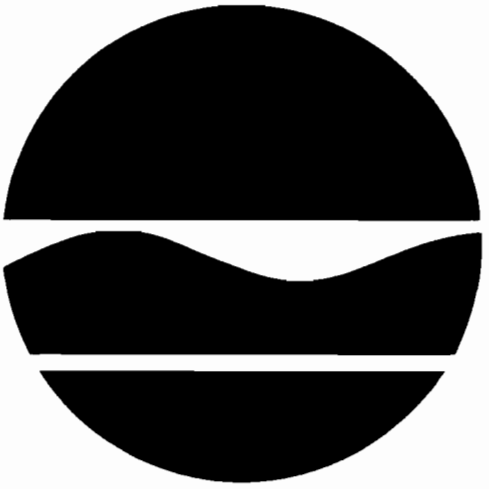
PROPOSED REMEDIAL ACTION PLAN
Fourth Street Site (915167)
Buffalo (c), Erie County
February 2001



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Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN
FOURTH STREET SITE
Buffalo (c), Erie County
Site No. 915167
February 2001

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) is proposing a remedy to address the significant threat to human health and/or the environment created by the presence of hazardous waste at the Fourth Street site from a manufactured gas plant (MGP), which was operated by the former Citizens Gas Works. As more fully described in Sections 3 and 4 of this document, coal tar left at the site from the Citizens Gas Works has resulted in the disposal of hazardous waste constituents such as benzene.

1.1: Significant Threat

These disposal activities have resulted in the following significant threats to the public health and /or the environment.

- a significant potential threat to human health associated with contaminated soils and groundwater. This threat is due principally to the toxic effects of chemical contaminants contained in coal tar; known as polycyclic aromatic hydrocarbons (PAHs), phenols, and benzene, toluene, ethylbenzene, xylenes (BTEX). This threat is due to potential human contact with benzene, a known human carcinogen and PAH compounds, some of which are known or suspected carcinogens. Potential exposure could occur by contact with contaminated soils, groundwater, and possible indoor air contamination; and
- a significant environmental threat associated with highly contaminated soils and their impact upon area groundwater. Area groundwater has been contaminated with BTEX, PAHs, and phenols.

1.2: Proposed Remedy

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the comment period.

In order to restore the Fourth Street Site inactive hazardous waste disposal site to pre-disposal conditions to the extent feasible and authorized by law, but at a minimum to eliminate or mitigate the significant threats to the public health and/or the environment that the hazardous waste disposed at the site has caused, the following remedy is proposed:

- Excavation and off-site disposal of contaminated soil exceeding the remediation goals.
- Removing contaminated water during excavation.
- Backfill the excavated area with clean fill.
- Conduct groundwater monitoring.

The proposed remedy, discussed in detail in Section 7 of this document, is intended to attain the remediation goals selected for this site in Section 6 of this Proposed Remedial Action Plan (PRAP), in conformity with applicable standards, criteria, and guidance (SCGs).

1.3: Citizen Participation

The NYSDEC has issued this PRAP as a component of the citizen participation plan developed pursuant to the New York State Environmental Conservation Law (ECL) and 6 NYCRR Part 375. This document is a summary of the information that can be found in greater detail in the Remedial Investigation (RI), Feasibility Study (FS) and other relevant reports and documents, available at the document repositories.

To better understand the site and the investigations conducted, the public is encouraged to review the project documents at the NYSDEC Region 9 Office.

270 Michigan Avenue
Buffalo, NY 14203-2999
(716) 851-7220
Attn: Jaspal S. Walia, P.E.

or at the following document repository
Reference Section
Central Library
Lafayette Square
Buffalo, NY 14202

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from February 19, 2001 through March 21, 2001 to provide an opportunity for public participation in the remedy selection process for this site. A public meeting is scheduled for February 27, 2001 at the Waterfront School, Fourth Street, Buffalo, New York beginning at 6:30 pm.

At the meeting, the results of the RI/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 you can submit verbal or written comments on the PRAP.

The NYSDEC may modify the preferred alternative 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 all of the alternatives identified here.

Comments will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision. The Record of Decision is the NYSDEC's final selection of the remedy for this site. Written comments may be sent to Mr. Walia at the above address during the period of February 19, 2001 and March 21, 2001.

SECTION 2: SITE LOCATION AND DESCRIPTION

This 5 acre site consists of a vacant lot which is located near the corner of Fourth and Village Court streets in the City of Buffalo. As shown in Figure 1 the site is bounded by the Waterfront School building and National Fuel Gas Buffalo Service Station on the south, Fourth Street on the west, Pine Harbor Apartments on the east and play grounds on the north. The site is located in a mixed residential, commercial, and recreational setting approximately 1500 feet east of the Lake Erie shoreline. A school parking lot is built on a portion of the site. There is tar on the surface in one area of the site. A fence has been installed to prevent access to that area. Three water lines, a sewer, and several other utility lines are also underground in the site area. No drinking water wells are located in the vicinity of the site. It is noted that the National Fuel Gas property, located south of the site, is another former Manufactured Gas Plant site which is currently undergoing an environmental investigation.

In general, fill material is present over the entire

site. The depth of fill varies from 4.5 to 14 feet. The fill consists of bricks, cement, slag, coal, wood, silt, sand, and gravel. Below this fill material are sediment layers of glacial lake deposits consisting of clay, silt, gravel, and sand. Below the sediment layer is limestone bedrock which is found at an approximate depth of 22 feet below the ground surface.

Precipitation onto the top of the land surfaces is collected by area sewers and is treated at the Buffalo Sewer Authority before being discharged into the Niagara River. In the site area, the general groundwater (precipitation that has seeped into the ground) flow direction is towards Lake Erie, however, the hydrology on the south side of the school building is complex due to the building and the former Wilkeson Slip (which is completely filled in and is not visibly noticeable) located at the property line of the school and National Fuel Gas. The groundwater (water table) is encountered between 4 to 6 feet below ground surface.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

From 1870 to approximately 1915 the Citizens Gas Works operated a manufactured gas plant (MGP) at the site property. (See Fig. 2 - Location of Historical Structures). This plant produced gas for heating and lighting by "heat-treating" coal and petroleum products. From 1934 to 1958 a portion of the property was used by the Greyhound Bus Company. Historical information and maps indicate that historical businesses in the area contained coal bins, sand piles, engine rooms, garages, etc.

The exact nature of the operation at the Citizens Gas Works is unknown, however, a typical MGP facility produced gas by either a carbonation or gasification process. The carbonation process heated coal in the absence of oxygen to produce primarily a methane and hydrogen gas mixture called coal gas. The gasification process infused steam through hot coal or coke, resulting in the formation of water gas, which consisted primarily of hydrogen and carbon dioxide. Water gas was often combined with "oil gas" to increase its BTU content.

The by-products from these operations included a dense, oily liquid known as "coal tar", coke, and ammonia. Large quantities of ash were also produced from the carbonation process. Substantial amounts of tar typically escaped collection and was spilled or disposed onto the land. It is believed that during demolition of the Citizens Gas Works facility, these wastes were covered with various fill materials.

The site is currently owned by the Buffalo Urban Renewal Agency.

3.2: Remedial History

- 1991-1992 - The Buffalo Urban Renewal Agency (BURA) undertakes an environmental assessment in preparation for a possible residential development.

- 1996 - NYSDOH conducts sampling of sump water and indoor air in the basement of the Waterfront School.

- 1996 - NYSDEC/NYSDOH collects samples of surface soils, subsurface soils, waste material and groundwater.

- 1996 - Based upon the significant threat created by the presence of hazardous waste as defined in the 6NYCRR Part 371, the site was listed as a class 2 site in the registry of Inactive Hazardous Waste Disposal sites in New York State. A classification 2 means that site poses a significant threat to the public health and/or the environment and action is required.

- 1998 - 2001 : BURA undertakes a remedial investigation and feasibility

study of the property.

SECTION 4: SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to human health and the environment posed by the presence of hazardous waste, BURA completed a Remedial Investigation/Feasibility Study (RI/FS) in January 2001.

4.1: Current Status - Summary of the Site Investigations:

To determine the nature and extent of environmental problems at the Fourth Street site, several site investigations were completed between 1992 and 1999. The site investigations conducted at this site are summarized below:

1. Phase II Environmental Investigation: *Waterfront Redevelopment Project - Huntingdon - Empire Soils Investigations, Inc. - May, 1992.*

During this investigation, the following tasks were performed:

- Soil gas sampling at 25 locations
- Excavated 29 test pits
- Installed 4 monitoring wells

During this investigation coal tar was discovered in some test pits. Test results of tar material (see Table 1) indicate elevated levels of total PAHs (53,000 ppm), BTEX (9,160 ppm), and phenols (3,050 ppm). Elevated levels of BTEX were found in two groundwater monitoring wells MW-1 (20.8 ppm) and MW-2 (27.9 ppm). The levels of PAHs and phenolic compounds were also elevated in MW-1 (5.2 ppm naphthalene, and 71 ppm total phenols) and MW-2 (6.5 ppm naphthalene and 114 ppm of total phenols). A thick oily material - also referred to as DNAPL (dense non-aqueous phase liquid) - was present in MW-2.

2. NYSDEC/NYSDOH Sampling 1996:

The purpose of this sampling was to determine the level of contamination in surficial soils and groundwater and to determine whether or not the coal tar waste was hazardous according to the 6NYCRR Part 371.

The following samples were collected:

8 surface soil samples
1 groundwater sample
4 subsurface samples

The results confirmed earlier data that groundwater was highly contaminated with benzene (16,000 ppb) and the waste material exceeded regulatory threshold levels thereby designating the coal tar as hazardous waste (7.5 mg/l benzene in a leaching test compared to the regulatory level of 0.5 mg/l). The data also determined that surface soils near the school contained total PAHs equal to 420 ppm, of which 220 ppm were carcinogenic PAHs. This area was subsequently fenced to prevent trespass.

3. Remedial Investigation (RI)
Remedial Investigation/Feasibility Study at the Fourth Street site by Parsons Engineering Science - January 2001:

The purpose of the RI was to define the nature and extent of contamination resulting from previous activities at the site. The RI was conducted in two phases. The first phase was conducted between April and November 1998 and the second phase between June and August 1999.

The RI included the following activities:

- Installation of 23 soil borings and 8 monitoring wells for analysis of soils and groundwater to determine the nature and extent of contaminants in the subsurface as well as determining physical properties of soil and hydrogeologic conditions.

- Collection of 12 surface soil samples to determine levels of contamination in surficial soils.

- Collection of eight sub-surface soil samples to determine any NAPL migration along the under ground utility lines.

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the analytical data from the RI and other site investigations was compared to environmental standards, criteria, and guidance values (SCGs). Groundwater SCGs identified for the Fourth Street site are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part 5 of the NYS Sanitary Code. The Remedial Investigation/Feasibility Study evaluated background values as well as Total Organic Carbon to develop site-specific clean-up goals for this site. After review by NYSDEC it was determined that the values are consistent with Technical and Administrative Guidance Memorandum (TAGM) - 4046 values. Therefore, TAGM -4046 values will be used as the recommended remedial goals for this site.

After comparison to the remediation goals and evaluation of potential public health and environmental exposure routes, it has been determined that certain areas and media of the site will require remediation. More complete information can be found in the RI /FS Report dated January 2001.

Chemical concentrations are reported in parts per billion (ppb) or parts per million (ppm). For comparison purposes, where applicable, SCGs are provided for each medium.

4.1.1 Nature of Contamination:

As described in the RI Report, many surface soil, subsurface soil, and groundwater samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed their Standards, Criteria, Guidance values (SCGs) or Remediation Goals in subsurface soil and groundwater are volatile organic compounds (VOCs) - benzene, toluene, ethylbenzene, and xylenes (BTEX) and semivolatile organic compounds (SVOCs) - polycyclic aromatic hydrocarbons (PAHs) and phenols.

Contaminants were released to the soil in the form of coal tar, which is a dense, oily liquid that does not readily dissolve in water. Materials such as this are referred to as dense non-aqueous phase liquids (DNAPL). DNAPL was determined to have impacted approximately 40,000 cubic yards of soil/fill material.

4.1.2 Extent of Contamination:

Table 1 summarizes the levels of contamination found in soil, groundwater, and waste/tar and compares the data with the SCGs/remediation goals for the site. The following are the media which were investigated and a summary of the findings of the investigation.

SOIL

Surface Soil :

Five on-site and seven off-site (background) surface soil samples were collected (see Fig.3). PAHs were detected in all on-site and off-site samples. Concentrations of PAHs in surficial on-site soils ranged from 1 ppm in SS-04 to 136 ppm in SS-01. SS-01 is located in the area of the retort house of the former MGP facility (see Fig. 2). Total cyanides were detected in three on-site samples with highest concentration of 7.2 ppm in SS-03.

The total PAHs in off-site (background) surface soil samples varied from 0.75 to 19 ppm. Total cyanides were not detected in off-site samples.

Subsurface Soil:

Subsurface soil samples showed four types of contaminants (BTEX, PAHs, phenols, and cyanides). Among the off-site subsurface soil samples, the highest level of BTEX (33 ppm) and benzene (13 ppm) were found in SB-12 (see Fig. 4).[It appears that BTEX detected at the SB-12 location may be due to some source other than MGP site because of the depth at which BTEX was found and also because of absence of PAHs in that sample.] Total PAHs in off-site samples were found up to 21 ppm in SB-22 at a depth of 6-8 feet.

The on-site subsurface soil samples showed BTEX up to 32 ppm and xylenes at 17 ppm in SB-13. Total PAHs were found up to 212 ppm in SB-06 at a depth of 4-6 feet. [The purpose of sub-surface soil sampling during the RI was to define the extent of contamination in the areas *outside* of the DNAPL-soaked soil i.e. samples were collected above and/or below the DNAPL layer.]

In the utility borings, levels of BTEX varied from 0.001 ppm to 0.43 ppm and total PAHs from non-detect to 0.9 ppm.This data indicates that contamination does not appear to be migrating off-site along the underground utility lines.

Traces of phenols were detected in SB-03, SB-22 and MW-9 locations. Total cyanides levels were 4.2 ppm in SB-03, 46.3 ppm in SB-06, and 2.9 ppm at MW-9.

GROUNDWATER

Groundwater samples were collected from monitoring wells MW-03 to MW-10 (well locations are shown in Fig. 5). No water samples were collected from MW-2 due to the presence of DNAPL in it.

BTEX concentrations in groundwater samples ranged from non-detect to 1,987 ppb. The highest concentration of BTEX was reported in MW-09, which is located next to the National Fuel Gas facility (NFG) where a similar MGP facility operated historically. As described in Section 2, the general groundwater flow direction is from east to west in the site area. MW-05 which detected BTEX at 21.7 ppb, is hydraulically down gradient of the tar area while MW-09 is up gradient of the site. The source of contamination in MW-09 will not be clearly determined until site investigation at the NFG is complete. No contamination was found in MW-0 7 and MW-0 8. Only BTEX were found in MW-04 (11 ppb), MW-06 (3 ppb), and MW-10 (1 ppb). The low levels of groundwater contamination could be due to very low solubility of DNAPL in water and slow groundwater movement in the area.

An evaluation of the groundwater flow patterns and chemical concentrations concludes that the highly concentrated DNAPL source area has a limited impact on the general down-gradient groundwater area. Cyanides were found in MW-03, MW-05, MW-09, and MW-10. The concentrations of cyanides were below the ground water standard (200 ppb) and varied from 11 ppb to 140 ppb with the highest concentration being in MW-10.

DNAPL/TAR WASTE

As shown in Table 1, the data from Empire Soils Investigation Report in 1992 shows DNAPL or coal tar in the source area to contain elevated levels of benzene (3,300 ppm), toluene (3,000 ppm), xylenes (2,700 ppm), phenolic compounds (3,000 ppm), and total PAHs (53,000 ppm).

During the RI, DNAPL was identified in samples from MW-02, MW-03, SB-03 to SB-07, and SB-13. The area of DNAPL occurrence is shown in Fig. 6.

The DNAPL area, containing BTEX and PAHs well above cleanup goals, is considered the source of contamination at this site resulting in the adverse impact to soil and groundwater.

[Note: DNAPL was also found between the School building and the National Fuel Gas (NFG) property. The extent of this DNAPL will be

determined during investigation of the NFG site]

INDOOR SCHOOL Water/Air

In 1996, the NYSDOH sampled sump water and indoor air in the basement of the Waterfront School. The analytical results documented very low concentrations of volatile organic compounds that are associated with site contaminants in one of the sumps. Sampling data did not document an adverse impact to the air quality in the school from the site.

4.2 Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section 5 of the Remedial Investigation Report.

An exposure pathway is how an individual may come into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Pathways which are known to or may exist at the site include:

- ingestion of contaminated soil by local residents, students from the nearby school, or utility workers.
- inhalation of volatile compounds by visitors or workers at the site.
- dermal contact with contaminated soils by visitors or workers
- ingestion of groundwater through the use or consumption of water from groundwater wells. There is currently no known use of groundwater as a source of potable water. The area is served by public water; and
- Underground utility trenches and conduits may serve as potential preferential pathways for groundwater flow away from the site. Five sumps are also located in the basement of the Waterfront School and are potential receptors to groundwater.

4.3 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site.

Currently the site does not directly impact any surface water body or wildlife. However, if the migration of DNAPL and other contaminants in soil is not prevented, contamination can migrate off-site through groundwater, sewers, and underground utility trenches and could impact the nearby school and or the residential area.

Surface water route: Surface water enters the on-site sewer which is subsequently treated at the Buffalo Sewer Authority wastewater treatment plant. There was little evidence of on-site surface erosion that could cause adverse impacts to the sewer system and treatment plant.

Subsurface soil route: There is a possibility that due to the higher density of DNAPL, migration downwards will continue to occur within the unconsolidated fill until it reaches an impermeable layer. DNAPL may then begin horizontal migration along the impermeable boundary towards low lying areas and in the direction of groundwater movement.

SECTION 5: ENFORCEMENT STATUS

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 NYSDEC and the Buffalo Urban Renewal Agency (BURA) entered into a Consent Order on July 24, 1997 (B9-0505-96-12). The Order obligates BURA to implement the RI/FS remedial program. Upon issuance of the Record of Decision the NYSDEC will approach all Potentially Responsible Parties (PRPs) to implement the selected remedy under an Order on Consent.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria and Guidance (SCGs)/ Remediation Goals and be protective of human health and the environment. At a minimum, the remedy selected should eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- *Eliminate to the extent practicable the source of contamination at the site to meet remediation goals;*
- *Eliminate, to the extent practicable, ingestion of groundwater affected by the site that does not attain NYSDEC Class GA Ambient Water Quality Criteria;*
- *Eliminate, to the extent practicable, off-site migration of groundwater that does not attain NYSDEC Class GA Ambient Water Quality Criteria;*
- *Eliminate, to the extent practicable, migration of DNAPL;*
- *Eliminate the potential for direct human or animal contact with the contaminated soils and waste materials on site; and*
- *Eliminate the long-term threat of exposure to contamination to users of the School and/or nearby residential area.*

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Fourth Street site were identified, screened and evaluated in the report entitled Remedial Investigation/Feasibility Study at the Fourth Street site, dated November 1999. A summary of the detailed analysis follows.

As presented below, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

7.1: Description of Alternatives

The potential remedies are intended to address the contaminated soils and groundwater at the site.

Alternative 1 - Limited Action:

Under this alternative, the site would be fenced to restrict public access; a deed restriction to prevent the use of on-site groundwater would be applied; groundwater monitoring would be performed for five years; and intrinsic bioremediation in groundwater would be enhanced. Under this alternative the site would essentially remain in an un-remediated state.

Present Worth:	$ 160,000
Capital Cost:	$ 60,000
Annual O&M:	$ 100,000
Time to Implement:	Less than 6 months

Alternative 2 - Containment:

This alternative was proposed in the Feasibility Study and would consist of constructing an impermeable cap with vegetation or an asphalt cover over the contaminated soils (see Fig. 7), a deed restriction to prevent the use of on-site groundwater, and groundwater monitoring.

Present Worth:	$680,000
Capital Cost:	$550,000
Annual O&M:	$130,000
Time to Implement:	Less than 6 months

Alternative 3 A - Partial Source Removal and Off-site Disposal:

Under this alternative contaminated soils (estimated quantity - 27,000 cubic yards) would be excavated from the surface to a depth of one foot below the water table. Underground utilities in the site area, such as an 8 foot diameter sewer may have to be rerouted. A cost estimate for rerouting utilities is not included in this alternative. All MGP structures and piping would be removed. The excavated soils would be taken off-site for treatment, if needed, and for landfill disposal. The excavated area would be backfilled with clean fill and would likely be covered with asphalt for use as a parking lot. Groundwater would be monitored with re-evaluation in 5 years. The results of this monitoring would form the basis for a decision about what, if any, active groundwater remediation would be undertaken.

It is noted that the costs for the remedial alternatives is higher than calculated in the Feasibility Study due to the following reasons:

- added provisions for odor control.
- added provisions for an elaborate community Health & Safety Plan.
- revised estimates for hazardous waste volumes

Present Worth:	$5,200,000
Capital Cost:	$5,100,000
Annual O&M:	$100,000
Time to Implement:	Less than 6 months

Alternative 3 B - Complete Source Removal and Off-site Disposal:

This alternative would excavate all contaminated soils above the Recommended Soil Cleanup Objectives given in TAGM-4046 including surficial contaminated soils and subsurface soils associated with the source i.e., the former MGP facility. Additional data would be gathered during Remedial Design to determine the exact nature and extent of contamination.

Removal of the deeper DNAPL will require excavation under the water table. The groundwater encountered during excavation (estimated to be 552,000 gallons) would be removed and treated. (The cost to remove the groundwater encountered during excavation is included in the capital cost and is given in Appendix H of the RI/FS). The estimated volume of soil to be excavated is 40,000 cubic yards. The approximate limit of excavation is shown in Fig. 8. It is recognized that underground utilities, such as the 8 foot diameter sewer line, may cause difficulty during the excavation activities. A cost estimate for rerouting utilities is not included in this alternative. All MGP structures and piping would be removed.

Excavated soils would be taken off-site for treatment (if necessary) and/or landfill disposal. The excavated area would be backfilled with clean fill. Groundwater would be monitored with re-evaluation in 5 years. The results of this monitoring would form the basis for a decision about what, if any, additional active groundwater remediation would be undertaken.

It is noted that the costs for the remedial

alternatives is higher than calculated in the Feasibility Study as discussed above in Alternative 3A.

Present Worth:	$7,420,000
Capital Cost:	$7,320,000
Annual O&M:	$100,000
Time to Implement:	Less than 6 months

7.2 EVALUATION OF REMEDIAL ALTERNATIVES

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. **Compliance with New York State Standards, Criteria, and Guidance (SCGs)**:

Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, and guidance. The most significant SCGs for this site are outlined in Table 2.

Alternatives 1 (Limited Action) and 2 (Containment) would not meet the SCGs for soil and groundwater. The source of contamination would stay in place at the site under both alternatives 1 and 2. Alternative 2 simply provides for a protective cover to be placed over the waste material (source area). The SCGs establish criteria for removing and/or treating the source areas of contamination to prevent future exposures from occurring. SCGs would not be fully addressed under Alternatives 1 and 2 since the source area would not be treated or removed. Alternative 3A (Partial Removal) would only partially meet the SCGs objectives because highly contaminated materials would remain in contact with groundwater. Alternative 3B (full removal) would provide additional protection since contaminated soil and highly contaminated water would be removed from the site. Alternative 3B would effectively remove the threat of site contamination migration to the school, as well as eliminate, to the extent feasible, migration through area utility lines to off-site receptors such as the Buffalo Sewer Authority and/or the Niagara River.

2. **Protection of Human Health and the Environment:**

The site would remain in its current condition in Alternative 1 and the potential for exposure to pedestrians from surficial contaminated soils and to utility or construction workers from subsurface contamination in soils and groundwater would remain. In addition, highly concentrated waste materials left in close proximity to the public school is not considered protective of human health. Under Alternative 2 and 3A, the exposure of pedestrians to contamination would be significantly reduced, however, the exposure potential to utility or construction workers would remain. Since the contamination source would remain in Alternatives 1 and 2 and would only be partially removed in Alternative 3A, the potential exists that the highly concentrated waste material could impact the adjacent school, residential properties, or migrate off-site through sewers or utility lines. Therefore Alternatives 1, 2, and 3A would not be considered adequately protective of human health or the environment. Among all the alternatives considered for this site, only Alternative 3B (full removal) would provide adequate protection of human health and the environment. Alternative 3B would conceivably remove highly contaminated waste material (DNAPL/coal tar), contaminated soils above remediation goals, and significant amounts of

highly contaminated groundwater.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. **Short-term Effectiveness**. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

In Alternatives 1 and 2, no excavation or treatment is proposed which would result in any short term impacts on the workers or the community. Short term impacts would occur during a period of 2-3 months from the hauling of cover material as described in Alternative 2. Hauling of cover material over a period of 2-3 months would have short term impacts such as dust and noise. Excavation and hauling of waste materials in Alternatives 3A and 3B could result in dust, odor, and noise for 3 - 6 months. Dust and odor controls could be implemented in accordance with a site Health and Safety Plan. Engineering controls would likely be required to control odors. The noise due to heavy equipment can be controlled by limiting work hours.

4. **Long-term Effectiveness and Permanence**. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Limited Action in Alternative 1 and Containment in Alternative 2 would not be considered permanent remedies since the source of contamination remains. In addition, direct engineering controls, such as groundwater control, would not be in place to prevent off-site migration of contaminants. Alternatives 1 and 2 would not be effective in preventing possible human exposures to contaminated soil, coal tar and highly contaminated groundwater that may migrate from the source area. Alternative 3A would not be considered a permanent remedy since waste below the water table would not be removed and no further controls are contemplated to prevent migration and prevent long term exposure to the wastes left behind. Removal of soil exceeding remediation goals and monitoring of remaining contaminated groundwater as proposed in Alternative 3B would substantially reduce the magnitude of risk and would be considered more permanent and effective in the long- term.

5. **Reduction of Toxicity, Mobility, or Volume.**

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

Alternative 1 would not reduce the toxicity, mobility, or volume of contaminants in soil and groundwater. Alternative 2 would reduce infiltration due to rain and snow and would help reduce the mobility of contaminants through groundwater but would not reduce toxicity or volume of the waste. Alternative 3A would significantly eliminate the toxicity, mobility, and volume of the constituents in the soil above the groundwater table. Overall reduction in toxicity, mobility, or volume would be better achieved in Alternative 3B as wastes above and below the water table would be removed.

6. **Implementability.** The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific

operating approvals, access for construction, etc.

Alternatives 1 and 2 would be considered easy to implement. Alternatives 3A and 3B would be implementable, however, would require significant engineering to overcome impediments such as re-routing underground utilities, or providing adequate protection to workers and the community during excavation of the waste material. With respect to all four alternatives, the administrative work for deed restrictions, data management, and reporting on groundwater monitoring would be considered routine and implementable. It is noted that implementation of the deed restriction would be dependent upon the landowners, in this case the Buffalo Urban Renewal Agency.

7. **Cost.** Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in in the following table:

Alternative	Capital Cost	Annual O&M	Total *
1	$60,000	$100,000	$160,000
2	$550,000	$130,000	$680,000
3A	$5,100,000	$100,000	$5,200,000
3B	7,320,000	$100,000	$7,420,000

[* In Alternatives 3A and 3B, The cost for relocation of utilities is not included.]

Among the four alternatives evaluated in the FS, the most expensive alternative is 3B with a cost of $7,420,000. (This does not include costs to relocate utilities) The high cost would be due to complete removal of the waste.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. **Community Acceptance** - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated. A "Responsiveness Summary" will be prepared that describes public comments received and how the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

It is noted that BURA has prepared a Remedial Investigation and Feasibility Study, however BURA's report dated January 2001 does not recommend Alternative 3B as the preferred remedy. NYSDEC and NYSDOH believe that Alternative 3B is the best remedial alternative and seek comments from the community including the Buffalo Urban Renewal Agency, the Buffalo Public School - Board of Education and other local government agencies as well as the general public.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is proposing Alternative 3B - Complete Source Removal to meet TAGM-4046 cleanup levels and Off-Site Disposal as the remedy for this site.

This selection is based upon the conclusion that the remedy proposed in Alternative 3B would best meet all the remedial goals for this site and would best achieve the threshold and balancing criteria described in Section 7.

Alternatives 1 and 2 would not meet clean up goals and would not be considered protective of human health and the environment since highly concentrated waste material containing elevated

levels of known carcinogenic compounds such as benzene (3,300 ppm) and suspected carcinogenic PAHs (9,940 ppm) would remain on site. Capping (covering) the waste on-site, as described in Alternative 2, would not allow for future development. In addition, the proximity of highly concentrated waste material next to a public school would pose a constant health threat to the school and the nearby residential areas and would require intense monitoring. Simply covering the waste material would not address the likelihood that contaminants from the waste may start migrating off-site via area utility lines and sewers.

Clean-up goals for soil would be fully met in Alternative 3B but not in Alternative 3A. By fully removing the waste material, the development potential of the property would be greatly increased. With partial removal of waste in Alternative 3A, groundwater SCGs would not be met in the foreseeable future. Initially groundwater SCGs would not be met in Alternative 3B, however, the threat of migration of highly contaminated groundwater to the nearby school would be significantly reduced. Alternative 3B would be preferred over other alternatives as it would best meet the SCGs/remediation goals and would be the most protective of human health and the environment.

Alternatives 1 and 2 were eliminated as these alternatives would neither provide reduction of toxicity, mobility, or volume of waste nor would they be effective in the long term. Alternatives 1 and 2 would not meet the criteria for permanence. Alternative 3B was chosen over Alternative 3A because Alternative 3B would be effective in the long term and would be considered permanent, and would provide better reduction of toxicity, mobility, or volume of waste at the site.

The estimated present worth cost to implement the remedy would be $7,420,000. (Additional cost may be incurred to relocate utilities). The cost to construct the remedy is estimated to be $7,320,000 and the estimated average annual operation and maintenance cost for 5 years is $100,000. Alternative 3B would be more expensive as compared to other alternatives, however, considering the location of site next to a school, residential area, and play grounds, the long term benefit of Alternative 3B would outweigh the cost.

A detailed remedial engineering design would be required to verify the components of the conceptual design and provide the details necessary for the construction of the project. Any uncertainties identified during the RI/FS, such as the extent of waste, migration along utility lines etc. would be resolved during the Remedial Design.

The elements of the proposed remedy are as follows:

- Complete Source Removal (Excavation and off-site disposal of contaminated soils and DNAPL above TAGM 4046 levels).
- Treatment of contaminated groundwater encountered during excavation.
- Possible re-routing of some utilities.
- Removal of all MGP structures and piping.
- Backfilling the excavated areas.
- Groundwater monitoring with re-evaluation in 5 years. The results of this monitoring would form the basis for a decision about what, if any, active groundwater remediation would be undertaken.

Table 1
Nature and Extent of Contamination

OFF-SITE SURFACE SOILS (Reference: RI/FS Report January 2001)				
Class	**Contaminant of Concern**	**Concentration Range (ppb)**	**SCG (ppb)**	**Frequency of Exceeding SCG**
SVOCs	Benzo(a)anthracene	74-1800	224	4 of 7
	Benzo(a)pyrene	69-1600	61	7 of 7
	Chrysene	76-1600	400	4 of 7
	Dibenzo(a,h)anthracene	ND(10) - 1900	14	5 of 7

ON-SITE SURFACE SOILS (Reference: RI/FS Report January 2001)				
Class	**Contaminant**	**Concentration Range (ppb)**	**SCG (ppb)**	**Frequency of Exceeding SCG**
SVOCs	Benzo(a)anthracene	20-11,000	224	4 of 5
	Benzo(a)pyrene	490-10,000	61	4 of 4
	Chrysene	120-8,800	400	3 of 5
	Dibenzo(a,h)anthracene	98-1000	14	4 of 4

SUBSURFACE SOILS (Reference: RI/FS Report January 2001)				
Class	**Contaminant**	**Concentration Range (ppb)**	**SCG (ppb)**	**Frequency of Exceeding of SCG**
VOCs	Benzene	ND (1.2) - 13,000	60	11 of 30
	Toluene	ND(1.2) - 1,900	1,500	1 of 30
	Ethylbenzene	ND(1.2) - 19,000	5,500	5 of 30
	Xylenes	ND(1.2) - 17,000	1,200	5 of 30

Contaminants in TAR or DNAPL (Ref.: Empire Soils Investigation Report May, 1992)	
Contaminant	**Concentration (ppm)**
Benzene	3,300
Toluene	3,000
Ethylbenzene	160
Styrene	550
Xylenes	2700
Acenaphthene	740
Acenaphthylene	2,900
Anthracene	3,000
Benzo(a)anthracene	2,200
Benzo(b)fluoranthene	1,200
Benzo(k)fluoranthene	1,300
Benzo(a)pyrene	1,700
Benzo(g,h,i)perylene	680
Chrysene	2,100
Benzo(a,h)anthracene	160
Dibenzofuran	2,400
Fluoranthene	5700
Fluorene	2,600
Indeno(1,2,3-cd)pyrene	700
2-Methyl Naphthalene	3,800
Naphthalene	12,000
Phenanthrene	6,400
Pyrene	3,600
2,4-Dimethyl Phenol	820
2-Methyl Phenol	460
4-Methyl Phenol	1,300
Phenol	470

GROUNDWATER (Ref: Empire Soils Report May, 1992)				
Class	**Contaminant**	**Concentration - ppb**		**Standards -ppb**
		MW-1	**MW-2**	
VOCs	Benzene	16,000	21,000	0.7
	Toluene	3,700	5,800	
	Xylenes	1,100	1,100	
SVOCs	2- Methyl Naphthalene	530	640	
	Naphthalene	5,200	6,500	10
	Phenol	17,000	27,000	Total Phenols = 5
	2,4- Dimethyl Phenol	13,000	21,000	
	2-Methyl Phenol	13,000	20,000	
	4-Methyl Phenol	28,000	46,000	

VOCs --- Volatile Organic Compounds
SVOCs --- Semi Volatile Compounds
GW --- Groundwater
mg/l --- milligrams per liter (ppm)
ug/l --- microgram per liter (ppb)
ppm --- parts per million
ppb --- parts per billion
SCG --- Standards, criteria, guidance values
DNAPL --- Dense non-aqueous phase liquid

TABLE 2

Standards, Criteria, and Guidance

Regulation/Policy	Title	Applicability
6 NYCRR Part 360	Solid Waste Management Facilities - Land Disposal Restrictions	Land disposal of solid waste
6 NYCRR Part 371	Identification and Listing of Hazardous Wastes	Defines hazardous waste for purposes of disposal
6 NYCRR Part 375	Inactive Hazardous Waste Disposal Site Remedial Program	Regulates the permitting of activities at the site, defines new uses, public participation and otherwise provides guidance to the hazardous waste clean up program
TAGM HWR-94-4046	Determination of Soil Cleanup Objectives and Cleanup Levels.	Guidelines for developing clean up goals
6 NYCRR Parts 700 -705	Water Quality Regulations for Surface Water and Groundwater	Sets standards for groundwater
TAGM HWR-89-4031	Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.	Guidelines for remedial activities

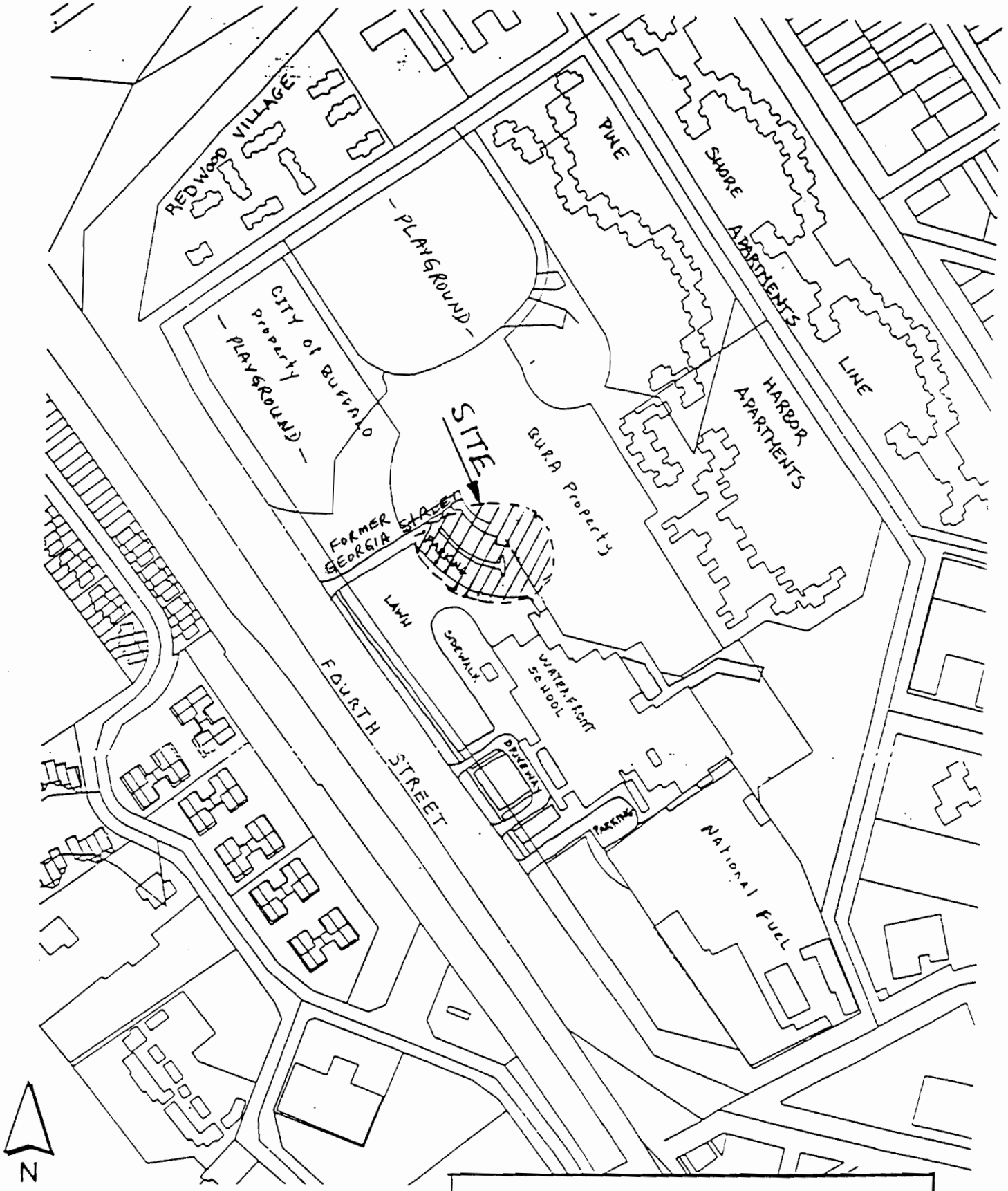


Figure 1

Buffalo Urban Renewal Agency
Fourth Street Site
SITE PLAN

PARSONS ENGINEERING SCIENCE, INC.
DESIGN * RESEARCH * PLANNING
* WILLIAMSVILLE, N.Y. 14221 * 716/633-7074

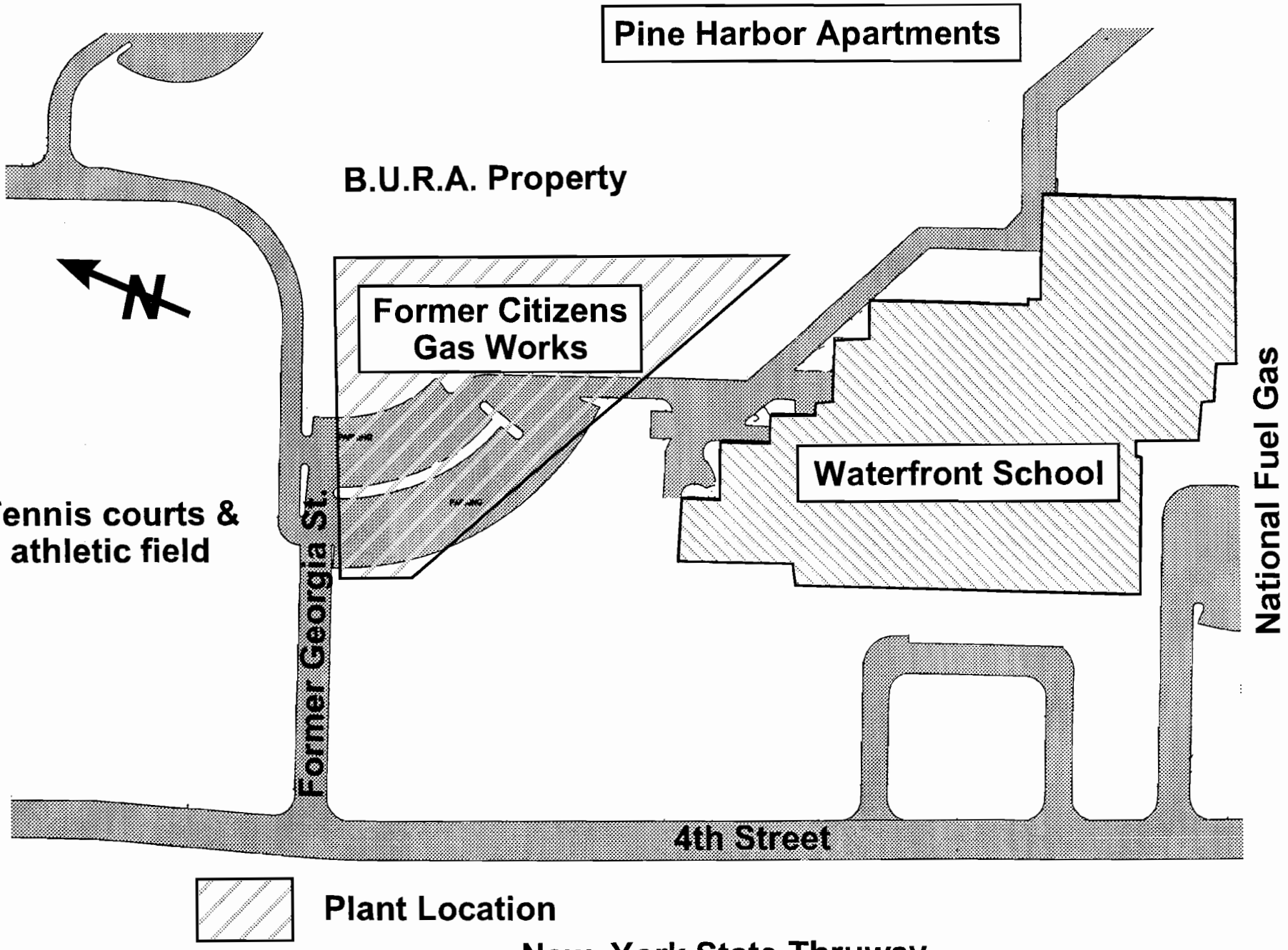


Figure 1: Fourth Street Site Plan

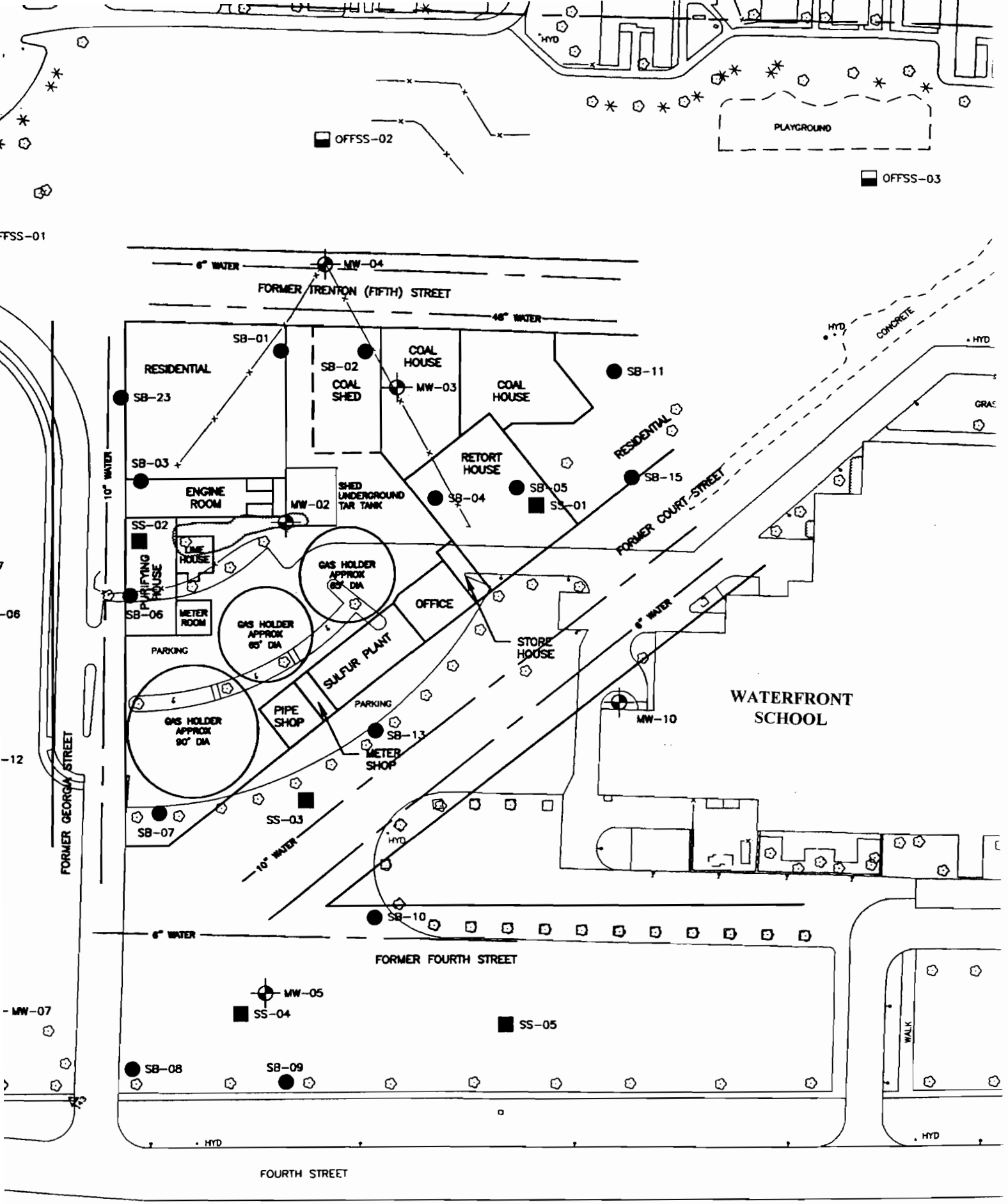


Figure 2: Location of Historical Structures and Utilities

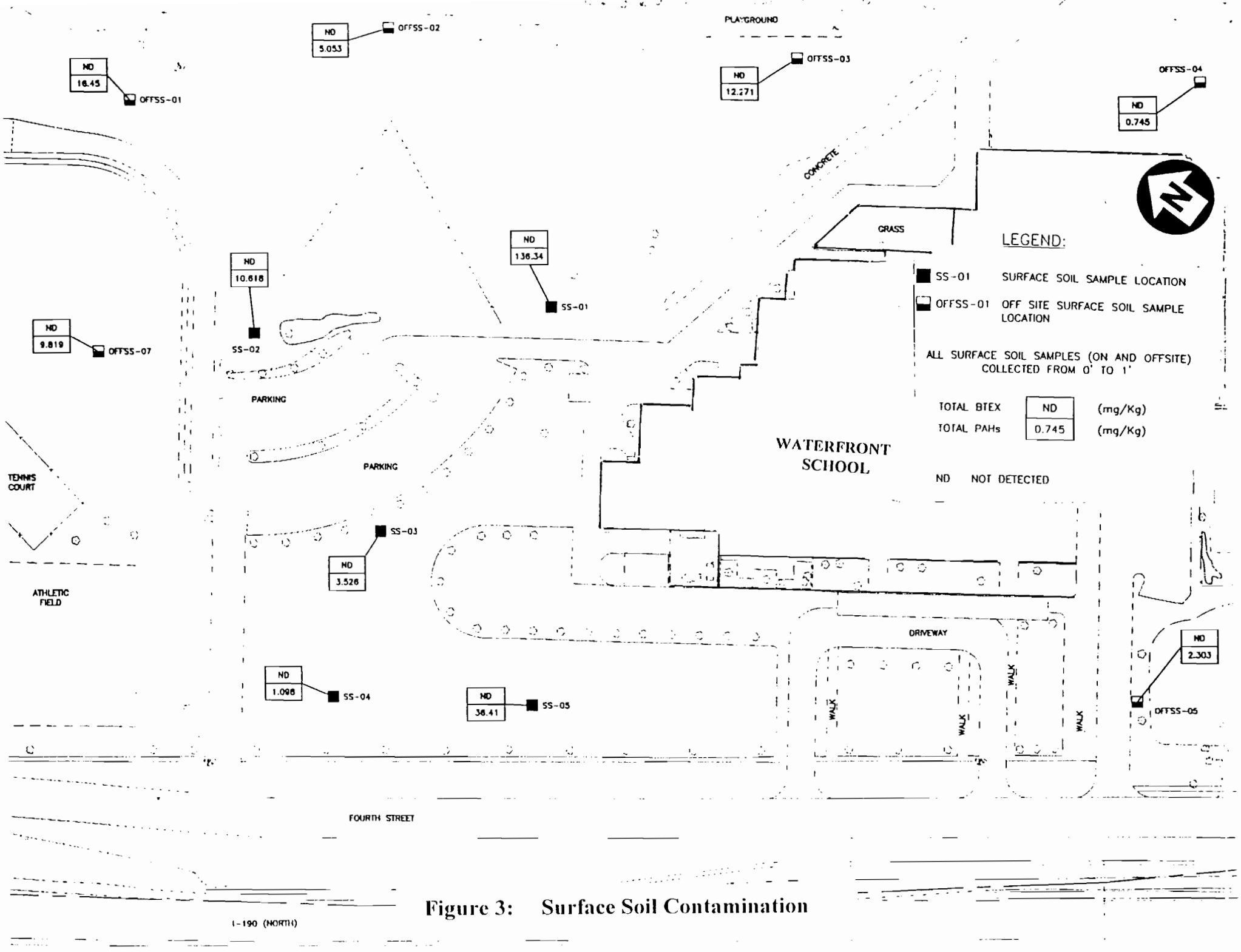


Figure 3: Surface Soil Contamination

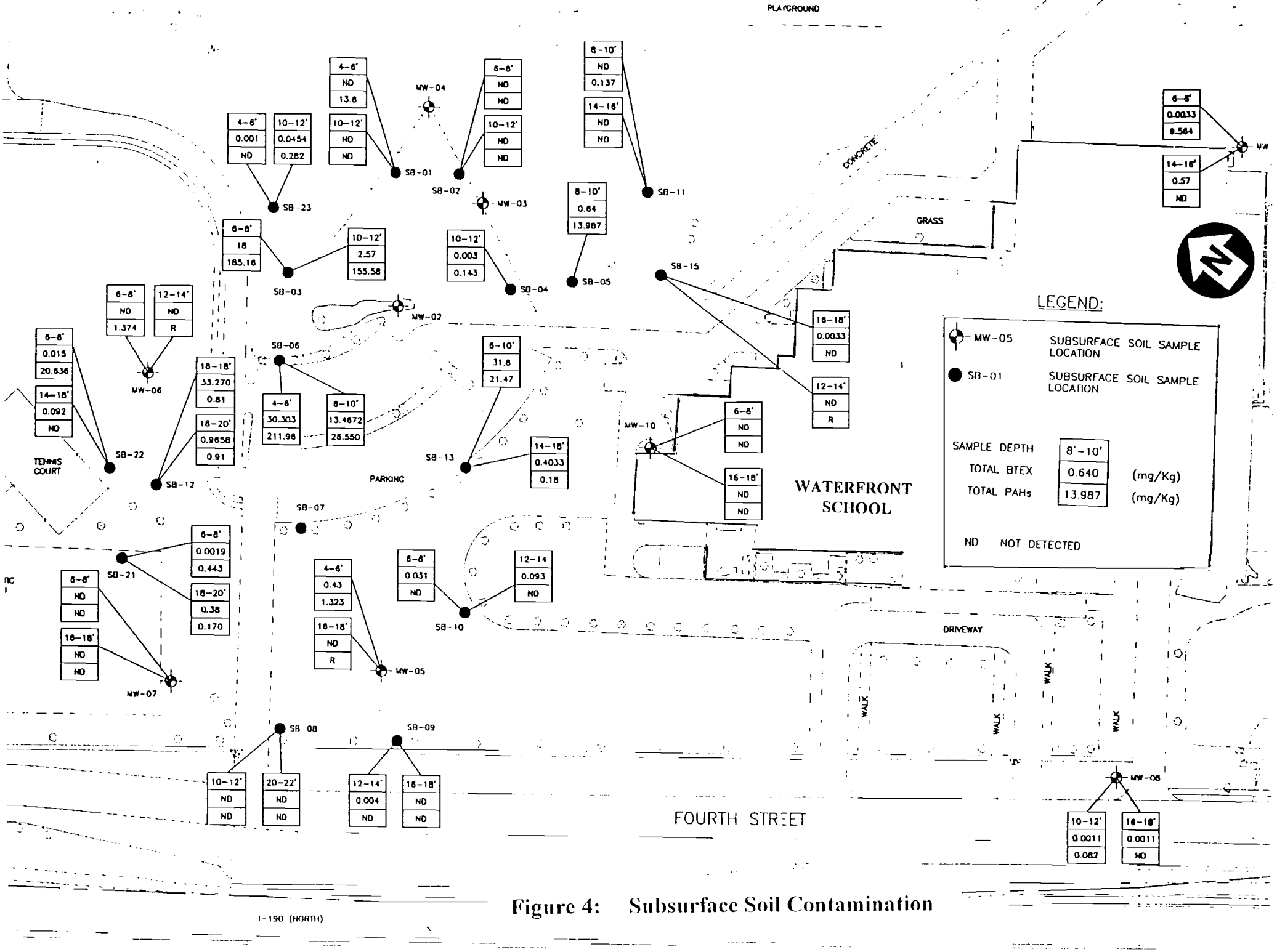


Figure 4: Subsurface Soil Contamination

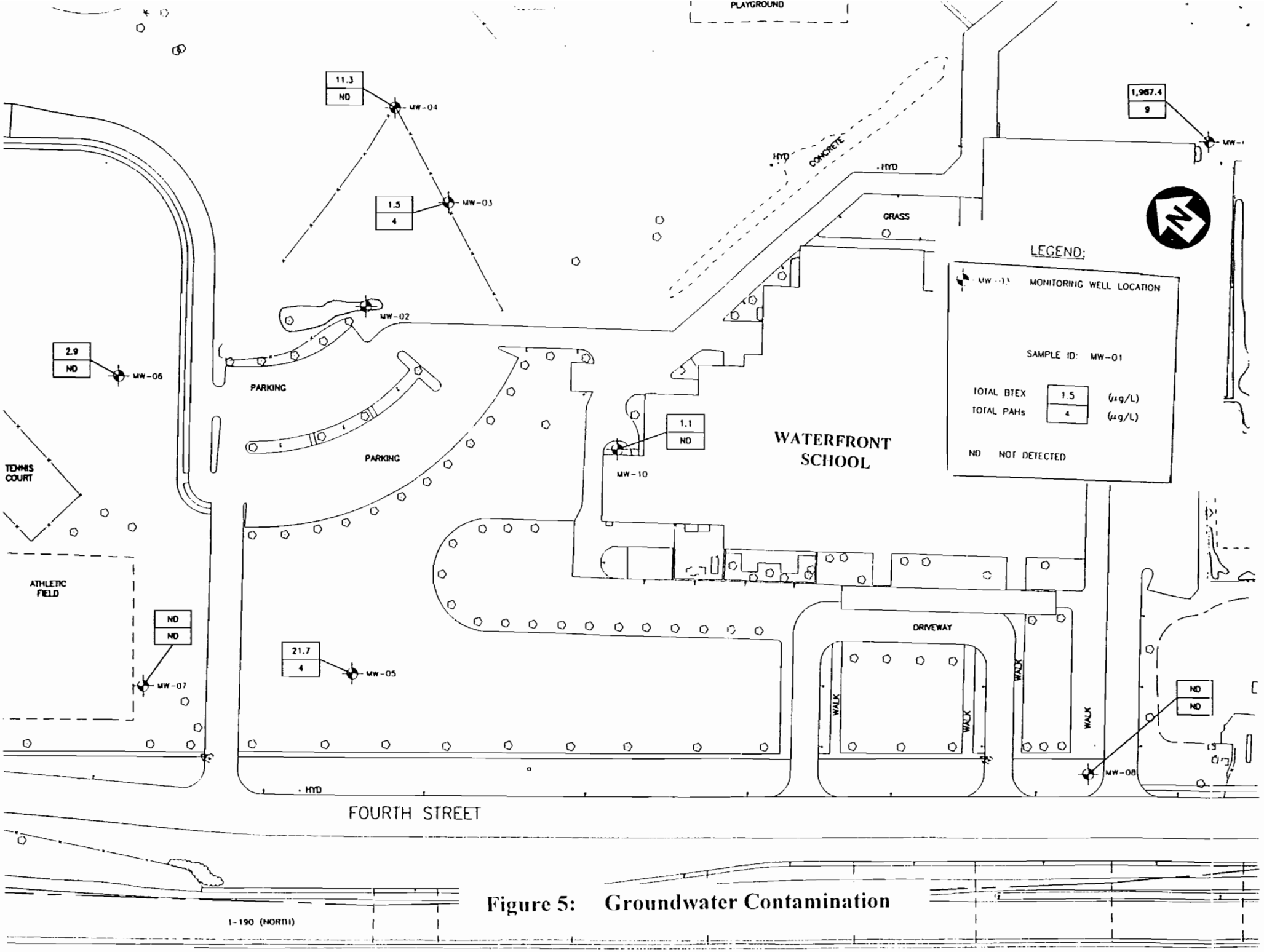


Figure 5: Groundwater Contamination

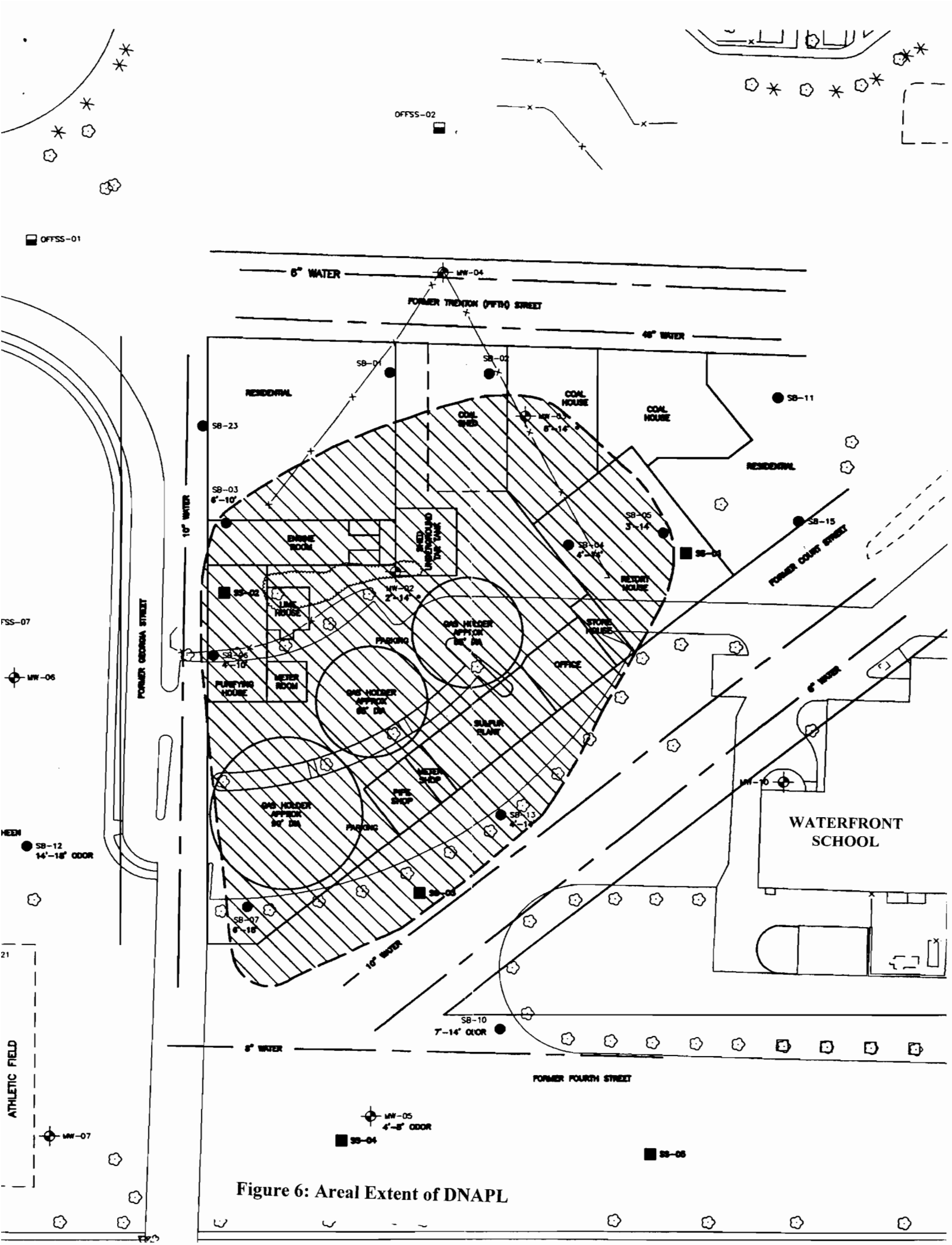
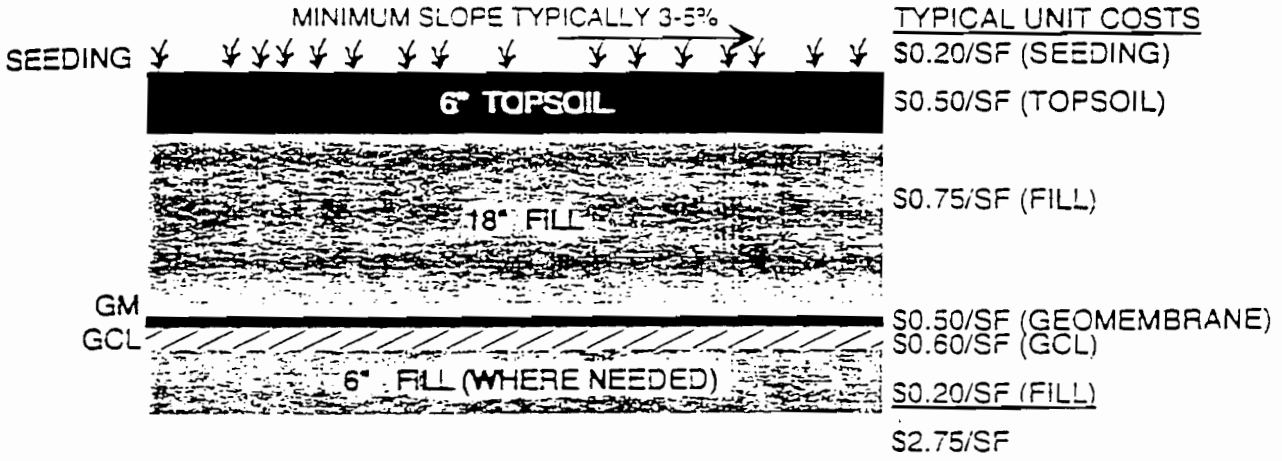


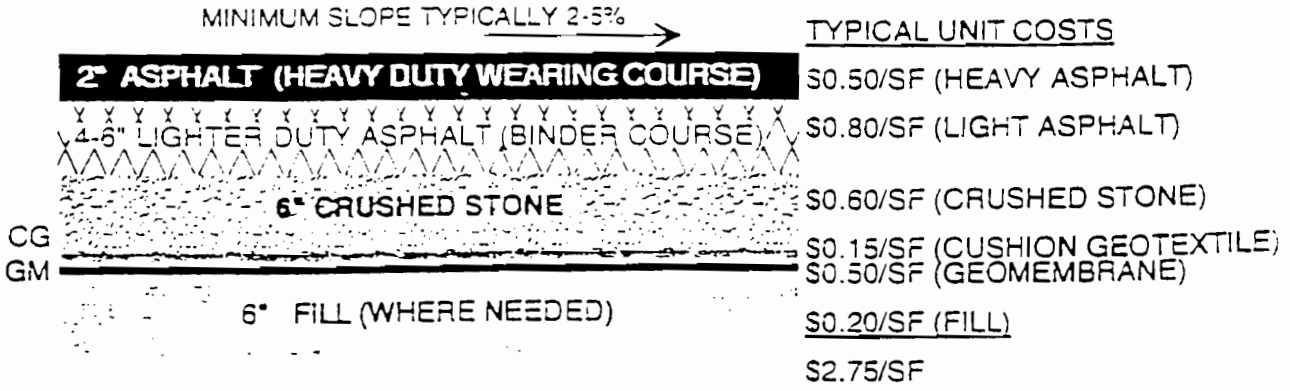
Figure 6: Areal Extent of DNAPL

IMPERMEABLE CAP SCENARIOS

WITH GRASS COVER



WITH ASPHALT COVER



CG - CUSHION GEOTEXTILE
GM - GEOMEMBRANE
GCL - GEOSYNTHETIC CLAY
SF - SQUARE FOOT

Figure 7: Alternative 2 - Capping

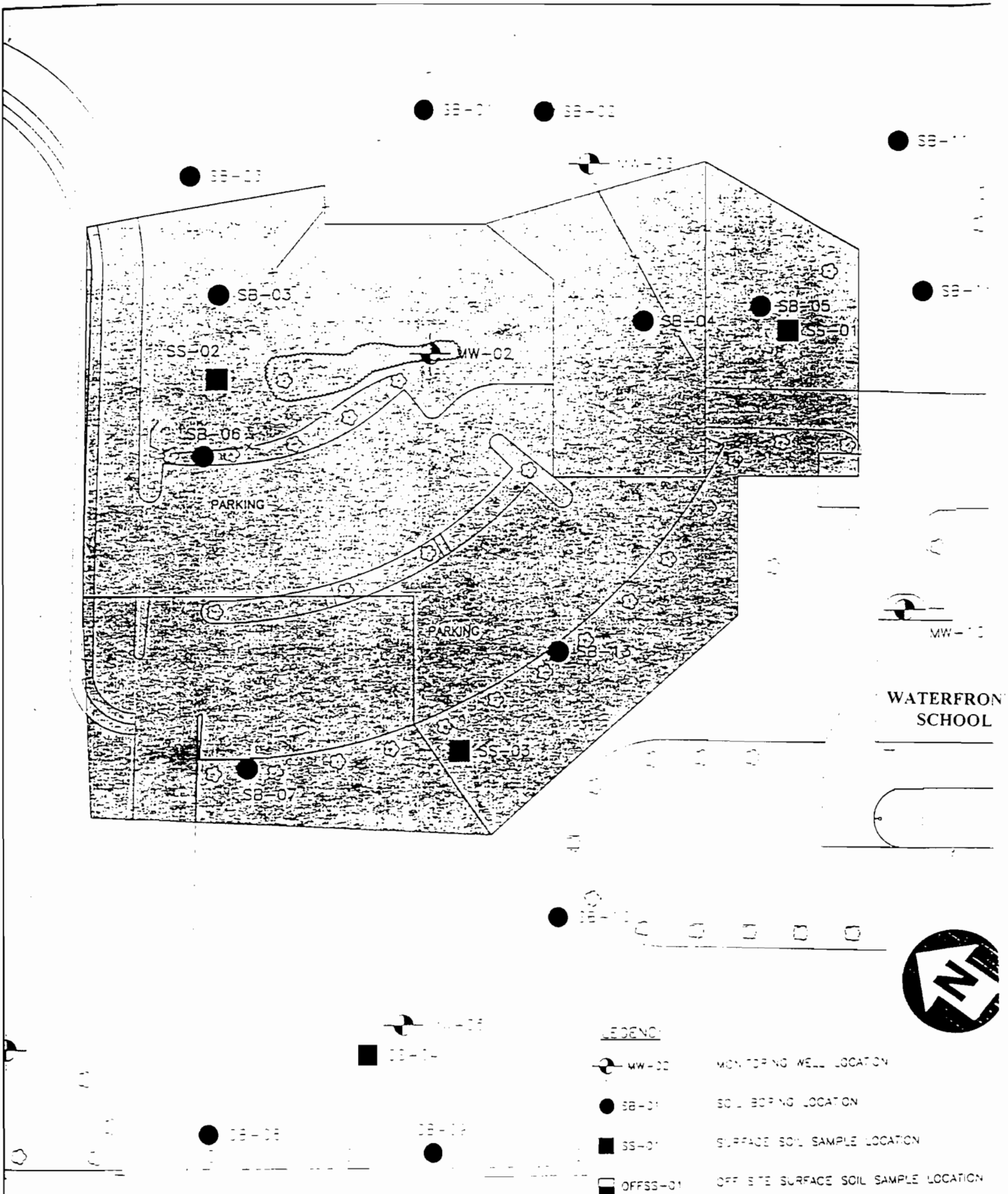


Figure 8: Alternatives 3 and 4 - Soil Excavation Area