13	6 of 10	16	5 of 10
Barium	58.4 J – 464 J	350	4 of 10	10,000	0 of 10
Cadmium	1.2 J – 85.7 J	2.5	7 of 10	60	2 of 10
Chromium	8.7 J – 209 J	30	7 of 10	800	0 of 10
Copper	31.8 J – 609 J	50	7 of 10	10,000	0 of 10
Lead	102 J – 353 J	63	10 of 10	3,900	0 of 10
Manganese	110 J – 3,230 J	1600	2 of 10	10,000	0 of 10
Mercury	0.216 J – 0.889 J	0.18	10 of 10	5.7	0 of 10
Nickel	11 J – 78.7 J	30	6 of 10	10,000	0 of 10
Pesticides/PCBs					
4,4'DDD	0.058	0.0033	1 of 10	180	0 of 10
4,4'DDE	0.079	0.0033	1 of 10	120	0 of 10
4,4'DDT	0.058	0.0033	1 of 10	94	0 of 10

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Industrial Use

The primary surface soil contaminants identified in the drainage swale are SVOCs and inorganics (metals).

The pesticides found in the drainage swale soils were only found at one location at levels exceeding the 6NYCRR Part 375 unrestricted use soil cleanup objectives. Therefore, pesticides are not considered a site-related contaminant of concern.

Table 5 – Drainage Swale Soils Background Concentrations

Compounds of Concern	Concentration Sed-01 (ppm)	Concentration Sed-02 (ppm)	Unrestricted SCG[b] (ppm)	Industrial Use SCG[c] (ppm)
VOCs				
Vinyl Chloride	ND	ND	0.02	27
SVOCs				
Benzo(a)anthracene	2.1 J	9.5 J	1	11
Benzo(a)pyrene	3.4 J	17 J	1	1.1
Benzo(b)fluoranthene	5.8 J	27 J	1	11
Benzo(k)fluoranthene	3.5 J	22 J	0.8	110
Chrysene	3.5 J	20 J	1	110
Dibenzo(a,h)anthracene	ND	2.8 J	0.33	1.1
Fluoranthene	25 J	11 J	100	1,000
Indeno(1,2,3-cd)pyrene	1.3 J	7.5 J	0.5	11
Phenanthrene	1.4 J	8.7 J	100	1,000
Pyrene	3.4 J	21 J	100	1,000
PCB/Pesticides				
4,4'DDD	ND	ND	0.0033	180
4,4'DDE	ND	ND	0.0033	120
4,4'DDT	ND	ND	0.0033	94
Metals				
Arsenic	6.5 J	7.9 J	13	16
Barium	58.4 BJ	154 J	350	10,000
Cadmium	4.5 J	1.5 BJ	2.5	60
Chromium	23 J	21.7 J	1	800
Copper	39.4 J	66 J	50	10,000
Lead	142 J	289 J	63	3,900
Manganese	155 J	329 J	1600	10,000
Mercury	0.216 J	0.349 J	0.18	5.7
Nickel	11 BJ	16.4 J	30	10,000

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Industrial Use,
ND – non detect
J – estimated, QC criteria exceeded
B – greater than instrument detection limit, less than quantitation limit

Based on the findings of the RI, the disposal of hazardous waste has resulted in the contamination of drainage swale surface soils. The site contaminants that are considered to be the primary contaminants of concern to be addressed by the remedy selection process for the drainage swale surface soils are SVOCs and Metals.

Soil Vapor

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the sampling of soil vapor, sub-slab vapor under structures, and indoor air inside structures. At this site due to the presence of buildings in the impacted area samples were collected to evaluate whether actions were needed to address exposure via soil vapor intrusion.

Sub-slab vapor samples were obtained from beneath the on-site manufacturing building. Elevated levels of VOCs were detected (e.g., TCE up to 75,000 ug/m^3). See Figure 6.

Soil vapor contamination identified off-site during the RI was addressed during the IRM described in Section 6.2.

Based on the concentration detected, the disposal of hazardous waste has resulted in the contamination of soil vapor. The site contaminant that is considered to be the primary contaminants of concern which will drive the remediation of soil vapor is trichloroethene.

Exhibit B

Description of Remedial Alternatives

The following alternatives were considered to address the contaminated media identified at the site as describe in Section 5:

GROUNDWATER

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

Groundwater Alternative 2: Site Management

Present Worth:..*720,000*
Capital Cost:..*48,000*
Annual Costs:
(Years 1-5):...*66,000*
(Years 6-30):...*35,000*

The Site Management Alternative requires only institutional controls for the site. This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site.

Institutional Controls would be implemented to restrict direct exposure to contaminated groundwater. Future use of the Parker Hannifin property site would also be restricted to industrial usage.

The site management plan includes a long-term groundwater monitoring program, known as Monitored Natural Attenuation (MNA), to evaluate the continuing effectiveness of the natural attenuation processes in restoring groundwater quality. The groundwater monitoring program would consist of both hydraulic and water quality monitoring in overburden and bedrock monitoring wells. The purpose of the hydraulic monitoring program would be to confirm that the groundwater flow patterns do not change over time resulting in unexpected off-site impact. Groundwater quality monitoring would be conducted to track the reductions in COC concentrations over time, evaluate the continuing favorable conditions for natural attenuation, and confirm the protectiveness of the remedy. Groundwater will be monitored for site related contamination and also for MNA indicators which will provide an understanding of the (biological activity) breaking down the contamination. It is anticipated that contamination will decrease by an order of magnitude in a reasonable period of time (5 to 10 years). Reports of the attenuation will be provided annually, and active remediation will be proposed if it appears that natural processes alone will not address the contamination. The contingency remedial action will depend on the information collected, but it is currently anticipated that (insert contingency technology, e.g., "oxygen injection ") would be the expected contingency remedial action.

Groundwater Alternative 3: Enhanced Biodegradation with Monitoring and Institutional Controls

Present Worth: *1,300,000*
Capital Cost: *550,000*
Annual Costs:
(Years 1-5): *69,000*
(Years 6-30): *39,000*

An in situ groundwater treatment would be performed in hotspot areas to accelerate the biodegradation of COCs in overburden and bedrock groundwater and thus actively reduce risk. In situ enhancement of biodegradation would be conducted through supplementation of nutrient/carbon sources. Application areas would include areas beneath and adjacent to the manufacturing building and the former Barge Turnaround. Specific injection locations will be determined during the remedial design. The biological breakdown of contaminants through anaerobic reductive dechlorination will be enhanced by injecting a solution of sodium lactate and soybean oil into the subsurface to promote microbe growth. The method and depth of injection will be determined during the remedial design. Proposed areas for nutrient/carbon enhancement are shown on Figure 7.

Groundwater will be monitored for site related contamination and also for monitored natural attenuation (MNA) indicators which will provide an understanding of the biological activity breaking down the contamination. It is anticipated that contamination will decrease by a magnitude deemed acceptable to NYSDEC within a reasonable period of time (5 to 10 years). Groundwater monitoring will be performed quarterly, and additional active remediation will be proposed if it appears that biodegradation processes alone will not address the contamination. The contingency remedial action will depend on the information collected, and will be detailed further during the remedial design. In addition, the monitoring of surface water within the Barge Canal will be performed during remediation to evaluate the effectiveness of the remedy.

The site management actions described for GW Alternative 2 are included in Groundwater Alternative 3.

Groundwater Alternative 4: Permeable Reactive Barrier with Site Management

Present Worth: *2,100,000*
Capital Cost: *995,000*
Annual Costs:
(Years 1-5): *94,000*
(Years 6-30): *60,000*

A Permeable Reactive Barrier (PRB) would consist of a passive iron treatment wall. The iron treatment wall would be comprised of 70 percent soil/sand and 30 percent iron contained in a slurry. The slurry is injected into the subsurface under pressure to create a barrier. At the Site, the PRB would be constructed in a "T" configuration as shown on Figure 7.2. The PRB would extend vertically to the top of the confining layer (e.g., till) or, where the till is not present, to the top of the bedrock surface.

In addition, enhanced biodegradation in the hotspots beneath and adjacent to the manufacturing building would be performed as described in GW Alternative 3.

The site management actions described for GW Alternative 2 are included in Groundwater Alternative 4.

Groundwater Alternative 5: In-Well Air Stripping and Enhanced Biological Degradation with Site Management

Present Worth: *2,900,000*
Capital Cost: *830,000*
Annual Costs:
(Years 1-5): *160,000*
(Years 6-30): *125,000*

In-well stripping of COCs would be performed in a system of double-screened wells installed within the former Barge Turnaround. Groundwater would be circulated through the wells in situ (in place) for stripping of COCs and soil vapor would be extracted for treatment by catalytic oxidation or carbon. A conceptual layout of the well system is shown in plan view on Figure 7.3.

In addition, enhanced biodegradation in the hotspots beneath and adjacent to the manufacturing building would be performed as described for Groundwater Alternative 3.

The site management actions described for GW Alternative 2 are included in Groundwater Alternative 5.

Groundwater Alternative 6: Hydraulic Containment/Collection with On-Site Treatment and Disposal and Site Management

Present Worth: *3,500,000*
Capital Cost: *1,100,000*
Annual Costs:
(Years 1-5): *180,000*
(Years 6-30): *150,000*

Hydraulic containment and groundwater collection would occur in the former Barge Turnaround. The extraction well system would be designed to contain and recover impacted groundwater. The system would consist of a series of extraction wells constructed in the former Barge Turnaround. The proposed well layout is shown on Figure 7.4. Extracted groundwater would be treated utilizing air stripping. If required, catalytic oxidation or carbon would be used to treat vapors.

The site management actions described for GW Alternative 2 are included in Groundwater Alternative 6.

SOILS

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

Soil Alternative 2: Fencing and Site Management

Present Worth: *61,000*
Capital Cost: *30,000*
Annual Costs:
(Years 1-30): *2,000*

The area of the former Barge Turnaround in which the soils exhibiting concentrations in excess of 6 NYCRR Part 375-6.8(c) restricted use soil cleanup objectives (RSCOs) for the protection of public health, restricted residential use, would be enclosed with fencing, as shown on Figure 8.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site.

An environmental easement will be placed on the property which includes the former Barge Turnaround. The easement would detail the site's environmental history and restrict land use on the property to restricted residential, commercial, or industrial uses as defined by 6NYCRR Part 375.

The site management plan will include a soils management plan for any maintenance or construction activities conducted on-site. Any future conveyance of the property would be subject to these restrictions.

Soil Alternative 3: Cover System/Extension of Storm Drain with Site Management

Present Worth:..*120,000*
Capital Cost:..*90,000*
Annual Costs:
(Years 1-30):...*1,700*

The area of the former Barge Turnaround in which the soils exhibiting concentrations in excess of 6 NYCRR Part 375-6.8(c) restricted use soil cleanup objectives (RSCOs) for the protection of public health, Industrial use, would be covered, as shown on Figure 8. The cover would be a permeable cover consisting of one foot of imported clean fill in compliance with NYSDEC's DER-10 guidance document. The 48 inch corrugated metal drain pipe along the south end of the site/barge turnaround would also be extended 80 feet to extended drainage flows past areas of contaminated sediments.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site.

An environmental easement will be placed on the property which includes the former Barge Turnaround. The easement would detail the site's environmental history and restrict land use on the property to industrial uses as defined by 6NYCRR Part 375.

The site management plan will include a soils management plan for any maintenance or construction activities conducted on-site. Any future conveyance of the property would be subject to these restrictions.

Soil Alternative 4: Excavation and Off-Site Disposal with Site Management

Present Worth:..*120,000*
Capital Cost:..*94,000*
Annual Costs:
(Years 1-30):...*1,700*

The top foot of soil in the area of the former Barge Turnaround exhibiting concentrations in excess of 6 NYCRR Part 375-6.8(c) restricted use soil cleanup objectives (RSCOs) for the protection of public health, restricted residential use, would be excavated. Excavated soil would be disposed of at a permitted landfill. The estimated area from which surface soil would be excavated is shown on Figure 8.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site.

An environmental easement will be placed on the property which includes the former Barge Turnaround. The easement would detail the site's environmental history and restrict land use on the property to restricted residential, commercial, or industrial uses as defined by 6NYCRR Part 375.

SOIL Vapor

Soil Vapor **Alternative 1: No Action**

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

Soil Vapor Alternative 2: Sub-Slab Ventilation with Site Management

Present Worth: *170,000*
Capital Cost: *99,000*
Annual Costs:
(Years 1-30): *4,500*

This alternative would consist of sub-slab ventilation with vapor treatment as required. A sub-slab depressurization system beneath the floor slab of the manufacturing building would be installed. The venting system would provide a preferential pathway for the migration of sub-slab soil vapors, preventing its possible intrusion into indoor air. The sub-slab depressurization system would consist of vapor extraction by a vacuum system.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site.

The site management plan includes the long-term operation and maintenance of the sub-slab ventilation system.

Soil Vapor Alternative 3: Soil Vapor Extraction with Site Management

Present Worth: *930,000*
Capital Cost: *140,000*
Annual Costs:
(Years 1-30): *51,000*

This alternative would consist of a soil vapor extraction (SVE) system beneath the floor slab of the manufacturing building. The SVE system would actively extract soil vapors, promote additional volatilization from soil and/or groundwater, and ultimately prevent intrusion of sub-slab soil vapors into indoor air. It is assumed that nine wells would be installed evenly spaced in the manufacturing building and that extracted vapors would be passed through vapor phase carbon for treatment prior to discharge to ambient air.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site.

The site management plan includes the long-term operation, maintenance, and monitoring of the sub-slab ventilation system. Monitoring of Soil Vapor Alternative 3 would consist of monthly sampling of influent and effluent from the vapor treatment system with analysis of the samples for VOCs.

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
No Action	0	0	0
Groundwater Alt 1: No Action	0	0	0
Groundwater Alternative 2	48,000	Years 1-5: 66,000	720,000
		Years 6-30: 35,000	
Groundwater Alternative 3	550,000	Years 1-5: 69,000	1,300,000
		Years 6-30: 38,000	
Groundwater Alternative 4	995,000	Years 1-5: 94,000	2,100,000
		Years 6-30: 60,000	
Groundwater Alternative 5	830,000	Years 1-5: 160,000	2,900,000
		Years 6-30: 125,000	
Groundwater Alternative 6	1,100,000	Years 1-5: 180,000	3,500,000
		Years 6-30: 150,000	
Soil Alternative 1: No Action	0	0	0
Soil Alternative 2	30,000	2,000	61,000
Soil Alternative 3	100,000	1,700	126,000
Soil Alternative 4	94,000	1,700	120,000
Soil Vapor Alternative 1: No Action	0	0	0
Soil Vapor Alternative 2	99,000	4,500	170,000
Soil Vapor Alternative 3	140,000	51,000	930,000

Exhibit D

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Groundwater Alternative #3 (Enhanced Biodegradation with Monitored Natural Attenuation (MNA) and Institutional Controls), Surface Soil Alternative #3 (Cover System /Extension of Storm Drain with Site Management), and Soil Vapor Alternative #2 (Sub-Slab Ventilation with Site Management). The elements of this remedy are described in Section 7.2. The proposed remedy is depicted in Figures 7 and 8.

Basis for Selection

The proposed remedy is based on the results of the RI and the evaluation of alternatives and is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the balancing criterion described in Section 7.2. It would achieve the remediation goals for the site by treating groundwater contamination, limiting potential exposure to contaminated soils, and limiting potential exposure to soil vapor.

Alternative 1 (No Action) does not provide any protection to public health and the environment and will not be evaluated further.

GROUNDWATER REMEDY

Groundwater (GW) Alternative #3 Enhanced Biodegradation with Monitoring and Institutional Controls) is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It achieves the remediation goals for the site by effectively reducing the concentrations of chemicals in groundwater in the areas with the highest concentrations of contamination, and by reducing any remaining residual contamination over time. Since biodegradation of the contaminants of concern is occurring naturally, long term monitoring of the biodegradation process is utilized to confirm continued biodegradation. If the Department determines that the remedy is not performing adequately or as designed, enhancement to the remedy or evaluation of a contingency remedy will be required.

GW Alternative #3 is the most effective alternative for reducing contaminant levels in the hotspot areas in the former barge turnaround and beneath the manufacturing building, consequently reducing the potential risk to human health and the environment. Since significant natural bio-remediation is already occurring at the site, the addition of bio-remediation enhancers improves and accelerates this process. Any remaining contamination continues to be remediated over time by both enhanced and naturally occurring bio-remediation. Further, GW Alternative #3 provides for treatment of contaminated bedrock groundwater.

GW Alternatives 5 and 6 are ranked second in protectiveness. Both alternatives reduce the chemical presence in groundwater beneath the manufacturing building, similar to Alternative 3. Both alternatives also treat contamination in the former barge turnaround; however, only in groundwater that flows to or is drawn to the immediate vicinity of the extraction arrays. Further, bedrock groundwater contamination is not an integral part of these remedial alternatives.

All the GW Alternatives considered achieve compliance with SCGs over time. All alternatives are ranked equally, as each achieves the chemical-specific SCGs either through natural attenuation or a combination of natural attenuation and another remedial technology. All groundwater alternatives comply with the applicable action and location specific SCGs, where such exist.

All the GW Alternatives considered for the Site achieve reductions in toxicity and volume over time. Alternatives 3, 4, 5, and 6 are ranked higher than Alternative 2 since they actively address the contaminants.

GW Alternative 2 is ranked first in short-term effectiveness because a low risk to workers conducting monitoring activities would be present. The risks to workers conducting monitoring activities are the same in GW Alternatives 2 through 6. The differences in short-term effectiveness associated with GW Alternatives 3 through 6 are associated with the risks posed by system construction, maintenance, and monitoring activities, and the potential for spills or leaks of treatment solutions or extracted groundwater. GW Alternative 3 is ranked second in short-term effectiveness. There are risks due to the installation of injection points, and the storage and handling of the in situ treatment solutions.

GW Alternative 3 is ranked first in long-term protectiveness and permanence because it is the most predictable of the alternatives and reduces chemical concentrations utilizing a proven treatment technology (in situ biodegradation). The enhancement of the naturally occurring bio-remediation process effectively and permanently degrades and destroys the COCs in groundwater. Enforcement of institutional controls protects residents and workers.

The alternatives are ranked based upon the ability to impose and enforce institutional controls, the ability to obtain access to off-Site properties for construction/treatment and monitoring and maintenance, the technical ability related to well or barrier wall installation, and duration and frequency of system operation and maintenance. GW Alternative 2 is the most implementable alternative since it does not require any construction for the remedy. Due to well and treatment system installation requirements, GW Alternative 3 is considered the next most implementable, followed by GW Alternatives 5 and 6. GW Alternative 4 is the least implementable given the complexity of a barrier wall construction versus well installation. Further, GW Alternative 4 requires access to areas beyond the former Barge Turnaround for construction, raising access issues.

The costs of GW Alternatives 2 through 6 are $720,000, $1,300,000, $2,100,000, $2,900,000, and $3,500,000, respectively.

The estimated present worth cost to implement GW Alternative 3 is $1,300,000. The cost to construct the alternative is estimated to be $545,000 and the estimated average annual costs for 30 years is $60,000.

SOIL REMEDY

Alternative 3 (Cover System/Extension of Storm Drain with Institutional Controls) is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It achieves the remediation goals for the site by limiting transport and exposure to soils that exhibit SVOC and metals concentrations exceeding soil cleanup objectives.

Soil Alternatives 3 is protective of human health and the environment. Extension of the drainage and covering of contaminated soils eliminates potential impacts on human health and the environment.

Soil Alternative 3 reduces the mobility of COCs in surface soils.

A low risk to community, workers, or the environment is presented by Soil Alternatives 2. Alternative 4 is ranked lower than alternative 3 due to the additional handling of impacted surface soils.

Soil Alternative 2 is the most implementable as extensive access with large vehicles is not required to install fencing. Sediment Alternative 3 would be next most implementable. Soil Alternative 4 would be the least implementable. Both alternatives require hauling soil, but Sediment Alternative 4 also would involve excavation activities.

The cost associated with the implementation of the soil remedial alternatives is lowest for Soil Alternative 1: $0. The costs of Soil Alternatives 2 through 4 are $61,000, $126,000, and $120,000, respectively.

The estimated present worth cost to implement Soil Alternative 3 is $126,000. The cost to construct the alternative is estimated to be $100,000 and the estimated average annual costs for 30 years is $1,700.

SOIL VAPOR REMEDY

Soil Vapor Alternative 2 (Sub-Slab Ventilation with Site Management) is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It achieves the remediation goals for the site by utilizing a sub-slab depressurization system to vent impacted sub-slab soil vapors to the atmosphere, thus minimizing the potential for exposure via infiltration into the indoor air of the manufacturing building.

Currently, off-site soil vapor issues are being addressed by a mitigation system and periodic monitoring. Continued maintenance and monitoring of the mitigation system would be required as part of the selected remedy.

Both Soil Vapor Alternatives 2 and 3 are protective of human health through the removal of sub-slab vapors, thus preventing intrusion into indoor air. However, there is potential that the vapor extraction process in Soil Vapor Alternative 3 could interfere with the natural attenuation processes for COCs in groundwater beneath the manufacturing building.

Soil Vapor Alternatives 3 reduces the concentrations of VOCs in sub-slab soil vapor by pulling contaminated vapors from the subsurface. Soil Vapor Alternative 2 also performs this removal, but to a lesser extent.

Soil Vapor Alternative 3 reduces the volume of VOCs in sub-slab soil vapor through extraction of vapors and treatment prior to discharge to ambient air. Soil Vapor Alternative 2 reduces the mobility of soil vapors by preventing intrusion into indoor air. Soil Vapor Alternative 2 only minimally reduces the toxicity or volume of VOCs in sub-slab soil vapor.

A minimal risk of exposure to workers inside the manufacturing building is presented by Soil Vapor Alternatives 2 and 3 during construction. However, these risks can be mitigated through proper work procedures and scheduling. Soil Vapor Alternative 3 has additional potential risk associated with discharge of extracted vapors.

Both Soil Vapor Alternatives 2 and 3 provide long-term effectiveness through the mitigation of soil vapor intrusion into indoor air. Soil Vapor Alternative 2 does not provide permanence in that VOCs present in sub-slab vapors are not destroyed. However, permanence with Soil Vapor Alternative 3 is also unlikely unless the VOCs in the groundwater under the building are first completely remediated. Un-remediated groundwater would act as a continuing source of soil vapor contamination, and seasonal groundwater fluctuations may re-contaminate soil with VOCs.

Soil Vapor Alternative 2 is implementable, but with difficulty, due to interference with manufacturing activities. These interferences could be minimized through adjusting work schedules during construction and through proper siting of permanent features of the ventilation system. Soil Vapor Alternative 3 is the most difficult to implement due to the more extensive extraction and treatment systems.

The costs of Soil Vapor Alternatives 2 and 3 are $170,000 and $930,000, respectively.

The estimated present worth cost to implement Soil Vapor Alternative 2 (Sub-Slab Ventilation with Site Management) is $170,000. The cost to construct the remedy is estimated to be $99,000 and the estimated average annual costs for 30 years is $4,500.

The estimated present worth cost to implement all of the Department's proposed alternatives is $1.6M. The cost to construct the remedies is estimated to be $740,000 and the estimated average annual costs for 30 years is $67,000.

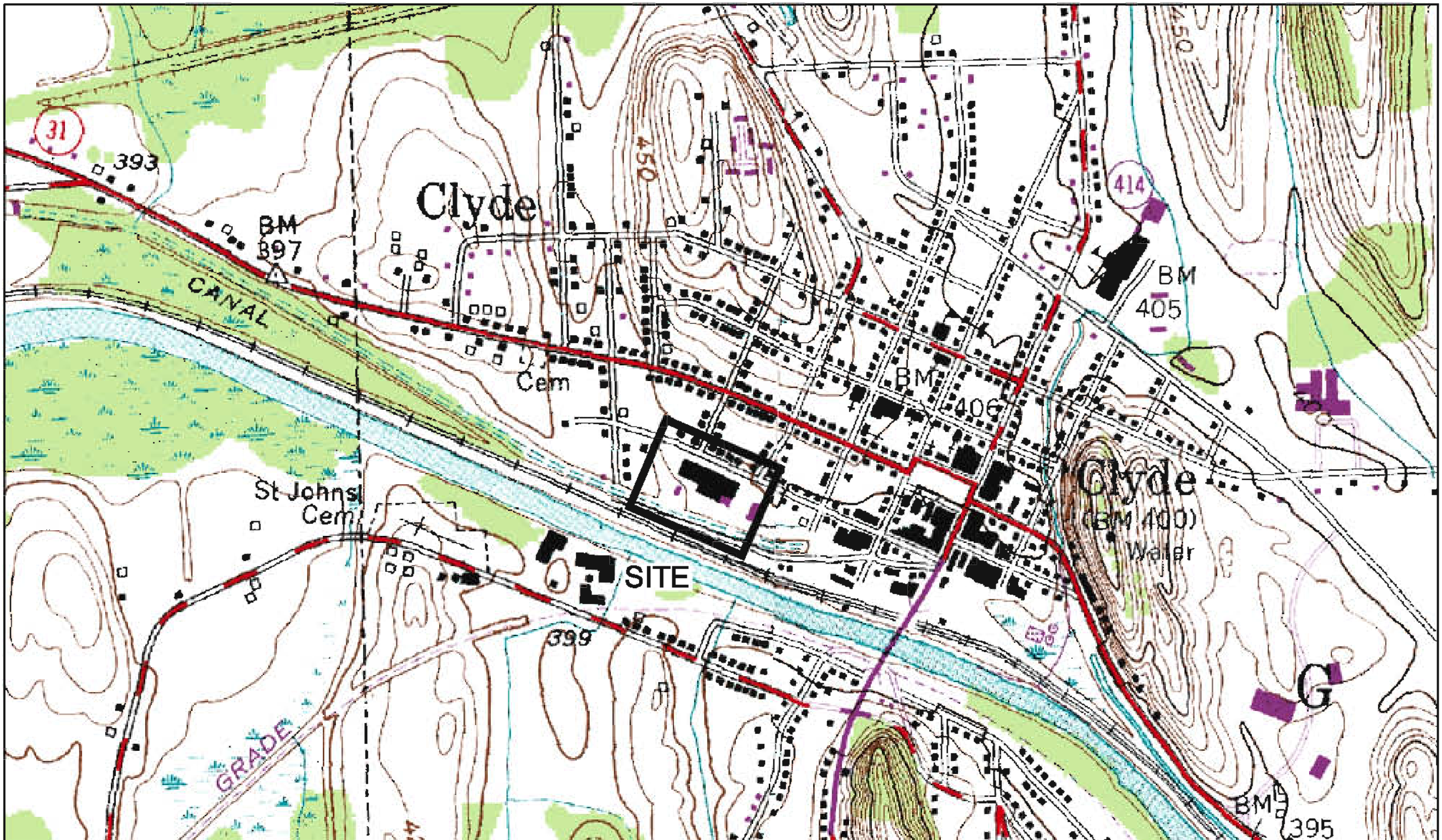


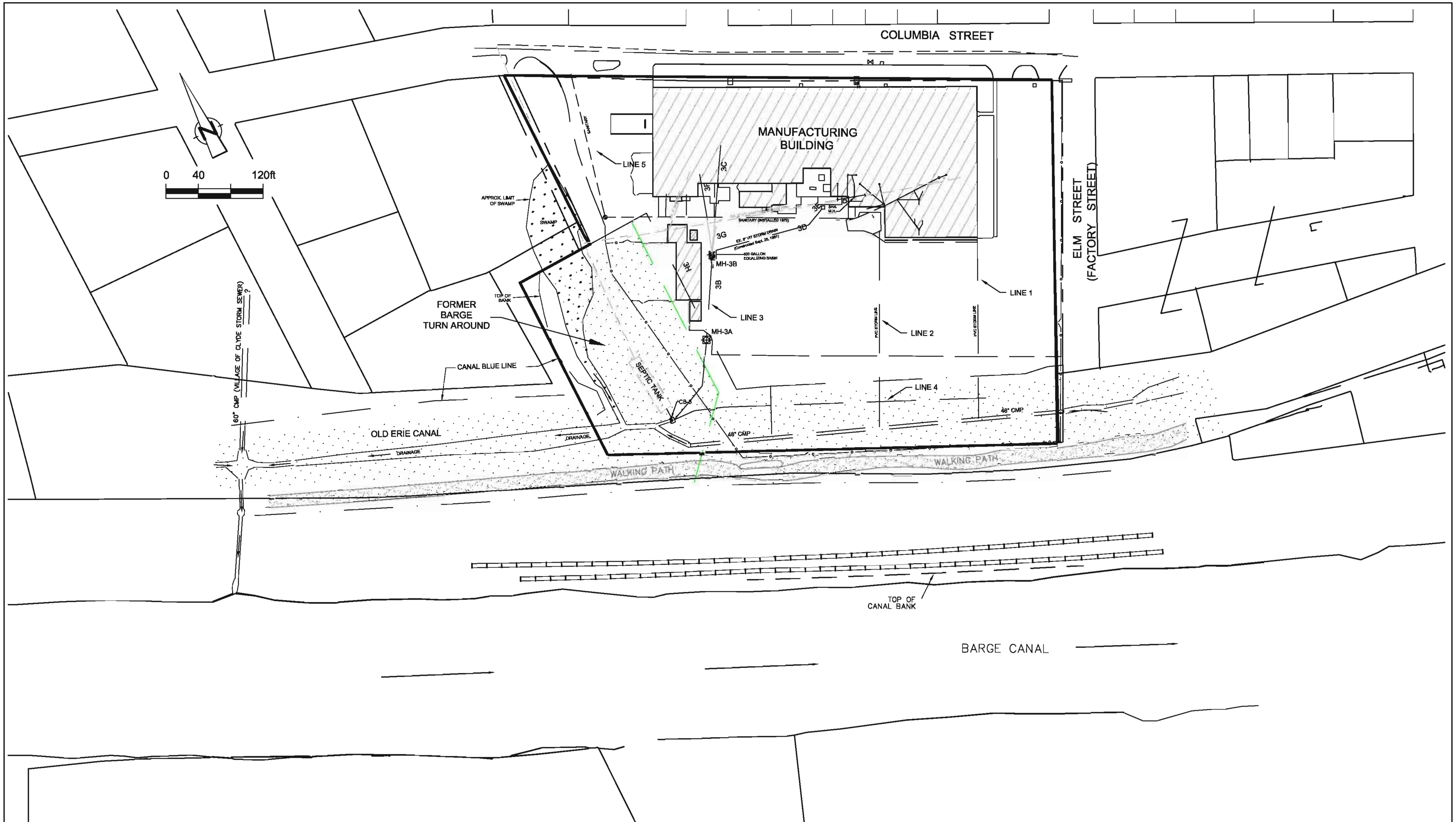
Figure 1

SITE LOCATION MAP
OLD ERIE CANAL SITE
Clyde, New York

SOURCE:
USGS, USC&GS,TVA, NEW YORK
QUADRANGLE, DATED 1953

0 500 1000ft

35048-01(002)GN-BU001 JAN 10/2008



LEGEND

PROPERTY BOUNDARY

CANAL

FENCE LINE

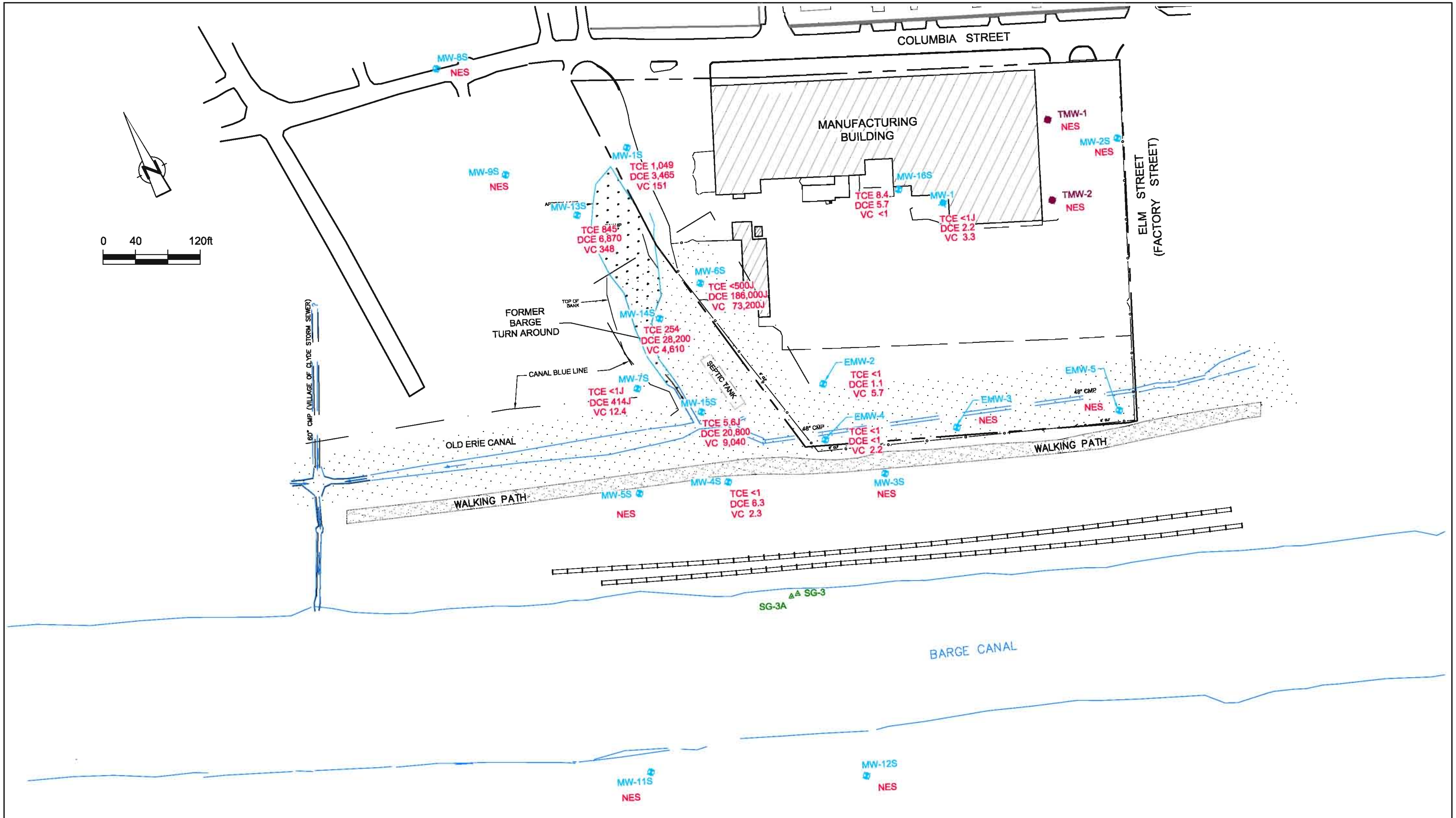
EASEMENT

SOURCE:
"REMEDIAL INVESTIGATION ADDENDUM NO.1 REPORT",
O'BRIEN & GERE ENGINEERS, INC.
MAY 13,2005

Figure 2

SITE PLAN
OLD ERIE CANAL SITE
Clyde, New York

35048-01(002)GN-BE001 MAR 14/2007



LEGEND

PROPERTY BOUNDARY
CANAL
STORM SEWER
48-INCH CMP

MW-3S OVERBURDEN MONITORING WELL
TEMPORARY MONITORING WELL
J VALUE IS ESTIMATED
NES NO EXCEEDANCE OF STANDARD

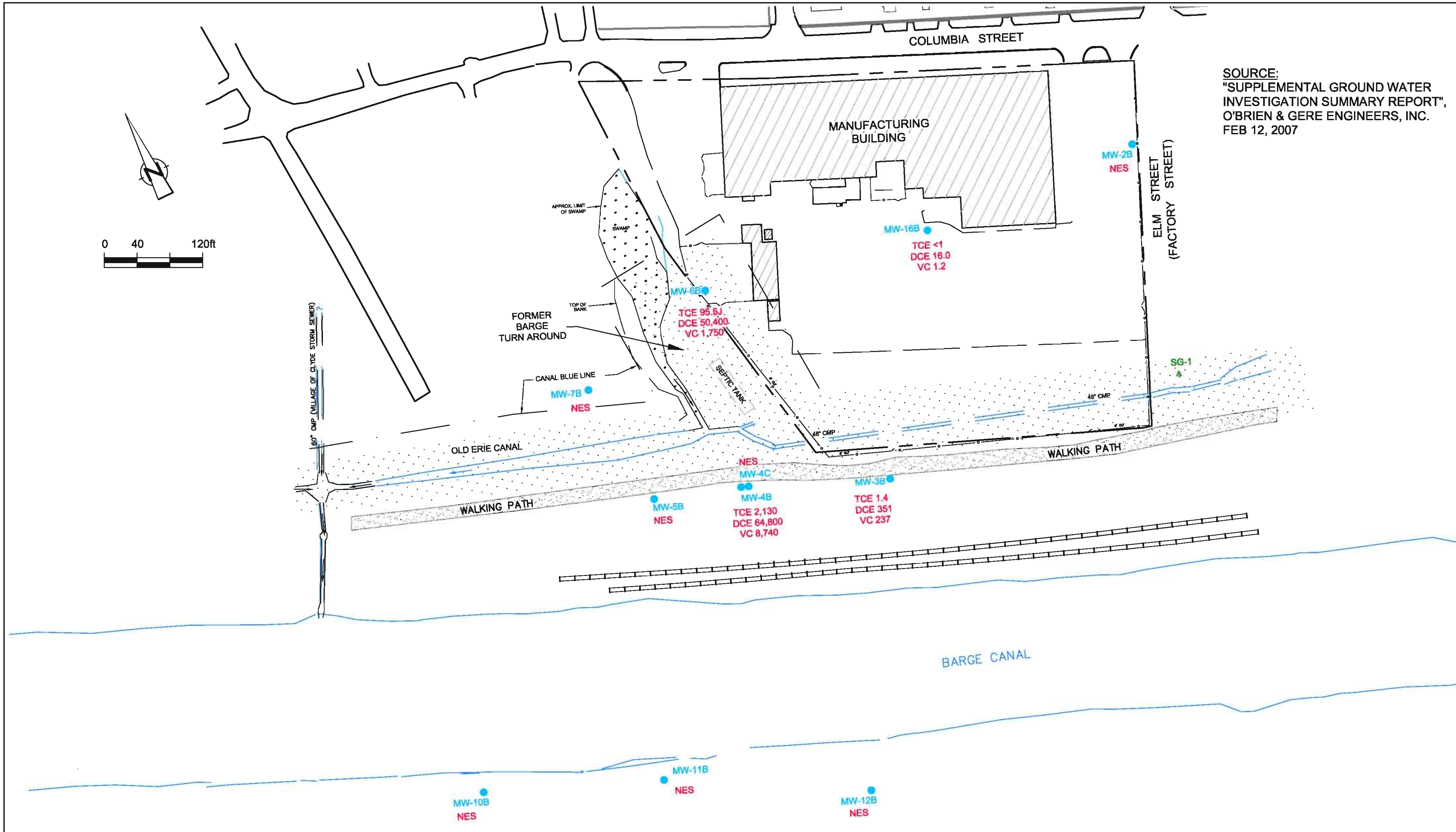
NOTES

CONCENTRATIONS EXPRESSED IN ug/L

Figure 3

CONCENTRATIONS OF TCE, DCE, & VINYL CHLORIDE IN OVERBURDEN GROUNDWATER - DECEMBER 2006
OLD ERIE CANAL SITE
Clyde, New York

35048-01(002)GN-BE040 MAR 19/2007



LEGEND

PROPERTY BOUNDARY
CANAL
STORM SEWER
48-INCH CMP
MW-3B BEDROCK MONITORING WELL
J VALUE IS ESTIMATED
NES NO EXCEEDANCE OF STANDARD

NOTES

CONCENTRATIONS EXPRESSED IN ug/L

Figure 4

CONCENTRATIONS OF TCE, DCE, & VINYL CHLORIDE IN BEDROCK GROUNDWATER - DECEMBER 2006
OLD ERIE CANAL SITE
Clyde, New York

35048-01(002)GN-BE041 MAR 19/2007

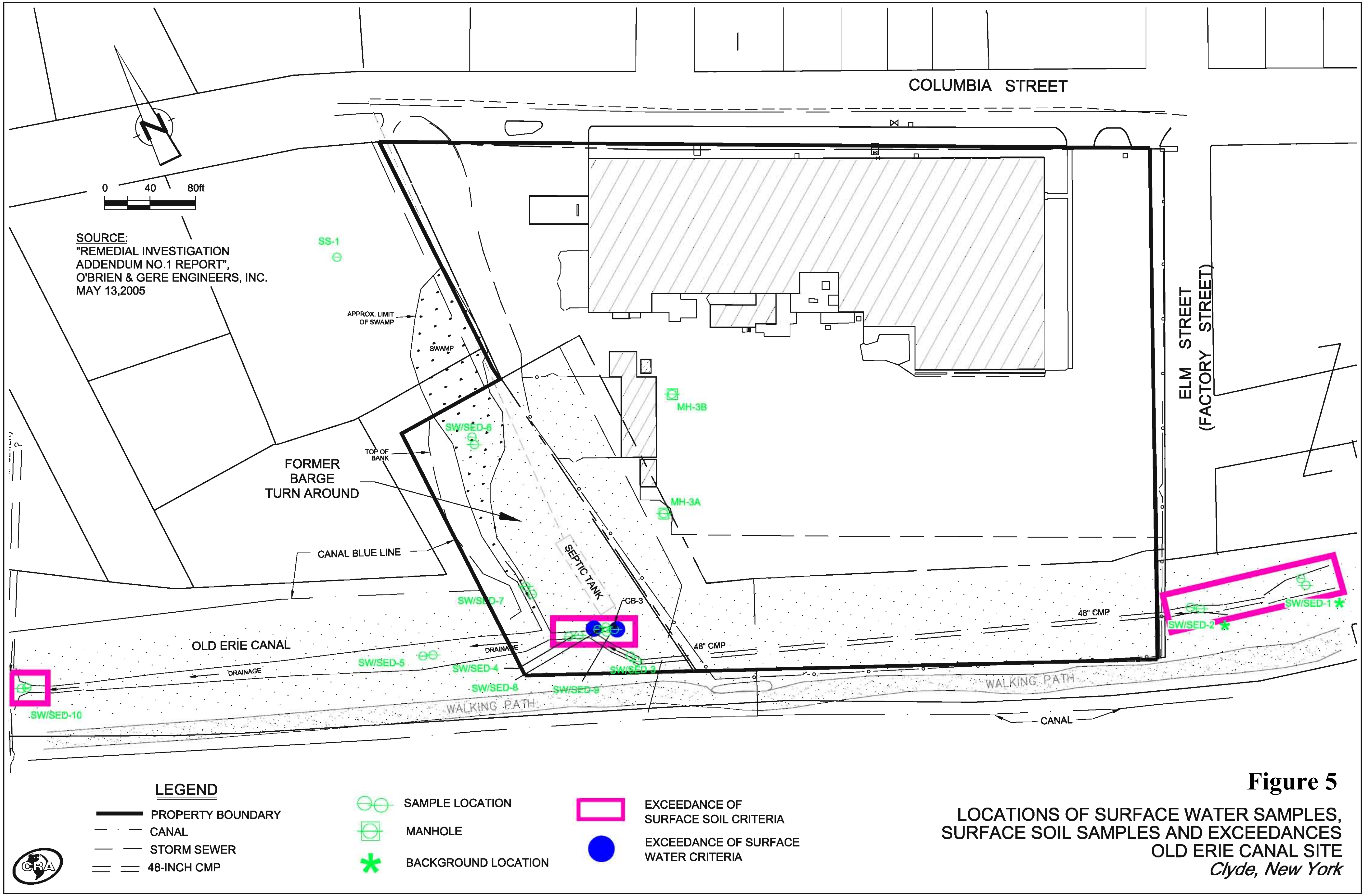
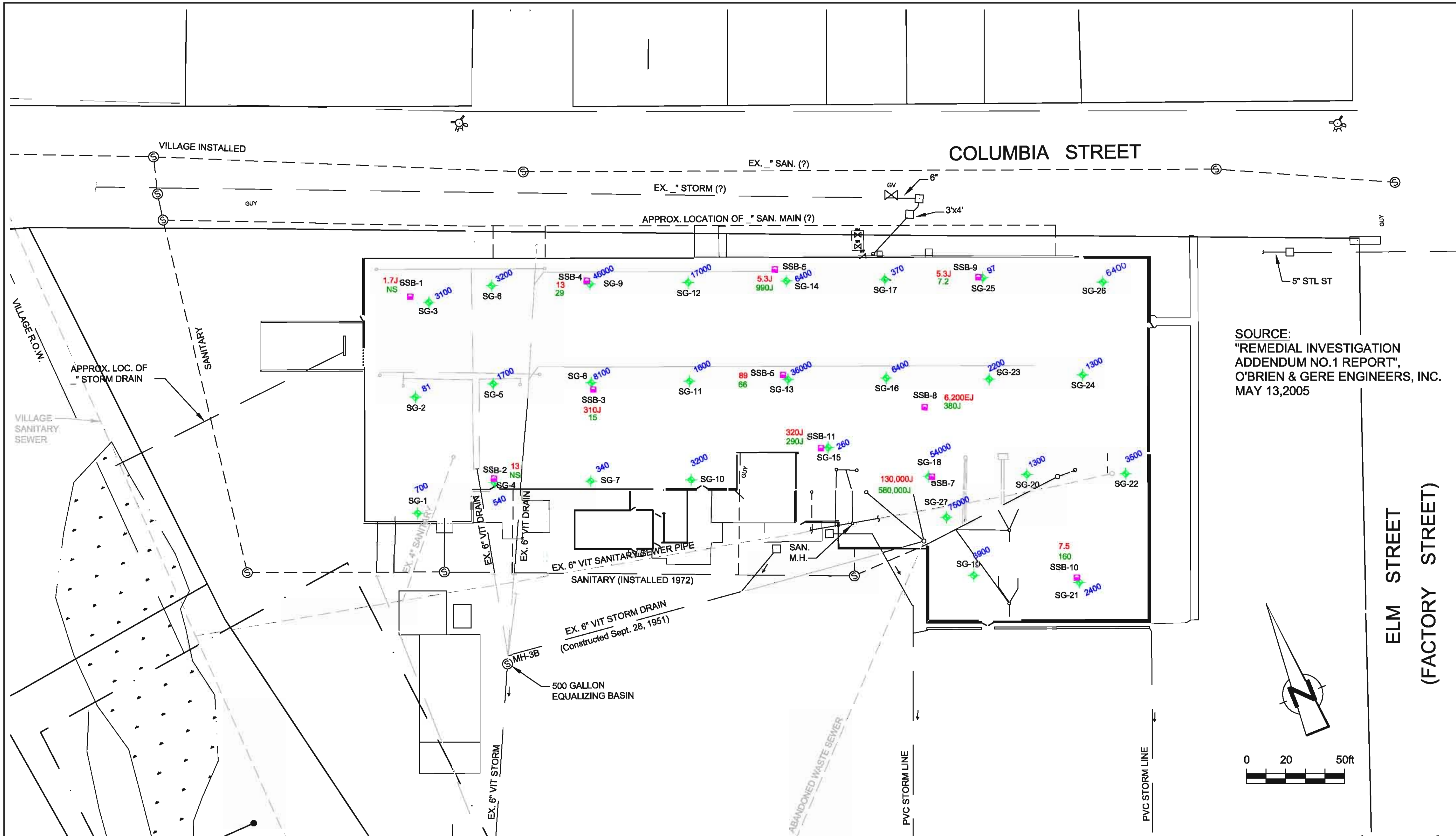


Figure 5

LOCATIONS OF SURFACE WATER SAMPLES, SURFACE SOIL SAMPLES AND EXCEEDANCES
OLD ERIE CANAL SITE
Clyde, New York

35048-01(002)GN-BE004 NOV 2/2005



LEGEND

———	PROPERTY BOUNDARY
— · —	CANAL
— —	STORM SEWER

300 TCE IN SOIL GAS, ug/m
200 TCE IN SOIL, ug/Kg
1000 TCE IN GROUNDWATER, ug/L

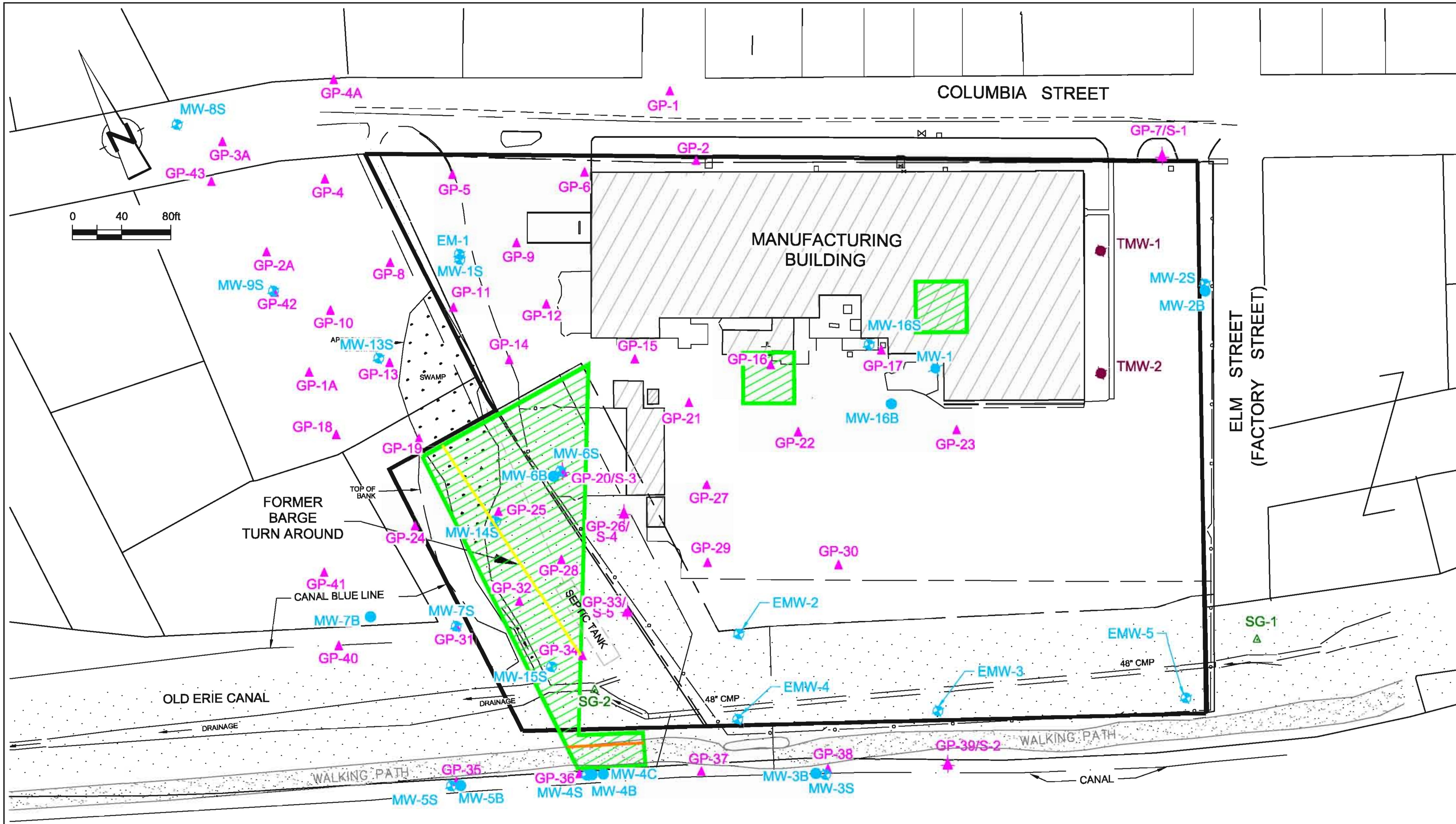
SG-1 SOIL GAS SAMPLE LOCATION

SSB-10 SUB-SLAB SOIL AND GROUND WATER SAMPLE LOCATION

Figure 6

SUB-SLAB SAMPLE LOCATIONS AND TCE ANALYTICAL RESULTS
OLD ERIE CANAL SITE
Clyde, New York

35048-01(002)GN-BE002 OCT 21/2005



LEGEND

SITE BOUNDARY

CANAL

FENCE LINE

MW-3S OVERBURDEN MONITORING WELL

MW-3B BEDROCK MONITORING WELL

GP-39 DIRECT PUSH SAMPLE LOCATION

GP-7/S-1 DIRECT PUSH AND SUBSURFACE SOIL SAMPLE LOCATION

AREA FOR NUTRIENT/CARBON ENHANCEMENT

TEMPORARY MONITORING WELL

LINE OF INJECTION WELLS INTO SHALLOW BEDROCK

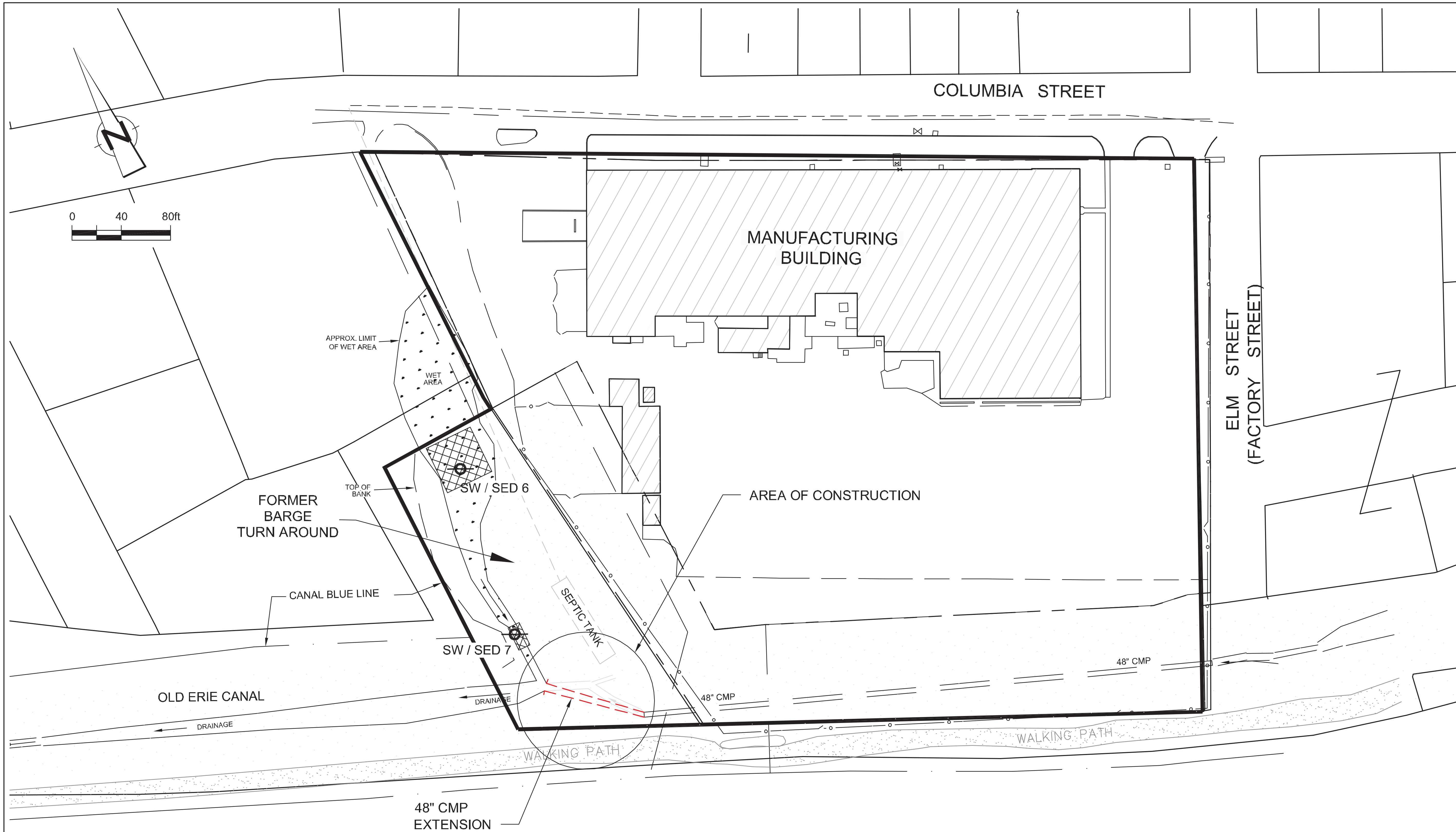
LINE OF INJECTION WELLS TO TOP OF BEDROCK

CRA

Figure 7

CONCEPTUAL PLAN
GW ALTERNATIVE 3
OLD ERIE CANAL SITE
Clyde, New York

35048-01(002)GN-BE018 FEB 04/2008



LEGEND

SITE BOUNDARY
CANAL
FENCE LINE
PROPOSED 48" CMP EXTENSION
SW / SED 6
SURFACE SOIL LOCATION
AREAS TO BE CAPPED

Figure 8

CONCEPTUAL PLAN
SURFACE SOIL ALTERNATIVE 3A
OLD ERIE CANAL SITE
Clyde, New York

35048-06(001)GN-BU002 FEB 14/2011