DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Olin Corporation
Facility Address: 2400 Buffalo Avenue, Niagara Falls, NY
Facility EPA ID #: NYD002123461

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   __✓__ If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ if data are not available, skip to #8 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

__✓__ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

_____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):_____

BACKGROUND

The Olin Niagara Falls Plant (the "Plant") is located at 2400 Buffalo Avenue in Niagara Falls, New York. The Plant, comprised of two separate lots, is located south of Buffalo Avenue, approximately 1,000 feet north of the Upper Niagara River. Historically, Olin produced chlorine and caustic soda from rock salt (sodium chloride) using various modifications of the mercury-cell/chlor-alkali process. In the past, Mercury cells were operated on both plant sites, but, they are no longer in operation. Olin also manufactured several organic chemicals, including trichlorobenzene, trichlorophenol, and BHC (hexachlorocyclohexane) but production of those chemicals stopped after a production related accident (explosion) severely damaged the production facility in 1956. Production of chlorine, caustic and organic chemicals has ceased. Olin currently manufactures sodium hypochlorite for use in swimming pools.

A map showing the Plant's two lots in detail is presented on Figure 1. The smaller (six acre) western site (Plant 1) is separated from Plant 2 by Chemical Road and by 300 feet of property owned by E.I. duPont de Nemours and Company (DuPont). Plant 2 (16 acres) is divided into two sections by Alundum Road (private). The eastern margin of the operating area of Plant 2 is bounded by Gill Creek, a small channelized stream flowing to the Niagara River. In the Remedial Plan, Plant 1 and Plant 2 are collectively referred to as the Plant. Only when these facilities are discussed individually are the numeric designations used. On the east side of Gill Creek, Olin also owns the property bounded by Gill Creek, DuPont Road, and Buffalo Avenue. Most of this property is currently leased to DuPont for employee parking.

The Olin Plant is located in a heavy industrial area. Plant 1 is bounded on the west and south by former production facilities owned by Carborundum Company. Olin property is bounded on the east by the Solvent Chemicals Site (also referred to as the 3163 Buffalo Avenue Site), a former chemical plant and disposal site currently being remediated by the Department. Adjacent to Plant 2 to the south is the DuPont Niagara Plant, which has conducted environmental investigations and remedial actions pursuant to a Consent Order with the Department. Both the DuPont (Registry Number 932013) and Solvent Chemicals (Registry Number 932096) Sites are listed as Class 2 sites in the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites. (Class 2 sites are sites which pose a significant threat to human health and the environment.)

The topography of the Site is characterized by very gentle slopes (less than 1 percent), generally toward the south. Stormwater drains to a number of plant storm sewers and ultimately to the Buffalo Avenue sewers.

The overburden (soil) at the plant is thin, with depths to bedrock ranging from 5.9 to 10.6 feet in the Plant 1 area, and 4.0 to 8.9 feet in the Plant 2 area west of Gill Creek. The overburden soil consists of fill materials overlying glacial deposits. The upper bedrock encountered at the Plant is the Lockport Dolomite which is approximately 150 feet or greater in thickness in the vicinity.

Saturated conditions (the water table) were generally encountered during drilling within the lower two feet of soil above the top of bedrock in Plant 2. In Plant 1, the soil was found to be generally unsaturated. The uppermost water bearing zone is defined as the lower two feet of overburden and the weathered bedrock surface and is designated the A-Zone. The waterbearing properties of the bedrock (Lockport Dolomite) have been extensively studied at the Olin Plant, the adjacent DuPont Niagara Plant, the Solvent Chemicals Site, and elsewhere in the vicinity. These studies have shown that groundwater flow within the bedrock occurs primarily within dissolution channels which have developed along horizontal bedding planes and through vertical fractures and joints. The horizontal bedding plane fracture zones can be considered to be leaky-confined waterbearing zones, with vertical leakage occurring through vertical fractures and joints.

During drilling for well installation, waterbearing fracture zones were identified based on drilling water loss to the formation, core inspection, and sudden changes in the drilling mechanics (such as a drill rod dropping or vibration). Two major waterbearing fracture zones were encountered at the Olin Plant. Using terminology consistent with that used for the hydrogeologic assessments performed at the adjacent DuPont facility, these zones are referred to as the B- and CD-Zones(see Figure 2). A less widespread waterbearing fracture zone was encountered during the drilling of five wells (OBA-1C, OBA-7C, OBA-4C, OBA-14C, and OBA-15B). This minor waterbearing zone corresponds to the C-Zone identified in the DuPont studies and is located between the B- and CD-Zones. The B-Zone is located between approximately 16 and 21 feet below ground surface (BGS). The CD-Zone is located between approximately 45 and 50 feet BGS. When present, the C-Zone was encountered between approximately 25 and 35 feet BGS.

Olin operates two production wells in the eastern portion of Plant 1 (see Figure 1). The wells are approximately 20 feet apart and only one well is pumped at any given time. Therefore, the wells are considered to be one withdrawal point and are referred to collectively as the Olin Production Well. The Olin Production Well is open in the C-Zone and below and is pumped at an average rate of approximately 600 gallons per minute (GPM). Under its remedial commitment to the state of New York, DuPont is required to operate the Olin Production Well. well. Most groundwater in the C- and CD-Zones west of Gill Creek appears to be captured by the Olin Production Well. The pumped groundwater is treated using an activated carbon adsorption system prior to being discharged.

The Olin Production Well creates cones of depression in the C-/CD-Zone and, through induced leakage, in the B-Zone. Other features influencing groundwater flow in the A- and B-Zones are the sanitary sewers beneath Buffalo Avenue and a DuPont sanitary sewer located along the east side of Gill Creek to Buffalo Avenue.

RCRA Facility Investigation/Corrective Measures Study

Olin completed a RCRA Facility Investigation (RFI) in 1994 and a Corrective Measures Study (CMS) in 1995. The RFI identified impacts to groundwater and soil, and the CMS recommended corrective measures to remedy such impacts. The RFI and CMS have been approved by the Department and by the United States Environmental Protection Agency (USEPA).

The RFI/CMS documented mercury presence in soils throughout the Plant. Concentrations ranged from less than 1 to 15,600 mg/kg (ppm). The distribution of mercury did not correlate with locations of Solid Waste Management Units (SWMUs), suggesting that the sources of mercury were handling losses during past Plant operations, rather than releases from specific SWMUs. Elevated concentrations of BHCs (ranging from <1 to 171 mg/kg total BHCs) were observed near the former BHC production area of Plant 2.

The RFI concluded that three plumes of contaminated groundwater, each with a different source, are present beneath the Plant. Potential Olin-derived chemicals were present in groundwater sampled from the monitoring wells in the area of Plant 2 located between Alundum Road and Gill Creek (ARGC Area). A more concentrated and widespread plume of groundwater contamination emanates from the DuPont plant (south of Olin) and has migrated throughout the RFI Study Area. The third plume is migrating from the Solvent Chemical Site. The nature and extent of these plumes are assessed in the RFI.(see Figures 3-11)

The plume of groundwater contamination which appears to be derived from Olin sources consists primarily of benzene, and chlorinated benzene compounds with lower levels of BHCs, chlorinated phenols, methanol and mercury. The highest concentrations of these chemicals at the Olin Plant occur in the A and B Zones within the ARGC Area.

In summary, Olin has concluded that hazardous waste constituents are present in the

fill/soil and groundwater beneath the Plant. The most significant source of Olin generated contaminants is the ARGC Area of Plant 2. Lesser concentrations of these contaminants have been measured in other parts of the Plant. Another significant source of groundwater contamination is a plume that has migrated onto and throughout the Olin Plant from the DuPont Plant to the south.

A list of the Olin-derived hazardous waste constituents which have been detected in the soil or groundwater, and the "groundwater protection standard" for those constituents is included in Table 1.

Table 1
Potential Olin-Derived Hazardous Waste Constituents
Measured in Soil and Groundwater
Olin Niagara Falls Plant

Parameter	*CAS No.*	*Groundwater Protection Standard* (µg/L)
Volatile Organic Compounds		
Benzene	71-43-2	ND
Acid/Base Neutral/Pesticides		
Phenol	108-95-2	5.0
2,4,5-Trichlorophenol	95-95-4	5.0
2,3,4,6-Tetrachlorophenol	58-90-2	5.0
2-Chlorophenol	95-57-8	5.0
Chlorobenzene	108-90-7	5.0
1,2,4-Trichlorobenzene	120-82-1	5.0
m-Dichlorobenzene	541-73-1	5.0
O-Dichlorobenzene	95-50-1	4.7
P-Dichlorobenzene	106-46-7	4.7
α-BHC	319-84-6	ND
β-BHC	319-85-7	ND
δ-BHC	319-86-8	ND
Alcohols		
Methanol	67-56-1	1.8×10^4
Inorganics		
Mercury (total)		2.0

SUMMARY OF REMEDIAL ALTERNATIVES

Olin screened a variety of corrective measures alternatives in the CMS. Those alternatives included: Excavation and Disposal; Capping; Fixation/Stabilization in Place; Physical Containment; and Hydraulic Containment. Each of the potential corrective measures was evaluated for technical feasibility, reliability and time requirements. Based upon the historical data which were developed as a result of the site investigations, the NYSDEC determined that the Final Corrective Measures for the facility should be based upon the use of a "pump and treat" remedial technology to address impacted groundwater, and continued use of infiltration controls (paving) and institutional measures (deed restrictions) to address impacted soils.

SCOPE OF FINAL CORRECTIVE MEASURES

Because of the long-term potential for off-site migration, the NYSDEC determined that impacted groundwater is the primary threat to human health and the environment at the Olin facility. The remedy incorporates groundwater containment and recovery in the bedrock A, B and C Zones and in the overburden, maintenance of existing infiltration controls (caps and pavement) and groundwater monitoring to assess the effectiveness of the remedy. The cleanup objectives are to prevent current and future exposure to impacted groundwater and soils through treatment and/or containment, reduce the migration of contaminants from soil to groundwater, and reduce the migration of contaminants through the groundwater.

The NYSDEC required installation of a groundwater collection and treatment system and paving of soils currently exposed to the weather as the primary remedy to address the contaminated media at the Olin Plant. Details of the proposed remedy are provided below:

At the request of the NYSDEC and the USEPA, Olin developed a Remedial Plan to address Olin-derived soil and groundwater contamination which has been observed at the site. The Remedial Plan sets forth the "remedial goals" which Olin and NYSDEC/USEPA have established to address releases of Olin-derived hazardous constituents; describes the "remedial criteria" which shall be used to insure that the remedial goals will be attained; and requires the development and implementation of a corrective measures program to achieve the remedial criteria.

The Remedial Plan formed the basis for the detailed designs which were prepared prior to implementing the corrective measures. The Remedial Plan also included a monitoring program to assess the performance of the corrective measures and criteria to determine when the remediation is complete.

Components of the Remedy

The components of the remedy are as follows:

i) Paving of exposed soils in the Soils Management Area;

ii) Surface drainage control in the Soils Management Area;

iii) Installation and operation of five downgradient perimeter groundwater recovery wells screened across the A-Zone and the B-Zone (Figure 12);

iv) Installation and operation of five downgradient passive relief wells screened across the A-Zone and the B-Zone (Figure 13);

v) Continued operation of the Olin Production Well; or some alternate pumping system to contain C-zone and the remainder of B-zone groundwater.

vi) Treatment of the recovered groundwater.

The remedy was designed to prevent erosion and fugitive dust emissions of the soils. Through time, any residual contaminants in the soils will leach into the groundwater and subsequently be collected by the groundwater recovery wells.

The remedy for the groundwater includes development and maintenance of "capture zones" in the contaminated aquifers beneath the Plant. These capture zones prevent the continuing spread of the contaminant plumes from the site and should ultimately result in restoration of the aquifers..

To evaluate the effectiveness of the groundwater remedy, Olin has implemented a performance monitoring program that includes hydraulic monitoring to establish the extent and continuity of the hydraulic containment, groundwater quality monitoring to evaluate the changes in groundwater chemistry, and treatment plant effluent monitoring to ensure that discharge limits are achieved. If, after review of the performance monitoring data, the NYSDEC determines that the design or operation of the Remedial System has not been sufficient to achieve the remedial criteria specified below, Olin will be required to modify the system accordingly.

REMEDIAL GOALS AND CRITERIA

REMEDIAL GOALS

The goals for the corrective measures to be implemented at the Olin Plant are:

1) Restrict[1] off-Site migration of Olin-derived hazardous constituents in the overburden and bedrock groundwater beneath the Site.

2) Restrict discharge of Olin-derived hazardous constituents from the groundwater to storm and sanitary sewers and the State Pollution Discharge Elimination System (SPDES) permitted outfalls;

3) Minimize human contact with hazardous constituents in on-Site soils;

4) Minimize the need for future/ongoing remediation and Operation and Maintenance activities by implementing technologies that will be reliable and effective over the long-term;

5) Maintain compatibility among the various remedial efforts and with Plant operations;

6) Reduce the concentration of Olin-derived hazardous constituents within the soil and groundwater to acceptable levels (as defined by State and Federal standards and guidelines) consistent with the use of the property and adjacent property; and

7) Minimize residual risks in terms of volumes, and concentrations of waste remaining following implementation of remedial efforts, and the persistence, toxicity, propensity to bioaccumulate; and mobility of the hazardous constituents in the soil and groundwater.

REMEDIAL CRITERIA

The remedial criteria presented below constitute the specific performance objectives to be targeted during the implementation of the remediation program.

1) Plume Capture - Dissolved Phase: Establish and maintain a groundwater capture zone that extends to the downgradient edge of the on-Site plumes of Olin-derived contamination. At a minimum, the groundwater capture zone for the Overburden and Upper Bedrock Zones (A and B Zones) shall extend from Gill Creek north to Buffalo Avenue and west to Alundum Road. The target extent of groundwater capture for the intermediate Bedrock Zones (C and CD Zones) shall extend from Gill Creek north to Buffalo Avenue and west to western boundary of Plant 1. Groundwater contamination in the C and CD zones is addressed under a consent order with the DuPont facility adjacent

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[1] The definition of the word "restrict", as used in this document, is to eliminate significant off-site discharge or migration to the maximum extent possible or technically feasible.

to Olin. Containment of that contamination is required in a consent order between NYSDEC and DuPont. The containment is required by means of pumping, utilizing the Olin production well and associated treatment facilities, all of which are located on the Olin Plant. Under the proposed Remedial Plan, Olin will monitor the extent of the C and CD capture zones relative to the target capture zone and document results in quarterly and annual reports.

In the event that the NYSDEC releases DuPont from its obligation to utilize the Olin Production Well to remediate DuPont-derived groundwater contamination, Olin shall, if requested by the NYSDEC, evaluate the risks associated with the presence of Olin-derived compounds in the C and CD Zones at the Plant. The evaluation of the need for remediation resulting from this assessment of risk posed by Olin-derived compounds will be made in consideration of the remaining risk posed by residual compounds from other sources, including any that remain from DuPont contaminants. If, based upon that risk assessment, the NYSDEC determines that continued remediation of formerly captured zones is required to address the presence of Olin-derived compounds, Olin shall assume the responsibility for C and CD Zone remediation until the termination criteria specified in Section 8.1 or Section 8.3 of the Remedial Plan have been satisfied for the C and CD Zones for these Olin-derived compounds.

The intent of the groundwater capture zones shall be to control the movement of groundwater so as to prevent off-Site migration of Olin-derived hazardous constituents (excluding migration beneath the DuPont Niagara Plant situated between Olin Plant 1 and Plant 2), and to restore the groundwater quality of those aquifers.

If future performance monitoring data indicate that Olin-derived contaminants are migrating beyond these capture zones, the capture zones may need to be expanded.

2) Cleanliness Standards: Restore the quality of the on-Site Overburden and B, C, and CD Zone aquifers to levels at or below the Groundwater Protection Standards set forth in Table 1.1

Targeted reductions in the concentration of Olin-derived hazardous constituents are 50 percent after ten years of remedial system operation and 75 percent after 15 years of operation. If the targeted reductions in the concentration of Olin-derived hazardous constituents in the on-site plumes are not achieved, the NYSDEC may require Olin to evaluate whether a substantial reduction in risks would be achieved by modifying the remedial system to speed-up the rate of constituent reduction. Thereafter, if based on that risk assessment, the NYSDEC determines that the rate of constituent reduction should be increased, Olin may be required to modify the remedial system.

In the event that recoverable quantities of Olin-derived non-aqueous phase liquids (NAPL) are documented at the site, Olin may be required to modify the remedial system to address the presence of the NAPL.

3) Treatment and Discharge: On-Site groundwater collected pursuant to the Remedial Plan shall be treated and discharged in compliance with the requirements of the NYSDEC SPDES Program.

Institutional Controls

In order to minimize the impacts of the soil and groundwater ~~contamination~~ on the surrounding community Olin must:

1) Maintain the integrity and effectiveness of the pavement which covers the plant site.

2) Restrict public access to the facility.

3) Place a formal notification on the deed to the Plant property, or on some other instrument which is normally examined during title search, that will in perpetuity notify any potential purchaser of the property that:

   (I) the land has been used to manage hazardous waste;

   (ii) its use may be restricted under 6NYCRR Part 373-2.7., as if it were a "hazardous waste disposal facility."

EVALUATION OF THE REMEDY

The NYSDEC has determined that the selected corrective measures are sufficiently protective of human health and the environment. In 1997, the NYSDEC and Olin entered into an Order on Consent which required Olin to design and implement the remedy.

The following section profiles the performance of the remedy with the four general standards and five remedial decision factors which the NYSDEC used to evaluate the efficacy of the remedy.

1. Overall Protection. The proposed remedy extracts groundwater and treats it to remove contaminants thereby reducing the risks of direct contact and minimizing the migration of contaminants from the site. Maintenance of the existing paving network will minimize the amount of groundwater which will need to be recovered from the overburden and will prevent wind-blown or surface water transport of contaminated soils.

2. Attainment of Media Cleanup Standards. The proposed remedy includes attainment of Federal and State groundwater standards as a remedial goal. Termination of the remedial program will only be possible when the standards are achieved or when the risks posed by

any residual groundwater contamination are below accepted levels. Because the proposed remedy involves treatment of collected groundwater, discharge of the treated water must be in compliance with applicable regulations and/or permits.

3. Controlling the Sources of Releases. Historical data indicate that the proposed remedy will be effective in reducing, to the maximum extent practicable, further migration of contaminants in groundwater. The proposed remedy will remove contaminated groundwater before it migrates beyond the facility boundary.

4. Compliance with Waste Management Standards. The removal of groundwater and its treatment complys with the applicable requirements for the management of generated wastes. This compliance assures that the management of wastes is conducted in a protective manner.

5. Long-term Reliability and Effectiveness. Historical operations of similar remedial systems in the Niagara Frontier indicate that the technology of the proposed remedy is effective and reliable on a long-term basis.

6. Reduction of Toxicity, Mobility or Volume of Wastes. The remedy should reduce the mobility, volume and, hence, the toxicity of the hazardous constituents via the removal of impacted groundwater from the site.

7. Short-term Effectiveness. Historical operations of similar remedial systems in the Niagara Frontier indicate that the technology of the remedy is effective and reliable on a short-term. The Remedial Plan contains provisions to modify the system if the specified remedial criteria are not being achieved.

8. Implementability. The proposed remedy was readily implemented.

9. Cost. Historical operations of similar remedial systems in the Niagara Frontier indicate that the technology of the remedy is cost effective. The Remedial Plan contains a provision which requires Olin to provide appropriate financial assurance for the long-term operation of the remedial system.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

__✓__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the

designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):_____

Performance Monitoring

Olin currently performs routine monitoring of select groundwater monitoring wells and extraction wells to evaluate the performance of the remedial system. During each monitoring event, the hydraulic performance of the system is evaluated to determine if the system is operating in accordance with the intent of the system's objective. In addition, during each monitoring event chemical analysis of groundwater samples from select wells is performed. Groundwater samples collected from monitoring and extraction wells are analyzed for VOC's, ad SVOC's according to USEPA SW-846 Methods . An evaluation of the groundwater chemistry is also used to determine if the system is operating in accordance with the intent of the system's objective.

The review of the hydraulic response in the overburden and bedrock monitoring zones due to the operation of the remedial system indicates that the system is operating in accordance with the design objectives. There is a consistent and significant overlap of the cone-of-depression and the contaminant plume at the facility. Groundwater flow directions have remained relatively consistent since start-up of the groundwater recovery system in December 1997. (Representative Figures are attached.)

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_____ If yes - continue after identifying potentially affected surface water bodies.

_✓____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):____**See discussion above.**__

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1)

the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):_____

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):_____

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__✓__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):____**See discussion above. Monitoring wells are shown on attached Figure 12, Figure 13 and Figure 14. (Details in the Remedial Plan and in Quarterly Reports.)**

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

__✓__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the _**Olin Facility**, EPA ID #__**NYD002123461**_, located at **Niagara Falls, NY**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by (signature) William E Wertz Date 9/18/2000
(print) William E. Wertz, Ph.D.
(title) Senior Engineering Geologist

Supervisor (signature) Paul J. Merges Date 9/ /2000
(print) Paul J. Merges, Ph.D.
(title) Director, Bureau of Radiation & Hazardous Site Management
(EPA Region or State) NYSDEC

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Rationale and Reference(s):____**See discussion above. Monitoring wells are shown on attached Figure 12, Figure 13 and Figure 14. (Details in the Remedial Plan and in Quarterly Reports.)**

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

__✓__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the _**Olin Facility**, EPA ID #__**NYD002123461**_, located at **Niagara Falls, NY**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by (signature) William E Wertz Date ___9/18/2000___
(print) William E. Wertz, Ph.D.
(title) Senior Engineering Geologist

Supervisor (signature) Paul J. Merges Date 9/ /2000
(print) Paul J. Merges, Ph.D.
(title) Director, Bureau of Radiation & Hazardous Site Management
(EPA Region or State) NYSDEC

Locations where References may be found:

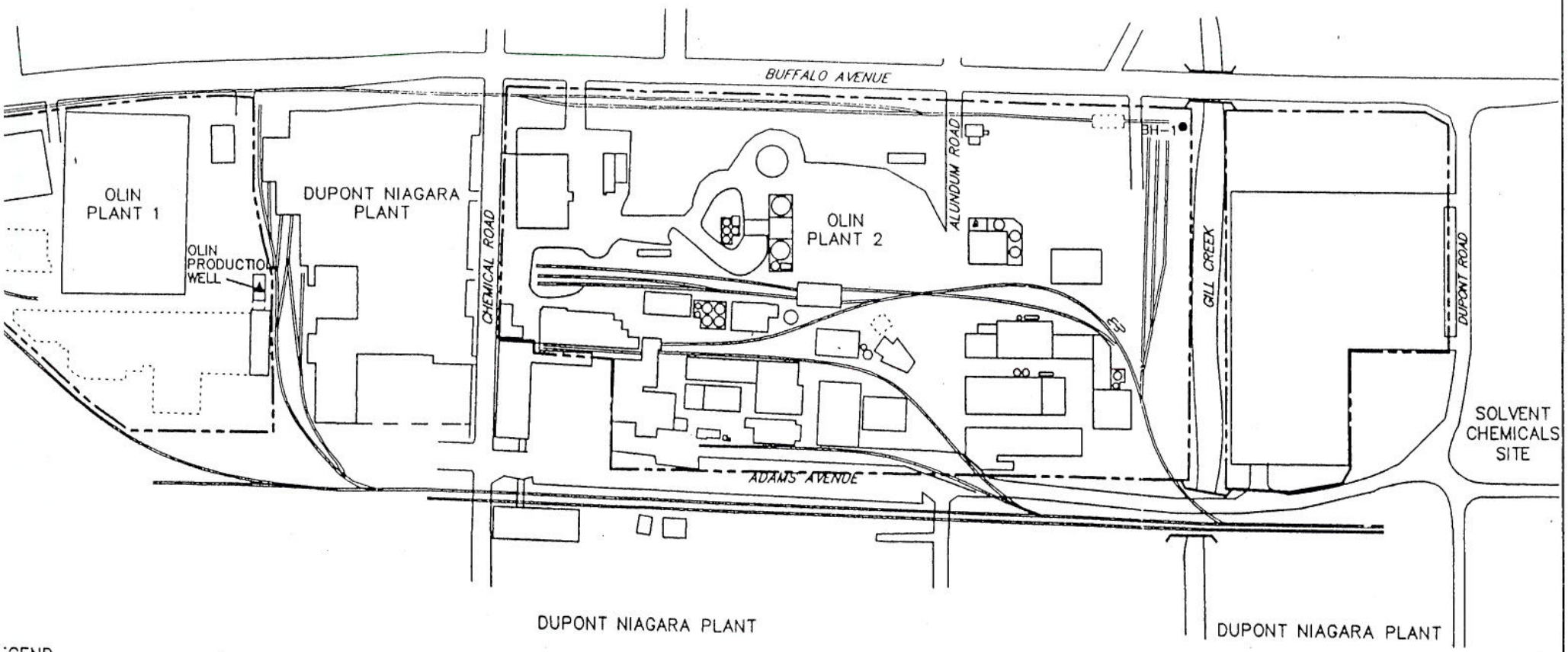
NYSDEC
Division of Solid and Hazardous Materials
50 wolf Road
Albany NY 12233

Contact telephone and e-mail numbers

(name)	William E. Wertz, Ph.D.
(phone #)	(518) 457-9253
(e-mail)	wewertz@gw.dec.state.ny.us

Note: Figures are attached as a separate file: **OlinEIFig**.pdf

200ft



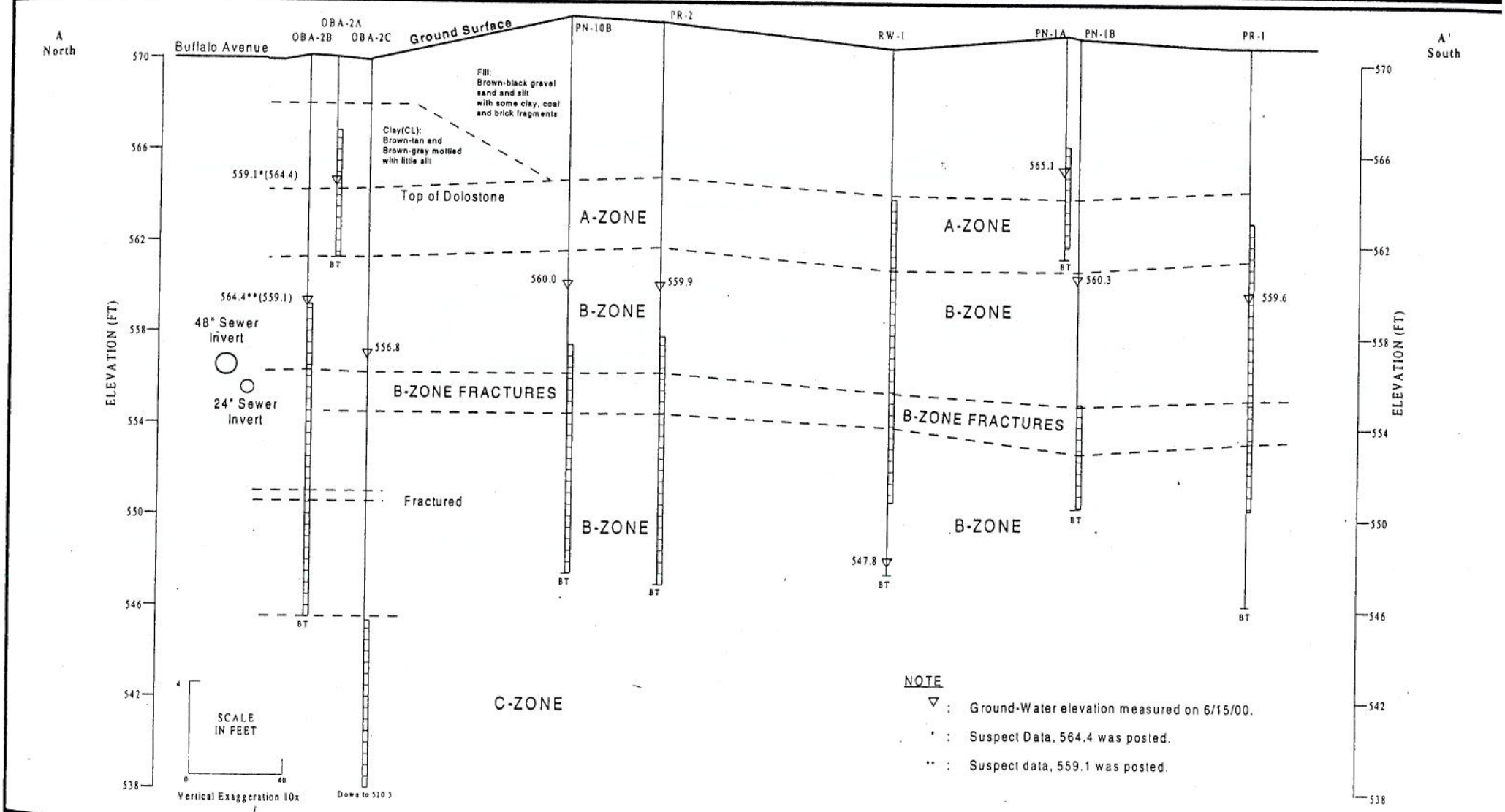
GEND

PROPERTY LINE

figure 1.

SITE LAYOUT
OLIN CORPORATION
Niagara Falls, New York

(NF) REV.0 (P-05)

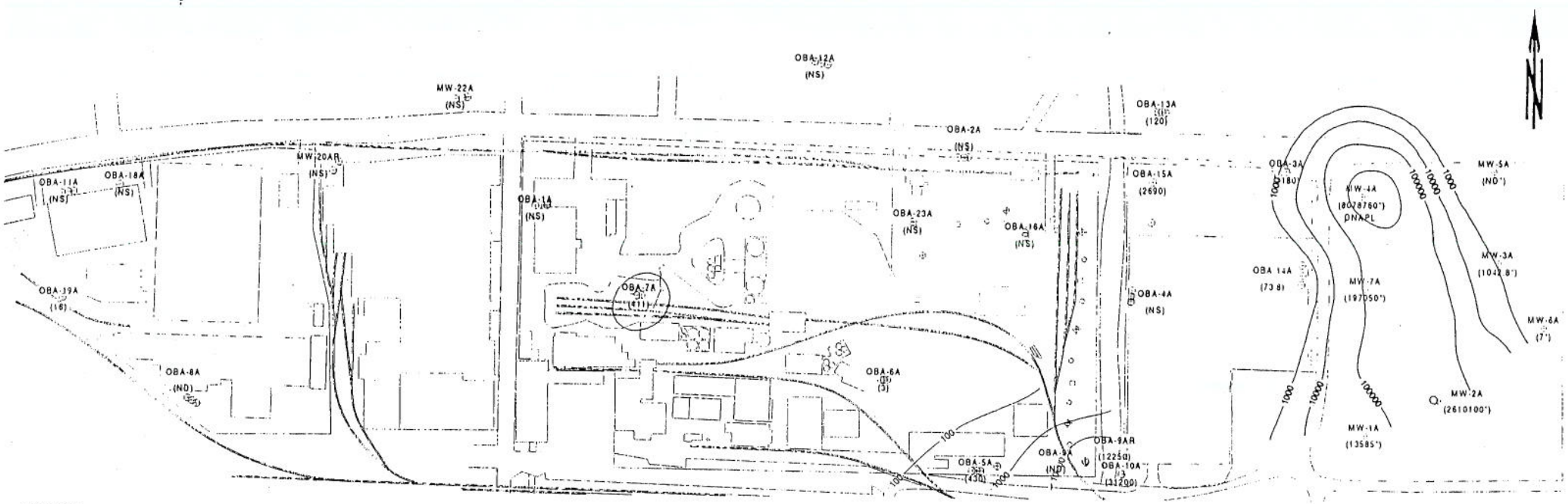


OLIN CHEMICAL
NIAGARA FALLS, NEW YORK

LAW
LAWGIBB Group Member

Hydrogeologic Cross Section AA'

Figure 2



LEGEND:

- ⊕ Monitoring Well
- (1700): Concentration (ug/L); November, 1998.
- (ND): Not Detected.
- (NS): Not Sampled. Insufficient volume of ground water to collect sample.
- ——— Isoconcentration Contour. Olin November, 1998 data.
- ——— Isoconcentration Contour, Olin November, 1998 and Solvent chemical June, 1997 data.
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

Concentrations are total of Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, and 1,2,4-Dichlorobenzene.

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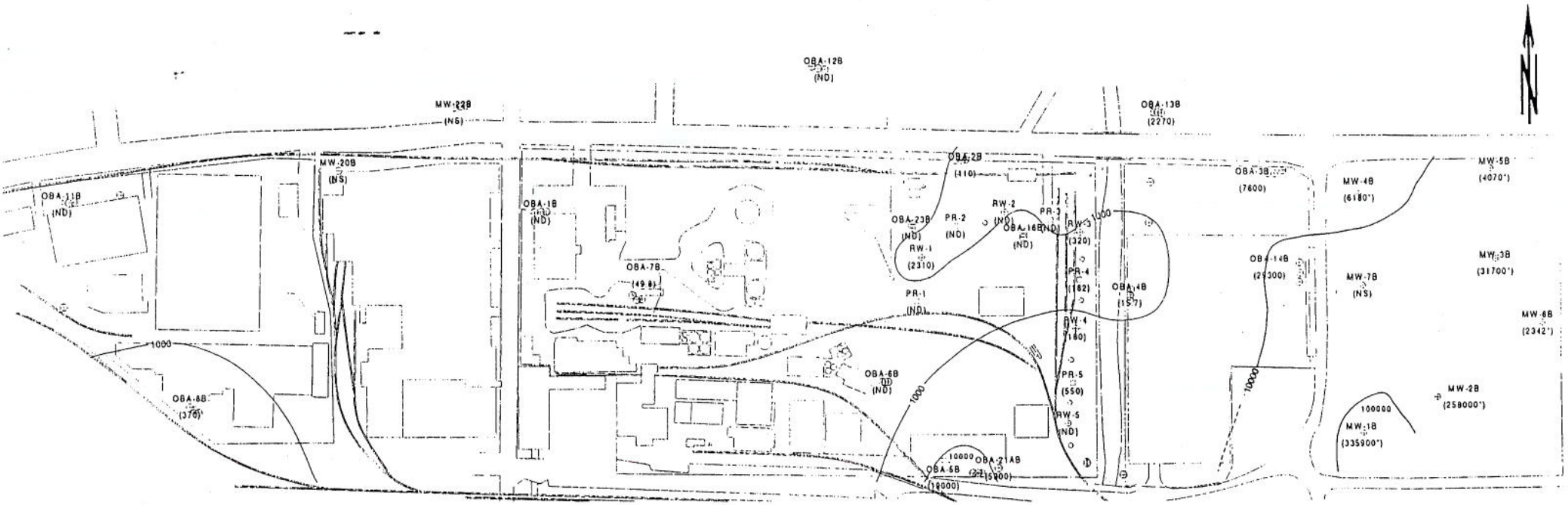
ENGINEERING AND ENVIRONMENTAL SERVICES

TOTAL MAJOR AROMATICS
ISOCONCENTRATION CONTOUR MAP
A ZONE

Job No.: 12000-8-0030

Figure 3



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- ——— Isoconcentration Contour, Olin November, 1998 and Solvent chemical June, 1997 data.
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

Concentrations are total of Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, and 1,2,4-Dichlorobenzene.

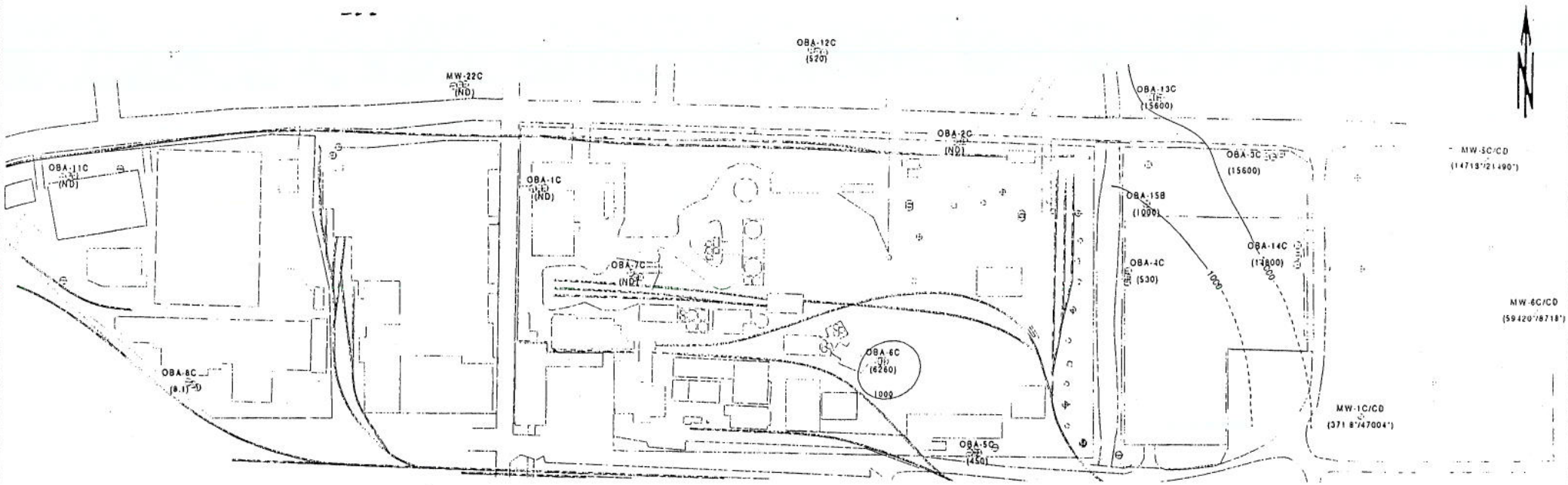
OLIN CHEMICAL
NIAGARA FALLS, NEW YORK

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

TOTAL MAJOR AROMATICS
ISOCONCENTRATION CONTOUR MAP
B ZONE

Job No.: 12000-8-0030

Figure 4



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- (NS): Not Sampled. Insufficient volume of ground water to collect sample.
- ——— Isoconcentration Contour. Olin November, 1998 data.
- ——— Isoconcentration Contour, Olin November, 1998 and Solvent chemical June, 1997 data.
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 Inch = 200 feet

Concentrations are total of Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, and 1,2,4-Dichlorobenzene.

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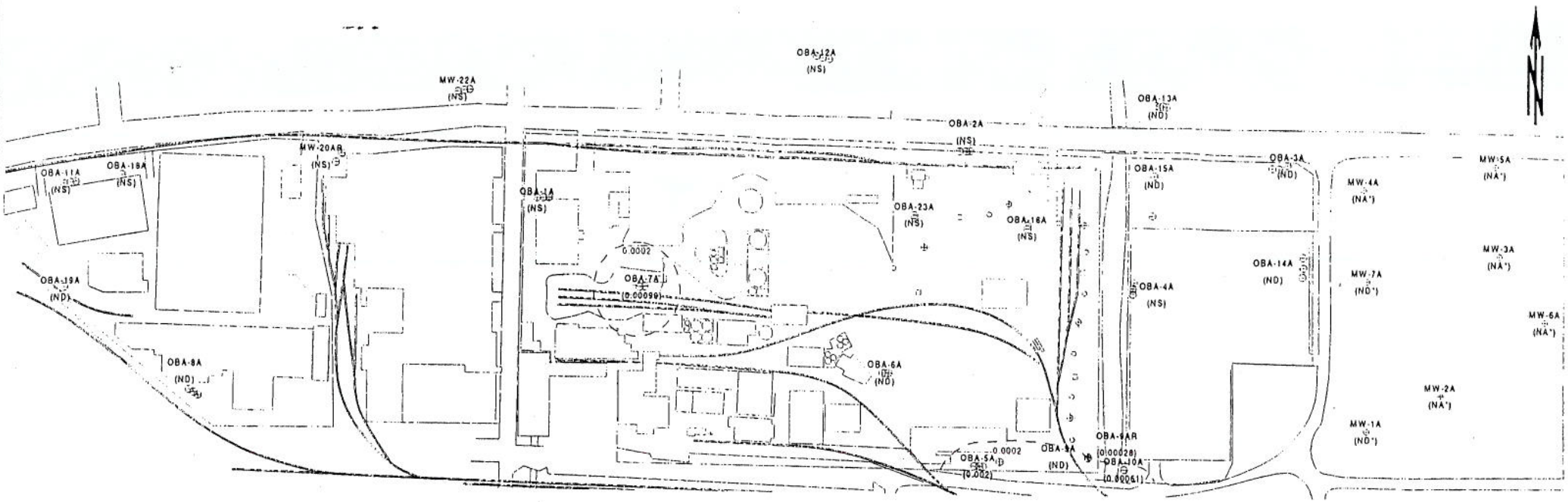
TOTAL MAJOR AROMATICS
ISOCONCENTRATION CONTOUR MAP
C AND CD ZONE

Job No.: 12000-8-0030

Figure 5



LEGEND:

- ⊖ Monitoring Well
- (0.00061): Concentration (mg/L); November, 1998
- (ND): Not Detected. Detection Limit: 0.0002 mg/L.
- (NS): Not Sampled. Insufficient volume of ground water to collect sample.
- (NA): Not Analyzed.
- – – – – MCL mercury 0.0002 mg/L.
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

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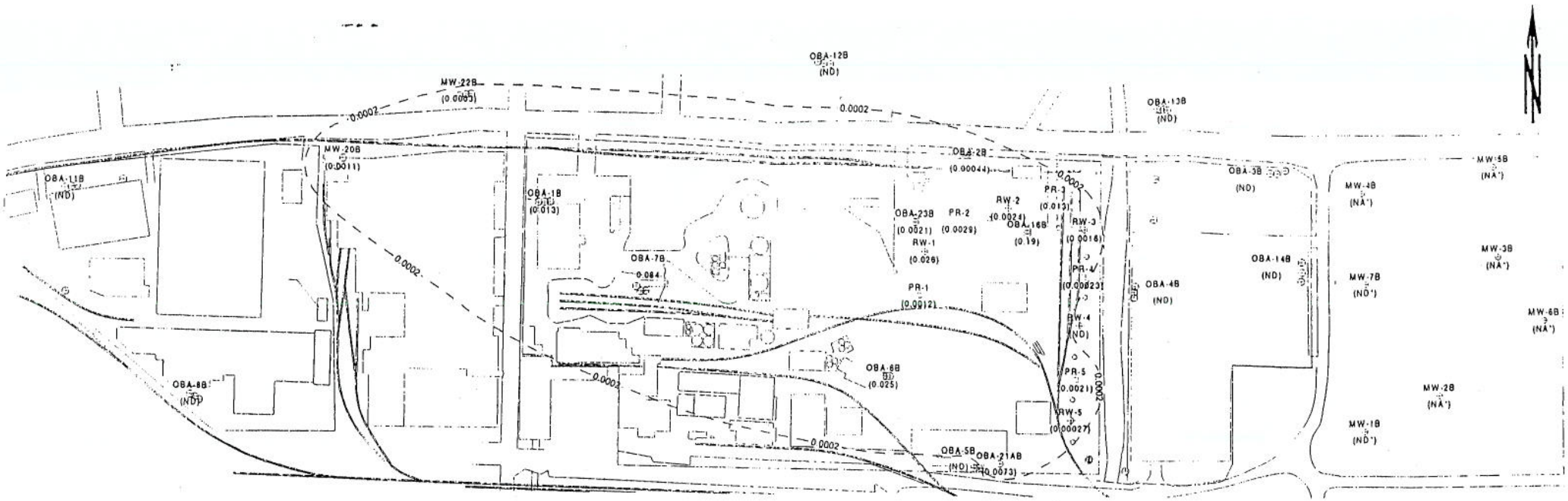
NIAGARA FALLS, NEW YORK

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

DISSOLVED MERCURY CONCENTRATIONS
A ZONE

Job No.: 12000-8-0030

Figure 5



LEGEND:

- ⊖ Monitoring Well
- (0.084): Concentration (mg/L); November, 1998
- (ND): Not Detected. Detection Limit: 0.0002 mg/L
- (NS): Not Sampled. Insufficient volume of ground water to collect sample.
- (NA): Not Analyzed.
- — — — MCL Mercury (0.0002 mg/L)
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

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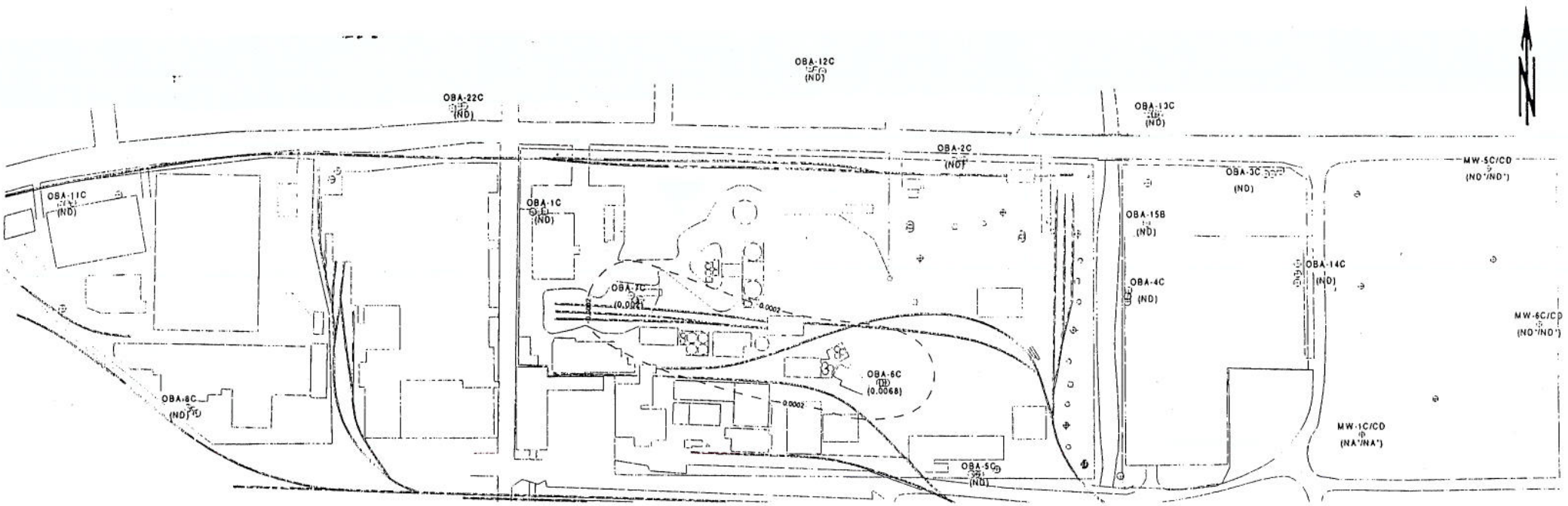
LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

DISSOLVED MERCURY CONCENTRATIONS
B ZONE

Job No.: 12000-8-0030

Figure 7



LEGEND:

⊕ Monitoring Well

(0.0068): Concentration (mg/L); November, 1998

(ND): Not Detected (Detection Limit: 0.0002 mg/L)

(NS): Not Sampled. Insufficient volume of ground water to collect sample.

(NA): Not Analyzed.

— — — MCL Mercury (0.0002 mg/L)

*: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

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NIAGARA FALLS, NEW YORK

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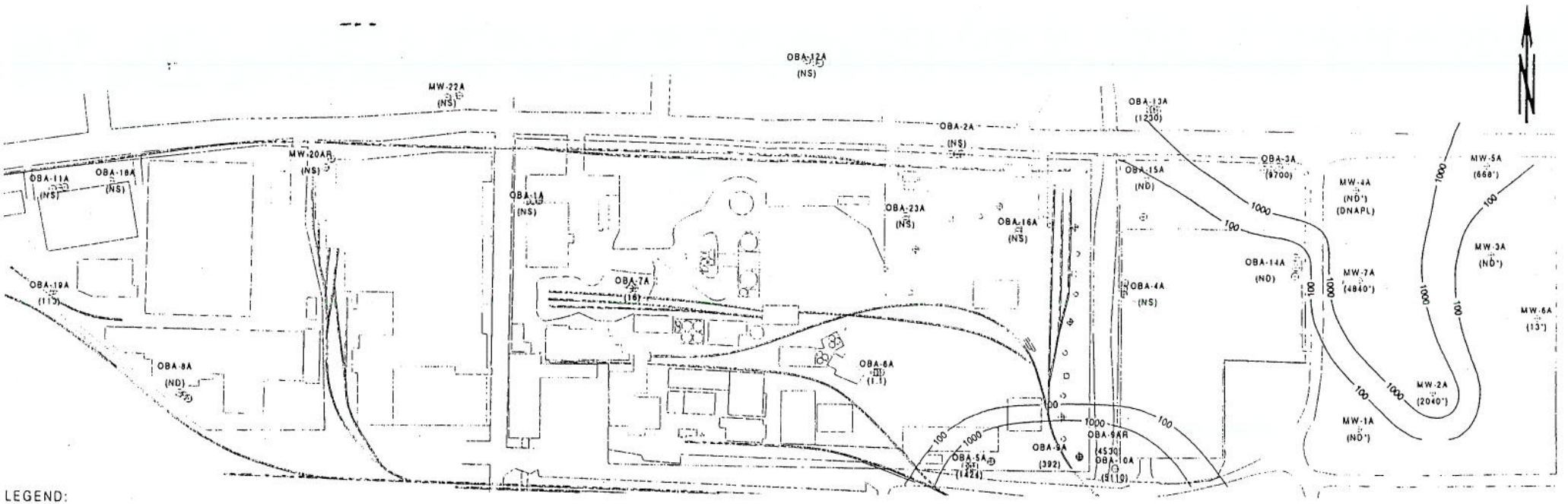
ENGINEERING AND ENVIRONMENTAL SERVICES

DISSOLVED MERCURY CONCENTRATIONS
C AND CD ZONE

Job No.: 12000-8-0030

Figure 8



LEGEND:

- ⊖ Monitoring Well
- (1700): Concentration (ug/L); November, 1998.
- (ND): Not Detected.
- (NS): Not Sampled. Insufficient volume of ground water to collect sample.
- ——— Isoconcentration Contour. Olin November, 1998 data.
- ——— Isoconcentration Contour, Olin November, 1998 and Solvent chemical June, 1997 data.
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

Concentrations are total of Tetrachloroethene, Trichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,1-Dichloroethene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, and vinyl chloride.

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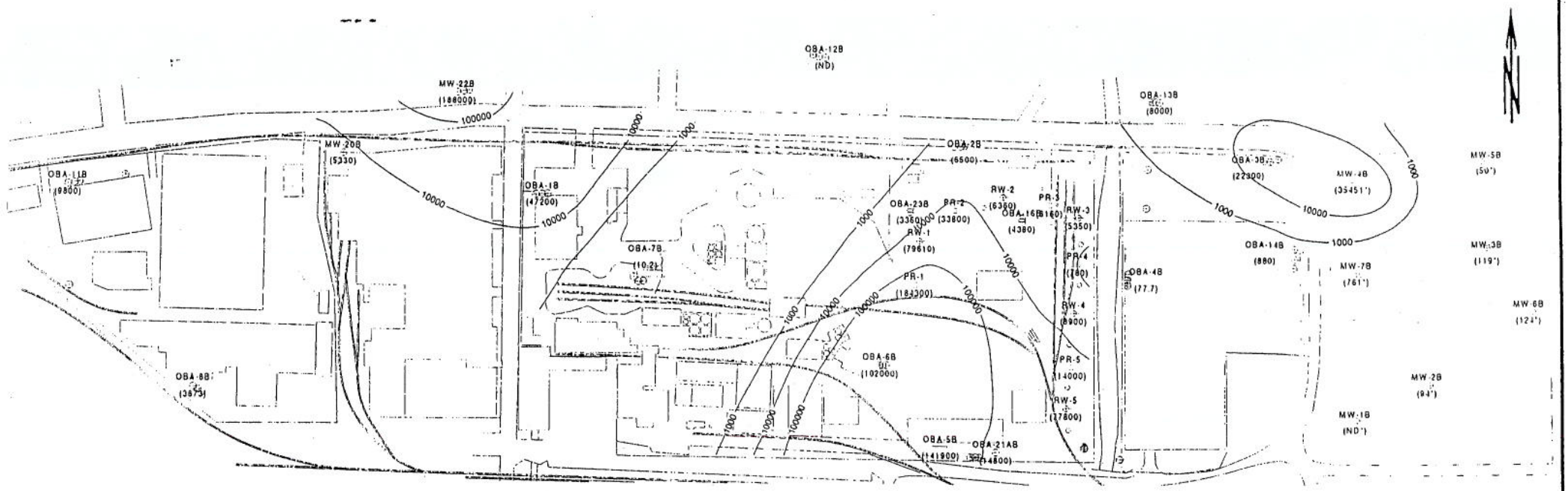
TOTAL CHLORINATED ALIPHATICS
ISOCONCENTRATION CONTOUR MAP
A ZONE

Job No.: 12000-8-0030

Figure 9



LEGEND:

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- (1700): Concentration (ug/L); November, 1998.
- (ND): Not Detected.
- (NS): Not Sampled. Insufficient volume of ground water to collect sample.
- ——— Isoconcentration Contour. Olin November, 1998 data.
- ——— Isoconcentration Contour, Olin November, 1998 and Solvent chemical June, 1997 data.
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

Concentrations are total of Tetrachloroethene, Trichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,1-Dichloroethene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, and vinyl chloride.

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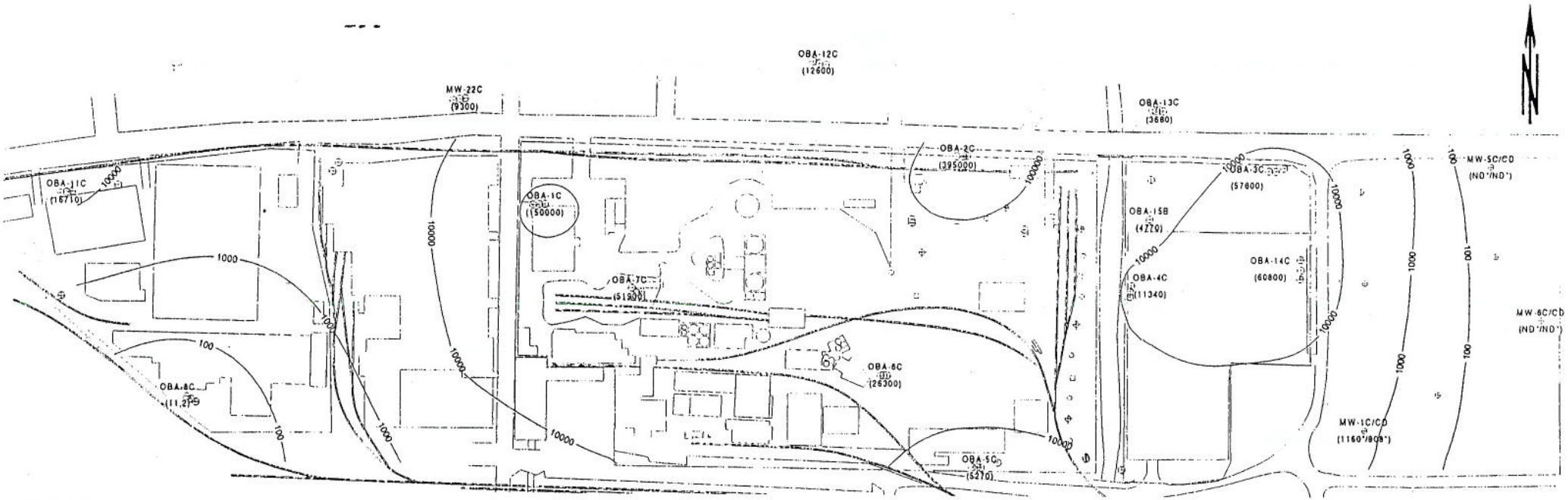
TOTAL CHLORINATED ALIPHATICS
ISOCONCENTRATION CONTOUR MAP
B ZONE

Job No.: 12000-8-0030

Figure 1-0



LEGEND:

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- (1700): Concentration (ug/L); November, 1998.
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- (NS): Not Sampled. Insufficient volume of ground water to collect sample.
- ——— Isoconcentration Contour. Olin November, 1998 data.
- ——— Isoconcentration Contour, Olin November, 1998 and Solvent chemical June, 1997 data.
- *: Solvent chemical data (MW-1 through MW-7) from June, 1997.

0 200 400

Scale 1 inch = 200 feet

Concentrations are total of Tetrachloroethene, Trichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,1-Dichloroethene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, and vinyl chloride.

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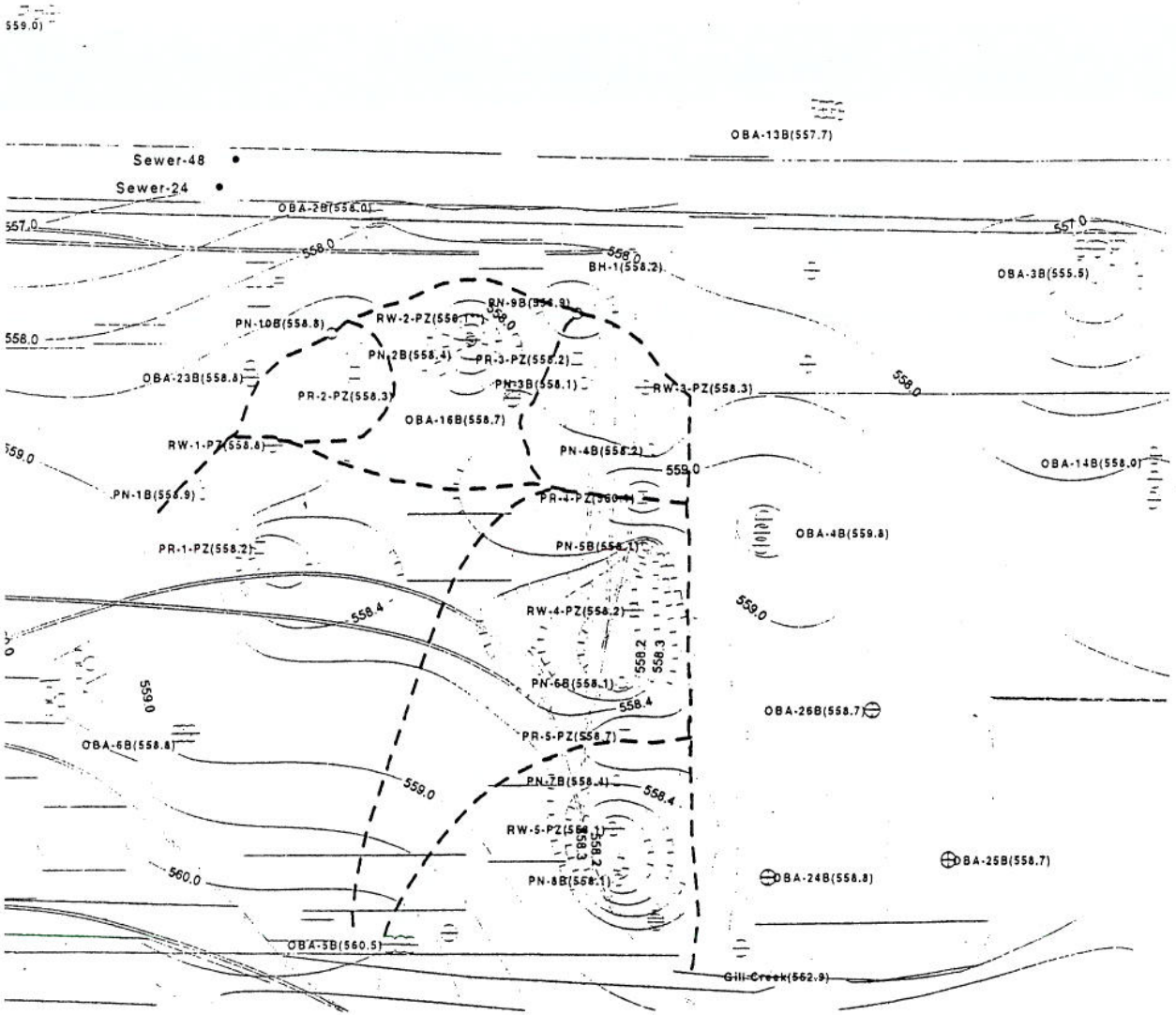
TOTAL CHLORINATED ALIPHATICS
ISOCONCENTRATION CONTOUR MAP
C AND CD ZONE

Job No.: 12000-8-0030

Figure 11



Well	Average Flow Rate(gpm)*
RW-1	0.0
RW-2	1.4
RW-3	5.3
RW-4	17.0
RW-5	21.3

*: Averaged using daily flow rates since previous monthly field measurements.

LEGEND

- ◇ GILL CREEK MONITORING POINT
- ▲ OLIN PRODUCTION WELL (FLOW RATE FROM DUPONT)
- ⊖ WATER QUALITY MONITORING WELLS
- ⊃ A/B ZONE PIEZOMETER NESTS
- ⊖ GROUND WATER RECOVERY WELLS (FLOW RATE FROM OMNX SYSTEM)
- ⊏ PASSIVE RELIEF WELLS
- ● SEWER INVERT ELEVATION
- PROPERTY LINE
- 565 ESTIMATED GROUND-WATER CONTOUR LINES (CONTOUR INTERVAL: 0.5 FEET)
- ESTIMATED CAPTURE ZONE BOUNDARY

0 120 240

Scale 1 inch = 120 feet

NOTE

*: Elevation not used in contourng.
**: RW-2-PZ was set at 556.1 due to obstacle inseide well.
▲ Olin Production Well.
● Suffalo Avenue Sewer invert is assumed to be a ground-water sink. The piezometric surface is not kr
The ground water conturs were estimated based on the sewer invert elevation.
PN-2S elevation used as dummy points north of RW-2.

Three water level measurements were obtained in Gill Creek throughout the day at 10:07 am (562.9 f
12:50 pm (562.9 feet), and 15.25 pm (562.7 feet). The Gill Creek elevation was not used in contourn
the B zone but is included on the map for comparative purposes.

POTENTIOMETRIC SURFACE CONTOUR GENERATED USING SURFER FOR WINDOWS BY GOLDEN SOFTWARE, INC. 1999. CAPTURE ZONE BOUNDARY WAS DRAWN BASED THE FLOW PATHLINES GENERATED BY GWPATH.

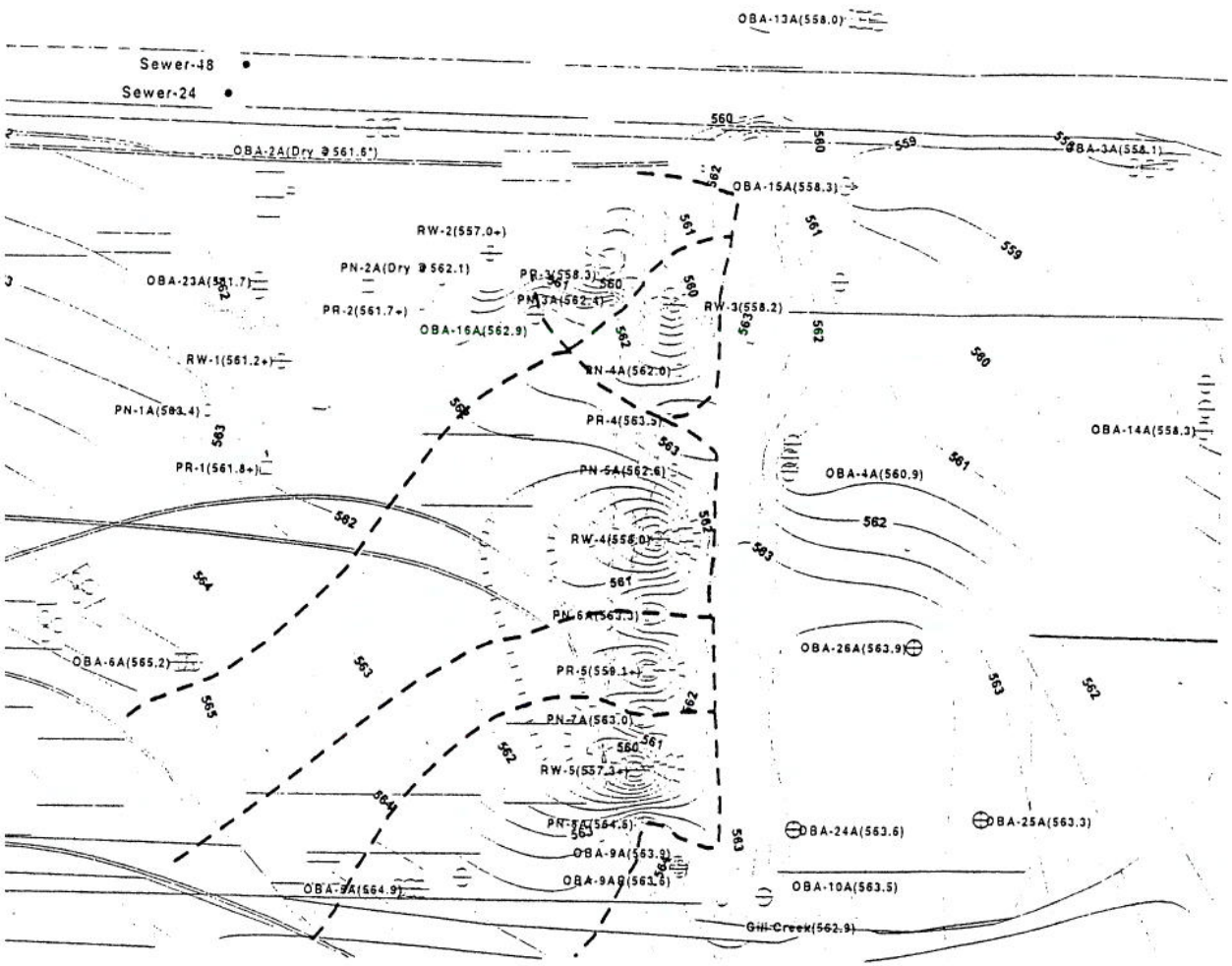
OLIN CHEMICAL
NIAGARA FALLS, NEW YORK

LAW
LAWGIBB Group Member

ESTIMATED CAPTURE ZONE AND POTENTIOMETRIC SURFACE -- B ZONE (DECEMBER 2, 1999)

Job No.: 12000-8-0030

Figu



Well	Average Flow Rate (gpm)*
RW-1	0.0
RW-2	1.4
RW-3	5.3
RW-4	17.0
RW-5	21.3

*: Averaged using daily flow rates since previous monthly field measurements.

LEGEND

- GILL CREEK MONITORING POINT
- OLIN PRODUCTION WELL (FLOW RATE FROM DUPONT)
- WATER QUALITY MONITORING WELLS
- A/B ZONE PIEZOMETER NESTS
- GROUND WATER RECOVERY WELLS
- PASSIVE RELIEF WELLS
- SEWER INVERT
- PROPERTY LINE
- 565 — ESTIMATED GROUND-WATER CONTOUR LINES (CONTOUR INTERVAL: 0.5 FEET)
- ESTIMATED CAPTURE ZONE BOUNDARY
- ESTIMATED DRY AREA IN ZONE A

0 120 240

Scale 1 inch = 120 feet

NOTE

*: Well dry, elevation of bottom of A-Zone used in contouring.
-: Bottom of A-Zone elevation used in contouring.
● Buffalo Avenue Sewer invert is assumed to be a groundwater sink.
The piezometric surface is estimated as the bottom of the A-zone
The bottom of the A-zone along Buffalo Avenue was estimated from borings OBA-1A, OBA-2A, OBA-3A, and OB

Three water level measurements were obtained in Gill Creek throughout the day at 10:07 am (562.9 feet), 12:50 pm (562.9 feet), and 15:25 pm (562.7 feet). The Gill Creek elevation (562.9 feet) coinciding with the time water level measurements were obtained in the piezometers along Gill Creek was used in contouring in A zone.

TENTIOMETRIC SURFACE CONTOUR GENERATED USING SURFER FOR WINDOWS BY GOLDEN SOFTWARE, INC. 1995. CAPTURE ZONE BOUNDARY WAS DRAWN BASED THE FLOW PATHLINES GENERATED BY GWPATH.

OLIN CHEMICAL
NIAGARA FALLS, NEW YORK

LAW
LAWGIBB Group Member

ESTIMATED CAPTURE ZONE AND POTENTIOMETRIC SURFACE -- A ZONE (DECEMBER 2, 1999)

Job No.: 12000-8-0030

Figure 12

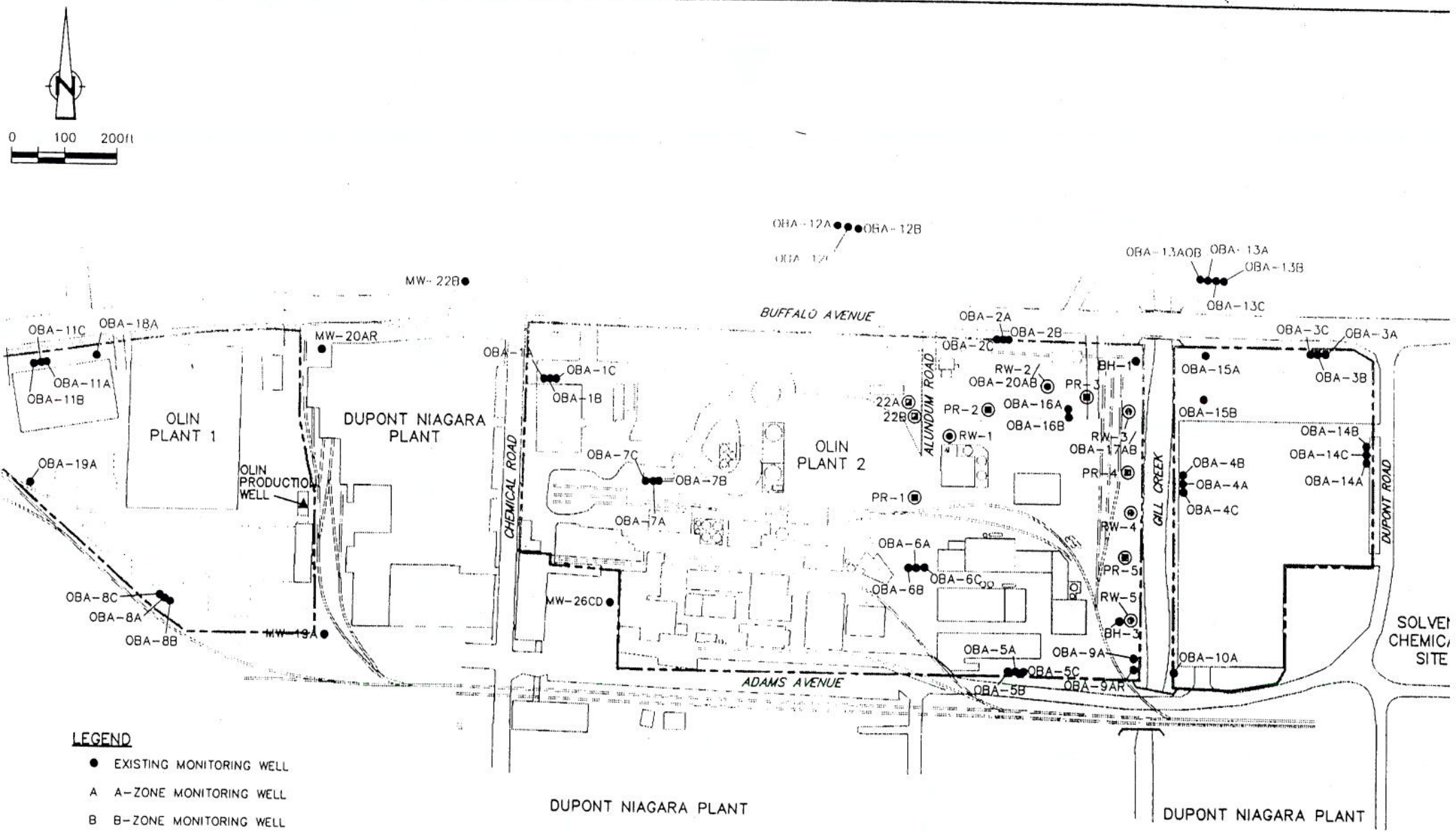


figure 14

HYDRAULIC HEAD PERFORMANCE MONITORING WELLS
OLIN CORPORATION
Niagara Falls, New York