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Superfund Enforcement Decision Document:

Hyde Park Landfill, NY

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(Please read Instructions on the reverse before completing)

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16. ABSTRACT

The Hyde Park landfill, approximately 15 acres in area, is located in the northwest corner of the Town of Niagara, New York. It is immediately surrounded by several industrial facilities and property owned by the Power Authority for the State of New York (PASNY). Th Niagara River, an international waterbody, is located 2000 feet to the northwest. Between 1954 and 1975, Occidental Chemical Corporation (OCC) disposed of approximately 80,000 tons of chemical wastes at the landfill and 0.6 to 1.6 tons of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) contaminated material. Between 1975 and 1979, OCC, pursuant to directives from the State, implemented a number of remedial actions. These actions included capping the site, and installing a shallow tile drain and a ground water monitoring program. Soil and ground water are contaminated with VOCs, organics, toluene, phenol, PCBs and dioxin.

The selected remedy for this site includes: installation of a prototype purge well system to extract non-aqueous phase liquids (NAPL) for destruction by incineration; installation of an overburden tile drain system; implementation of engineering controls for an industrial protection program designed to eliminate exposure to nearby workers; installation of ground water wells as part of a residential community monitoring program; installation of the first stage of a bedrock NAPL Plume Containment System; installation of two to three purge wells as an aqueous phase liquid (APL) Plume
(See attached sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Enforcement Decision Document Hyde Park, NY Contaminated Media: soils, gw Key contaminants: VOCs, organics, PCBs, toluene, phenol		

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EPA/ROD/R02-86/038
Hyde Park, NY

16. ABSTRACT (continued)

Containment System; implemenation of a lower formation and deep formation study; implementation of a Niagara Gorge Seep program; treatment of ground water with activated carbon; implementation of a monitoring program. The estimated present worth cost for this remedial alternative is $17,000,000.

Enforcement Decision Document
Remedial Alternative Selection

SITE: Hyde Park Landfill, Town of Niagara, New York

DOCUMENTS REVIEWED OR RELIED UPON

I am basing my decision on the Agreement and Stipulation for the Hyde Park Landfill, on EPA staff and expert consultant recommendations, information and analyses performed during the negotiations, and their review and/or preparation of the following documents describing the analysis of the remedial alternatives, the factors in the National Contingency Plan, including cost and effectiveness, and the standards in Paragraph 4 of the Hyde Park Settlement Agreement. Among the documents that have been reviewed and documents and advice considered are:

- Hyde Park Aquifer Survey;
- Occidental Chemical Corporation's (OCC) Requisite Remedial Technology Study (RRT Study)(May 1984);
- EPA/State Response to OCC's RRT Study (September 5, 1984);
- Summary of Remedial Alternative Selection;
- Affidavits and/or oral advice of Dr. Charles Faust, Dr. Neil Shifrin, Dr. Brian Murphy, Dr. Joseph Rodricks, Dr. Paul Jonmaire, and Livia Benavides. Some Affidavits are final, others are still under preparation.
- Hyde Park Landfill Evaluation of Excavation Option (Benjamin Mason);
- Chemical Exposures from Fugitive Dust Emissions at Hyde Park (Brian Murphy);
- Risks from Chemical Releases Associated with Proposed Excavation of the Hyde Park Landfill (Environ Corporation);

- Responsiveness Summary;
- Proposed Agreement and Stipulation Concerning Requisite Remedial Technology for the Hyde Park Landfill;
- Advice of Dr. Robert Lewis (ORD) and Rodney Turpin (National Environmental Response Team), and
- numerous other documents, including reports submitted by the government of Canada and the Province of Ontario, as well as advice received during the negotiations.

DESCRIPTION OF SELECTED REMEDY

The selected remedy consists of:

1) Source Control: Installation of a prototype purge well system in the overburden inside the landfill designed to extract non-aqueous phase liquids ("NAPL") from the landfill for destruction by incineration. If this system proves to be feasible, a final system will be designed and implemented.

2) Installation of an overburden tile drain system to contain and collect contaminated groundwater and NAPL.

3) An industrial protection program which requires implementation of engineering controls to eliminate exposure to nearby workers.

4) A Residential Community Monitoring Program which requires installation of groundwater wells in the community to provide early warning and trigger further action in the unlikely event that chemicals migrate into nearby residential area.

5) A Bedrock NAPL Plume Containment System: A bedrock purge well and recirculation well system which is designed to prevent the further migration of contaminated groundwater or NAPL laterally from inside the NAPL plume in the Lockport Dolomite. The system will be installed in stages, first, a prototype and then, when sufficient data are available, a final system.

6) APL Plume Containment System: Installation of two to three purge wells at the Niagara Gorge Face to collect a significant portion (60 to 88%) of the contaminated groundwater outside the NAPL plume. The portions of the APL (Aqueous Phase Liquids) plume not collected will be monitored and, if the loading to the river (flux) exceeds flux action levels (which are risk based and would result in less than one-in-one million ($< 1 \times 10^{-6}$) lifetime cancer risk), then OCC must perform additional remedial action to reduce the flux to below the action flux level.

7) Lower Formation and Deep Formation Study: Based on data from new wells installed in Irondequoit and Reynales formations, a total flux will be calculated (Lockport plus lower formations) and, if the flux action levels are exceeded, further remedies will be required to reduce the loading to the river to below the flux action level. If, based on the Lockport and intermediate formations fluxes, certain flux levels are exceeded, additional wells must be installed down to approximately river level (350 feet) to determine if chemicals have migrated to the deep formation. If they have, additional wells will be installed and a flux estimated. The total flux from the Lockport, Intermediate and Deep Formations cannot exceed the flux action level or additional remedial action is required.

8) Niagara Gorge Seep Program: Water seeps will be diverted and soil either excavated or covered where there is a potential for contamination.

9) Monitoring: Each program has a monitoring provision and performance standards. If these criteria are not met, further action must be taken.

10) The contaminated groundwater collected by the remedial programs will be treated with activated carbon as specified in the Stipulation and NAPL will be incinerated.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the National Contingency Plan (40 C.F.R. Part 300), and the terms and conditions of the Hyde Park Stipulation and Judgment Approving Settlement Agreement, I have determined that this remedy at the Hyde Park Landfill provides adequate protection of human health and the environment; is requisite, within the meaning of Paragraph 4 of the Judgment in the Settlement Agreement. The State of New York is a co-plaintiff; has been a full participant in the negotiations of this Stipulation; and agrees with the approved remedy. In addition, the action will require OCC to operate and maintain these remedies in the future to ensure the continued effectiveness of the remedy as long as it is necessary to protect human health and the environment. These monitoring and maintenance activities are part of the approved action. A proposed Agreement and Stipulation has been reached between EPA, the State and OCC based on the selected remedy. I have also determined that EPA considered cost-effectiveness in selecting remedial actions alternatives, when compared to the other remedial options reviewed, including excavation and landfilling and excavation and incineration. That is, once an appropriate level of protection or other objective standard was chosen, EPA evaluated which technology could reliably accomplish that goal with the lowest cost.

Excavation is not a remedy of first choice now because of the severe health risk which would be involved in excavation and

incineration of all the contents of the landfill and the substantially increased costs which have no comparable benefits. Excavation, however, is explicitly left open as an option in the future if the containment system fails.

NOV 26 1985

DATE

Assistant Administrator

Office of Solid Waste and Emergency Response

Attachments:
Summary of Remedial Alternative Selection
Community Relations Responsive Summary
Proposed Agreement and Stipulation

Summary of Remedial Alternative Selection

Hyde Park Landfill Town of Niagara, New York

I. Introduction

This Remedial Alternative Selection involves the selection of additional remedial alternatives proposed as part of the implementation of an existing Settlement Agreement with Occidental Chemical Corporation ("OCC"). The Hyde Park Settlement Agreement required OCC to implement certain specified remedies, but the bulk of the remedies were to be determined after OCC obtained additional field data, evaluated several remedial alternatives and the remedies were reviewed and accepted by EPA and the State (this process the equivalent of a Superfund or enforcement remedial investigation and feasibility study "RI/FS", except that it was more extensive than most RI/FSs performed by EPA. It is called in the Settlement Agreement, an Aquifer Survey and Requisite Remedial Technology or "RRT" Study).

As a result of OCC's implementation of the Aquifer Survey and RRT Study and subsequent negotiations, the remedies specified in the Agreement and Stipulation and summarized in this Summary have been agreed to by EPA, State and OCC negotiators. This Agreement and Stipulation modifies the Hyde Park Settlement Agreement to require OCC to perform a comprehensive remedial program at the site, primarily to address areas were there was no specified remedy in the original Settlement Agreement. Other modifications have been made to make the specified remedies in the original Settlement Agreement compatible with the RRT remedies or because new information is available. Further technical support for this Stipulation is supplied in the affidavits, reports, and other advice of EPA's technical experts.

II. Location and Description

The Hyde Park landfill is approximately 15 acres in area and is located northwest of the City of Niagara Falls in the northwest corner of the Town of Niagara (see Figure 1). It is immediately surrounded by several industrial facilities and property owned by the Power Authority for the State of New York ("PASNY"). There is a residential neighborhood to the northwest and south of the landfill. The Niagara River, an international waterbody, is located 2,000 feet to the northwest, down the Niagara Gorge which descends approximately 350 feet below the surface of the landfill (generally see the Affidavit of Dr. Charles Faust).

OCC disposed of approximately 80,000 tons of chemical wastes at the landfill, primarily chlorobenzenes (21%), benzoly chloride (9%), C-56 wastes and derivatives (7%), and 2,4,5-trichlorophenol still bottoms (4%) (Table 1), and an estimated

0.6 to 1.6 tons of 2,3,7,8-tetrachlorodibenzo-p-dioxin ("TCDD") (Affidavit of Dr. Neil Shifrin).

III. Chronology/Procedural History

- 1954 - 1975: OCC disposed of 80,000 tons of wastes.
- 1975: OCC closed the landfill;
- 1975 - 79: OCC, pursuant to directives from the State, implemented a number of remedial actions (capping the site; installing a shallow tile drain and a groundwater monitoring program in the top fifteen of the bedrock);
- December 1979: The Federal government filed a lawsuit seeking complete cleanup of the site;
- 1981: The federal, state, local governments, and OCC entered the Settlement Agreement;
- 1981: During the public comment period, there were numerous adverse public comments and a request for an evidentiary hearing (See Responsiveness Summary);
- September and October of 1981: The Court required briefs to be filed and ordered a seven day evidentiary hearing on the adequacy of the Settlement Agreement. EPA, the State, OCC and representatives of local and Canadian environmental groups presented witnesses and these witnessess were cross-examined.
- April 30, 1982: The Court approved the Settlement Agreement, calling it the "best possible solution to the problem given all the circumstances."
- 1983: OCC submitted the Aquifer Survey required by the Settlement Agreement.
- May 1984: OCC submitted its RRT Study.
- September 5, 1984: EPA and the State responded ("EPA/State Response") to OCC's RRT Study. EPA/State concluded that it was inadequate and proposed modifications, additions and alternative remedies.
- August 1984 - present: EPA, the State and OCC have been negotiating the appropriate RRT remedies. EPA assembled a multidisplicinary team of experts, in hydrogeology, health, and fate of chemicals among others areas, to advise EPA during the negotiations

(costing over $1 million). Numerous Agency experts from the Office of Research and Development, the Emergengy Response Team, the Great Lakes National Program Office, and other offices have been consulted and involved. Substantial effort has been made to solicit public comment during the negotiations.

- On October 2, 1985: Technical and legal issues were resolved.

IV. Extent of Contamination

Geology and Hydrogeology

The geology of the area is characterized by an overburden with relatively low permeability (approximately 0 to 30 feet thick), overlain on top of bedrock. Bloody Run Creek is a drainage channel that flows from the northwest corner of the landfill directly north, eventually into storm sewers, and down the Niagara Gorge Face into the Niagara River. The bedrock is composed of various layers starting with the Lockport Dolomite (approximately 100 feet thick, Figure 2), followed by the Rochester Shale (60 feet), and several layers divided between the Intermediate (the Irondequoit/Renayles) and Deeper Formations (everything below the Irondequoit/Reynales and above the Queenston Shale) in the Settlement Agreement (Faust Affidavit).

The groundwater in the overburden moves toward the northwest toward the Gorge Face and strongly downward into the bedrock (see Figure 3). The groundwater in the bedrock moves downward and laterally, primarily in the northwest direction towards the Gorge Face, which acts as a giant natural drain pulling the bedrock groundwater toward the Gorge Face (Figure 4 for flow near the site). Some of the bedrock groundwater emerges from the Gorge Face as seeps or springs (see Figure 5: A map showing the locations of those seeps which have been sampled). The water from the seeps flows overland through Devil's Hole State Park into the Niagara River and the bedrock groundwater that does not emerge as seeps flows into the Niagara River underneath the ground surface at the gorge (id.)

The chemicals at the site migrate primarily in two phases: (1) chemicals dissolved in the groundwater (called aqueous phase liquids or "APL") and (2) a primarily, heavier-than-water phase that migrates down through and along the slope of the bedrock under the influence of gravity (called non-aqueous phase liquids or "NAPL")(id. and Shifrin Affidavit).

Figure 6 illustrates the extent of contamination in the overburden as determined using criteria in the Settlement Agreement (assuming the edge of the plume is halfway between the last 'dirty' and first 'clean' well). The area within the

dashed lines in Figure 6 represents the general area where NAPL has been found and the area between the dashed line and the solid line where just APL is present.

Much of the contamination in the Bloody Run drainage basin area (north of the landfill) is likely to have been a result of the infiltration of surface runoff during the period when chemicals were disposed of at the landfill, not groundwater flow from the landfill.

The area where the overburden plume is closest to homes or apartments is west of the landfill. The lateral movement of the overburden APL plume is extremely slow because of the type of soil in the area. Based on an in depth review of the data and a house-by-house survey by DEC, it is the professional judgment of the EPA and State experts that it is highly unlikely that the plume has actually crossed Hyde Park Boulevard or that anyone is presently being exposed or will likely be exposed in the immediate future to the Hyde Park APL plumes in the overburden or the bedrock (Faust Affidavit, Shifrin Affidavit, and the advice of Dr. Brian Murphy, to be documented in an Affidavit and hereinafter referred to as the "Murphy Affidavit").

Figures 7, 8, and 9 respectively show the extent of contamination in the bedrock as determined using the criteria in the Settlement Agreement, a contour map of the TOH in the groundwater from upper Lockport Dolomite bedrock, and a contour map of the TOH in the groundwater from the lowest level in the Lockport Dolomite bedrock. In Figure 7, a well is considered 'dirty' if any chemical or survey parameter was detected at any depth at the location of the well. The area within the dashed lines on Figure 8 is the area where NAPL was found (at some depth) in the bedrock and the area between the dashed and solid lines is where APL was found at some point in the bedrock. This data shows that the APL plume is a different shape at various depths in the bedrock (Faust Affidavit).

The extent of contamination is consistent with our knowledge of the site and the hydrogeological data.

Chemical Composition

The leachate and APL plume are composed primarily of benzoic acids, chlorobenzoic acids, chlorendic acid, and phenol (Table 2). The known major components of NAPL are dichlorotoluene, chlorotoulene, toluene, tetrachloroethylene, phenol, methly benzoate, benzoic acid and benzochlorotrifluorides. At least 20 ppm of TCDD and substantial amounts of PCBs have also been detected in NAPL (Table 3). However, at present, 40-50% of the constituents of NAPL are high molecular weight compounds which have not been identified by library matching of mass spectra from gas chromatograph mass spectrometry analyses ("GC/MS")(Shifrin Affidavit).

Part per million levels of TOH, phenol and other chemicals have been detected in the bedrock groundwater seeping out of the Gorge Face since August 1984 (Table 2). TCDD has been detected in the bedrock groundwater within the NAPL plume at between 0.44 to 0.9 parts per trillion (ppt) and in the bedrock groundwater seeping out of the Gorge Face at 0.18 ppt (id.).

V. Terms of the Settlement Agreement

The Settlement Agreement required OCC to perform certain field studies to define the extent of the contamination in the overburden and Lockport Dolomite, assess the remedial alternatives available, and determine what, if any, additional data gathering was necessary. If a technology is determined either by the parties (EPA, the State and OCC) or the Court to be "requisite," i.e., it is a Requisite Remedial Technology (see Paragraph 4 of the Judgment), OCC must implement such technology.

In determining whether a technology is "requisite", one must consider whether it is an "engineering or construction practice used or accepted for use in landfill containment or other industrial projects which are applicable to the materials and hydrogeologic conditions found at the Landfill," the "nature of the endangerment to human health and the environment," the "extent to which the application of the Remedial Technology would reduce such endangerment ... or would otherwise benefit human health or the environment; and the economic costs required to apply the Remedial Technology" (Paragraph 4(a) and (b) of the Judgment). If there is a dispute, Paragraph 4(c) of the Judgment requires OCC to apply the RRT proposed by EPA and/or the State:

> unless, upon the evidence, the Court determines:
>
> (i) that application of such technology is unnecessary to satisfy the goal described in subparagraph (a) or
>
> (ii) that, considering the factors described in subparagraphs (a) or (b), it would be arbitrary and capricious to require Hooker [OCC] to bear the economic costs incurred in applying such technology.

(Paragraph 4(c) of the Judgment).

The Court Opinion approving the Settlement Agreement characterized RRT process as an "enormously flexible" concept. United States v. Hooker Chemicals & Plastics Corp., 530 F. Supp. 1067, 1077 (W.D.N.Y. 1982).

EPA used these factors, as well as the almost identical factors required for private party cleanup by the National Oil and Hazardous Substances Contingency Plan ("NCP"), 40 C.F.R. 300.68(c), in evaluating OCC's and our own consultant's remedial proposals.

VI. Summary of Proposed Remedial Actions and Evaluation Alternatives

The remedial program is outlined in the proposed Stipulation (and Appendixes). The following is a summary of the remedies and their justifications. The detailed rationale for selection of the remedies are provided in the Affidavits and advice of EPA experts and other supporting documents. Some decisions were made based on the best professional judgment of our experts which was communicated orally during the negotiations.

The remedial program in the Stipulation should be viewed as a whole. No one system, e.g. Source Control or the Bedrock APL Plume RRT, is complete in itself. In the opinion of the negotiating team and other experts involved in the negotiations, these systems together adequately protect the public health and the environment and satisfy the requirements of the National Contigency Plan, 40 C.F.R. Part 300, and in the opinion of Office of Enforcement and Compliance Monitoring-Waste ("OEM") and Department of Justice ("DOJ") equal to or exceeds what could be obtained through litigation.

SOURCE CONTROL (40 CFR 300.68(e)(2))

In its RRT Study, OCC did not propose to implement any source control measures, although they considered and rejected lateral drains, extraction wells, and excavation as remedial alternatives. The EPA/State Response indicated that OCC had provided insufficient documentation that such systems were not "requisite", as defined in the Settlement Agreement, Paragraph 4 of the Judgment (EPA/State Response, at p. 3-03).

EPA/State proposed that OCC consider and better evaluate extraction wells, lateral drains, and excavation (although it was noted that excavation was not a remedy of first choice) and that OCC consider grouting the bedrock beneath the landfill alone or in conjunction with another remedy (id. at p. 3-05 to 3-10).

EPA and the State considered excavation, purge wells, and lateral drains during the negotiations. The proposed Stipulation requires OCC to implement a prototype extraction well system to determine whether extracting NAPL from the landfill is feasible (Section 2.2 of the Stipulation see Figure 10 and Faust Affidavit). The information gathered from the prototype system will be used to design a final extraction system. In the opinion of EPA's experts, a final system will be feasible (id.)

The NAPL extracted from these wells and all other remedies in Stipulation is required to be destroyed through incineration (Paragraph E(5) of Addendum I of the Settlement Agreement) and the APL must be treated with activated carbon (Section 10.0 of the Stipulation.)

The other alternatives were evaluated during the negotiations and were deemed not appropriate at this time. EPA prepared an extensive evaluation of health risks, feasibility and costs of total excavation of the historic landfill and other highly contaminated areas (Reports of Dr. Benjamin Mason, Dr. Brian Murphy, and Environ Corp., 1985, hereinafter referred to as the "Excavation Report").

The results of the Excavation Report indicates that (a) there would be extremely high health risks from total excavation (greater than 1 in 100 risk); (b) there is no reliable fully tested, existing dust and vapor suppression technology that could lower the risk from excavation of this magnitude to an acceptable level; and (c) the costs of total excavation and either reburial or incineration was extremely high, between $125 million (for the low estimate for off-site landfilling) and over $3 billion (for the high estimate for on-site incineration) not including all costs.

This study also concluded that there was no landfill which was legally permitted to accept the chemicals, soils, and other debris, particularly because of the high levels of TCDD, and there are no existing commercial incinerators capable of incinerating or permitted to incinerate the contaminated soils and other debris at the Hyde Park site (although recent EPA research has demonstrated that TCDD contaminated soil can be incinerated)(id.).

The Excavation Study also briefly examined a dust suppression technology (use of a movable inflatable dome) for adaptation to hazardous waste site remedial construction. Use of such a technology under these circumstances would require considerable development and testing before it could be approved for use given the extremely hazardous atmosphere that would be created inside the dome during total excavation of the site.

EPA has approved or recommended partial or total excavation in other cases, e.g., the Westinghouse, Wilsonville, Petro Processors, and the McColl cases. As part of EPA's consideration of excavation, EPA staff investigated the facts of these cases and found that these other sites involved either excavation of smaller volumes of wastes, wastes contained in drums or capacitors; and none presented anywhere near the health risk.

Wilsonville involved primarily the reburial of containerized PCB waste. That site was located over abandoned mines which were subject to subsistence. No similar geological feature exists at Hyde Park and the wastes were primarily poured into the ground not in containers. Petro Processors involves emptying open lagoons containing nonaqueous phase liquids (mostly trichloroethylene) and excavation of a relatively small areas.

At the McColl site, the wastes are also less toxic than at Hyde Park. Test excavations have been performed at McColl and these tests indicated that there are potential hazards from volatization of organic vapors during excavation. These tests also evaluated the feasibility of reducing the potential hazard through the use of foaming agents. No excavation has yet been performed at this site because two state courts have enjoined reburial at two potential sites. Further evaluation of the appropriate remedies at this site is continuing.

In the Westinghouse case, the defendant offered to excavate and incinerate approximately 650,000 cubic yards of chemicals, soil and municipal wastes. The primary chemical in the Westinghouse case was PCBs which were contained in old capacitors. This situation is completely different from Hyde Park where liquids were disposed of in open pits and have migrated through the overburden and bedrock. Also, EPA experts in that case concluded that a remedial system to contain and clean up the chemicals in the bedrock was not feasible. Unlike the Hyde Park case, no formal risk assessment of the effects of excavation was performed in this case.

The Westinghouse consent decree gives Westinghouse 15 years from the date the incinerator permit is issued to destroy the wastes and soil. However, local citizens groups have vigorously opposed excavation and incineration in court because of concerns about health and safety and the date of implementation is uncertain.

The health risks from excavation of all of these other sites was found by EPA not to be substantial, unlike Hyde Park situation where excavation would present substantial risks.

The negotiators and experts have concluded that <u>at this time excavation of this site was not acceptable</u> based on public health and environmental risks; feasibility; the enormous costs; and the magnitude of the benefits.

In the judgment of OECM-W and DOJ the costs were so high that such a remedy would not be ordered by a court without a substantial showing of a benefit and, if the remedies required by the proposed Stipulation are effective, no such showing was likely.

It should be noted that all the remedies specified in the Stipulation (except the extraction wells in Section 2.0) would have to be implemented, even if excavation occurred immediately, because NAPL has migrated into the overburden and bedrock outside the historic landfill. Also, because of the presence of NAPL offsite, particularly in the bedrock, these systems will be operated for a very long time.

Based on the advice of our experts and a report submitted by OCC, grouting was not considered worth pursuing at this time because some amount of NAPL would continue to enter the bedrock (even with the best grouting techniques); over time that amount would increase; it may not be feasible to effectively grout the upper bedrock because of the presence of NAPL in those cracks and fissures; and the cost were considered to be very high compared to the benefits (at this time)(Faust Affidavit; Conestoga-Rovers, Grouting Report; and other information available to EPA).

The Stipulation, however, requires the reconsideration of these alternatives, including excavation, in the future if: 1) the information from the prototype system indicates that no extraction well system is feasible; 2) Hyde Park chemical are found in the Rochester Shale and the Lockport RRT will not prevent NAPL from migrating below the Rochester Shale; 3) Hyde Park chemicals are found in the Intermediate or Deep Formations and NAPL is migrating below the Rochester Shale; or (4) the RRT in the Lockport Dolomite is not working (Section 2.3(A)(1, 2, 3, and 4 of the Stipulation).

Excavation is only precluded from further consideration if "OCC is required by the Court to implement an operational grouting program proposed by EPA/State" and even in that case, excavation can be require if there is

> a substantial failure to meet the performance monitoring criteria of any bedrock system and such substantial failure cannot be addressed by modifying any existing system or using in situ technology.

(Section 2.3(B)(2) of the Stipulation).

This standard is consistent with the Court's opinion approving the Hyde Park Settlement Agreement:

> It is possible that Hooker tests and studies regarding migration of chemicals will demonstrate that no containment program will meet the performance standards. It is possible that the governmental parties in their capacities as supervisors of Hooker's proposal for RRT will conclude that the containment programs are inadequate. If such is the case, then ultimately Hooker may be forced to excavate the materials as part of a remedial program.

United States v. Hooker Chemicals & Plastics Corp., 530 F.Supp. at 1079.

It should be noted that grouting may also be considered for use in conjunction with other source control methods to enhance recovery of NAPL, if necessary.

The original Settlement Agreement had a provision which required maintenance of the remedial systems in the Settlement for 35 years (the term of the Settlement Agreement), but allowed OCC terminate the limited bedrock purge well system specified in the Settlement Agreement earlier, if OCC demonstrated to EPA and the State that specified conditions had occurred. (Paragraph F of Addendum III). This provision also required resumption of the system of other specified conditions occurred.

All the remedial systems in the settlement, however, could be required to be extended upon a showing to the Court that it was "necessary to effectuate the purposes and goals of this Judgment" (Paragraph G of Addendum III), i.e., the remedies are necessary to protect human health and the environment (see Joint Response to Court's order of February 12, 1981 (March 17, 1985).

Each of the major remedial programs, including Source Control, contains such a provision. In the case of the prototype purge well system, starting five years after the final cap is placed on the site (which is the last construction activity at the site), OCC may try to convince either EPA and the State or, if necessary, a Court that such system is no longer requisite, as defined in Paragarph 4 of the Judgment (Section 2.3(D)).

OCC can only turn off a system, if both EPA and the State agree or, if a Court orders it after an evidentiary hearing. The negotiators accepted this provision because it is consistent with the original Settlement Agreement and, in their opinion, places a heavy burden on OCC. Although it was recognized by all the parties to the negotiations that the containment system as a whole will will have to be operated for a very, very long time, there may be portions of the system, which can be turned off at some point.

The Stipulation also contains provisions that would allow EPA and the State to either extend operation of an existing system (Section 2.3(E)) or resume the operation of a system that has been turned off through the procedure specified in the termination provision (Section 2.3(F)).

OVERBURDEN RRT/RESIDENTIAL COMMUNITY MONITORING PROGRAM
[Source Control - 40 CFR 300.68(e)(2) and Offsite Remedial Action - 40 CFR 300.68(e)(3)]

One of the specified remedies in the original Settlement Agreement was a new, deeper tile drain around the site (Figure 11). OCC's RRT proposed a similar, but differently designed tile drain to contain and collect APL and NAPL within the historic boundaries of the landfill and to contain and collect the NAPL and APL plumes

which have already moved offsite and would not be collected by the Bedrock RRT.

The EPA/State Response accepted the concept of a new deep tile drain with a different design, but proposed certain modifications and required more information to ensure that the tile drain or the Bedrock RRT would contain and collect the overburden APL and NAPL or that the overburden APL or NAPL would not endanger human health before the APL or NAPL entered the bedrock (EPA/State Response, at pp. 4-02 to 03; 5-02 to 03).

The Overburden RRT, the Industrial Protection Program, and the Residential Community Monitoring Plan ("CMP") satisfy the EPA and State requirements.

(1) Overburden RRT

The Overburden RRT in the Stipulation consists of (a) implementing an overburden plume survey (see Figure 12 and Sections 3.3.1 and 3.3.2) to refine our knowledge of the extent of the APL and NAPL plumes in the overburden, (b) installing a deeper tile drain system around the landfill (the overburden collection system or "OBCS" - Figure 12 and Sections 3.2, 3.4); (c) identifying and addressing any hot spots which constitute a human health endangerment which is not addressed by the tile drain system (Section 3.4); and (d) installing and operating a monitoring system (Sections 3.5 - 3.7)(Faust Affidavit).

The purpose of the OBCS is to contain the lateral migration of the overburden NAPL plume and, to the extent practicable, contain the APL plume. Hyde Park chemicals must either be contained and collected by one of three sets of systems: the OBCS; the Bedrock RRT; or the remedies previously specified in the Settlement Agreement. The specified remedies in the original Settlement Agreement address the contamination in Bloody Run Creek (Paragraphs G and H of Addendum I) and the chemicals migrating in sewers near the landfill (Paragraph B(4) of Addendum I).

In effect, it will be designed to stop the outward migration of chemicals from the landfill in the overburden APL plume. That portion of the overburden plume not pulled back into the OBCS will move down into the bedrock and be collected by one of the remedial systems installed in the bedrock (id.).

Each remedial program has its own effectiveness monitoring. The tile drain will be monitored by ensuring the groundwater is flowing toward the drain or downward into the bedrock and by checking wells to ensure that NAPL does not enter (Figure 12 and Section 3.6). If the inward gradient is not achieved or NAPL is detected, the plume will be redefined and the tile drain system modified (id.). If after a modification, the tile drain system still does not work, OCC must perform another RRT study to determine

that the overburden and APL bedrock plumes would not present an endangerment to human health or environment.

The CMP is designed to address EPA, State, and the community's concern that there might be an endangerment either before the remedies are installed or before they become fully effective.

Based on existing data and other information, EPA and the State are of the opinion that there is no present residential exposure to the local residents from the Hyde Park chemical plumes and such exposure is highly unlikely to occur in the immediate future (Faust Affidavit, Shifrin Affidavit, and Murphy Affidavit).

However, as a matter of prudent public policy, EPA and the State have included a Residential Community Monitoring to "supplement these other programs by monitoring to provide 'early warning' of APL plume migration toward residential areas, taking all feasible actions to prevent or remediate such migration to residential areas and taking any additional action required to protect those living in the Hyde Park-Bloody Run area" (Section 8.2).

As soon as possible after the Stipulation is initially lodged with the Court, OCC is required to submit detailed plans, specifications and protocols (Section 1.1.1). The program consists of installing 8 monitoring well pairs, one in the overburden and on in the upper bedrock (Figure 13) and monitoring water elevations and chemicals in groundwater, or, if necessary, the air in the unsaturated overburden (Faust Affidavit).

If the Community Early Warning Parameters (Table 4, Section 9.8) are detected, indicating the potential for exposure, OCC is required to prevent exposure or implement additional remedies to remediate exposure, to the extent economically and technically feasible (Faust Affidavit). OCC will also monitor more frequently and perform complete GC/MS survey of the groundwater (analysis for highly polychlorinated dioxins and polychlorinated dibenzofurans at 0.5 parts per trillion). The analysis will enable a better assessment of the endangerment (Section 8.5.2).

EPA and the State may also seek additional remedies if "EPA/State demonstrates (1) that the action is necessary to prevent or remediate human health endangerment to residents or chemical odors on residential properties and (2) that the action proposed to address such endangerment or odors is requisite, as defined in Paragraph 4 of the Judgment" (Section 8.6.3). This is the standard in the Settlement Agreement and in the opinion of OECM and DOJ is favorable to EPA/State.

The Community Early Warning Parameters were chosen as good indicators of the movement of the APL plume into overburden. In the opinion of our experts, they will provide early warning of the movement of the APL plume (Shifrin Affidavit).

what additional remedies might be effective and necessary (Section 3.6.3). Since there are no limits on the technologies to be evaluated during RRT, OCC must also reconsider excavation at this time.

As noted before, there are termination, extension, and resumption provisions for this system also (see Section 3.7). The resumption provision requires OCC to maintain all facilities and equipment related to the tile drain system for a period of 35 years, even if the system has been terminated following the procedures in the Stipulation. This provision requires more than what was in the original Settlement Agreement and was added so that the deterioation of equipment could not be used as reason that resumption was not requisite (too costly).

(2) Industrial Protection Program [Offsite Remedial Action - 40 CFR 300.68(e)(3)]

The EPA/State Response required OCC to address whether or not the APL and NAPL plumes could threaten public health (at pp. 4-03 and 5-03). During the negotiations, EPA and the State identified two populations at potential risk, the workers in the nearby industries and the local residents.

EPA, State and OCC personnel and consultants toured the local industries and examined the blueprints for the industries (Advice of Dr. Paul Jonmaire, to be documented in an affidavit and hereinafter referred to as the "Jonmaire Affidavit"). As a result, an Industrial Protection Program was developed (Section 3.5 and Section 3.8). The Industrial Protection Program lists a number of specific actions were identified which would eliminate the potential of exposure, e.g., provide a seal to sump lid in Laboratory Building (# 106) at TAM Ceramics. In the opinion of EPA's experts, these measures will prevent exposure to Hyde Park chemicals (id.).

Because the overburden is contaminated, OCC will request that any property owner or public agency contact OCC before initiating construction activity below ground within the APL or NAPL plumes (Section 3.9). OCC will inform EPA and the State and they will advise whoever is contemplating such construction of the appropriate health and safety requirements. EPA and the State will notify the local governments and request that EPA and the State be notified of any applications for construction in the contaminated area and similar advise will be provided by OCC and EPA/State. The legal rights and liabilities between OCC and such landowners are not addressed nor affected by this Stipulation (Section 1.6).

(3) Residential Community Monitoring Program

There was no Community Monitoring Program ("CMP") in OCC's RRT or the EPA/State response. The parties agreed to develop a specific separate program in order to address EPA/State's concern

Since it is theoretically possible that some monitoring on residential property might possibly be needed, EPA is giving the State $250,000 for such monitoring. Additional monitoring if necessary could be done by EPA. Furthermore, if EPA or the State perform such monitoring, they may obtain reimbursement from OCC for the usual reimbursable costs, i.e., normal administrative overhead costs are not reimbursable (Section 8.6.I.2.)

OCC is not required to perform monitoring inside of homes or monitoring which requires "construction on residential property or otherwise significantly affects the use and enjoyment of such property" unless such monitoring (1) is required to provide data for the design of a remedial technology; (2) is necessary to measure the effectiveness of a technology that is installed; or (3) EPA/State have performed such monitoring for at least one year and obtained reimbursement for such monitoring from the Court (Sections 8.6.2 and 8.6.3). As indicated above, the proposed Stipulation provides that EPA and the State will perform any such monitoring.

In the opinion of the negotiation team and the experts, this program will protect the public health and is extraordinarily broad and comprehensive, yet flexible (id., Faust Affidavit, and Murphy Affidavit). The fact that OCC will not monitor inside homes does not adversely affect protection of human health or EPA since EPA's monitoring costs can be recovered from OCC, in this situation, requiring monitoring by OCC inside homes might be perceived as appropriate, and requiring OCC to perform such monitoring might undermine confidence in the data and the program.

EPA has prepared a background document on the CMP for use by the public during the public comment period.

LOCKPORT BEDROCK RRT/GORGE FACE SEEPS
[Offsite Remedial Action [40 CFR 300.68(e)(3)]

OCC's RRT considered approximately 10 different remedial alternatives or combinations of alternatives for remedying contamination in the Lockport Dolomite, including purge wells installed in the top 15 feet of bedrock, purge wells installed throughout the Lockport Dolomite, and excavation (see Attachment 2: The list of alternative remedial technologies from the RRT Study). OCC proposed a purge well hydraulic system to contain both the APL and NAPL within the NAPL plume in the Lockport (the area within the darker line on Figure 8), tests to determine if a vertical grout curtain wall would reduce groundwater inflow (and thereby reduce treatment costs), and a study to determine if the Rochester Shale (the next geological formation) would prevent vertical migration of chemicals. This remedy

would be installed in phases.

OCC proposed no remedy for the APL plume outside the NAPL plume (the area between the solid line and the dotted line on Figure 8), because there would be an insignificant benefit from such a remedy (the risk estimated by OCC without an APL remedy was 1.9×10^{-8} and with a remedy was 0.94×10^{-8}). OCC also proposed no remedy for the Gorge Face seeps because no data on contamination at the seeps was available at the time the RRT Study was prepared.

After reviewing the alternatives, the EPA/State Response accepted in principle hydraulic containment of the NAPL plume, suggested modifications to OCC's design (including the addition of recirculation wells); requested more details; questioned the effectiveness of grouting; and requested more information on the other alternatives (at p. 7-05 to 7-06). EPA and the State also pointed out numerous deficiencies in OCC's risk assessment, particularly the omission of TCDD (at pp. 9-01 to 9-18), and concluded that OCC had not demonstrated that containment of the entire APL plume was not "requisite" (id. at p. 6-03 to 6-05).

There are three interrelated systems in the Stipulation designed to address the chemicals in the Lockport Dolomite as they migrate laterally from the landfill towards and at the Gorge Face: (1) the NAPL Plume Containment System (Sections 4.2.1 and 4.3); (2) the APL Plume Containment System (Sections 4.2.2 and 4.4); and (3) the Gorge Face Seep Program (Section 7.0). These systems are described below. Sections 5.0 and 6.0 address the potential for vertical migration of chemicals, and are discussed in the next section of this memorandum.

(1) NAPL Plume Containment System

The purpose of the NAPL Plume Containment System ("NAPL System") is to contain, to the extent practicable, APL and NAPL within the NAPL plume in the Lockport Dolomite and to maximize the collection of NAPL (Section 4.1). The NAPL System, as a practical matter, will contribute to the elimination of seepage of chemicals at the Gorge Face (Section 4.1 and Faust Affidavit).

First, an additional eight wells will be installed to refine the exact present lateral extent of the NAPL plume (Figure 14 and Section 4.3.1.1 and Faust Affidavit). Because there is insufficient hydrogeological data to design and implement a final system now, OCC will install a prototype system and design the final system in phases, as more data becomes available. This allows a remedy to be installed immediately, yet provides that the final remedy be based on adequate data (id.).

Initially, four purge wells, two recirculation wells and three cluster monitoring wells will be installed (Figure 15 and

Sections 4.3.2, 4.3.4 and 4.3.6.1). A number of field tests, e.g. pump, injection, packer, and tracer tests, laboratory tests, will be performed (Section 4.3.5) and other data collected (Sections 4.3.6.2 and 4.4.1.2). More wells can be added as warranted by the data. The design of the final NAPL System will be based on this data (Section 4.3.7.2)(id.).

The final system will be monitored hydraulicly to ensure that the flow of the bedrock groundwater is inward toward the landfill, chemically to ensure that there is no statistically significant increase in the major components of the chemicals in the groundwater after the system is installed and stabilized, and visually for the presence of NAPL (Section 4.3.7.3).

Sixteen piezometer well pairs will be installed around the landfill (with at least one piezometer in each pair outside the NAPL plume). The eight initial NAPL plume definition wells (called performance monitoring wells) will be used to monitor Total Organic Halogens (TOH) and the NAPL System effectiveness monitoring chemicals (Figure 14 and Table 4)(Shifrin Affidavit). These chemicals comprise the major chemicals in leachate and bedrock groundwater and in the opinion of our experts will detect any system failure (id.).

If NAPL is found in any performance monitoring well, a statistically significant increase occurs in TOH or any two of the specific monitoring chemicals, or the inward gradient is not met, the NAPL System must be modified or, if necessary, supplemented with additional purge wells (Sections 4.3.8.1 and 4.3.8.2). If there is a statistically significant increase in only one specific chemical (an unlikely event if there is leakage, Shifrin Affidavit), then OCC must perform an assessment to determine the reason for the increase (Section 4.3.8.1). The 90% loading effectiveness criteria was specified in the Settlement Agreement for the bedrock purge well system in the top 15 feet of the Lockport (the Bedrock Barrier Collection System or "BBCS", Paragraph J(1) of Addendum II). Since the NAPL Containment System is not the BBCS, this criteria is not applicable to the NAPL Containment System.

If these corrective actions do not work, OCC is obligated to perform an RRT Study to determine what technology, if any, will meet the requirements of the Settlement Agreement and re-evaluate source control (including excavation) (Section 4.3.8.2).

As with all the remedial systems, there are termination, extension, and resumption provisions. OCC cannot attempt to terminate the NAPL system until after 17 years initial operation of the prototype purge well system, however, after 7 years, any party may propose termination criteria and if no agreement is reached by EPA, State and OCC, any party may petition the Court to set appropriate criteria, i.e., criteria consistent with the objectives of the NAPL System and Paragraph 4 of the Judgment

(Section 4.3.9.1). In addition to the extension and resumption provisions, OCC must maintain all NAPL effectiveness monitoring wells for 35 years after the effective date of the Settlement Agreement. As discussed previously, all maintenance activities may be extended beyond 35 years by order of the Court (Paragraph G of Addendum III of the Judgment).

In the opinion of the negotiating team and its experts, the final NAPL System will prevent the continued lateral migration of APL and NAPL within the NAPL plume and maximize the collection of NAPL (id. and Faust Affidavit). The vertical migration of NAPL and APL within the NAPL plume will be addressed by the Intermediate and Deep Formation programs (Sections 5.0 and 6.0, described below).

(2) APL Plume Containment System

The single most difficult issue in the negotiations was obtaining additional remedial action for the APL plume located outside the NAPL plume (Figure 8). Under the standard in the Settlement Agreement, the major issue was whether an APL Plume remedy was "requisite", i.e., whether imposing the cost of an APL remedy was arbitrary and capricious compared to the benefit (i.e., the reduction in endangerment or risk).

As with virtually all risk assessments, there was insufficient objective data to conclusively determine the risk and therefore worst case assumptions had to be used (Advice of Dr. Joseph Rodricks, to be documented in an affidavit and hereinafter referred to as the "Rodricks Affidavit"). Rather than requiring OCC to submit a revised written risk assessment (which would be time-consuming and inefficient), OCC agreed for the purposes of negotiations, that the various experts would discuss the appropriate assumptions and once these assumptions were agreed upon, the risk calculations would be performed by EPA's health effects consultants (Dr. Rodrick's and his staff at Environ), using EPA risk assessment procedures.

A wide variety of assumptions were evaluated. The total potential cancer risk from the site was found to be dependent only on TCDD exposure from eating fish. The TCDD level in fish in turn is dependant on the concentration of TCDD in the APL plume and the fish bioaccumulation factor for TCDD (how much TCDD accumulates in fish tissue as a result of a given amount entering the Niagara River)(Rodricks Affidavit and Affidavit of Livia Benevides).

The worst case assumption used in this risk assessment are as follows. The TCDD concentration in the APL plume over the next 70 years was assumed to equal 20% of the average present value, i.e., 0.04 ppt (based on New York Department of Health measurements of TCDD at 0.2 ppt in one seep). There is uncertainty in this number, however, that uncertainty will be considerably lessened during the implementation of the proposed Stipulation.

The flow of contaminated groundwater was assumed to be 54 gpm. Only a portion of the APL plume is now entering the Niagara River. The flow of that portion is less than 54 gpm and the concentration of the southwest portion of the plume is approximately ten times less than the northwest. However, since what is important is lifetime risks and without an APL remedy all 54 gpm would eventually reach the river, it is an appropriate worst case assumption.

The risk assessment also used EPA's worst case bioaccumulation assumption for TCDD, Mirex, Hexachlorobenzene and PCBs (680,000 for TCDD)(Benevides Affidavit) and the EPA cancer potency factors. If the EPA Water Quality Criteria bioconcentration factor for TCDD (5,000) is used, the lifetime risk from TCDD would be $1/136^{th}$ the worst case estimate.

Using these assumptions the upperbound lifetime (70 year) cancer risk from the average level of all chemicals in the APL plume (assuming no APL remedy but containment of the NAPL plume) would be at approximately 0.2×10^{-6} (Rodricks Affidavit).

A back calculation of chemical concentrations in the APL plume that would result in a 1×10^{-6} lifetime risk from fish consumption also indicates that only TCDD is likely to be in the APL plume at such concentrations (Rodricks Affidavit).

The concentrations in the Niagara River resulting from Hyde Park discharges were compared to existing Niagara River concentrations and water quality standards and criteria, including the 1978 Great Lakes Water Quality Agreement. Only TCDD, PCBs, Mirex and Chloroform exceed water quality standards (the first three because of levels in fish, not water)(see Tables 5,6,7, and 8 and the Shifrin Affidavit).

Based in this information, the feasibility and costs of a remedy and other factors, the parties agreed upon the following:

(1) Installing two purge wells at the Gorge Face (Figure 16 and Section 4.4.1.1). They will be pumped to ensure the groundwater is flowing inward toward the center of the remediated area and to eliminate seepage to Gorge Face, but at a level not to exceed 15 gallons per minute ("gpm")(Section 4.4.1.1). An additional well may be installed if the flow in the area to be remediated does not converge or if it is requested by EPA and the State to further reduce or eliminate seepage (Section 4.4.1.1 and Faust Affidavit). In the opinion of EPA's expert, this remedy will dry up the Gorge Face seeps in the areas impacted by the APL plume (id.). It is estimated that this remedial action will collect approximately 60 to 88% of the chemicals in the APL plume, thereby reducing

the total risk approximately one-in-ten million (10^{-7}) lifetime cancer risk at most (id., Shifrin Affidavit, and Rodricks Affidavit);

(2) A monitoring program will be initiated that triggers additional remedial actions if specified Flux Action Levels (loadings to the river) from the chemicals not being remedied are exceeded (id. and Affidavit of Dr. Faust). The two purge wells at the Gorge Face and an additional three monitoring wells located up river along the Gorge Face will be monitored quarterly for APL Plume Flux Parameters (Table 9 and Section 9.3) and APL PLume Monitoring Parameters (Table 4 and Section 9.4)(see Section 4.4.4.1);

(3) The total flux to the Niagara River will be calculated for each chemical (i.e., the flux from the Lockport Dolomite as described above and, as explained below, also the flux from the Intermediate and, if necessary, Deep Formations) (id.). If the APL Plume Flux Action Level is exceeded for any four out of five monitoring periods, OCC must taken additional remedial action, either increase pumpage or add wells or both, to reduce the flux to the river to below the Flux Action Level (id., Section 4.4.4.3);

(4) If the remedial actions discussed above do not reduce the flux levels below the Flux Action Levels within two years, OCC must undertake a RRT study and reassess Source Control, including excavation (Section 4.4.5); and

(5) These Flux Action Levels will be re-evaluated initially after broad GC/MS scans (Section 4.4.3.1) and every five years (or sooner if demonstrated to be necessary by EPA/State)(Shifrin Affidavit). The level may be changed if there has been a significant change in data or information or statutory or regulatory requirements (Section 10.0).

The APL Plume Flux Action Parameters and Flux Action Levels were selected by EPA and the State based on our assessment of what is in the APL plume, the relative toxicity and risk presented by those chemcials, EPA's policy and guidance concerning cleanup levels for hazardous waste site remedial actions, i.e., 1×10^{-6} risk level is used as a goal and remedies are considered which would result in risks of 1×10^{-4} to 1×10^{-7} risk)(id. and Rodricks Affidavit), and water quality considerations.

In the case of TCDD, it was also determined that additional information was necessary to determine a final Flux Action Level (Benevides and Shifrin Affidavits), therefore, the Stipulation sets an Interim Flux Action Level for TCDD and requires the parties to implement field and laboratory studies to substantially resolve the remaining uncertainties (Section 4.4.3.3)(id.).

The APL Plume Flux Action parameters are the chemicals that, in our professional judgment, present the highest risk or now present water quality concerns. TCDD essentially drives the Hyde Park risk assessment (Rodricks Affidavit) and is presently in fish at levels in excess of State, FDA, and Canadian fish health advisories (an average of approximately 30 ppt in western Lake Ontario Benevides and Shifrin Affidavits).

PCBs and Perchloropentacyclodecane ($C_{10}C_{12}$, commonly known as Mirex) levels in fish in the lower Niagara River and Lake Ontario and the Niagara River exceed FDA action levels. Chloroform levels in Lake Erie which feed into the Niagara River exceed water quality standards, primarily because of the discharge of chlorinated water from waste water treatment plants and the formation of chloroform in drinking water treatment plants. Even though the loading of chloroform from Hyde Park is anticipated to be small, it is prudent to place a limit on this discharge.

To ensure that all chemicals which might present a significant risk are included on the APL Plume Flux Action Parameter list, initially, OCC will take samples from the five performance monitoring wells (Figure 14, inside the APL plume but outside the NAPL plume) and perform a complete GC/MS survey, including analysis for higher polychlorinated dibenzodioxin and polychlorinated dibenzofurans at 0.5 ppt (Section 4.4.3.1). The purpose of the survey is to identify as many components of the APL plume as possible (Section 4.4.3.1 and Shifrin Affidavit). This information will allow the governments to verify immediately that the proper APL Plume Flux Action Level chemicals have been chosen and, if necessary, to reassess the list (Section 10.2 and Shifrin Affidavit).

In order to assist in future reassessments, OCC must perform two additional complete GC/MS surveys and EPA has committed to perform three such surveys. A chemical can be added to the APL Plume Flux Parameter list, if the conditions in Section 10.0 are met.

The present Flux Action Levels were set primarily based on a consideration of risks and water quality standards. EPA's policy is to use 10^{-6} risk level as goal and consider remedies in the range of 10^{-4} to 10^{-7} risk levels. All of the final Hyde Park Flux Action Levels result in less than 10^{-6} cancer risk level from consumption of fish (Rodricks Affidavit). No other exposure route was as high as fish consumption (id.).

It is not possible to determine definitely the risk level of the Interim TCDD Flux Action Level at this time. If the bioconcentration factor in EPA's Water Quality Criteria document or in the State proposed water quality standards are used, the lifetime cancer risk from consumption of fish considerably is

less than 10^{-6} (Table 5). However, analysis of bioconcentration and bioaccumulation and site specific information, EPA has concluded that the bioaccumulation factor for TCDD may be as high as 680,000 (Benevides Affidavit).

If this bioaccumulation factor is used in the risk assessment, the TCDD risk would be approximately 1×10^{-5} (one-in-one hundred thousand)(Rodricks Affidavit). Even using this worst case bioaccumulation factor, the TCDD Interim Flux Action Level, TCDD would not result in the State, FDA or Canadian health advisory levels being exceeded (Table 5)(Shifrin Affidavit).

Because of this uncertainty, EPA, the State, and OCC agreed to implement jointly a laboratory and field bioaccumulation study to resolve or decrease, to the extent practicable, these uncertainties (Section 4.4.3.3). Because of their interest in and expertise in this area, the Canadians will be invited to joint this study. After the study, the parties will examine all the existing data and determine a final TCDD Flux Action Level (Section 4.4.3.2). The negotiation team anticipates setting a Final TCDD Flux Action Level at the 10^{-6} risk level.

Based on our best esimtate of the likely average 70 year concentration of Hyde Park chemicals entering the river (Shifrin Affidavit) and our risk assessment calculations (Rodricks Affidavit), the total risk from the Hyde Park chemicals entering the Niagara River after the remedies in the proposed Stipulation are implemented would be less than 10^{-6} and the flux action levels are designed to ensure that when more information is available the loading to the river will still result in less than 10^{-6} lifetime cancer risk. The Acceptable Daily Intake ("ADI") level for noncarcinogenic effects of these chemicals is substantially lower than the Flux Action Levels (Rodricks Affidavit) and the residual discharges will be substantially below the ADI levels.

APL Plume Monitoring Parameters are monitored so that EPA and the State can assess the impact of these chemicals on the Niagara River and Lake Ontario and determine whether additional Flux Action Levels need to be set during the periodic reassessments. The chemicals on this list are those which are most likely to present a water quality standard problem in the future although risks from Hyde Park landfill alone will be very low.

One of the unique and precedent setting features of this remedy is the flexibility and open-endedness of the Reassessment provisions (Section 10.0). There are no limitations or constraints on developing a Flux Action Level based on human health endangerment. For the purposes of this Stipulation, endangerment to the environment is more precisely defined as occurring if the loading of a chemical to the river exceeds or significantly contributes to a numerical standard being exceeded or otherwise violates or significantly contributes to the violation of a federal or state statute, or a

legally enforceable international treaty or agreement, or a regulation. This definition specifically includes the situation where the loading of Hyde Park chemicals causes or significantly contributes to a significant impairment of the Niagara River or Lake Ontario for any best usage as defined in State regulations (Section 10.3(b)).

Based on nearly a year of examining human health and environment risks, in all cases examined, the 10^{-6} human health risk level or acceptable daily intake levels for noncarcinogenics were much lower than levels which might create environmental harm.

The definition also includes the requirement that EPA and State take into account the extent of the contribution by Hyde Park and whether remedial action has been undertaken to abate the other sources (Section 10.3(c)). These are facts that EPA and the State would take into account in any case.

There are termination and resumption provisions for the APL Plume Containment System (Section 4.4.6). The system must be operated for 10 years and 50% of the Flux Action Levels may not be exceeded for any sampling period during the prior year before OCC may proposed to terminate the system (Section 4.4.6.1). After 15 years, OCC may proposes to the parties or the Court that operation of the system is no longer "requisite" (id.).

The Flux Action Level monitoring must continue for five years after termination, but can be extended for longer if EPA/State demonstrate that additional monitoring is necessary to effectuate the purposes and goals of the Settlement Agreement. If this monitoring indicates the flux to the river exceeds 50% of the Flux Action Level for any parameter (and that is confirmed), the operation of the system will be automatically resumed (Section 4.4.6.3).

Even after termination of the monitoring, the operation of system may be resumed if EPA/State sampling indicates that the flux exceeds 50% of the Flux Action Level and it is confirmed unless OCC can demonstrate that resumption is not "requisite" (Section 4.4.6.4). Furthermore, at any time, EPA/State may demonstrate that resumption of the system is "requisite" (id.).

The purge wells must be maintained for at least the five year monitoring period and the purge wells are maintained for 35 years (Section 4.4.5.6).

(3) Gorge Face Seep Program

Interim remedies (diversion of some seeps, fencing, and monthly monitoring) have already been implemented by OCC. One of the purposes of the APL Plume Containment Program is to eliminate the seeps, however, the Stipulation requires additional seep remedies.

Based on several surveys of the Gorge Face (Affidavit of Dr. Jonmaire), the parties have also agreed upon a set of specific additional remedial actions to eliminate or minimize human exposure to the identified seeps (Section 7.0 and Appendix A). The remedial actions specified for the Bloody Run drainage area along the Gorge Face in the original Settlement Agreement have been somewhat modified to be consistent with the Gorge Face Seep Program.

In general, the remedial program consists of the following. As soon as possible, all flowing seeps within the area anticipated to have the potential to be contaminated will be diverted (whether chemicals have been found in the water or not). Where practicable, the seep water will be diverted to a collector pipe and conveyed to the river to minimize exposure to fishermen (Jonmaire Affidavit).

As soon as possible (except for the Bloody Run drainage area), the soil beneath the flowing seeps and wet areas will be sampled for Soil Survey Parameters. (see Table 10). If Soil Survey Parameters are found, there will be sampling for the Soil/Sediment Action parameters (Table 10). If the Soil Survey levels are exceeded, but not the Soil Sediment Action levels, the area will be covered and up to 0.5 feet of soil will be removed to facilitate contouring.

If Soil/Sediment Action Levels are exceeded, up to 1 foot of soil will be excavated and the remaining soil covered. In the Bloody Run drainage area and an adjacent region ten TCDD soil samples will be taken regardless of whether soil survey parameters are found. In all other locations, not finding the soil survey parameters will create a rebuttable presumption that TCDD is not present. If EPA/State sample and find TCDD, however, remedies must be performed.

The Soil Survey Levels (Table 6) are the same levels as specified in the original Settlement Agreement and were selected as reasonably reliable detection limits for these chemicals. The risk levels for these chemicals at these levels are extremely low (less than 10^{-9} risk level for hexachlorobenzene and one millionth the ADI for 2,4,5-trichlorophenol)(Rodricks Affidavit).

The Soil/Sediment Action Levels were set based on several factors including a consideration of risks. The TCDD Soil/Sediment Action Level is the 1 part per billion ("ppb") recommended by the Centers for Disease Control as a level of concern. The PCB and Hexachlorocyclohexane levels of 25 ppm and 106 ppm, respectively, represent levels of approximately 1×10^{-6} or less cancer risk level, using worst case exposure assumptions.

The 1 ppb TCDD level is likely to be more conservative (i.e., more protective) in this case than the Missouri situation because the health assessment in Missouri was based on exposure

in backyards with children eating the soil and exposure levels at the Gorge Face are not likely to be as high in a State Park.

INTERMEDIATE AND DEEP FORMATIONS SURVEYS

The APL and NAPL Containment Programs address the lateral migration of chemicals from the landfill to the river, however, there is a downward component to the groundwater flow from the landfill (Faust Affidavit). The Intermediate and Deep Formation Studies are intended to determine if chemicals have migrated below the Lockport Dolomite and, if so, to require remedial action to prevent fluxes from entering the river in excess of Flux Action Levels (id.).

Initially, OCC will install six survey wells down into the Irondequoit/Reynales Formation (Figure 17); take and analyze water samples from the lower portion of the Rochester Shale and the Irondequoit/ Reynales Formation for Lower Formation Survey Parameters (Table 11 and Section 9.5); inspect for NAPL; and perform permeability and other tests (Section 5.3; Section 9.5; and Shifrin Affidavit).

If none of these chemicals are found the Irondequoit/Reynales, the formation will continue to be monitored semi-annually for two years and annally thereafter to ensure no leakage (Section 5.4) and no Deep Formation Study will be undertaken (Section 6.1). The failure to detect NAPL or chemicals in the groundwater indicates that neither the APL nor NAPL plume have migrated to the Intermediate Formation yet and therefore no chemicals attributable to the Hyde Park landfill are entering the river from these levels (id.).

If the Lower Formation Survey Parameters are found (either during the initial survey or subsequent monitoring), OCC is required to calculate the flux to the river from the Intermediate Formation. If the sum of the Intermediate Formation flux and the Lockport Dolomite flux exceeds the APL Plume Flux Action level for any chemical, OCC is required to take additional remedial action to reduce the total flux below the Flux Action Level, either by (1) modifying the operation of the APL or NAPL Plume Containment Systems; (2) if necessary, adding purge wells to the existing APL or NAPL Plume Containment Systems; or (3) if necessary, drilling and operating wells into the Intermediate or deep Formations (Section 5.5 and 6.6).

If such modifications do not lower the flux sufficiently or does not contain the NAPL, OCC must undertake a RRT Study. If NAPL is not contained, OCC must reassess Source Control, including excavation (Sections 5.6 and 6.7).

In addition to the above, when chemicals are detected in the Intermediate Formation, OCC must install initially three wells down into the Queenston Shale or the Niagara River elevation,

wherever is higher (approximately 350 feet below the surface), if any one of the following conditions occur:

- the flux from the Lockport Formation alone is greater than 70% of the Flux Action Level; or

- the sum of the flux from the Intermediate Formation and the flux estimated from the Deep Formation exceeds 50% of the Flux Action Levels. The flux of the Deep Formation is assumed to the same as for the Intermediate formation times the ratio of thickness of the Deep Formation to the Irondequoit/Reynales Formation; or

- the sum of the estimated flux from the Lockport Formation, the Intermediate Formations, and the Deep Formations (using the assumptions above) exceeds 100% (Section 6.1).

If the initial three wells are installed, the water will be analyzed for the Lower Formation Survey Parameters; there will be an inspection for NAPL; and permeability tests will be performed (Sections 6.4.1, 6.4.2, and 6.4.3). If no chemicals are found, the wells will continue to be monitored. In the professional judgment of our experts, the APL or NAPL plume would be detected by measurement of the Lower Formation Survey Parameters before the APL plume reached the river (Shifrin Affidavit).

If chemicals are found in any of the original three wells, OCC will install an additional three wells; sample these wells; and calculate a Deep Formation flux of chemicals to the river. If, after installation of the Deep Formation wells, the sum of fluxes from the Lockport Dolomite, the Intermediate Formations and Deep Formation exceed the Flux Action Level, OCC is required to reduce the flux to below the Flux Action Level by modifying the operation, or, if necessary, adding purge wells the existing APL and NAPL Plume Containment Systems, or installing wells into intermediate or deep formations (Section 6.6).

If these remedial actions do not lower the flux below the Flux Action Level or if NAPL is found, OCC must perform a RRT Study and if NAPL is not contained, they must reassess Source Control, including excavation (Section 6.7).

In the opinion of EPA experts, this is very comprehensive and expeditious program (Shifrin and Faust Affidavits). The additional data will be obtained expeditiously and further action triggered based on that data without any further delays. Further action is triggered based on the total flux to the river exceeding an APL Plume Flux Action Level and these levels represent relatively small risks (Rodricks Affidavit).

MONITORING AND TREATMENT OF COLLECTED LIQUIDS

Paragraph E of Addendum I of the Settlement Agreement requires OCC to treat the aqueous phase liquids "collected pursuant to Paragraphs C [which includes requirement to perform the RRT Study] and D" in an activated carbon treatment system and to the treament levels described in Paragraph E(1) and (2) of Addendum I of the Settlement Agreement ("the SA Treatment Levels").

The liquids collected by the various remedial technologies will be conveyed by pipeline to a central treatment system. The details of the treatment system will be determined in plans and specifications. Based on information provided by OCC, it is anticipated that the treatment system will consist of a NAPL separation unit, coagulation filter, a sacrifical, powdered carbon bed, a SBR biological treatment unit and finally an activated carbon treatment system (probably a standard Calgon unit with modifications as required by the Settlement Agreement)(Shifrin Affidavit). The filter and sacrifical carbon bed will probably have 85 gpm capacity, the activated carbon unit will probably have 170 gpm capacity and the biological treatment system will probably have a 65 gpm capacity.

All the liquids from the prototype Source Control system, new tile drain system, the NAPL system; and up to 15 gpm from the APL Plume Containment System will be treated to the SA treatment levels (Sections 11.1.1 and 11.2.1).

Although a literal application of Paragraph E of Addendum I of the Settlement Agreement would require treatment of all liquids to SA Treatment Levels, the costs and benefits of such treatment must also be considered in determining whether a remedy is "requisite." Based on a consideration of the level of endangerment presented by the APL plumes and in order to obtain the certainty of remedial action to reduce flux levels to below Flux Action Levels, EPA and the State agreed to modify the Settlement Agreement to require treatment down to Flux Action Levels (rather than the SA Treatment Levels) for any APL Plume Containment liquids in excess of 15 gpm and all liquids collected from the Intermediate or Deep Formations (unless NAPL is found in the Intermediate or Deep Formations in which case the treatment level will be determined as part of the RRT Study).

This change is consistent with the fact that the RRT is designed to prevent an "endangerment to human health or the environment." Although there will be less treatment of those chemicals which are not readily adsorbed on carbon, e.g., phenol and benzene and these chemicals will still reach the river, whatever is not removed through treatment must be included in the flux calculation to the river and therefore may be limited if it creates an endangerment. Thus, the change satisfies the goals of the Settlement Agreement, protection against

endangerment to human health and the environment.

After treatment, this water is reinjected into the bedrock at a depth which would assure no migration to the Gorge Face as a a seep, or discharged to the sanitary sewers if certain requirements are met. Since this discharge would receive additional treatment by the city wastewater treatment plant the use of this system will be encouraged if it does not interfere with the proper operation of the city waste water treatment plant (Section 11.1.2).

The spent media must be disposed of consistent with existing and future statutes and regulations, including the 1984 RCRA Amendments (Section 11.6).

All the NAPL is required to be destroyed through incineration (Paragraph E(5) of the Addendum I of the Settlement Agreement).

VII. Permit Provisions

Section 1.2 incorporates EPA's onsite CERCLA policy and the policy on compliance with other applicable federal standards or criteria. This Section makes EPA's policy enforceable in this case.

Section 11.7 makes the findings required by the 1984 RCRA Amendments and the Underground Injection Control ("UIC") regulations, 40 C.F.R. 144.13(c), concerning the reinjection of groundwater required in the NAPL Plume Containment System and injection for disposal after treatment. This finding has been reviewed and approved by the Regional and Headquarters Offices of Drinking Water which oversee this program.

VIII. Comparison With Other Applicable Federal Standards or Criteria

Clearly, in 1954, when disposal began at this site, it was not designed nor constructed to comply with todays' RCRA regulatory requirements. The remedial measures specified in the Stipulation specify a tile drain, a clay cap and synthetic membrane liner, surveys to further determine the extent of contamination, corrective action if action levels are exceeded, effectiveness monitoring for each remedial measure monitoring for 35 years, or longer if necessary, and further remedial action if NAPL is detected and a further remedy meets the requirements of Paragraph 4 of the Judgment.

These remedial actions, monitoring, requirements for further corrective action, and the financial guarantee requirements in the Settlement Agreement have as their basis the same performance goal as the RCRA requirements, i.e., the protection of human health and the environment.

The comprehensive remedial program must be viewed as a whole and could be compared to a RCRA landfill already leaking. The source control, overburden RRT, bedrock remedies, further monitoring and surveys which trigger additional remedial action are similar to the performance goals of a RCRA landfill which is closing and requires further action, i.e. a cap, monitoring and, if necessary, corrective action. In this case the cap, monitoring and the corrective action are required.

The on-site remedy involves the installation of the clay and synthetic membrane cover (see Section 11.5). All plans and specifications must be consistent with the substantive requirements of Federal and state statutes and regulations that otherwise would be applicable to such activities (Section 1.2(a).) In developing such plans and specifications, OCC will consider applicable federal and state health and environmental standards, criteria and guidelines even if they would otherwise not be legally applicable (Section 1.2(d).) EPA will provide OCC all RCRA guidance manuals and other appropriate documents to assist them in this effort, including those relating to clay and synthetic membrane covers for landfill closure.

The initial remedial actions to contain and recover the NAPL plume (the prototype of the NAPL Containment System) will be modified as warranted by the data obtained during the initial prototype period and the action levels, numbers of wells, chemicals monitored, etc. are reassessed periodically, once every five years and more frequently if EPA/State demonstrate that it is necessary (Section 10.0.)*/ Similarly additional wells may be installed as part of the APL Plume Containment System and action levels, etc. will be reassessed. Comprehensive chemicals analyses will be performed on the groundwater to confirm that all chemicals of concern have been identified and the Flux Parameters may be added, subtracted or changed (Section 4.4.3.1.)

These activities are similar in many ways to the corrrective action requirements under the Resource Conservation and Recovery Act ("RCRA") and the Hazardous and Solid Waste Amendments of 1984 ("HSWA".) Based on all the information currently availalble and the analysis of EPA's experts, the flux action levels used in the proposed Stipulation should ensure, upon completion of the corrective remedial activities, that the total additive risk is consistent with EPA policy (i.e., it will be less than 10^{-6} lifetime cancer risk). The procedures used to determine the levels in Section 9.0 are consistent with the

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*/ Within the CERCLA program, a remedy is referred to as an interim remedy if additional information and actions may be required, even though no further action other than containment may be necessary. Since chemicals, action levels, numbers of wells, etc. may be revised, the remedies proposed in the Hyde Park Stipulation are considered interim.

RCRA Alternative Concentration Limit ("ACL") policy which recommends the use of a 10^{-6} lifetime cancer risk level as the starting point for setting ground-water protection standards. Section 10.0 provides flexibility to ensure that new scientific information and regulatory requirements can be used to ensure that the action levels continue to adequately protect human health and the environment. Like the RCRA ACL, this action level can be modified at any time as long as EPA and/or the State demonstrate it is necessary.

As indicated above, these proposed remedial actions do not literally meet the specific technical requirements of Part 264, Subpart F (which apply to RCRA regulated landfills). The requirement for periodic broad scans to identify the majority of compounds present has been substituted for analysis of chemicals listed in Appendix VIII of Part 261 of the RCRA regulations (some of which were never produced nor disposed of by OCC). Those Appendix VIII chemicals, which are present and analyzable by generally accepted methods, will be identified, in addition to other chemicals.

In other cases, such as the point of monitoring (called point of compliance in the RCRA regulations), the RCRA regulations specify a location at the waste boundary to detect chemical migration before it adversely impacts the surrounding environment. However, the case of Hyde Park, unfortunately, the chemicals have been migrating for over 30 years and NAPL is present in the overburden and bedrock ground water at the waste boundary. At present, it would not be meaningful to monitor at the site boundary. It is anticipated that the NAPL Containment System will be operated for a very, very long time. However, the proposed Stipulation provides the flexibility that when the levels substantially decrease, that additional monitoring points and action levels may be set closer to the landfill (see Section 10.0 and Section 4.6.) The point of compliance will be reassessed in the future.

The RCRA regulations require the setting of a groundwater standard for every Appendix VIII chemical detected. OECM determined that it at this time was not necessary to set an action level on every chemicals to protect health and the environment, and that it would be unwise from an enforcement viewpoint. This can be reassessed in the future.

Finally, based on additional monitoring further remedial action (similar to corrective action) may be taken in the future (Part 264 requires corrective action to meet ground-water protection standards, e.g., an ACL set at the 10^{-6} lifetime cancer risk level.)

The combination of source control, various overburden and bedrock remedies in the opinion of EPA experts and the EPA negotiation team will control the risk from the site to below the 10^{-6} lifetime cancer risk level. The prototype and other remedies at the site (or additional actions required by the reassessment or other provisions in the proposed Stipulation) are necessary to protect against endangerment from this site. The applicability of other RCRA requirements will be determined pursuant to Section 1.2 of the proposed Stipulation. Other technical guidance, not legally applicable, will be considered, as appropriate.

It is the judgment of OECM-Waste and DOJ that no more stringent remedy could be obtained through litigation.

IX. Compliance With the National Contingency Plan

The NCP applies to cleanups at fund-financed sites and sites being cleanup by responsible parties (40 C.F.R. 300.68(c)). The factors that must be considered in determining the extent of and appropriateness of a remedial action:

1. In determining whether to implement initial remedial measures before a final remedy is determined, actual or potential direct contact, highly contaminated soils largely at or near surface, posing a serious threat to public health or the environment, contaminated drinking water, and other similar factors (40 C.F.R. 300.68(e)(1);

2. In determining whether source control, i.e., excavation, other types of removal, or "contain[ing] the hazardous materials where they are located", is appropriate, the extent to which substances pose a danger to public health, welfare, or the environment, including population, amount and form of the substance, hazardous properties, hydrogeological factors, rainfall, extent of migration, and prior experience (40 C.F.R. 300.68(e)(2));

3. Offsite remedial actions are actions "to minimize and mitigate the migration of hazardous substances and the effects of such migration. These actions may be taken when the lead agency determines that source control remedial actions may not effectivelly mitigate and minimize the threat and there is a significant threat to the threat to public health,

welfare, or the environment." EPA must consider the contribution of the contamination to air, water or land pollution, the extent of migration, the factors listed above (40 C.F.R. 300.68(e)(3));

4. The "cost of installing or implementing the remedial action must be considered, including operation and maintanence costs. An alternative that far exceeds (e.g., by an order of magnitude) the costs of other alternatives evaluated and that does not provide substantially greater public health or environmental benefit should usually be excluded." (40 C.F.R. 300.68(h)(1));

5. The effects of an alternative. If an alternative has significant adverse effects, it should be excluded (40 C.F.R. 300.68(h)(2));

6. Alternatives must be feasible (40 C.F.R. 300.68(h)(3);

7. The appropriate extent of remedy shall be determined by which remedial alternative is cost-effective "(i.e. the lowest costs alternative that is technologically feasible and provides adequate protection of public health, welfare, or the environment)." (40 C.F.R 300.68(j)).

All of these factors and others specified by the NCP were considered and balanced during the negotiations. The Stipulation requires immediate action in some cases, e.g., the Residential Community Monitoring Program or the Gorge Face Seep program. In other cases, long term remedies were necessary.

As described above, source control is required by the Stipulation, although the adverse health effects and excessive costs precluded excavation at this site at this time. There are extensive offsite remedies. EPA had extensive risk assessments and hydrogeological evaluations performed during the negotiations. The APL Plume Containment Program and monitoring for further action was determined appropriate based on a consideration of all of these factors, including the degree of risk from the unremedied plume (less than 1×10^{-6}), cost, comparision of the contribution from Hyde Park compared to other sources, and other relevant factors.

Cost-effectiveness was only considered in its classic application. Once an appropriate level of protection or other objective standard was selected, EPA evaluated which technology could reliably accomplish that goal with the lowest cost. Cost was also considered in determining whether the remedy was requisite.

In sum, the remedial actions specified in the Stipulation fully comply with or are in excess of what is required by the National Contingency Plan.

X. HEALTH AND SAFETY PLAN MODIFICATIONS

The original Health and Safety Plan in the Stipulation was more stringent than any other consent decree or Superfund health and safety plan. The modified health and safety plan is more stringent than any other consent decree or or Superfund health and safety plan.

The original Settlement Agreement required three rings of monitoring: (1) organic vapors and particulate monitoring where the work was being performed, (2) particulate monitoring at the perimeter of the work area; and (3) particulate monitoring in the commmunity. The original program required the use of dichotomous samplers to obtain air particulate samples at the perimeter and in the community. The purpose was to protect the local residents from those chemicals which adhere to soil and might migrate with airborne particulates into the community. Organic vapor monitoring was performed only at the work site because in the opinion of our experts the concentration of chemicals in the community would be very low.

In general many minor changes were made in the Hyde Park Health and Safety plan to include more specifics or incorporate more health protective measures specified in the S Area Settlement Agreement. There are three major revisions in the Health and Safety Plan: (1) a change in the type of semivolatile monitor; (2) a change in the real time particulate monitoring; and (3) the addition of volatile monitoring at the site perimeter.

Based on an in depth review by EPA's Office of Research and Development in Triangle Park, N.C., it was determined that the instrument specified in the Settlement Agreement for measuring particulates would strip chemicals off the particulates and therefore underreport the actual chemical concentration (Dr. R. Lewis, EPA, Recommendations for Monitoring Selected Semivolatile Organic Chemicals in Air (May 6, 1985) and Dr. R. Lewis, EPA, Assessment of Air Monitoring Proposals (May 6, 1985).

After meetings between the various experts, a high volume particulate sampler and PS-1 PUF sampler for semi-volatile organics (an instrument which measures chemicals both on particulates and in vapors) were determined to be appropriate for use at the perimeter of the Site and in the community (Sections and 12.10.4 and 12.10.5). OCC has agreed to this despite the fact that the prior plan had no organic vapor monitoring at the perimeter of the site or in the residential neighborhoods.

The detection limit in the prior plan were also not achievable with even the best instruments. The new action levels in the health and safety plan are twice the reliable GC/MS detection limits for the chemicals specified (Section 12.10.4) The action levels in dust inside of homes is also essentially

the detection limit for this type of sampling (Section 12.10.5(c)).

Since there is more data available now than in 1979 when the consent decree was originally negotiated, some of the indicator chemicals in the air monitoring program have also been changed.

It was also determined that the original real time particulate monitoring program was not practical. That program required several real time monitors connected by computer. Complete site shutdown occurred, if there was any statistically significant increase above background for 15 minutes (whether or not the dust was contaminated). After careful review, EPA and the State concluded that the system was not capable of being monitoring in the field using reliable field equipment.

This provision has been changed. The statistically significant increase is now determined by a different type of field configuration of instruments. Instead of complete shutdown, corrective action is taken if dust levels are above background for any 15 minute period (Section 12.10.3). Work is shut down if the hourly average dust level exceeds background. It is believed that as a practical matter that this new proposal is virtually as health protective since it requires action to reduce dust emission down to background levels. In the prior scheme, shutdown would result in reduction of the dust level to background. Again, the original plan had no organic vapor monitoring at the Site perimeter.

The plan now also requires more detailed organic vapor monitoring at the work site perimeter and at the perimeter of the site (Section 12.10.1). If action levels are triggered at the work site or at the site perimeter, action is taken to reduce the levels.

Other modifications have been made to conform the Hyde Park Health and Safety Plan to more up to date requirements in the S Area Settlement Agreement, e.g. even though existing monitoring data demonstrates no significant levels of chemicals during survey activities, see Affidavit of Dr. Joseph Spatola in the Hyde Park case (March 24, 1983), the concept of Survey Site monitoring has been incorporated into Hyde Park from the S Area Health and Safety plan (see Sections 12.2(c) and 12.11).

There is also a new provision in the Stipulation (Section 12.12) that allows EPA and the State to re-evaluate any of the chemicals to be monitored or action levels at least yearly and more frequently, if EPA and the State can demonstrate that it is necessary.

XI. SIGNIFICANT ISSUES

There are several significant issues which are likely to arise during the public comment period and thereafter.

Some citizen groups and the government of Canada and the Province of Ontario have requested that EPA and the State require excavation and incineration of the landfill. EPA seriously considered excavation and incineration during the negotiations and have documented those considerations in an "Excavation Report."

As far as can be determined, the Excavation Report is the most thorough evaluation of the feasibility, costs, health effects and other factors relating to excavation performed by EPA or anyonelse. The Excavation Report and the concept of excavation was independantly reviewed by EPA's Office of Research and Development experts in this field and essentially the same conclusions were reached. As described above, the EPA negotiation team has concluded that it was not requisite at this time.

EPA and the State have met with representatives of the government of Canada and the Province of Ontario and have carefully considered their technical comments and reports. EPA has addressed those concerns and has considered its obligations under the 1909 Boundary Waters Treaty and the objectives of the 1978 Great Lake Lakes Water Quality Agreement In our opinion, this proposed Stipulations meets those concerns. We will meet with the Canadians after lodging of the Stipulation and solicit their further comments and assistance.

Neither the government of Canada nor Ontario suggested excavation during the working level meetings held in 1984 and early 1985. In fact, Grant Anderson, a Canadian consultant, indicated his prior statements supporting excavation were based on the assumption that excavation could be performed without health risks, that costs were irrelevant, and that any level of discharge was unacceptable. No support for these assumptions have been provided.

However, during recent higher level meetings and in Court filings in the S Area case Canadian officials have expressed concern that excavation is the only permanent solution.

Over a year ago, EPA requested the Canadians to supply any information that they possessed concerning the effects or risks of the Hyde Park chemicals on human health or the environment. They provided a compilation of already public data on levels of TCDD in fish and the best estimate of Canadian experts on bioconcentration factors (this level 10,000 was lower than our experts opinion 680,000). We hope to receive additional information during the public comment period. This information will be evaluated.

Each remedial program has a monitoring effectiveness criteria. As described above, excavation must be re-evaluated under many conditions. The Reassessment provision also allows EPA and the

State to take into account any future inforamtion on health or environmental effects.

Local citizens will probably be most concerned about the Community Monitoring Program and the Health and Safety Plan. For example, one leader of a local citizens group sent a letter calling for permanent relocation. As indicated above, EPA and the State have extensively evaluated the likelihood of present exposure and concluded that it is unlikely. None-the-less, the proposed Stipulation provides for an extensive Community Monitoring Program.

We extensively replied to comments during the negotations and furthmore, we are preparing an extensive public comment period program of meetings and briefings. We have prepared detailed affidavits explaining what was decided and why. We have also prepared a detailed Community Monitoring Program Background Document which places all available information in one place and hopefully provides some useful context for the decisions that may be made during the program.

There will be many demands to speed up the remedial action process. We have attempted to meet those demands by requiring OCC to submit some plans and specifications, even before the end of the public comment period and others before the Court approves the Stipulation (Section 1.0). Even though this places OCC at risk, they have agreed to expedite these programs.

This remedy includes source controls, remedial action and monitoring. The effectiveness of this solution will be reassessed and modified, as needed over time. In designing the systems required by this settlement, OCC must consider applicable federal and state health and environmental standards, criteria and guidelines (including RCRA Part 264, Subpart F), even if they would not be legally applicable. Based on all the factors in the NCP, the Settlement Agreement, the 1978 Great Lakes Water Quality Agreement and the 1909 Treaty, including the level of risk which would result if no APL remedy were installed, the contributions from other sources along the Niagara River, and the cost, EPA decided that the proposed Stipulation provides the best solution given all the circumstances.

FIGURE 1

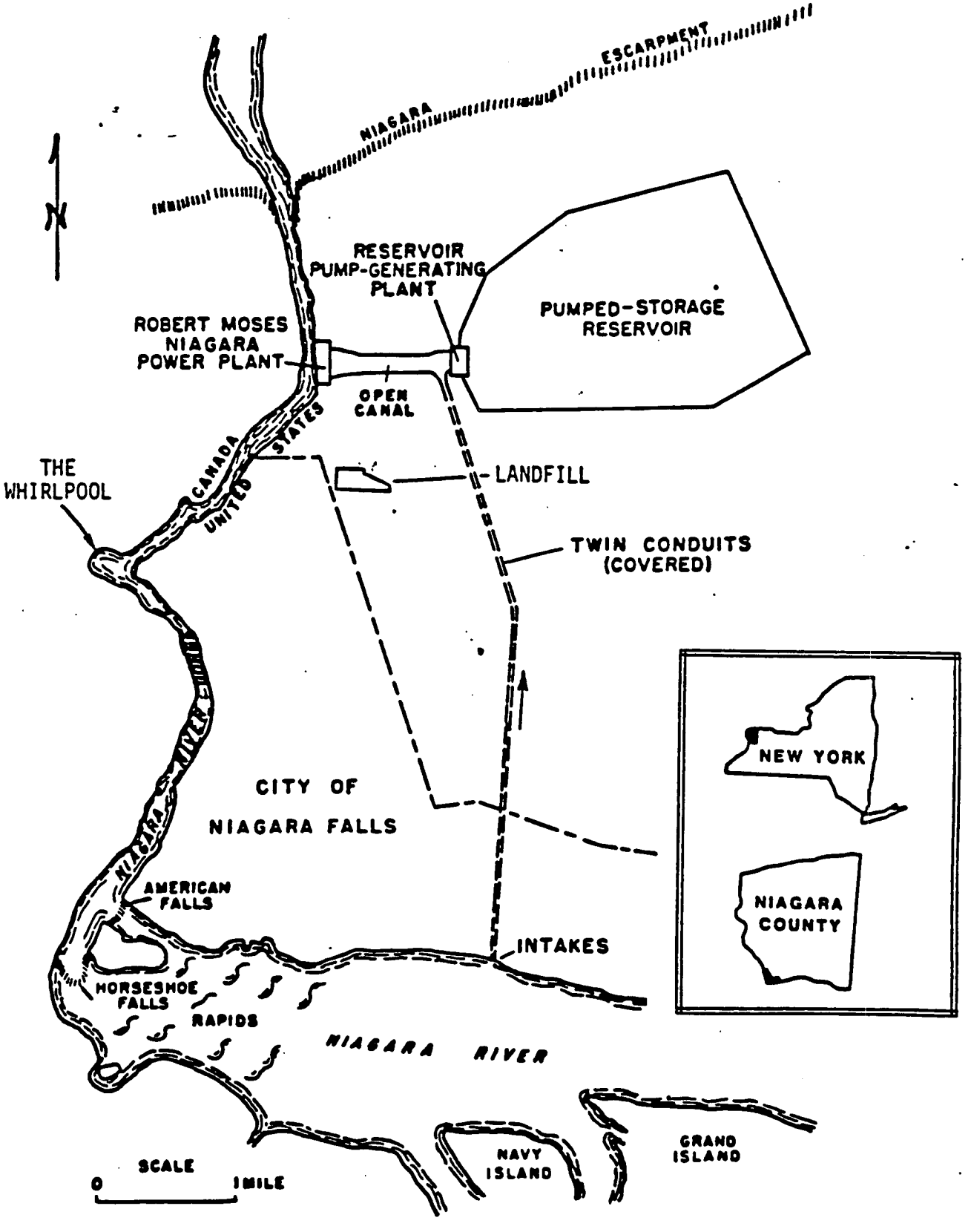
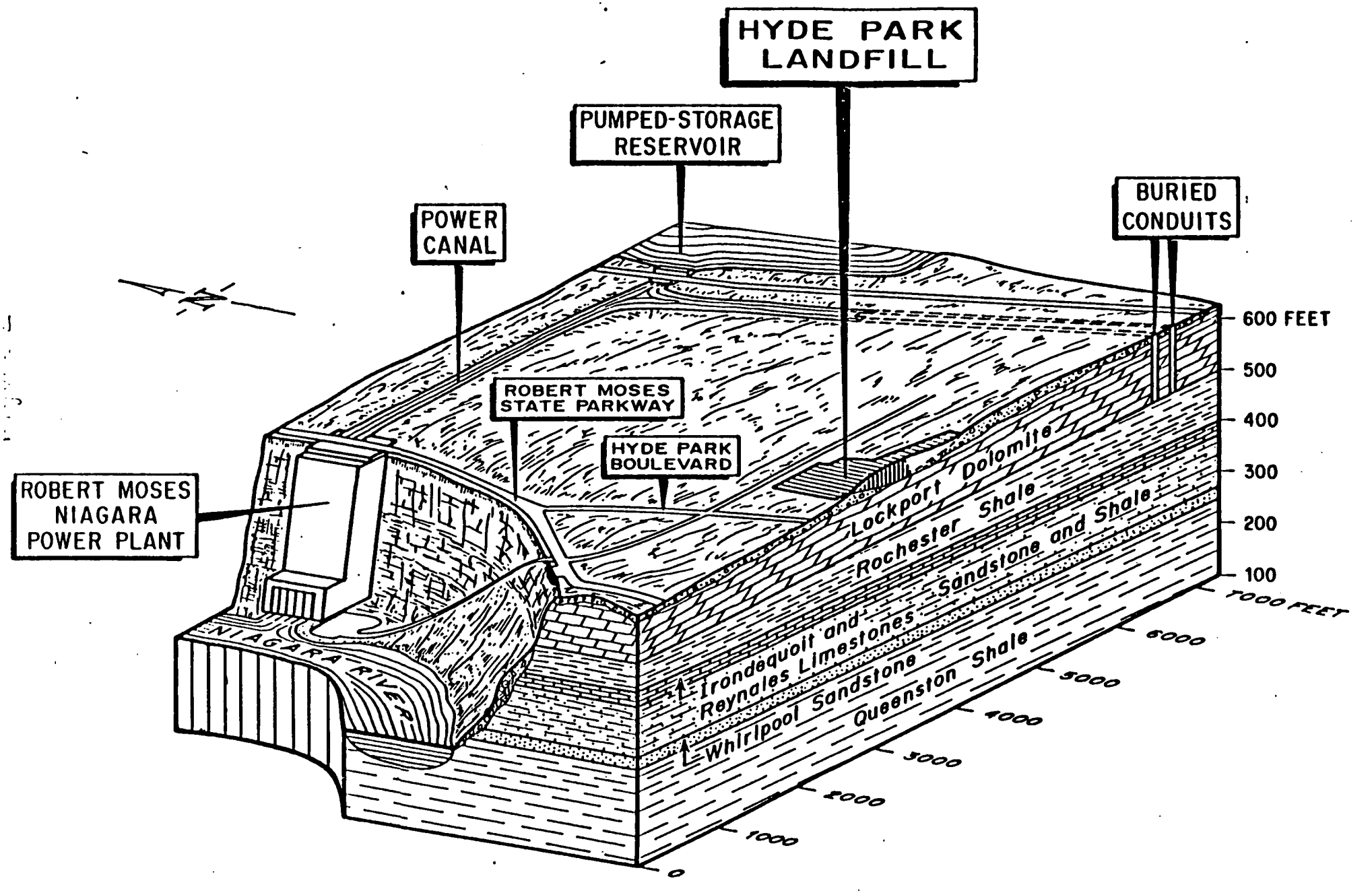


Figure 1. Location of Hyde Park Landfill (after Johnston, 1964).


HYDE PARK LANDFILL
PUMPED-STORAGE RESERVOIR
POWER CANAL
BURIED CONDUITS
ROBERT MOSES STATE PARKWAY
HYDE PARK BOULEVARD
ROBERT MOSES NIAGARA POWER PLANT
NIAGARA RIVER
600 FEET
500
400
300
200
100
7000 FEET
6000
5000
4000
3000
2000
1000
0
Lockport Dolomite
Rochester Shale
Sandstone and Shale
Irondequoit and Reynales Limestones
Whirlpool Sandstone
Queenston Shale

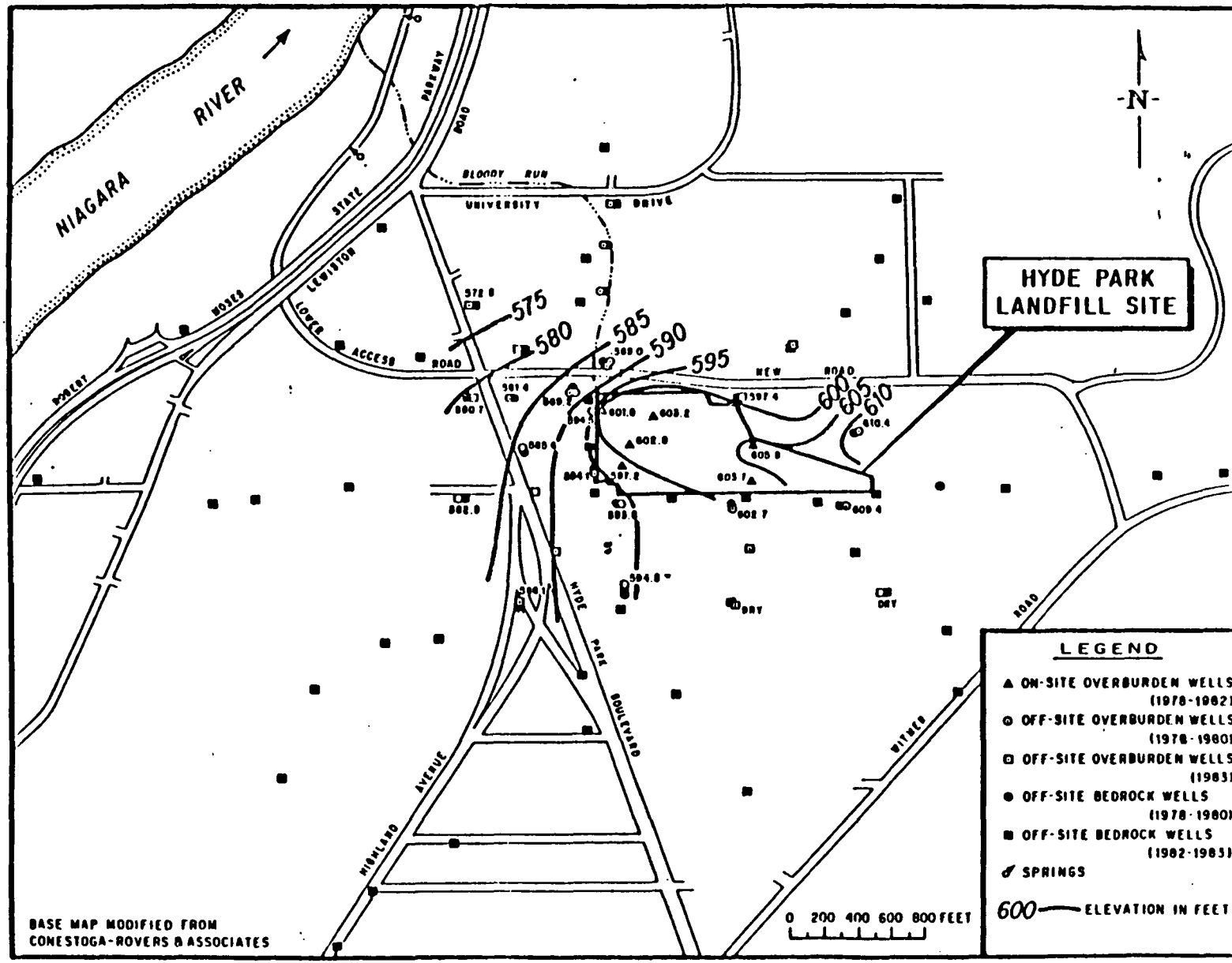


Figure 8. Ground-water elevations in the overburden material (January 20, 1983).

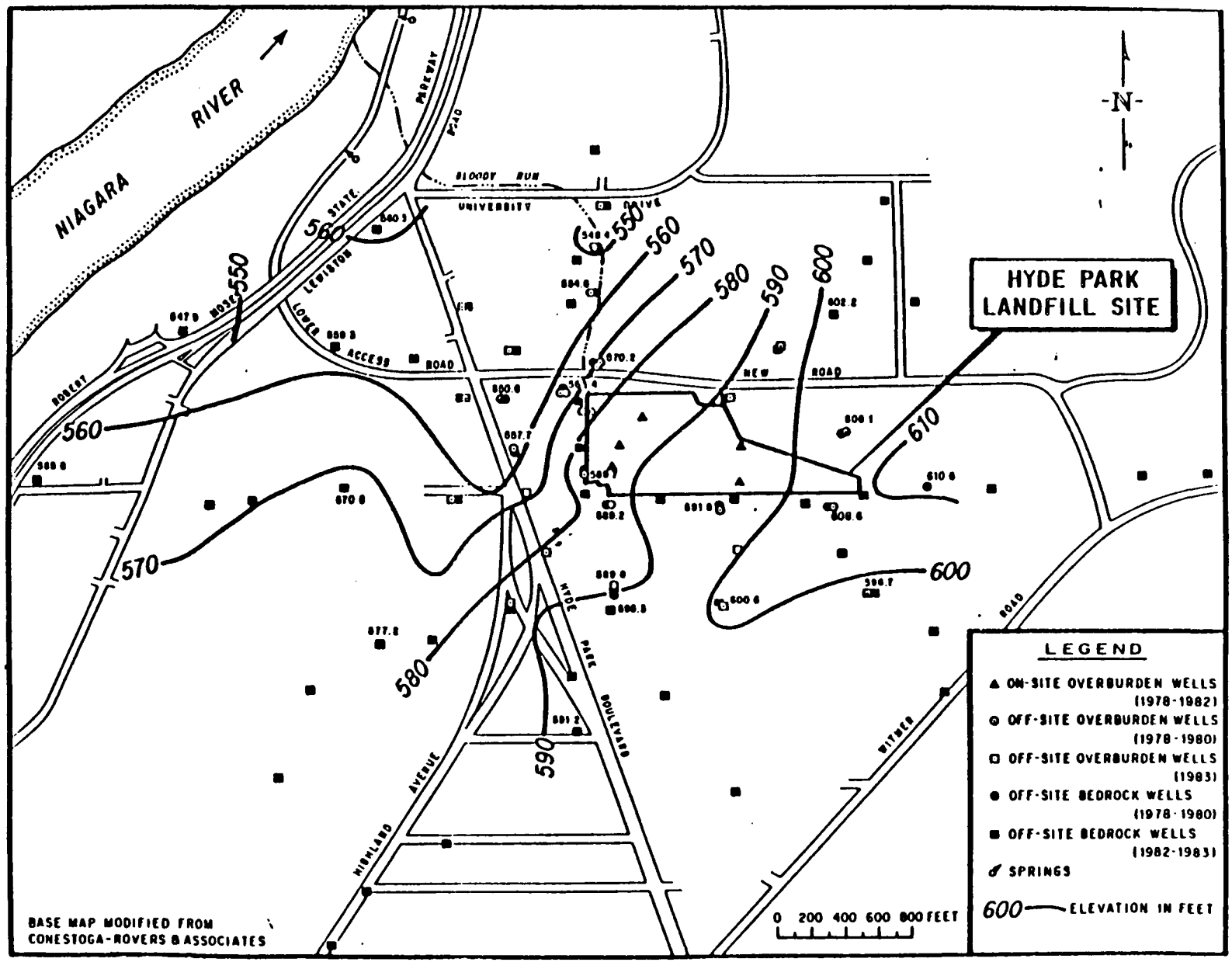


Figure 9. Ground-water elevations in the Lockport Dolomite (January 20, 1983).

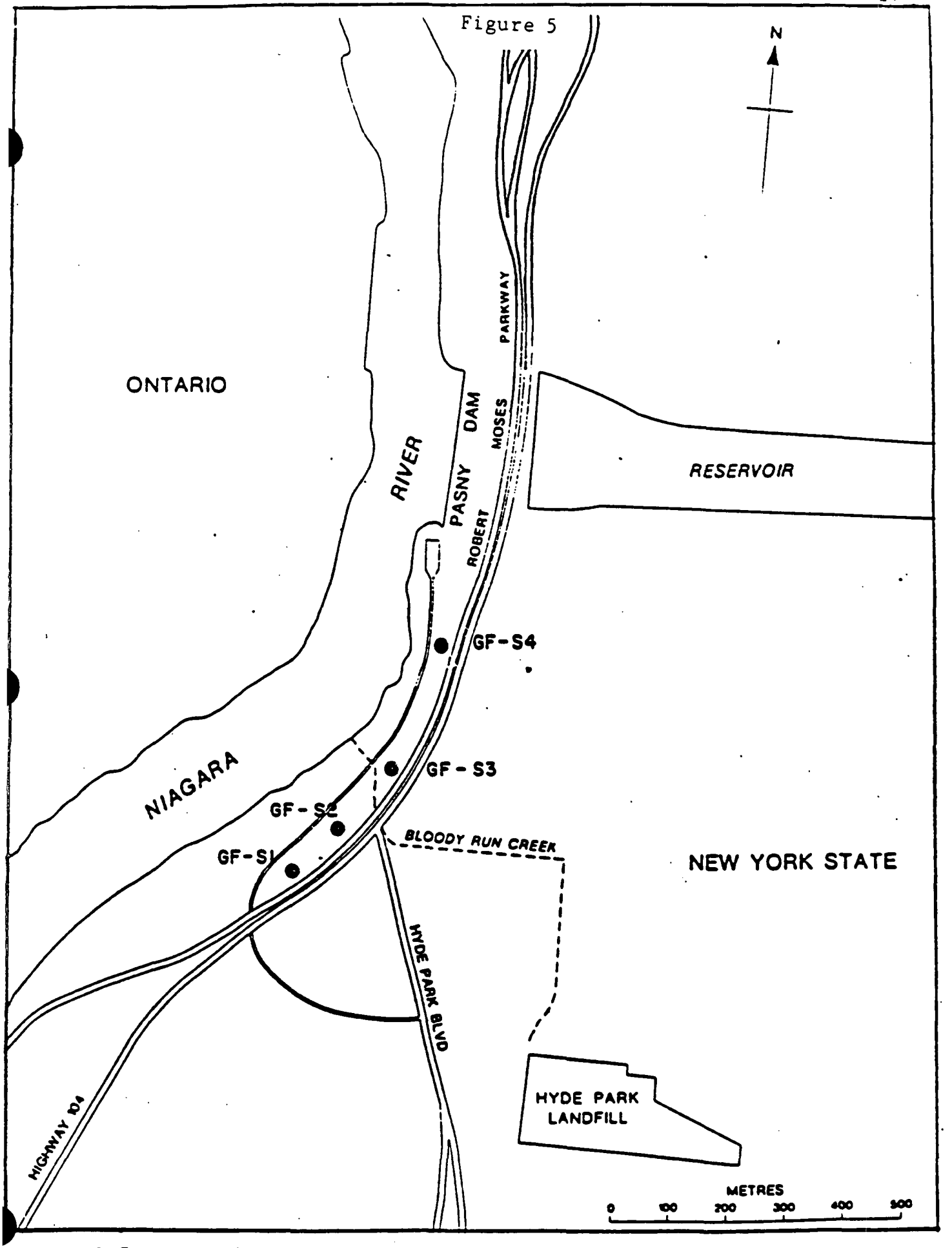


Figure 2.5 Approximate locations of ground water seep samples collected by New York State Department of Health (1984) GTC

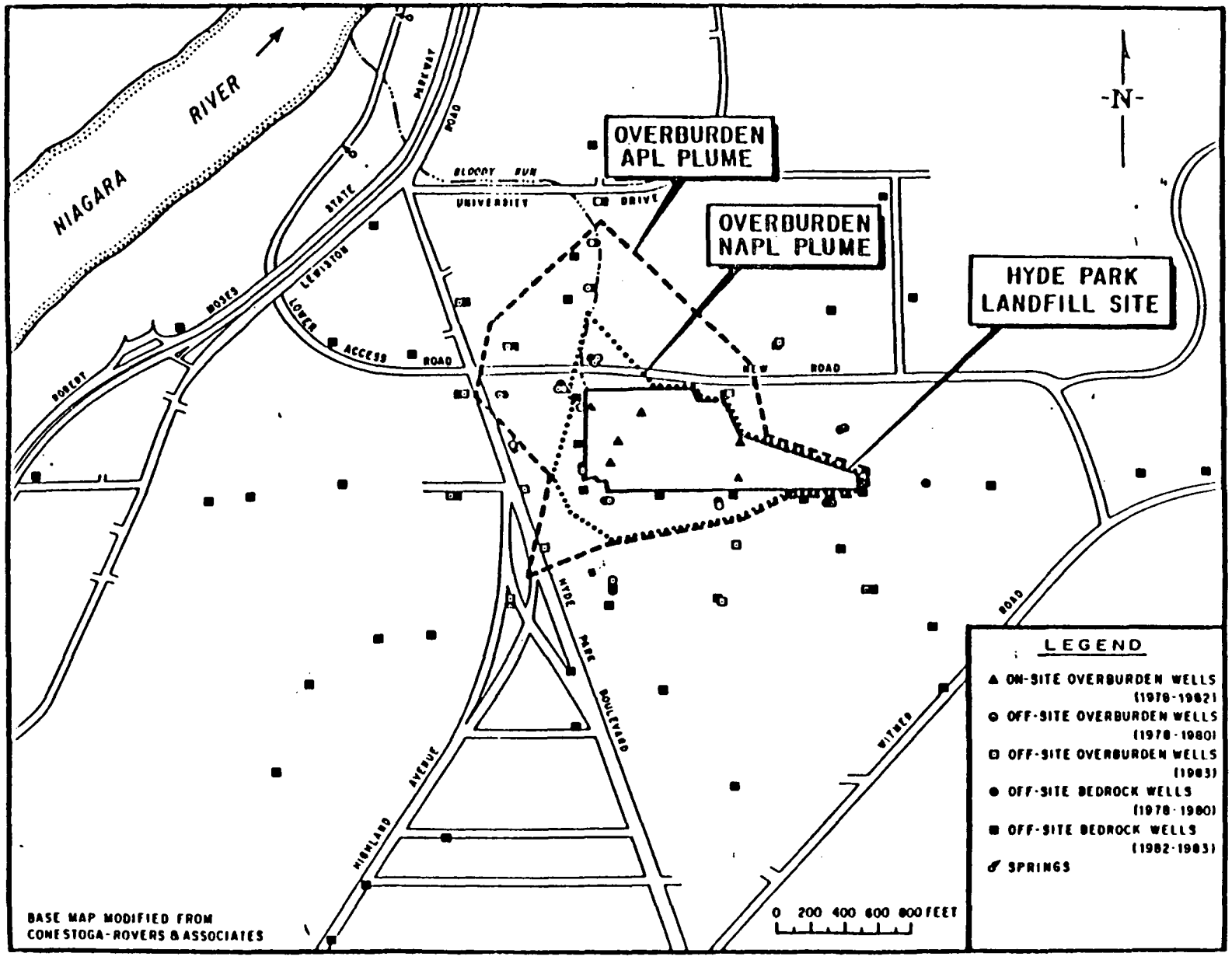


Figure 10. Overburden plumes as defined by the Hyde Park surveys in accordance with the Settlement Agreement (December 1982 - June 1983).

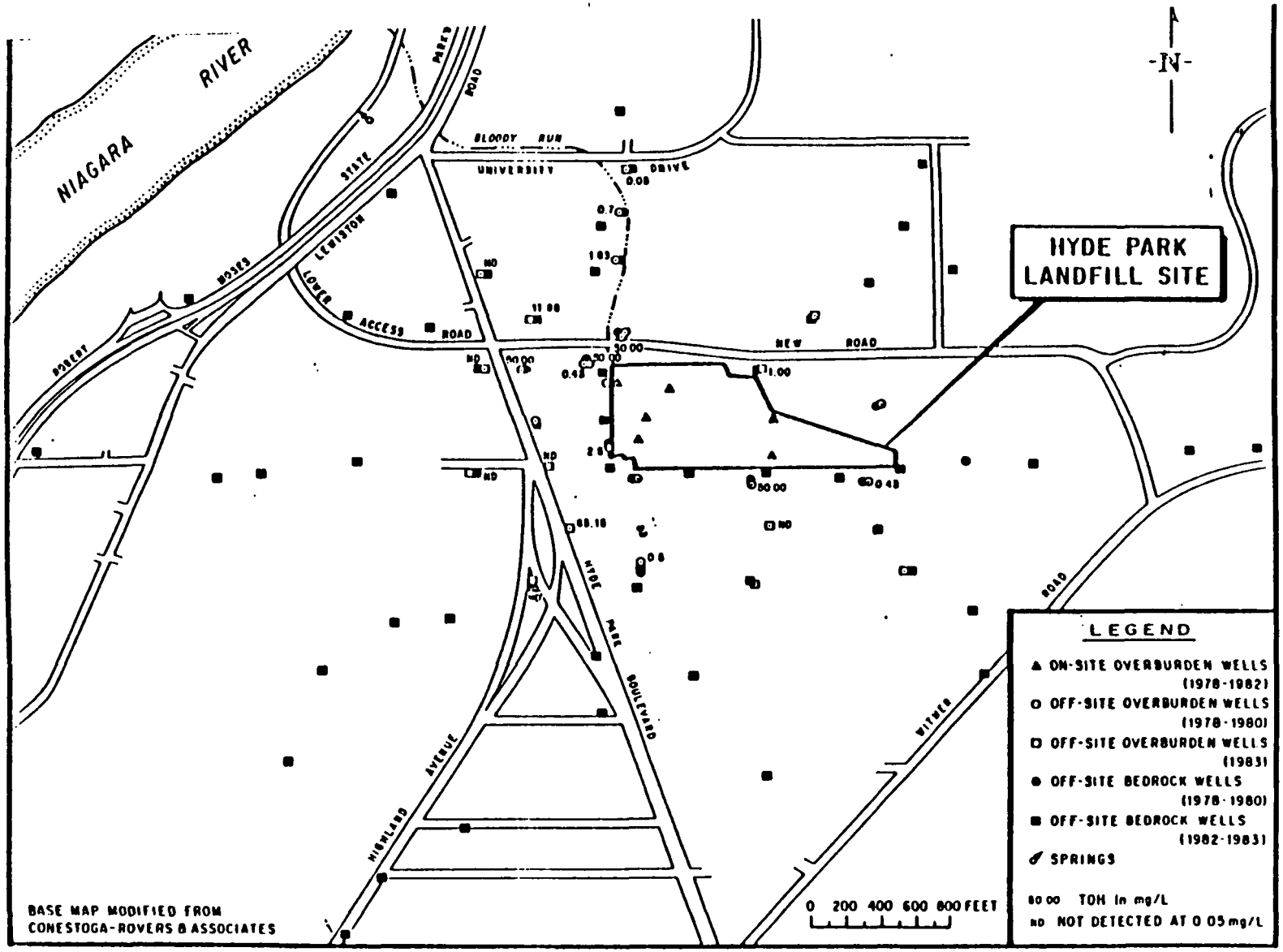


Figure 12. TOH values measured for overburden wells.

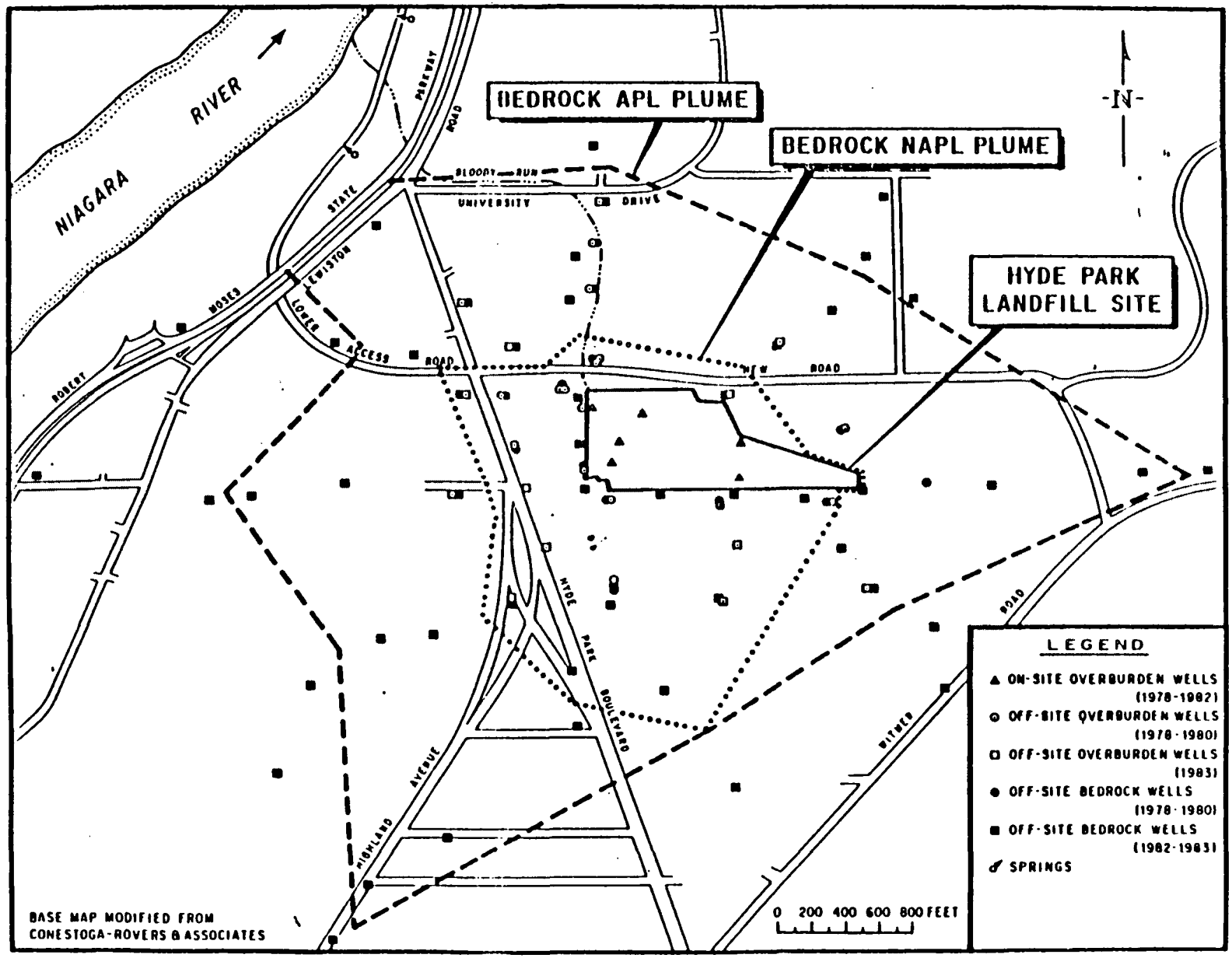


Figure 11. Lockport Dolomite plumes as defined by the Hyde Park surveys in accordance with the Settlement Agreement (December 1982 - May 1983).

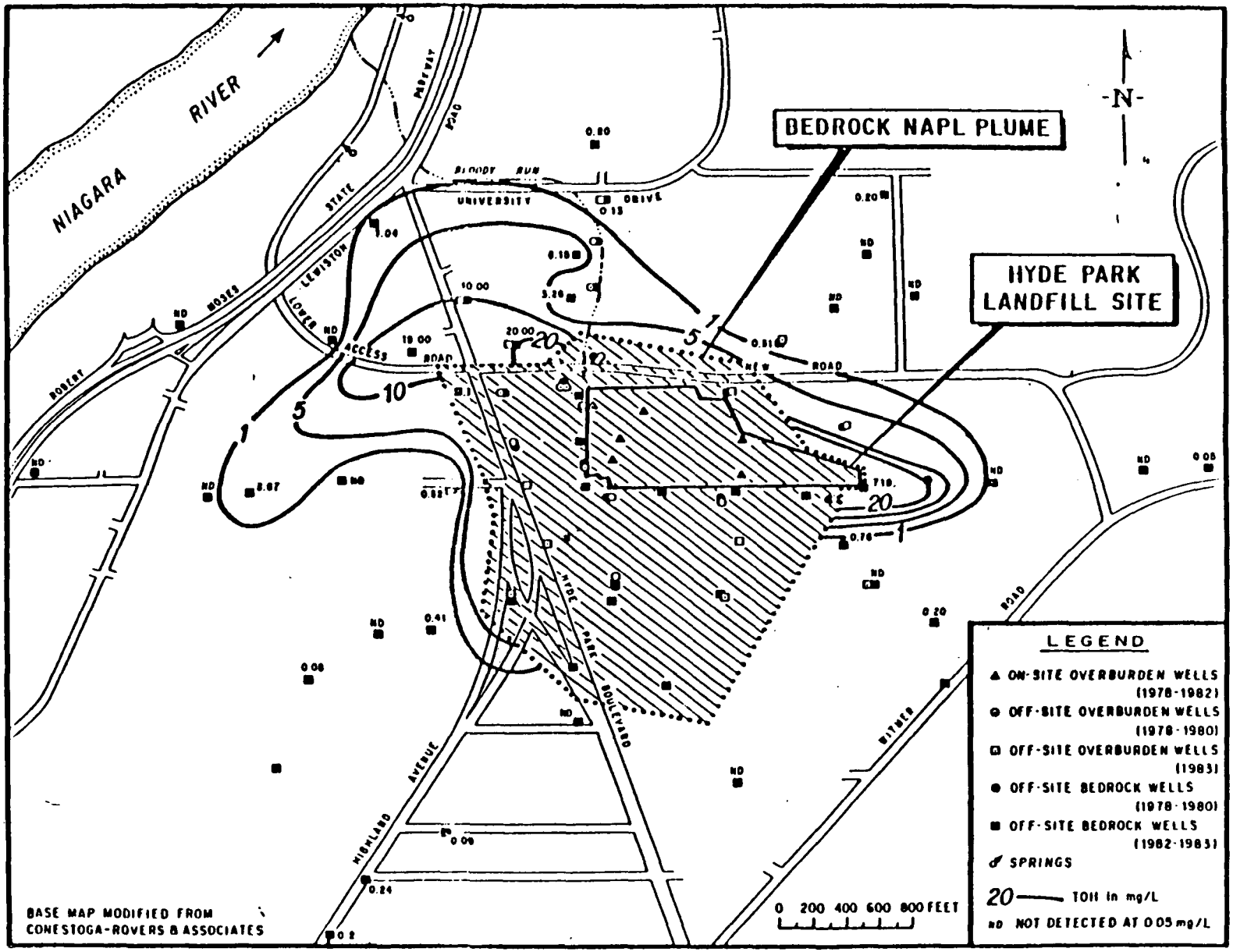


Figure 13. TOH values beyond the NAPL plume in the uppermost zone sampled in the Lockport Dolomite.

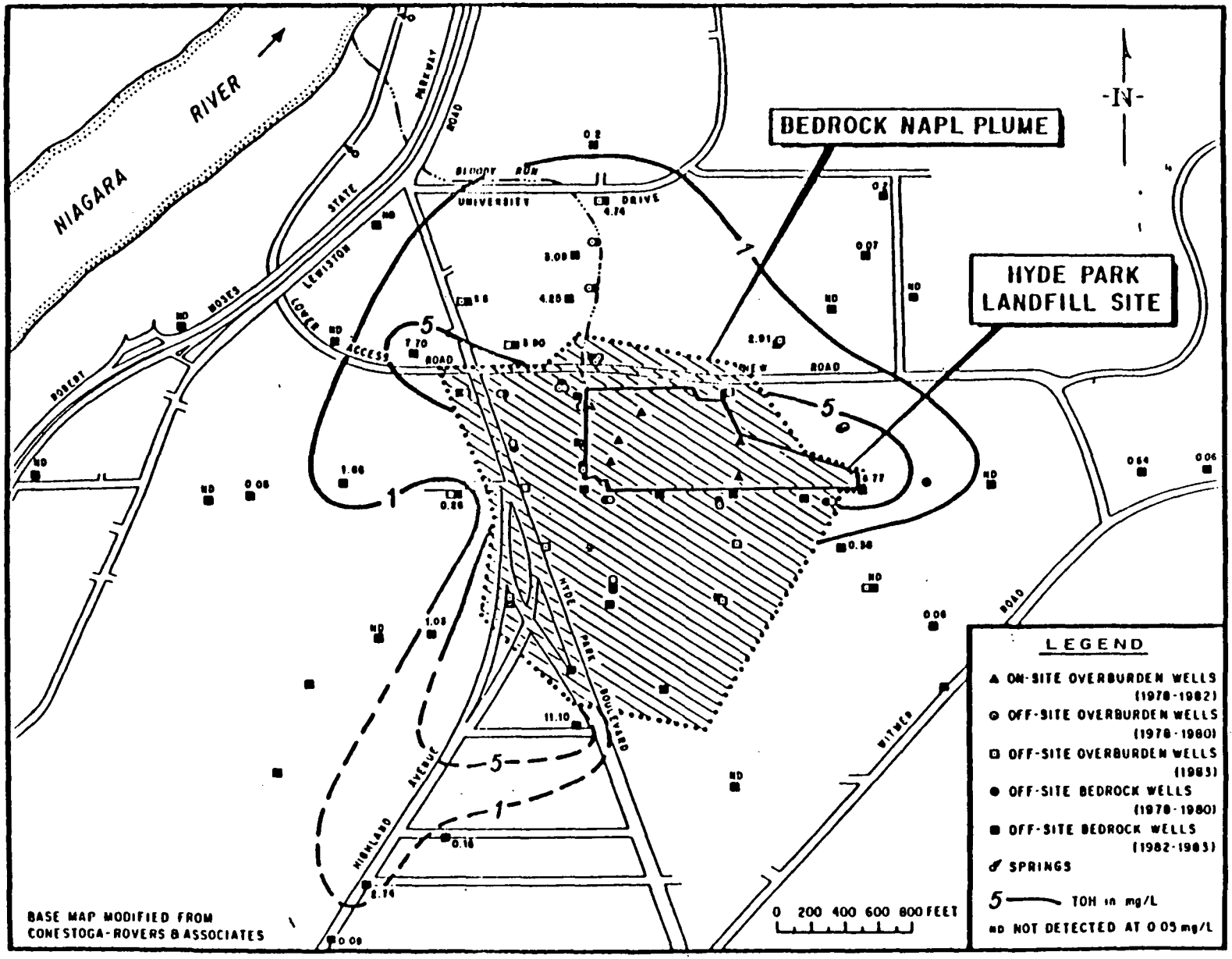


Figure 14. TOH values beyond the NAPL plume in the lowermost zone sampled in the Lockport Dolomite.

Figure 10

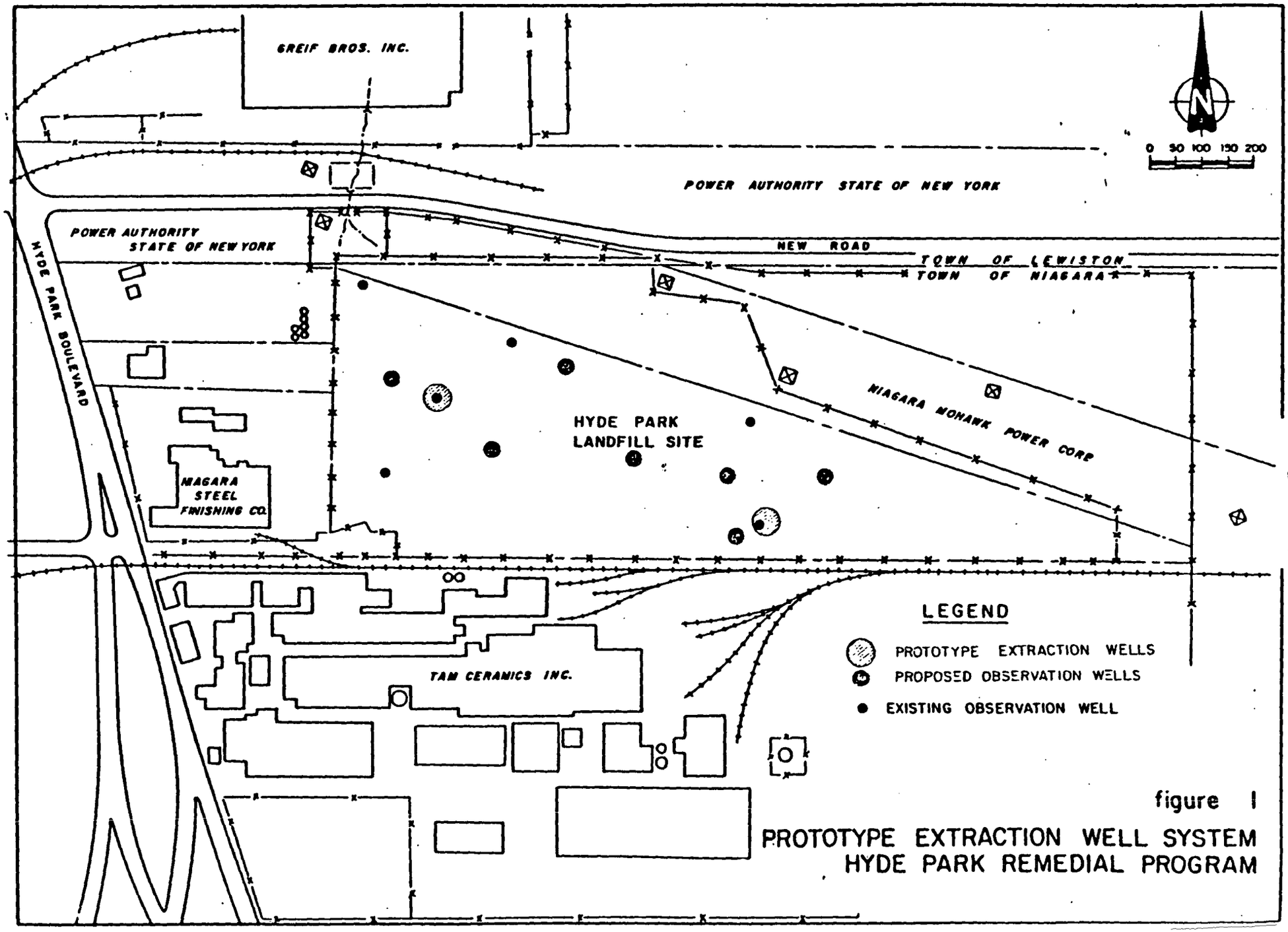


figure 1

PROTOTYPE EXTRACTION WELL SYSTEM
HYDE PARK REMEDIAL PROGRAM

Figure 11

Figure 12

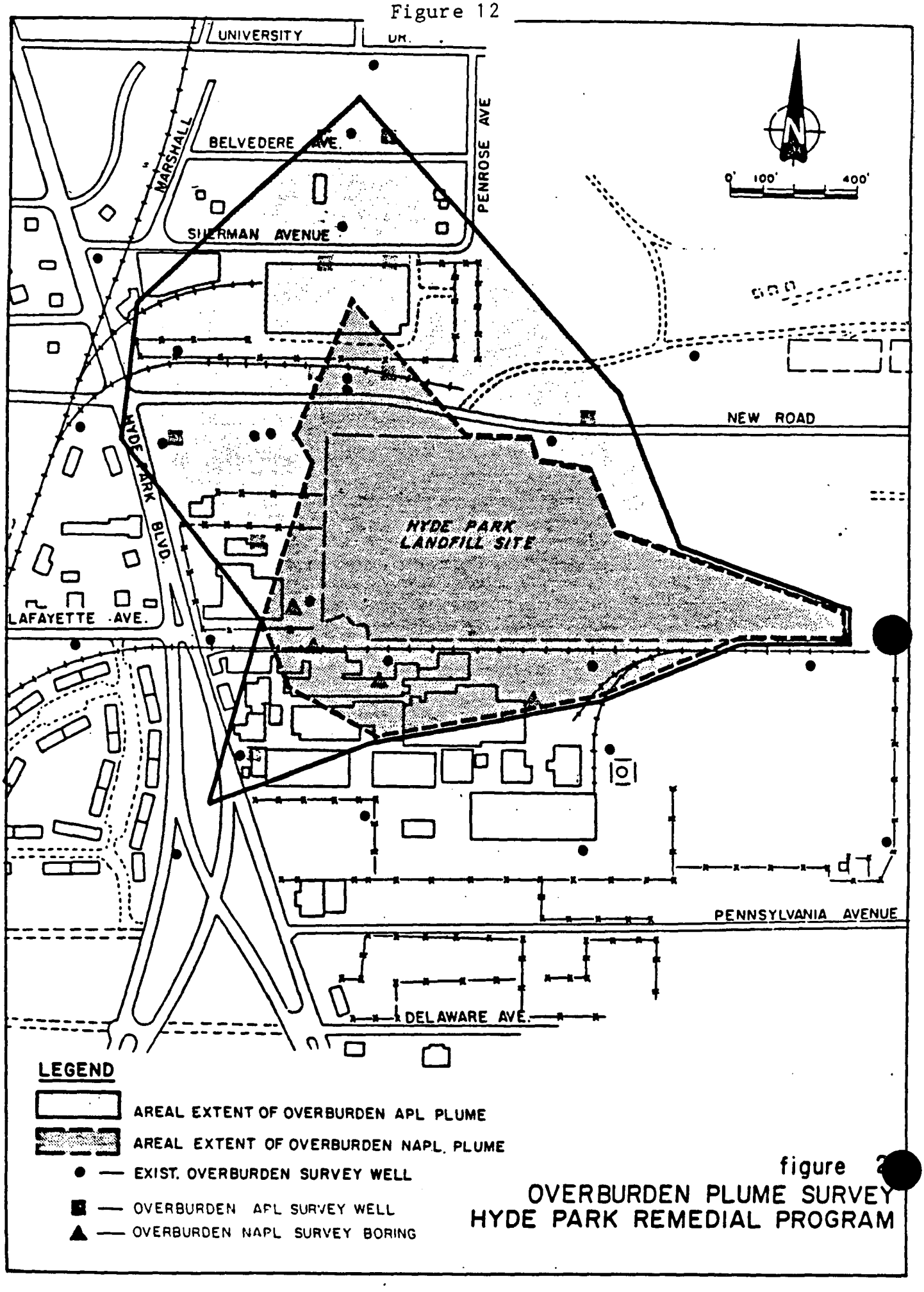


figure 2
OVERBURDEN PLUME SURVEY
HYDE PARK REMEDIAL PROGRAM

Figure 13

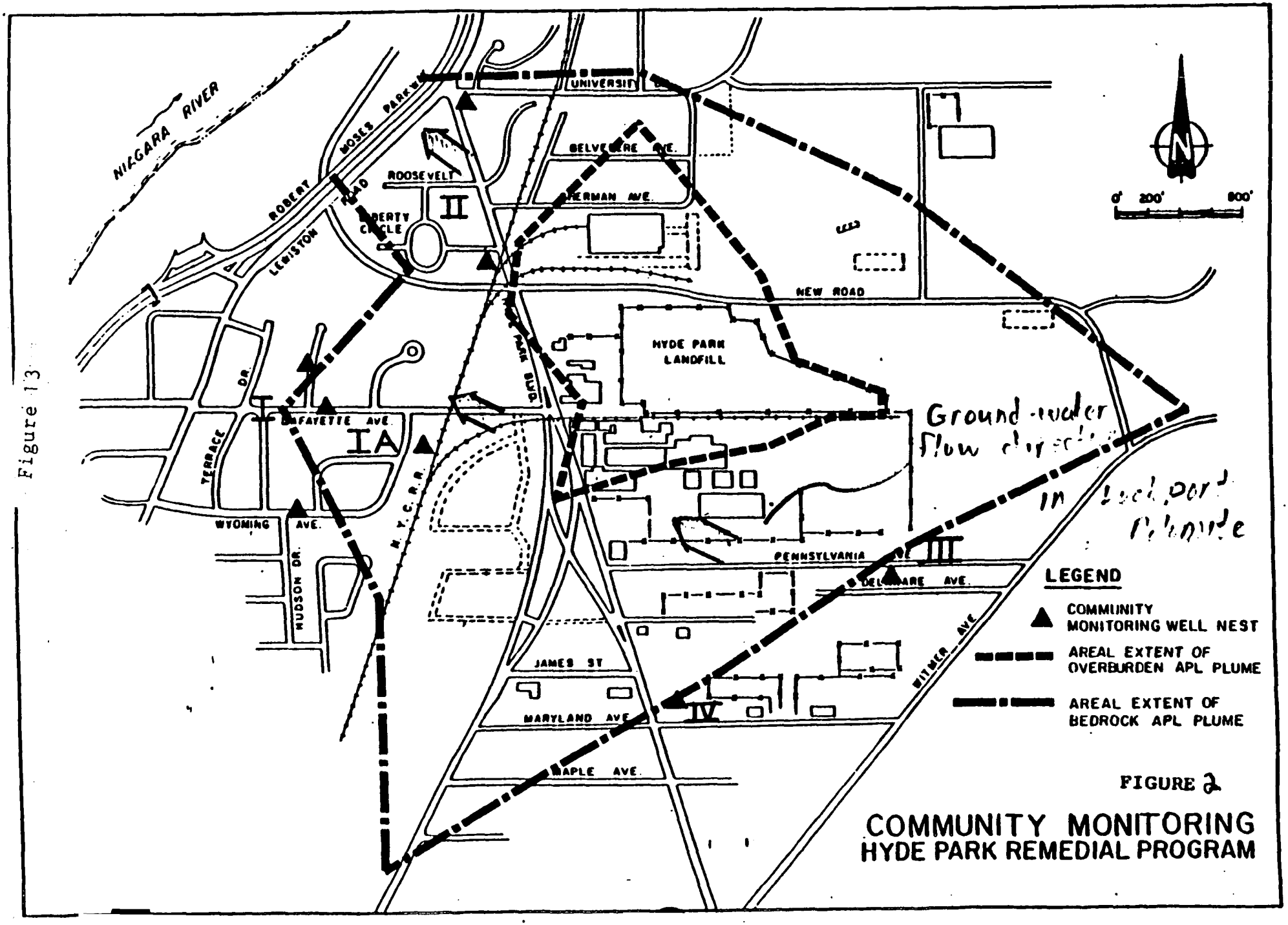


FIGURE 2

COMMUNITY MONITORING
HYDE PARK REMEDIAL PROGRAM

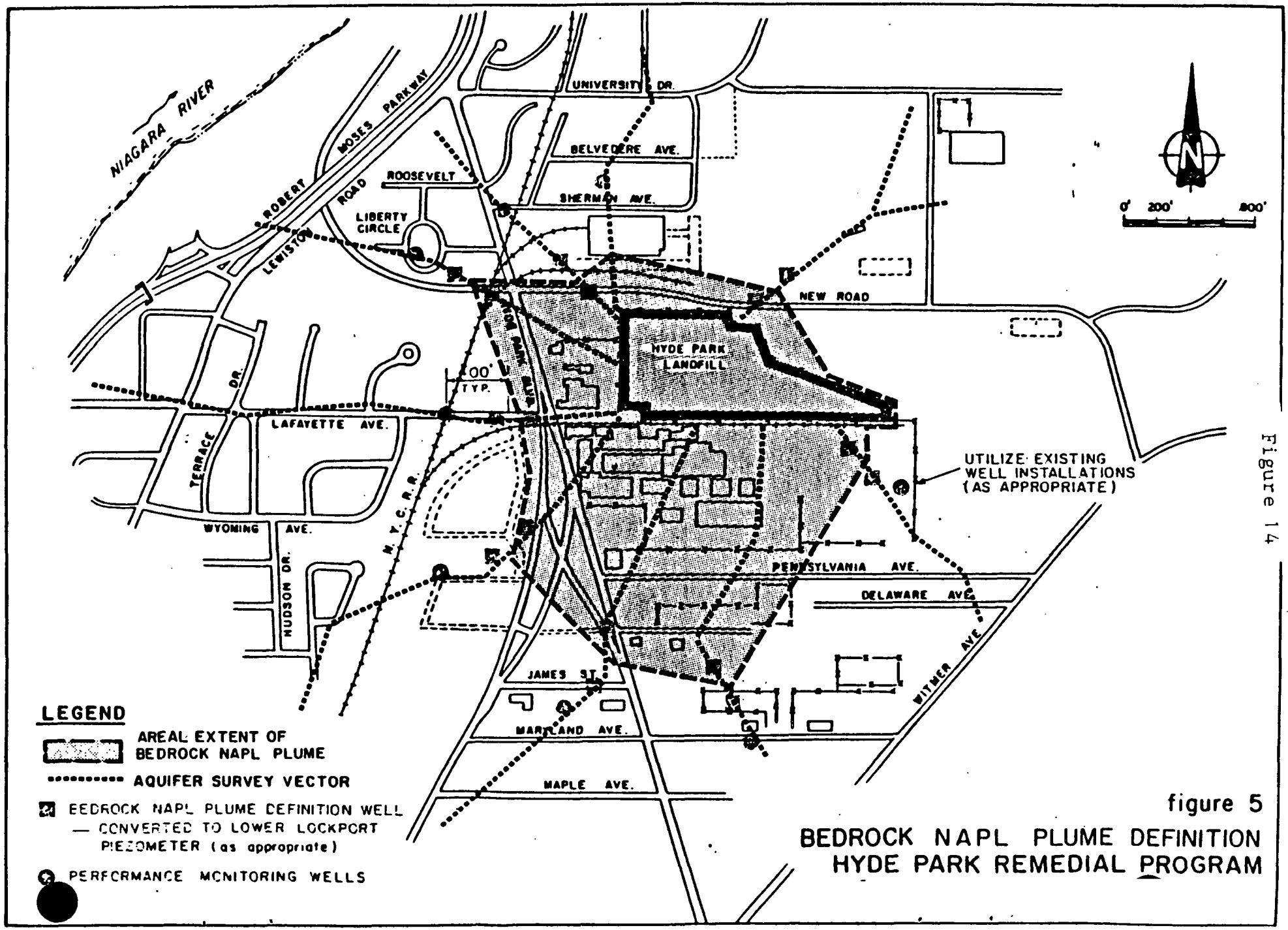


figure 5

BEDROCK NAPL PLUME DEFINITION
HYDE PARK REMEDIAL PROGRAM

Figure 14

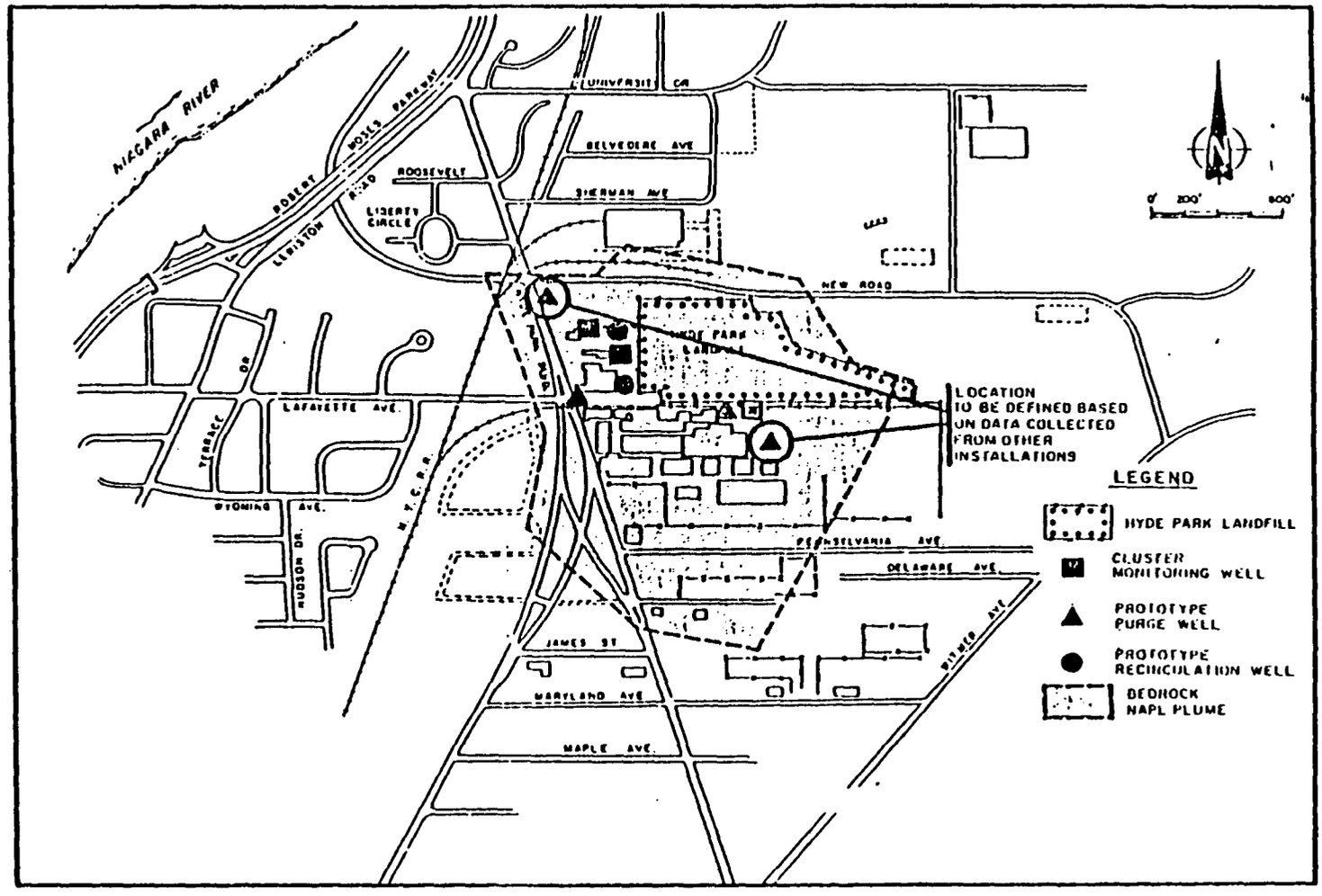


Figure 19. Well locations planned for prototype phase of NAPL Plume Containment System.

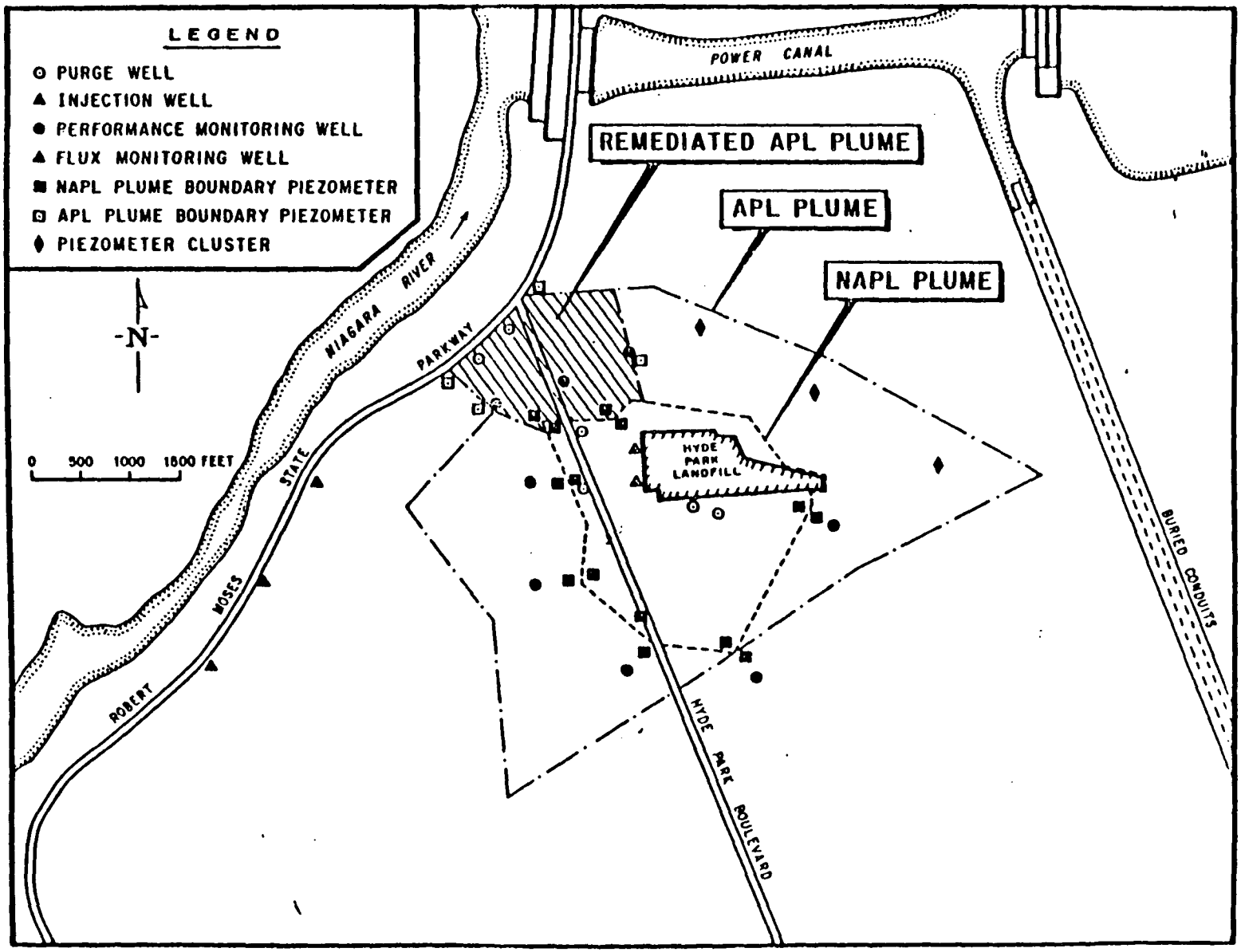


Figure 27. Monitoring well locations for NAPL Plume Containment System.

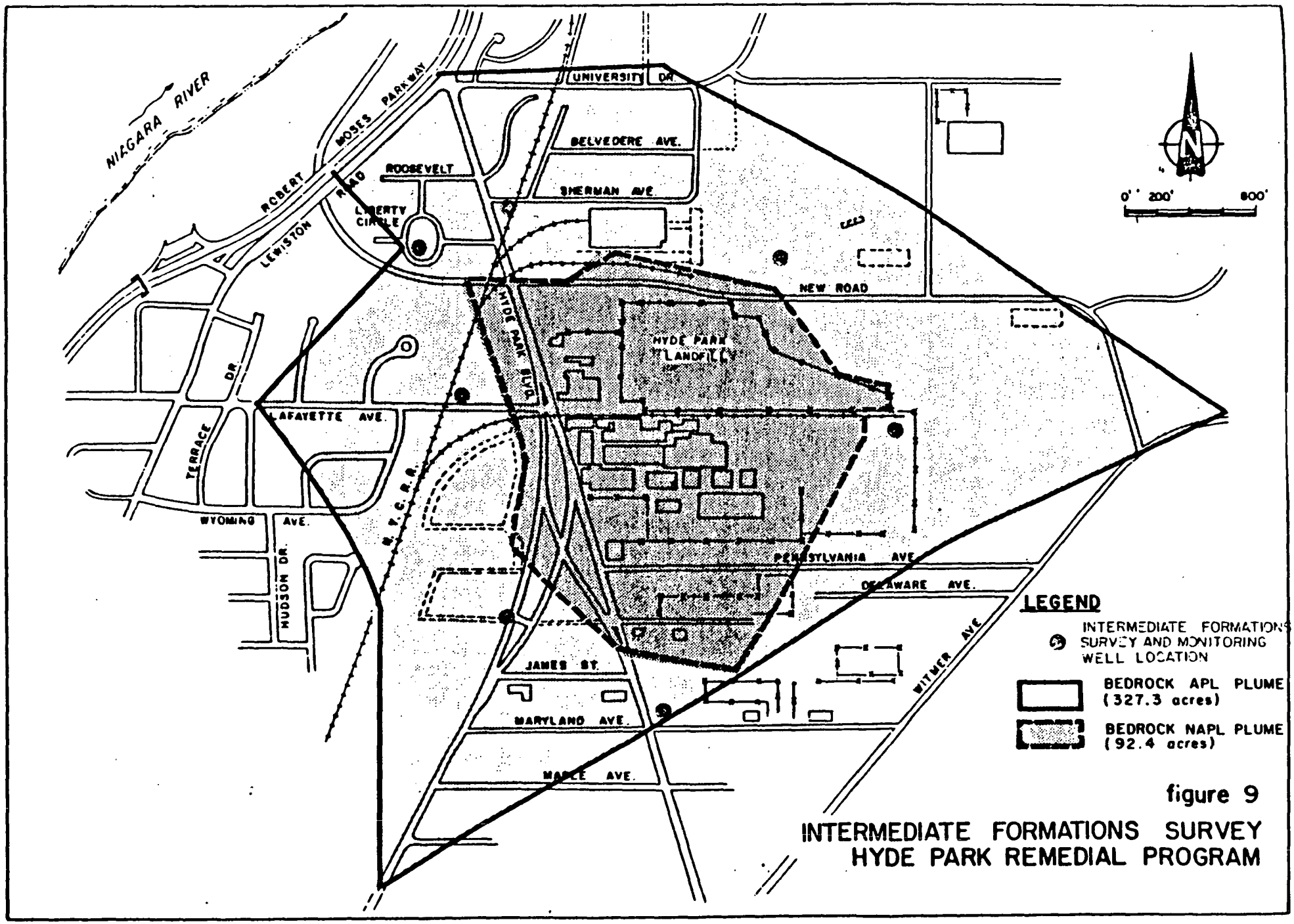
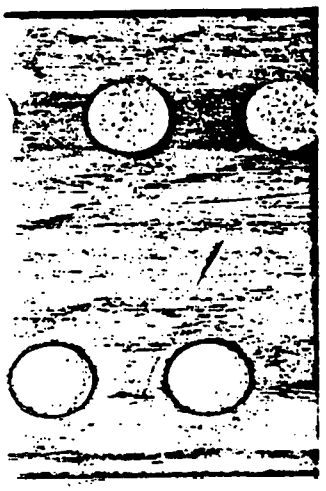


figure 9

INTERMEDIATE FORMATIONS SURVEY
HYDE PARK REMEDIAL PROGRAM

Figure 17

TABLE 1



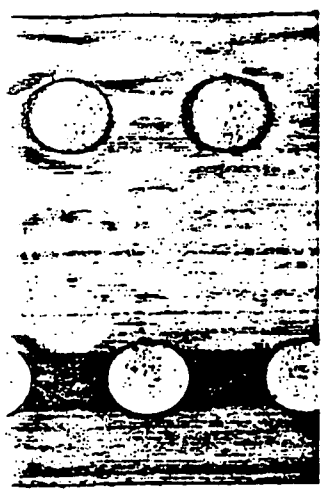


Table 2. Summary of Wastes Disposed in the Hyde Park Landfill Between 1953 and 1974

Type of Waste Category	Physical State	Total Est.[a] Quantity-Tons	Estimated % Liquid (b)	Estimated NAPL-Tons	% of Total Wastes
Calcium Fluoride	S	400	--	--	0.50
Mercury Brine Sludge	S	100	--	--	0.12
C-56 Derivatives	L,S	4,500	10	450	5.60
Org Phos	L,S	4,400	20	880	5.47
Hypo Mud	S	1,000	--	--	1.24
Inorg Phos	L,S	100	--	--	0.12
Misc Acid Chlorides	L,S	1,200	(d)	--	1.49
Dechlorane	S	200	--	--	0.25
BTC's	L,S	1,700	10	170	2.11
Chlorotoluenes	L,S	1,700	80	1,360	2.11
HET Acid	L,S	2,100	50	1,050	2.61
Misc Chlorinations	L,S	1,600	10	160	1.99
BTF Derivatives	L,S	2,900	50	1,450	3.61
DDM	L,S	4,500	--	--	5.60
TCP	L,S	3,300	40	1,320	4.10
BTF's	L,S	5,600	40	2,240	6.97
Benzoyl Chloride	L,S	6,200	--	--	7.71
LDS/MCT	L,S	900	75	675	1.12
Metal Chlorides	S	100	--	--	0.12
C-56	S	1,100	--	--	1.37
BHC	S	2,000	--	--	2.49
Chlorobenzenes	L,S	16,500	30	4,950	20.52
Benzyl Chloride	L,S	3,400	(d)	--	4.23
Thiodan	L,S	1,000	50	500	1.24
Sulfides	S	6,600	--	--	8.21
Misc 10% of above	L,S	7,300		1,625	9.08
Total		80,400		17,900[c]	99.98

L = Liquid
S = Solid

(a) As reported to ITF - November 17, 1978
(b) Source: J. Cull, OCC, 1984, personal communication
(c) At 10.5 lbs/gal. (1.25 Specific Gravity), this amount is equal to 3.4 million gallons.
(d) Water reactive organic chemicals

TAKEN FROM OCC'S BENEFITS REPORT

TABLE 2

Hyde Park Leachate Constituents as a Fraction of TOC* and TOH*

CHLORINATED ALIPHATICS	% of TOC	% of TOH
Chloromethane	0.02%	0.46%
Chloroform	0.01%	0.75%
Tetrachloroethylene	0.01%	0.45%
1,1,2,2-Tetrachloroethane	0.01%	0.35%
Trichloroethylene	0.01%	0.19%
Carbon Tetrachloride	<.01%	0.12%
Methylene Chloride	<.01%	0.11%
1,1,2-Trichloroethane	<.01%	0.04%
Trans-1-2-Dichloroethylene	<.01%	0.03%
1,2-Dichloroethane	<.01%	0.02%
Trichlorofluoromethane	<.01%	0.03%
Chloroethane	<.01%	0.01%
1,1,1-Trichloroethane	<.01%	<.01%
1,2-Dichloropropane	<.01%	<.01%
1,1-Dichloroethylene	<.01%	<.01%
1,1-Dichloroethane	<.01%	<.01%
Hexachlorohexanes (BHC)	<.01%	0.02%
alpha-Hexachlorohexane	<.01%	0.01%
beta-Hexachlorohexane	<.01%	<.01%
gamma-Hexachlorohexane	<.01%	0.02%
Hexachlorocyclopentadiene (C-56)	<.01%	<.01%
Hexachlorobutadiene (C-46)	<.01%	<.01%

AROMATICS AND SUBSTITUTED AROMATICS	% of TOC	% of TOH
Phenol	10.60%	0.00%
2,4,5-Trichlorophenol	0.05%	0.57%
Monochlorotoluene	0.05%	0.16%
Toluene	0.05%	0.00%
Benzene	0.04%	0.00%
2,4-Dichlorophenol	0.02%	0.13%
Ethyl Benzene	0.02%	0.00%
Chlorobenzene	0.02%	0.06%
Monochlorobenzotrifluoride	0.01%	0.10%
2,4,6-Trichlorophenol	<.01%	0.05%
Trichlorobenzene	0.01%	0.08%
2-Chlorophenol	<.01%	0.01%
o-Dichlorobenzene	<.01%	<.01%
p-Dichlorobenzene	<.01%	<.01%
Tetrachlorobenzene	<.01%	0.01%
1,2,4-Trichlorobenzene	<.01%	0.01%
2,4-Dinitrotoluene	<.01%	0.00%
1,3-Dichlorobenzene	<.01%	<.01%
2,6-Dinitrotoluene	<.01%	0.00%

TABLE 7

Hyde Park Leachate Constituents as a Fraction of TOC* and TOH*

ACIDS AND ESTERS	% of TOC	% of TOH
Benzoic Acid	23.01%	0.00%
o-Chlorobenzoic acid	6.03%	19.10%
p-Chlorobenzoic acid	1.88%	5.95%
m-Chlorobenzoic acid	2.19%	6.95%
Chlorendic acid	1.83%	27.81%
Bis-(2-ethylhexyl)phthalate	<.01%	0.00%
Di-n-butyl phthalate	<.01%	0.00%

MISCELLANEOUS	% of TOC	% of TOH
2,3,7,8-TCDD	0.00000979%	0.0000724%
Total of Above Compounds	45.87%	63.61%

* Based on average concentrations in Table 6.
The average concentration of Total Organic Carbon = 6,848,000 ppb.
The average concentration of Total Organic Halogens = 911,000 ppb.

TABLE 3

HYDE PARK NAPL COMPOSITION
OCC Analysis of October 1984

Chemical		mg/kg (ppm)	mmole/kg	% of samp (weight %
HALOGENATED ALIPHATICS	Subtotal =	27,700	174	2.7
tetrachloroethylene		21,000	126	2.1
trichloroethylene		1,600	12	0.1
hexachloroethane		1,200	5.1	0.1
1,1,2,2-tetrachloroethane		995	5.9	0.1
chloroform		900	7.5	0.0
methylene chloride		880	10.4	0.0
carbon tetrachloride		630	4.1	0.0
pentachloroethane		450	2.2	0.0
cis-1,2-dichloroethylene		NA	NA	0.0
AROMATICS	Subtotal =	54,800	537	5.4
Xylenes **		30,760	290	3.0
Toluene **		12,850	140	1.2
Methyl phenyl ether		5,900	54.6	0.5
Ethyl Benzene **		4,400	41.8	0.4
Benzene		870	11.1	0.0
CHLOROBENZENES	Subtotal =	51,100	263	5.1
Tetrachlorobenzenes *		23,100	107	2.3
Trichlorobenzenes		15,000	82.6	1.5
Pentachlorobenzene *		4,300	17	0.4
Monochlorobenzene **		3,550	31.5	0.3
Hexachlorobenzene		3,200	11	0.3
Dichlorobenzenes		1,900	13	0.1
CHLOROTOLUENES	Subtotal =	102,000	651	10.2
dichlorotoluenes		49,000	304	4.9
chlorotoluenes **		30,000	237	3.0
trichlorotoluenes		16,000	81.8	1.6
tetrachlorotoluenes *		3,270	14.22	0.3
hexachlorotoluenes *		2,160	7.23	0.2
pentachlorotoluenes *		930	3.5	0.0
heptachlorotoluenes *		820	2.46	0.0

* See footnotes on third page of this table

TABLE 3 (Con't)

HYDE PARK NAPL COMPOSITION
OCC Analysis of October 1984

Chemical		mg/kg (ppm)	mmole/kg	% of samp (Weight %
PHENOLS/CHLOROPHENOLS	Subtotal =	26,300	202	2.6
trichlorophenols		12,000	60.3	1.2
phenol		12,000	127	1.2
dichlorophenols		2,300	14.1	0.2
tetrachlorophenols		NA	NA	N
2,4-dimethylphenol		NA	NA	N
BENZOHALIDES	Subtotal =	42,900	227	4.2
dichlofobenzotrifluorides		17,000	79	1.7
chlorobenzotrifluorides **		12,000	66	1.2
benzochlorodifluoride		6,380	39.3	0.6
benzotrifluoride		4,800	33	0.4
tetrachlorobenzotrifluorides *		2,680	9.44	0.2
trichlorobenzotrifluorides		NA	NA	N
benzotrichloride		NA	NA	N
BENZOIC ACID DERIVATIVES	Subtotal =	46,500	313	4.6
methylbenzoate (niobe oil)		13,000	97	1.3
butylbenzoate *		10,900	61.2	1.0
benzoic acid		8,600	70	0.8
methyl m-chlorobenzoate *		7,820	46.4	0.7
m-chlorobenzoic acid		2,500	16	0.2
p-chlorobenzoic acid		1,400	8.9	0.1
phenylbenzoate *		1,300	6.6	0.1
o-chlorobenzoic acid		1,000	6.4	0.1
MISCELLANEOUS COMPOUNDS	Subtotal =	19,600	66.8	1.9
hexachlorobutadiene (C-46)		6,200	24	0.6
chlorendic acid		5,600	14	0.5
pentachlorocyclohexane		4,050	15.9	0.4
polychlorinated biphenyls (as 1248)		3,000	10	0.3
hexachlorocyclohexanes		780	2.7	0.0
hexachlorocyclopentadiene (C-56)		<100	<100	
unidentified but quantified*		92,500	--	9.2
Total quantified by authentic standards		303,000	2433	30.3
Total estimated by internal standard		130,000	--	13.0
Total unidentified but quantified		92,500		9.2
Total unidentified and not quantified		475,000	--	47.5
Total sample		1,000,000	--	100.0

* See footnotes on third page of this table

TABLE 3 (Con't)

HYDE PARK NAPL COMPOSITION
OCC Analysis of October 1984

* Estimated from internal standard (all others were based on authentic standards).

** Average of several quantitation approaches using the same sample.

Source: OCC Memo (from N. Simon to J. Czapla) December 7, 1984.

Table 4

9.2 NAPL SYSTEM EFFECTIVENESS PARAMETERS

The NAPL System Effectiveness Parameters are as follows:

Parameter	Detection Levels
Total Organic Halogen (TOH)	500 ug/L
Benzoic Acid	100 ug/L
Phenol	250 ug/L
Monochlorobenzoic Acids (sum of o, p, m-isomers detected)	100 ug/L
Chlorendic Acid	250 ug/L

9.3 APL PLUME FLUX PARAMETERS

The APL Plume Flux Parameters and Flux Action Levels are as follows:

Parameter	Detection Level	Flux Action Level
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.5 ng/L	0.5 g/year
Perchloropentacyclodecane ($C_{10}Cl_{12}$)	1.0 ug/L	.005 lbs/day
Polychlorobiphenyls as Aroclor 1248*	1.0 ug/L	.005 lbs/day
Chloroform	10 ug/L	1.7 lbs/day

* analyze for tri-, tetra-, and penta-chlorobiphenyls and report as Aroclor 1248 unless the reassessment per Section 10.0 indicates that such reported concentration represents less than 90 percent of the total quantity of polychlorobiphenyls.

TABLE 5

COMPARISON HYDE PARK ACTION LEVELS WITH WATER AND FISH CONCENTRATIONS FROM STANDARDS CRITERIA AND ADVISORIES FOR TCDD

STANDARD, CRITERIA OR ADVISORY	Action Level (g/yr)	FISH CONC. (ppb)	WATER CONC. (ppt)
HYDE PARK ACTION LEVEL	0.5	----	0.0000028
HYDE PARK ACTION LEVEL (BAF = 5,000)	0.5	0.014	0.0000028
HYDE PARK ACTION LEVEL (BAF = 10,000)	0.5	0.028	0.0000028
HYDE PARK ACTION LEVEL (BAF = 68,000)	0.5	0.19	0.0000028
HYDE PARK ACTION LEVEL (BAF = 680,000)	0.5	1.9	0.0000028
EPA WATER QUALITY CRITERIA	2.33	---	0.000013
NY STATE FISH (DOH) (BAF = 680,000)	2.63	10	---
GREAT LAKES WATER QUALITY AGREEMENT (BAF = 680,000)	<2.63	---	N.D.
EPA, DRAFT DRINKING WATER ADVISORY	3.89	---	0.00022
ONTARIO	5.26	20	---
CANADA	5.26	20	---
FDA (BAF = 680,000)	6.58	25	---
NY STATE FISH (DOH) (BAF = 10,000)	179	10	---
DEC PROPOSED WATER QUALITY STANDARD	179	---	0.001
GREAT LAKES WATER QUALITY AGREEMENT (BAF = 10,000)	<179	---	N.D.
FDA (BAF = 5,000)	895	25	---

TABLE 6

COMPARISON HYDE PARK ACTION LEVELS WITH WATER AND FISH CONCENTRATIONS FROM STANDARDS CRITERIA AND ADVISORIES FOR MIREX

STANDARD, CRITERIA OR ADVISORY	Action Level (g/yr)	FISH CONC. (ppb)	WATER CONC. (ppt)
HYDE PARK ACTION LEVEL	827.8	---	0.0046
HYDE PARK ACTION LEVEL (BAF = 18,200)	827.8	0.0837	0.0046
HYDE PARK ACTION LEVEL (BAF = 180,200)	827.8	0.837	0.0046
EPA WATER QUALITY CRITERIA	----	---	N.A.
DEC PROPOSED WATER QUALITY STANDARD	179,000	---	1.0
ONTARIO	98,352	100	---
CANADA	98,352	100	---
IJC	98,352	100	---

TABLE 7

COMPARISON HYDE PARK ACTION LEVELS WITH WATER AND FISH CONCENTRATIONS FROM STANDARDS CRITERIA AND ADVISORIES FOR PCBs

STANDARD, CRITERIA OR ADVISORY	Action Level (g/yr)	FISH CONC. (ppb)	WATER CONC. (ppt)
HYDE PARK ACTION LEVEL	827.8	----	0.0046
HYDE PARK ACTION LEVEL (BAF = 72,000)	827.8	0.331	0.0046
HYDE PARK ACTION LEVEL (BAF = 720,000)	827.8	3.31	0.0046
EPA WATER QUALITY CRITERIA	143,200	---	0.8
DEC PROPOSED WATER QUALITY STANDARD	179,000	---	1.0
ONTARIO	24,861	100	---
CANADA	24,861	100	---
GREAT LAKES WATER QUALITY AGREEMENT	24,861	100	1.0
FDA (BAF = 720,000)	497,222	2,000	---
NY STATE (BAF = 720,000)	497,222	2,000	---

TABLE 9

9.4 APL PLUME MONITORING PARAMETERS

The APL Plume Monitoring Parameters and Monitoring Levels are as follows:

Parameter	Monitoring Level
Phenol	50 ug/L
Benzene	10 ug/L
Hexachlorocyclohexanes	10 ug/L
2-Chlorophenol	10 ug/L
2,4-Dichlorophenol	10 ug/L
2,4,5-Trichlorophenol	10 ug/L
2,4,6-Trichlorophenol	10 ug/L

9.5 LOWER FORMATION SURVEY PARAMETERS

The Lower Formation Survey Parameters and Survey Levels are as follows:

Parameter	Survey Level
pH	Less than 4.5 or greater than 9.5 units
Conductivity	10 times background level (umhos/cm)
Total Organic Carbon (TOC)	200 mg/L
Total Organic Halogen (TOH)	0.5 mg/L
Phenol	0.25 mg/L
Monochlorobenzene	10 ug/L
Monochlorotoluenes	10 ug/L
Trichlorobenzenes	10 ug/L
Tetrachlorobenzenes	10 ug/L
Octachlorocyclopentene	10 ug/L
Monochlorobenzotrifluorides	10 ug/L
2,4,5-Trichlorophenol	10 ug/L
Hexachlorocyclohexanes	10 ug/L
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.5ng/L
Polychlorobiphenyls as Aroclor 1248*	1 ug/L
Perchloropentacyclodecane (C_{10} Cl_{12})	1 ug/L

TABLE 10

9.6 SOIL SURVEY PARAMETERS

The Soil Survey Parameters and Soil Survey Levels are as follows:

Parameter	Soil Survey Level
Monochlorobenzene	10 ug/kg
Monochlorotoluene	10 ug/kg
Hexachlorobenzene	100 ug/kg
2,4,5-Trichlorophenol	100 ug/kg

9.7 GORGE FACE SOIL/SEDIMENT PARAMETERS

The Gorge Face Soil/Sediment Parameters and Action Levels are as follows:

Parameter	Action Levels
2,3,7,8-Tetrachlorodibenzo-p-dioxin†	1 ug/kg
Polychlorobiphenyls as Aroclor 1248*	25 mg/kg
Hexachlorocyclohexanes	106 mg/kg

† EPA Method of Analysis for chlorinated dibenzo-p-dioxins and dibenzofurans (Appendix X to 40 CFR Part 261, Federal Register, January 14, 1985).

9.8 COMMUNITY EARLY WARNING PARAMETERS

The Community Early Warning Parameters and appropriate Detection Levels are as follows:

Parameter	Detection Level Water	Detection Level Soil Air
TOH	500 ug/L	NA
Chlorendic Acid	250 ug/L	NA
Benzoic Acid	100 ug/L	NA
Monochlorobenzoic Acids (sum of o,p,m-isomers detected)	100 ug/L	NA

TABLE 11

Parameter	Detection Level Water	Detection Level Soil Air
Monochlorobenzene	10 ug/L	see Section 8.4.2
Monochlorotoluenes	10 ug/L	see Section 8.4.2
Monochlorobenzotrifluorides	10 ug/L	see Section 8.4.2

Section 8.4.2 sets a 1 ppb goal as the detection limit.

9.9 COLLECTED LIQUIDS MONITORING PARAMETERS

The Collected Liquids Monitoring Parameters and Monitoring Levels are as follows:

Parameter	Monitorng Level
pH	(0.1 Unit)
Chloride	1,000 ug/L
Total Organic Carbon	200 mg/L
Total Organic Halogen	0.5 mg/L
Phenol	10 ug/L
Monochlorobenzene	10 ug/L
Monochlorotoluenes	10 ug/L
Trichlorobenzenes	10 ug/L
Tetrachlorobenzenes	10 ug/L
Octachlorocyclopentene	10 ug/L
Monochlorobenzotrifluorides	10 ug/L
2,4,5 Trichlorophenol	10 ug/L
Hexachlorocyclohexanes	10 ug/L

ATTACHMENT I

TABLE 1

ALTERNATE REMEDIAL PROGRAMS

Chemical Source	Remedial Program
Landfill	- hydraulic containment - physical containment - relocation - treatment
NAPL and APL in Overburden	- hydraulic containment - physical containment - relocation - treatment
NAPL and APL in Bedrock within NAPL plume	- hydraulic containment - physical containment - relocation - treatment

Attachment 2

TABLE 2

ALTERNATE REMEDIAL TECHNOLOGIES

Remedial Program	Remedial Technologies Considered, Found Suitable and Evaluated	Remedial Technologies Considered and Found Unsuitable
Landfill		
a) Hydraulic containment	- existing barrier collection system - capping (clay, concrete, asphalt, synthetic membrane) - NAPL and APL containment in bedrock (see remedial technologies for NAPL and APL in bedrock) - overburden barrier collection system (tile)	- extraction wells - enhanced recovery wells (recirculation, chemical injection and heat injection) - augment existing barrier collection system
b) Physical containment	- capping (clay, concrete, asphalt, synthetic membrane) - surface drainage control (ditches, swales, grading, pipes, culverts)	- grout base - continuous barrier wall around landfill in overburden (bentonite, clay, cement, asphalt, designed backfill) - pressure grouting in bedrock around landfill - fixation/stabilization in place
c) Relocation		- excavation
d) Extraction & Treatment	- biological treatment of liquids - chemical treatment of liquids - physical treatment of liquids (separation, incineration, activated carbon, filtration) - fixation/stabilization of collected liquids with landfilling	- landfilling of excavated site - biological treatment of liquids in situ - chemical treatment of liquids in situ

TABLE 2 (cont'd)

ALTERNATE REMEDIAL TECHNOLOGIES

Remedial Program	Remedial Technologies Considered, Found Suitable and Evaluated	Remedial Technologies Considered and Found Unsuitable
NAPL & APL in Bedrock		
a) Hydraulic containment	- extraction wells - enhanced recovery wells (recirculation wells) - bedrock fracturing (hydrofracturing and drilling)	- enhanced recovery wells (chemical injection and heat injection) - proposed bedrock barrier collection system - bedrock fracturing (blasting) - tile collection system
b) Physical containment	- pressure grouting (grout curtain wall, grouting through controlled fractures and defined fracture grouting using singularly or combination of bentonite, cement, fly ash, sodium silicates and chemicals)	- fixation/stabilization in place - continuous barrier wall (bentonite, clay, cement, asphalt, designed backfill)
c) Relocation		- excavation of all bedrock within NAPL plume
d) Extraction & Treatment	- biological treatment of liquids - chemical treatment of liquids - physical treatment of liquids (separation, incineration, activated carbon, filtration) - fixation/stabilization of collected liquids with landfilling	- landfilling of bedrock - biological treatment of liquids in situ - chemical treatment of liquids in situ

TABLE 2 (cont'd)

ALTERNATE REMEDIAL TECHNOLOGIES

Remedial Program	Remedial Technologies Considered, Found Suitable and Evaluated	Remedial Technologies Considered and Found Unsuitable
NAPL & APL in Overburden		
a) Hydraulic containment - surface & subsurface	- overburden barrier collection system (tile) - existing barrier collection system - capping	- extraction wells - enhanced recovery wells (recirculation, chemical injection and heat injection) - augment existing barrier collection system
b) Physical containment 1) Surface	- capping (clay, concrete, asphalt, synthetic membrane) - surface drainage control (ditches, swales, grading, pipes, culverts)	- fixation/stabilization in place
2) Subsurface		- surface capping (clay, concrete, asphalt, synthetic membrane) - continuous barrier wall (bentonite, clay, cement, asphalt, designed backfill) - fixation/stabilization in place
c) Relocation 1) Surface	- partial excavation to accommodate capping	- complete excavation
2) Subsurface		- excavation
d) Extraction & Treatment - surface & subsurface	- biological treatment of liquids - chemical treatment of liquids - physical treatment of liquids (separation, incineration, activated carbon, filtration) - fixation/stabilization of collected liquids with landfilling	- landfilling of excavated site - biological treatment of liquids in situ - chemical treatment of liquids in situ

TABLE 3

UNSUITABLE REMEDIAL TECHNOLOGIES

Technology	Discussion
* Further discussion of these alternatives are presented in the appropriate category of Section 8.0 of this report.	
Landfill	
- extraction wells*	- unsuitable hydraulic characteristics of landfill - redundant since it addresses only a portion of chemical source
- enhanced recovery wells	- unsuitable hydraulic characteristics of landfill - environmental risk due to unknown reactions - redundant since it addresses only a portion of chemical source
- augmented existing barrier collection system	- existing system not amenable to augmentation to address chemicals at depth - health and environmental risk of excavation into landfill - redundant since it addresses only a portion of chemical source
- grout base	- redundant since it addresses only a portion of chemical source - high cost - health and environmental risk due to extensive drilling through landfill
- continuous barrier wall around landfill in overburden	- made redundant by required installation of Overburden Barrier Collection System
- pressure grouting in bedrock around landfill	- redundant since it addresses only a portion of chemical source
- fixation/stabiliation in place	- unsuitable hydraulic characteristics of landfill - technology not available

TABLE 3 (cont'd)

UNSUITABLE REMEDIAL TECHNOLOGIES

Technology	Discussion
Landfill (cont'd)	
- excavation/landfilling*	- redundant since it addresses only a portion of chemical source - high cost - health and environmental risk - secure landfill availability
- biological treatment of liquids in situ	- technology not available
- chemical treatment of liquids in situ	- technology not available
NAPL & APL in Overburden	
- extraction wells	- unsuitable hydraulic characteristics
- enhanced recovery wells	- unsuitable hydraulic characteristics
- augment existing barrier collection system	- existing system not amenable to address chemicals at depth - made redundant by required installation of Overburden Barrier Collection System
- continuous barrier wall (surface & subsurface)	- made redundant by required installation of Overburden Barrier Collection System
- fixation/stabilization in place (surface & subsurface)	- unsuitable hydraulic characteristics of overburden - technology not available - made redundant by required installation of Overburden Barrier Collection System

TABLE 3 (cont'd)

UNSUITABLE REMEDIAL TECHNOLOGIES

Technology	Discussion
NAPL & APL in Overburden (cont'd)	
- capping (subsurface)	- existing clean surface soil provides suitable cap
- complete excavation (surface)	- high cost - redundant since it addresses only a portion of chemical source - made redundant by required installation of Overburden Barrier Collection System
- excavation/landfilling* (subsurface)	- high cost - made redundant by required installation of Overburden Barrier Collection System - health and environmental risk - secure landfill availability
- biological treatment of liquids in situ	- technology not available
- chemical treatment of liquids in situ	- technology not available
NAPL & APL in Bedrock	
- enhanced recovery wells* (chemical, heat)	- unknown NAPL rheological characteristics - health and environmental risk due to unknown reactions - technology not available (chemical injection) - high cost (heat injection)
- proposed Bedrock Barrier Collection System*	- redundant since it addresses only a small portion of chemical source in bedrock

TABLE 3 (cont'd)

UNSUITABLE REMEDIAL TECHNOLOGIES

Technology	Discussion
NAPL & APL in Bedrock (cont'd)	
- bedrock fracturing* (blasting)	- health and environmental risk due to chemical releases
- tile collection system*	- high cost - other technologies of equal effect and lower cost available - health and environmental risk due to construction requirements (blasting, dewatering, work environment)
- fixation/stabilization in place	- technology not available
- continuous barrier wall*	- high cost - other technologies of equal effect and lower cost available
- excavation/landfilling*	- high cost - health and environmental risk - secure landfill availability
- biological treatment in situ	- technology not available
- chemical treatment in situ	- technology not available