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New York State Department of Environmental Conservation

MEMORANDUM

TO: Jim Harrington, Bureau of Program Management
FROM: Karen Maiurano, Bureau of Western Remedial Action Karen
SUBJECT: **ROD for OCC Buffalo Avenue Plant, OUs 2 & 3 (Site #9-32-019)**

DATE: February 1, 2000

Attached is the Statement of Basis (SOB) for the Selection of Final Corrective Measures, Occidental Chemical Corporation (OCC), Buffalo Avenue Plant, signed on December 23, 1999. The SOB was prepared under the RCRA program by the Division of Solid and Hazardous Materials (DSHM) to document the agency's final decision on Final Corrective Measures for soil and groundwater contamination at the site. This SOB is the Record of Decision equivalent for the final two operable units of the site: OU 2 - On-Site Soils, and OU 3 - Off-Site Groundwater.

During the remedial investigations performed at the site, OCC implemented several Interim Corrective Measures (ICMs), the RCRA program equivalents to Interim Remedial Measures (IRMs).

The ICMs associated with OU 2 - On-Site Soils, include:

- X-Area soil cover (in the DER Tracking System as IRM OU 1A)
- U-Area mercury-contaminated soils removal (tracked as IRM OU 1B)
- NAPL recovery from soils and treatment
- Maintenance of capped and hard surfaced areas

OU 3 - Off-Site Groundwater, is addressed by the bedrock groundwater extraction wells and treatment system component of OU 1 - On-Site Groundwater (construction was completed September 1996) and the interception and treatment of flows from the Falls Street Tunnel by the City of Niagara Falls.

Other ICMs implemented by OCC include:

- Bedrock groundwater extraction wells and treatment system
- NAPL collection from bedrock wells
- Overburden groundwater collection and treatment systems
- Installation of barrier wall along the Niagara River (tracked as IRM OU 1C)

The Final Corrective Measures Study evaluated each ICM for suitability as a component of the Final Corrective Measures for the facility. The DSHM determined that the ICMs collectively meet the objectives of the Corrective Action Program, and combined with a detailed monitoring and response program and appropriate institutional measures, should serve as the basis for Final Corrective Measures. The DER concurs with DSHM, and issued a concurrence memo to DSHM on June 24, 1999 (copy also attached). The ICMs, combined with the detailed long-term monitoring and response plan set forth in the SOB, meet the objectives of the Inactive Hazardous Waste Disposal Site Remedial Program. The SOB is the equivalent of a No Further Action Record of Decision.

cc w/attach: C. Jackson
M. VanValkenburg, NYSDOH

cc w/o attach: E. Belmore
T. Quinn

New York State Department of Environmental Conservation

MEMORANDUM

TO: Paul Merges, Director, Bureau of Radiation and Hazardous Site Management, DSHM

FROM: Edward R. Belmore, P.E., Director, Bureau of Western Remedial Action, DER

SUBJECT: OxyChem Part 373 Permit Corrective Measures Module CDT for ERB

DATE: June 24, 1999

The BWRA has completed review of the June 16, 1999 draft Occidental Chemical Corporation Part 373 Permit Module II - Corrective Action Requirements for Solid Waste Management Units and Areas of Concern.

The Module identifies numerous NYSDEC- approved Interim Corrective Measures (ICMs) implemented by Occidental Chemical Corporation over the last several years. These ICMs were designed to mitigate the impacts associated with contamination identified in media at the Buffalo Avenue Plant site. The BWRA concurs that the ICMs should serve as the basis for Final Corrective Measures for the facility.

The Remedial Goals and Remedial Criteria set forth in the Module are consistent with CERCLA remedial goals and remedial criteria. Objectives of the Performance Monitoring Program set forth in the draft Module adequately address the needs of the remedial systems.

The BWRA supports the Final Corrective Measures contained in the draft Module.

cc: C. Jackson
K. Maiurano
W.Wertz

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John P. Cahill
Commissioner

STATEMENT OF BASIS

SELECTION OF FINAL CORRECTIVE MEASURES

OCCIDENTAL CHEMICAL CORPORATION

USEPA ID No. NYD000824482

Buffalo Avenue Plant

Niagara Falls, NY 14302

The New York State Department of Environmental Conservation (Department) has selected the Final Corrective Measures to address the presence of contamination at the Occidental Chemical Corporation Buffalo Avenue Facility (OCC), in Niagara Falls, New York. A public comment period occurred from August 25, 1999 to October 12, 1999 on the draft Statement of Basis and the proposed Final Corrective Measures Permit Module. In addition, the Department conducted a public information meeting on September 25, 1999 and a Legislative Hearing on October 6, 1999 in Niagara Falls, New York, at which Department staff made presentations explaining the investigation that was performed and the process that led to the selection of the proposed Final Corrective Measures.

No public comments on the proposed Final Corrective Measures were received during the public comment period or at the public information meeting other than some minor comments from OCC. The Department determined that the Draft Permit should be modified to incorporate the changes which OCC requested. A summary of OCC's comments and the changes which were made to the Draft Permit are described in the Responsiveness Summary for the Permit. Therefore, the Department has determined that the draft Statement of Basis dated August 25, 1999, as modified to address OCC's comments, shall be the Final Statement of Basis, and the proposed Final Corrective Measures, as modified to address OCC's comments, shall be implemented by OCC as the Final Corrective Measures.

Dated: 12-23-99

By: Stephen Hammond

Stephen Hammond, P.E.
Director
Division of Solid & Hazardous Materials

STATEMENT OF BASIS

Purpose

The purpose of this Statement of Basis is to provide an opportunity for the public to be informed of and participate in the selection of a remedy that addresses the soil and groundwater contamination which has been observed at the Occidental Chemical Corporation Buffalo Avenue Facility (OCC) in Niagara Falls, New York.

This document:

- provides a brief overview of the site history and site investigations which were conducted by OCC;
- identifies the proposed remedy for corrective actions at the facility and the rationale for selection of the remedy;
- describes public review and comments on the proposed remedy and other plausible remedies; and
- provides information on how the public can be involved in the remedy selection process.

It should be noted that, in the draft Statement of Basis, the New York State Department of Environmental Conservation (Department) had selected only a proposed remedy. Changes to the proposed remedy were made based upon comments submitted by the Permittee. There were no other comments on the proposed remedy. After the public comment period ended on October 12, 1999, the Department, in consultation with the U.S. Environmental Protection Agency (USEPA), selected the final remedy for the facility.

This document summarizes information that can be found in greater detail in the administrative record for the facility.

Introduction

This section begins with a brief discussion of the nature and extent of releases of hazardous waste constituents which have been observed at the OCC. It sets forth the "remedial goals" that the Department has established to address those releases and describes the "Final Corrective Measures," which will be used to attain those goals.

Background

RCRA Facility Investigation

OCC has completed the investigation of releases of hazardous waste constituents at the Buffalo Avenue facility. Overburden and bedrock geologic conditions underlying the Plant and adjacent off-site areas have been extensively investigated and are described in the following documents:

- Final SDCP Report - Buffalo Avenue Plant, April 1992
- Off-Site Investigation Summary Report, August 1992
- Off-Site Investigation Program Phase 2 Report, November 1993
- RCRA Facility Investigation Report, January 1995

As a result of the investigation, OCC has concluded that hazardous waste constituents have been released to the fill/soil and groundwater beneath the facility.

The extent of soil and groundwater contamination at the facility is such that the Department considers the entire facility an "Area of Contamination." The most significant sources of contaminants are located in the C-Area, D-Area, F-Area, M-Area, N-Area, U-Area, T-Area and Mercury Cell Area, (Figure II-1). The releases are related to spills and leaks associated with historical and present manufacturing activities.

The hazardous waste constituents which were released to the environment are present in the soil and groundwater as aqueous (dissolved) phase contaminant plumes and as dense non-aqueous phase liquids (DNAPL). A list of the Site Specific Indicators which have been released to the soil and groundwater, their historical range of concentrations and the "groundwater protection standard" for those hazardous waste constituents is included in Table II-1. The distribution of contaminants in the soil and groundwater is depicted on the attached figures.

TABLE II-1
SITE SPECIFIC INDICATORS
BUFFALO AVENUE PLANT

Analytes	Units	Max.	Min.	Mean	Groundwater Protection Standard
Phosphorus, Total Soluble (As P)	μg-P/L	12,000	ND	721	NA
Arsenic	μg/L	11,072	ND	791	25
Mercury	μg/L	5.3	ND	0.17	2
Lead	μg/L	160	MD	19.2	25
Toluene	μg/L	8,400	ND	417	5
2 Chlorotoluene	μg/L	98,000	ND	1,853	5
4 Chlorotoluene	μg/L	8,500	ND	394	5
2,4/2,5-Dichlorotoluene	μg/L	1,800	ND	67	5
2,6-Dichlorotoluene	μg/L	230	ND	10	5
2,3/3,4-Dichlorotoluene	μg/L	830	ND	26	5
2,3,6-Trichlorotoluene	μg/L	230	ND	10	5
2,4,5 Trichlorotoluene	μg/L	160	ND	3.75	5

Analytes	Units	Max.	Min.	Mean	Groundwater Protection Standard
Benzene	µg/L	33,000	ND	2,840	1
Chlorobenzene	µg/L	150,000	ND	2,780	5
1,2-Dichlorobenzene	µg/L	12,000	ND	664	1
1,3-Dichlorobenzene	µg/L	1,300	ND	200	5
1,4-Dichlorobenzene	µg/L	19,000	ND	773	1
1,2,3-Trichlorobenzene	µg/L	5,100	ND	174	5
1,2,3,4-Tetrachlorobenzene	µg/L	1,700	ND	85	5
1,2,4,5-Tetrachlorobenzene	µg/L	515	ND	33	5
Hexachlorobenzene	µg/L	170	ND	4.1	1
Trichloroethylene	µg/L	140,000	ND	4,090	5
Tetrachloroethylene	µg/L	20,000	ND	635	5
2-Chlorobenzotrifluoride	µg/L	3,900	ND	108	5
4-Chlorobenzotrifluoride	µg/L	4,600	ND	217	5
2,4-Dichlorobenzotrifluoride	µg/L	79	ND	2.5	5
3,4-Dichlorobenzotrifluoride	µg/L	76	ND	2.8	5
Hexachlorocyclopentadiene	µg/L	12,000	ND	226	5
Octachlorocyclopentene	µg/L	1,200	ND	23	5
Perchloropentacyclodecane (Mirex)	µg/L	25	ND	0.79	.03
2,4,5-Trichlorophenol	µg/L	160	ND	3.75	1
a-Hexachlorocyclohexane	µg/L	340	ND	19	5
b-Hexachlorocyclohexane	µg/L	180	ND	8.0	5
g-Hexachlorocyclohexane	µg/L	250	ND	3.9	5
d-Hexachlorocyclohexane	µg/L	310	ND	8.4	5
Benzoic Acid	µg/L	150,000	ND	19,129	100
2-Chlorobenzoic Acid	µg/L	5,500	ND	951	5
3-Chlorobenzoic Acid	µg/L	12,000	ND	1,256	5
4-Chlorobenzoic Acid	µg/L	15,000	ND	2,461	5
Chlorobenzaic Acid, Total	µg/L	28,000	ND	4,654	5

Analytes	Units	Max.	Min.	Mean	Groundwater Protection Standard
Chlorendic Acid	Ug/L	12,000	ND	1,780	5

Aqueous phase contamination has been observed in the soils and unconsolidated sediments (overburden) at the facility and in the bedrock. The extent of the aqueous phase plume in the overburden appears to be limited to the facility property. The extent of the aqueous phase bedrock plume is considerably greater. Contamination of the D, C and B Zones (upper 125 feet of bedrock) extends from the facility to the Fall Street Tunnel, approximately 1,800 feet to the north of the facility, and to the New York Power Authority (NYPA) conduit drains which run near the western boundary of the property. The extent of the Overburden and Bedrock DNAPL plumes are largely confined to the site. The stratigraphic setting of the study area and geographic distribution of the contaminant plumes are depicted on Figures II-2 through II-7.

Aqueous phase contamination has also infiltrated into the sanitary sewers and outfall sewers at the facility.

Interim Corrective Measures

During the course of investigating and evaluating site conditions, OCC implemented a number of Interim Corrective Measures (ICMs) designed to mitigate the impacts associated with the observed contamination.

The implemented ICMs include:

Bedrock Groundwater (See Figures II-9, II-10)

- Extraction wells along the downgradient west and northwest Plant property boundaries in the D, C, and B Zones
- NAPL collection from on-site bedrock wells

Overburden Groundwater (See Figure II)

- Flow Zone 1 - Stages 1, 3, and 4 groundwater collection systems
- Flow Zone 3 - Energy Boulevard Drain Tile System (EBDTS)
- Installation of a barrier wall along the Niagara River

Overburden Soil (See Figures II-12, II-13)

- Non-aqueous phase liquids (NAPL) recovery (when sufficient quantity is encountered) and treatment of recovered NAPL
- Capping of dioxin and elemental phosphorus areas and surface drainage control
- Demolition of a former mercury cell processing building and removal of elemental mercury from the soils and fill beneath the building
- Maintenance of capped and existing hard surfaced areas

Corrective Measures Studies

OCC has completed the following Corrective Measures Studies (CMS):

- Corrective Measures Study, Bedrock Groundwater Remediation, August 1992
- Corrective Measures Study, Overburden Groundwater Remediation, January 1994
- Corrective Measures Study, Overburden Soils, August 1996
- Final Corrective Measures Study, November 1998

For the Final CMS, OCC evaluated each ICM for suitability as a component of the Final Corrective Measures for the facility based on the following criteria:

- effectiveness
- implementability
- protection of human health and the environment
- consistency with cleanup goals
- cost effectiveness
- permanence of remedy
- reduction of toxicity, mobility and volume, and
- compliance with State and federal standards and guidelines.

Based on the results of the CMS and performance monitoring data generated as part of the Interim Corrective Measures projects, the Department has determined that:

- **The ICMs implemented for the bedrock groundwater flow regime are capable of achieving the goals of the corrective action program and are protective of human health and the environment.**

  Pumping from the bedrock along the west and northwest Plant property boundaries is an effective way to reduce the chemistry in the bedrock groundwater and to achieve an inward hydraulic gradient toward the Plant boundary. Any bedrock groundwater beneath the Plant is captured by the extraction wells before migrating off-site. Off-site bedrock groundwater adjacent to the Site is drawn back to the extraction wells. Chemicals in the on-site groundwater and adjacent off-site groundwater are removed and treated.

  The hydraulic and chemical monitoring results for the fourth semi-annual optimization period (November 1997 to April 1998) showed that the extraction system is operating effectively. The hydraulic monitoring data showed that hydraulic containment along the Plant boundary has been achieved in the bedrock D, C and B Zones, and in some cases extends well beyond the Plant boundary. The chemical monitoring data obtained from the off-site monitoring wells since pumping commenced in April 1996 have shown that there has been an overall decrease in the total organic SSI concentrations; a decrease attributable to the groundwater containment and extraction.

  The collection of NAPL from on-site bedrock wells has removed significant quantities of NAPL from the bedrock and as a result is helping to remove the source of the chemical presence in the groundwater.

Therefore, the groundwater extraction and treatment system and the NAPL removal program are considered highly effective.

- **The ICMs implemented for the overburden groundwater flow regime are capable of achieving the goals of the corrective action program and are protective of human health and the environment.**

  Collection of overburden groundwater utilizing the three collection components of the Flow Zone 1 collection systems, the Energy Boulevard Drain Tile System (EBDTS), and the on-site sanitary sewer network is a very effective way to reduce the chemical presence in the overburden groundwater and to achieve hydraulic containment along the Plant boundary.

  The Flow Zone 1 collection systems and the EBDTS are perimeter systems that collect overburden groundwater and divert it to either an on-site treatment system or to the City of Niagara Falls Waste Water Treatment Plant (WWTP). These systems also provide hydraulic containment along the Plant boundary in areas where off-site flow of groundwater historically occurred.

  The sanitary sewer network beneath the Plant is not a watertight system and as a result there is the potential for groundwater infiltration into the system. The system has not been remediated to prevent such infiltration as the sanitary sewer system provides a means for collection and treatment of the groundwater. The infiltrated groundwater and associated chemical loading flows to the City of Niagara Falls WWTP and is treated prior to discharge to the Niagara River. Collection of groundwater in the sewers in the middle of the Plant results in considerably less contaminated groundwater migrating across the Plant perimeter.

  Therefore, the collection of groundwater utilizing dedicated groundwater collectors and the sanitary sewer network is highly effective.

  The outfall sewer system is currently monitored under the Plant's SPDES permit. OCC will continue to implement corrective measures to the outfall system as dictated by SPDES monitoring. Previous corrective measures to the outfall system have been very effective in reducing groundwater infiltration. Similarly, the discharge of the sanitary sewer is continuously monitored to confirm that the effluent is within discharge limits set by the City WWTP. Consequently, it is occasionally necessary for OCC to implement corrective measures on the sanitary sewers to address specific groundwater infiltration situations.

- **The ICMs implemented for overburden soils are capable of achieving the goals of the corrective action program and are protective of human health and the environment.**

  The remedy selected to address chemical presence in the overburden soil beneath the Plant includes the following components:

- maintenance of overburden groundwater ICM components;
- deed restrictions;
- institutional controls;
- maintenance of Plant perimeter fence;
- perimeter overburden NAPL monitoring;
- NAPL recovery (when sufficient quantity is encountered) and treatment of recovered NAPL;
- capping of dioxin and elemental phosphorus areas and surface drainage control; maintenance of capped and existing hard surfaced areas; and on-site management of excavated soils.

The selected remedy is effective for restricting the migration of NAPL constituents and elemental phosphorus dissolved in overburden groundwater to off-site areas by capping areas and by recovering NAPL whenever sufficient quantities are encountered. The selected remedy is also effective for restricting the migration of dioxin and phosphorus to off-site areas by wind and surface water run-off vectors by capping affected areas and maintaining cover materials.

The F-Area long-term soil stockpiles are effective for restricting the migration of chemicals in the soils by limiting infiltration via grading and cover materials. The polyethylene cover and liner for the Category B soils further restricts releases of chemicals to the overburden from the stockpiles.

- **The vast majority of off-site contamination is captured and treated either by the Bedrock Groundwater ICM or by the Fall Street Tunnel (FTS). An additional off-site groundwater collection system is not necessary at this time. A groundwater monitoring program is required to determine whether additional off-site remedial programs are required for future protection of human health and the environment.**

Significant Plant-related chemical presence was not detected in the off-site bedrock wells west of the Plant or in a line of wells 1,000 feet north of the Plant. Off-site bedrock groundwater adjacent to the north Plant boundary flows toward and is collected by the bedrock groundwater extraction system. Bedrock groundwater beyond the capture zone of the groundwater extraction system north of the Plant is intercepted by the NYPA conduits drains and the FST, which act as regional groundwater line sinks. All dry weather flow in the FST is treated in the Niagra Falls WWTP. Bedrock groundwater west of the Plant is in the capture zone of the NYPA conduit drains. The NYPA conduit drains act as a groundwater divide and prevent groundwater from flowing further to the west. The conduit drains transport intercepted groundwater to the north where it flows into the FST.

Corrective measures to address the low level chemical presence in off-site bedrock groundwater have not been implemented at this time since the bedrock groundwater extraction system will have a positive and significant effect on the low level off-site bedrock groundwater chemical presence. Monitoring data for the past two years has shown that chemical concentrations in the off-site bedrock groundwater have decreased.

Monitoring data indicate that the bedrock groundwater extraction system is restricting off-site chemical migration, as chemical concentrations are decreasing with time. Off-site chemical presence is being drawn back toward the Plant where it is captured by the extraction system.

Groundwater that is beyond the capture zone will be captured by the NYPA conduit drains or the FST. All dry weather flow in the FST is treated by the Niagara Falls WWTP and has been since October 1993. Wet weather flows (overflow from WWTP) is discharged to the Niagara River under a SPDES Permit. The City is required to monitor wet weather flows twice per month and collect samples when water is present in the overflow.

- **The ICMs, when combined with a detailed monitoring and response program and with appropriate Institutional Measures should serve as the basis for Final Corrective Measures for the Occidental Chemical Corporation Buffalo Avenue Plant.**

  A monitoring program has been implemented at the Plant. Deed restrictions and institutional controls also have been implemented. The institutional controls (SOPs) present procedures to control excavations at the Plant to prevent chemical migration and exposure and ensure groundwater does not remain in potable water mains following repair. Source removal as future NAPL is encountered can be readily implemented as personnel and equipment are available. Exposed soil areas that contain dioxin or elemented phosphorus have been capped with gravel, asphalt or clean topsoil.

  The use of existing corrective measures will protect off-site waters from dissolved Plant NAPL and from contact with hazardous waste constituents in the soil and dissolved elemental phosphorus. Source removal will reduce the mobility of the NAPL by reducing the volume, and monitoring at the Plant perimeter will ensure detection of any off-site migration. Capping will reduce the potential for human contact with dioxin and elemental phosphorus and will restrict the migration of dioxin by wind and surface water run-off vectors. Capping also will reduce the percolation of precipitation through the elemental phosphorus and thereby reduce the generation of dissolved elemental phosphorus in the groundwater. An exposure/environmental risk may exist if the groundwater remedial system should fail, although the technology is reliable and readily controlled. Should the groundwater remedial system fail, the performance monitoring activities will indicate system failure, resulting in the implementation of corrective actions. Deed restrictions, implementation of institutional controls such as SOPs for excavation and water main repair, maintenance of the Plant perimeter fence, and NAPL volume reduction will ensure long-term protection of workers and the public.

<u>Remedial Goals</u>

The corrective action design goals for the remediation of the OCC are as follows:

- Restrict off-site migration of OCC hazardous waste constituents in the bedrock groundwater.
- Restrict off-site migration of OCC hazardous waste constituents in the overburden groundwater.
- Restrict discharge of OCC hazardous waste constituents to the outfalls.
- Restrict unacceptable (as determined by the NYSDEC and the City of Niagara Falls) discharge of OCC hazardous waste constituents to the sanitary sewers.
- Restrict migration of OCC hazardous waste constituents from the overburden to bedrock.
- Minimize human contact with OCC hazardous waste constituents in on-site soils.
- Minimize need for future/ongoing remediation and operation and maintenance activities by implementing solutions or technologies that will be reliable and effective over the long term.
- Maintain compatibility with remedial efforts for specific areas of the Plant (e.g., S-Area and any off-site remediations) and with Plant operations.
- Reduce the concentration of hazardous waste constituents within the soil and groundwater at the Plant with time to acceptable State and federal levels consistent with the use of the property and adjacent property.
- Protect City of Niagara Falls drinking water supply system components at the Plant from releases of hazardous waste constituents.

The definition of "restrict," as used in the above goals, is to eliminate significant off-site discharge or migration of OCC hazardous waste constituents that pose a potential threat to human health or the environment to the maximum extent possible or technically feasible.

These goals will be achieved through implementation of the Corrective Measures program specified herein. Given the magnitude of contamination present at the facility, the Department has determined that cleanup of the soils and groundwater beneath the facility to pre-industrial use conditions is not feasible at this time. Therefore, the primary objective of the Corrective Measures program is to utilize containment technologies to achieve the remedial goals. Because cleanup of the facility will not be feasible for the foreseeable future and because containment of the hazardous waste constituents is necessary for protection of human health and the environment, OCC is herein required to provide financial assurance that will ensure that the specified remedial systems are operated and maintained in perpetuity.

<u>Remedial Criteria</u>

The following general criteria have been established to ensure that the remedial goals are achieved. More detailed criteria are specified in the description of each of the various remedial components.

I. <u>Groundwater</u>

   A. Plume Capture - Dissolved Phase: Establish and maintain groundwater hydraulic barriers that contain the on-site plumes of contamination. The intent of the hydraulic barriers shall be to control the movement of groundwater so as to restrict off-site migration of hazardous waste constituents, and to ultimately restore the groundwater quality of the aquifers.

B. Mobile DNAPL Capture: Establish and maintain a capture zone throughout the area of DNAPL contamination. The primary purpose of the capture zone shall be to prevent the expansion of mobile DNAPL and the highly contaminated groundwater associated with the DNAPL. In addition, the remedial system shall be designed to collect as much DNAPL as is practicable given the present state of such technology.

C. Cleanliness Standards: Restore the quality of the on-site bedrock and overburden aquifers to levels at or below the groundwater protection standards set forth in Table II-1 (see page 2).

D. Treatment and Discharge: On-site groundwater collected pursuant to this Permit shall be treated and discharged in compliance with the requirements of the NYDSEC SPDES Program. On-site DNAPL shall be managed and treated as required by 6NYCRR Parts 370-376.

E. On-Site Soils: Establish and maintain cap and cover systems that preclude the dispersal of the contaminated soil, fill and waste.

II. Off-Site

A. Plume Capture: Establish and maintain a groundwater capture zone that extends from the property boundary outward into the off-site plumes. The intent of the groundwater capture zone shall be to control the movement of off-site groundwater so as to reduce any further degradation of the off-site aquifers, and to restore the groundwater quality of the aquifers.

B. Cleanliness Standards: Restore the quality of the off-site bedrock and overburden aquifers to levels at or below the groundwater protection standards set forth in Table II-1.

Reduce the measured concentration of hazardous waste constituents (as represented by the Site Specific Indicator Parameters in Table II-1) in the off-site contaminant plumes by 50% within ten years after system start-up; by 75% within 15 years after system start-up compared to the concentrations observed during the off-site Investigation (see Figure II-16 and Figure II-17 for background concentrations).

C. Treatment and Discharge: Off-site groundwater collected pursuant to this Permit shall be pretreated, as necessary, and discharged in compliance with the requirements of the NYSDEC SPDES Program.

Corrective Measures Implementation

OCC has implemented a variety of Interim Corrective Measures at the facility. The Department has determined that the most effective and timely way to achieve the remedial goals for the facility is to integrate those Interim Corrective Measures into a comprehensive site-wide remedial program. The Final Corrective Measures are specified herein.

I. <u>Bedrock Groundwater:</u> The Department has determined that the presence of hazardous waste constituents in the bedrock groundwater at the facility (see Table II-1) represents a potential threat to human health and the environment which must be addressed by Corrective Measures. The Department has also determined that the groundwater collection and treatment program which OCC has implemented is the most appropriate technique for long-term remediation of the bedrock groundwater contamination, and that the technique, in conjunction with the other Corrective Measures, is capable of achieving the specified remedial goals. The Corrective Measures Program which OCC must follow to collect and treat the bedrock groundwater contamination at the facility includes:

A. Objectives, Bedrock Groundwater Corrective Measures: The primary goals of the bedrock groundwater remedial system are to restrict off-site migration of hazardous waste constituents in the bedrock groundwater and to reduce the concentration of hazardous waste constituents within the bedrock groundwater with time. To achieve these goals, a hydraulic barrier in the D, C, and B Zones shall be created and maintained along the north and west Plant boundaries by operating a groundwater extraction system. The hydraulic barrier shall extend from the vicinity of Well Cluster 401 northward to the vicinity of Well Cluster 404, and then eastward to the vicinity of Well Cluster 408 (Figure II-8).

B. Groundwater Extraction: The bedrock groundwater extraction system consists of 19 extraction wells (six D Zone wells, six C Zone wells, and seven B Zone wells), a connecting forcemain, and an on-site treatment system. The location of each extraction well nest is shown on Figure II-9.

Operation of the bedrock groundwater extraction and treatment system commenced on April 1, 1996. As discussed in the "One Year Performance Evaluation" dated July 1997, performance monitoring data indicated that the system could not be operated at the desired flow rate due to higher than anticipated vinyl chloride concentrations and the need for an increase in treatment capacity. Therefore, the optimization period was extended in order to make the necessary modifications to the treatment plant. Full-scale operation of the system commenced in January 1999.

Consistent bedrock hydraulic containment has not yet been attained along the north and west Plant boundaries; however, now that the pumping rates have been increased to approximately 1,000 gpm, the Department anticipates that complete on-site hydraulic containment of bedrock groundwater will be achieved. If the performance monitoring data indicate that complete containment is not being achieved, OCC must modify the system accordingly.

C. Groundwater Treatment: Initially, the treatment system consisted of an equalization tank and two sets of three carbon beds in series. In 1998, the treatment system was upgraded to increase treatment efficiency and capacity. The current treatment system consists of an equalization tank, an air stripping/thermal oxidation system, and three sets of two carbon beds in series.

The treatment system must be operated and monitored in accordance with SPDES Permit No. NY0003336 (NYSDEC No. 9-2911-00112/00009-0) or subsequent modifications/renewals thereof.

D. Natural Attenuation: The bedrock groundwater remedial system components collect and treat bedrock groundwater flow at the north and west (downgradient) boundaries of the Plant except the east portion of the north Plant boundary (east of OW408). Concentrations of site-related chemicals in the bedrock groundwater in the eastern downgradient area are low and have been decreasing over time. Therefore, the Department has determined that Monitored Natural Attenuation of the bedrock groundwater in that area is an acceptable remedial approach.

If, by April 2009, natural attenuation fails to reduce the measured concentration of SSI parameters in bedrock groundwater in that area by 50%, or, if by April 2014, natural attenuation fails to reduce the measured concentration of SSI parameters in bedrock groundwater in that area by 75% (compared to OSI sampling results, Figure II-17), the Department may require OCC to take additional measures to remediate bedrock groundwater in that area.

II. Bedrock Non-Aqueous Phase Liquid (DNAPL): A NAPL recovery program has been implemented to provide containment of DNAPL in the bedrock beneath the Plant. The collection and incineration of DNAPL from the bedrock beneath the Plant are consistent with the goal of reduction of the concentration of hazardous waste constituents within the bedrock. The program involves the collection of DNAPL from any bedrock well exhibiting collectable quantities of DNAPL.

Currently, there are only three bedrock wells that exhibit collectable quantities of DNAPL: OW402A, OW413A, and OW417A. The following amounts of DNAPL have been collected from these wells as of the end of 1998:

	Amount of NAPL (gallons)
OW402A	5,746
OW413A	330
OW417A	27

The program to address the presence of NAPL in the bedrock involves NAPL collection and monitoring in 17 A Zone wells as shown on Figure II-10. The schedule for DNAPL monitoring, collection and reporting activities for the bedrock regime is summarized below:

A. All bedrock A Zone wells are checked for DNAPL presence on an annual basis. If DNAPL is detected in an A Zone well, the corresponding B Zone well also is checked for DNAPL.

B. DNAPL is collected on a semi-annual basis from wells OW402A and OW413A. If the volume of DNAPL collected from either well is greater than 100 gallons during any one event, the collection frequency increases to quarterly until the volume collected in one event is less than 50 gallons, after which semiannual pumping resumes.

C. DNAPL is collected from well OW417A on an annual basis. If the volume of DNAPL collected during any one event is greater than 100 gallons, the pumping frequency increases to quarterly until the volume of DNAPL collected in one event is less than 50 gallons, after which annual pumping resumes.

D. Collected DNAPL currently is incinerated at OCC's Liquid Thermal Destruction Unit (LTDU) or shipped off-site for incineration.

E. On an annual basis (due April 1), OCC shall submit a report that describes the results of the DNAPL pumping and observation program which OCC conducted during the previous calendar year, and includes recommendations for future DNAPL collection and monitoring.

F. OCC shall check each of the wells in the Bedrock Monitoring Network for the presence of DNAPL on an annual basis. If DNAPL is observed in a well, OCC shall notify the agencies in writing within 30 days. A proposed DNAPL collection program for the well shall be included with the notification.

Overburden Groundwater

Chemical presence in the overburden groundwater beneath the Plant was extensively investigated during the RFI and earlier investigations. Four overburden groundwater organic chemical plumes were identified beneath the Plant as shown on Figure II-4. These four plumes coincide with the observed presence of DNAPL in the overburden.

I. Objectives Overburden Groundwater Corrective Measures: The primary objectives of the overburden groundwater remedial system are to restrict off-site migration of hazardous waste constituents in the overburden groundwater, to reduce the concentration of hazardous waste constituents within the bedrock groundwater with time, to restrict migration of hazardous waste constituents from the overburden to the bedrock, and to restrict the discharge of hazardous waste constituents to the outfalls. An additional objective is to restrict unacceptable (as determined by the NYSDEC and the City of Niagara Falls) discharge of hazardous waste constituents to the sanitary sewers. Hydraulic containment of the contaminated plumes is the principal remedial approach which will be employed to achieve these objectives (Figure II-11).

II. Groundwater Extraction: The overburden groundwater extraction system shall be comprised of the following components:

A. Stage 1 Collection System (Converted 002 Outfall)
B. Stage 2 Collection System Monitoring
C. Stage 3 Collection System (Drain Tile System Above Stage 1)
D. Stage 4 Collection System (Drain Tile System -Southwest Plant) Energy Boulevard Drain Tile System

III. Groundwater Treatment: At the present time, overburden groundwater from Stage 1, Stage 3 and Stage 4 is treated at the U-Area carbon treatment system. Treatment of that groundwater at the F-Area treatment system requires the written authorization of the Department. The F-Area treatment system must be operated and monitored in accordance with SPDES Permit No. NY0003336 (NYSDEC No. 9-2911-00112/00009-0) or subsequent modifications/renewals thereof.

Overburden groundwater treated by the U-Area carbon treatment system or from the EBDTS is discharged to the sanitary sewer under permit with the City of Niagara Falls (Significant Industrial User Wastewater Discharge Permit No. 22).

IV. Sanitary Sewers: Historic sewer installations at the Plant did not use watertight construction materials and methods. Consequently, groundwater infiltration into the sanitary sewer system occurs. Throughout the late 1970s and to the present, OCC has been upgrading the sewers to improve the quality of the water leaving the Plant. The City of Niagara Falls is aware that infiltration of contaminated groundwater represents a source of chemical loadings to the sewers. The OCC sanitary systems currently operate within the discharge limits established by the City of Niagara Falls (Significant Industrial User Wastewater Discharge Permit No. 22).

As conditions currently exist, the overburden flow which discharges to the sanitary sewer is treated by the City of Niagara Falls prior to discharge to the Niagara River. The sanitary sewer system is an effective collection system and as such serves as an essential component of the overall Plant remedial plan.

To ensure that the City of Niagara Falls continues to be aware of the role of groundwater infiltration into the sanitary sewers, all subsequent renewals of Permit No. 22 must include a description of the groundwater infiltration to the sewers and an estimate of the chemical load associated with that infiltration.

OCC must comply with the discharge limits specified in Significant Industrial User Wastewater Discharge Permit No. 22. In the event that the City of Niagara Falls formally notifies OCC that the rate of groundwater infiltration into the sanitary sewers is unacceptable, or modifies the Discharge Permit to preclude such infiltration, OCC must take whatever actions are necessary to reduce unacceptable groundwater infiltration into the sewers.

Should the City of Niagara Falls so notify OCC, the company must, within 30 days of receipt of said notice, submit for Department review and approval a Plan to evaluate the impacts associated with the anticipated changes in the sewer infiltration rates, including a proposal for evaluating alternative remedial strategies for overburden groundwater. Thereafter, the Department will work with OCC and with the City to implement any necessary enhancements to the Overburden Groundwater Corrective Measures program.

V. Outfall Sewers: OCC has made numerous modifications to the outfall sewer network beneath the Plant to reduce chemical loadings to the Niagara River. Modifications have included abandoning sewer sections in demolished areas of the Plant, replacing sewers with watertight piping, lining existing sewer pipes, repairing and parging manholes, cleaning and conducting video inspections of sewers, and sampling sewer flows.

Outfall sewer modifications have reduced the estimated total loading of chlorinated compounds and benzene and toluene to the Niagara River from the outfall sewers from approximately 119 lbs/day in 1984 to 8 lbs/day in 1990 for the sum of the outfalls. The current estimated loading to the river from the outfall sewers is less than 5 lbs/day. The results of the outfall sewer modifications are consistent with the remedial goal of restricting discharge of OCC hazardous waste constituents to the outfalls.

Given the nature and extent of overburden groundwater contamination and the nature of the outfall sewer network, it is reasonable to expect that future unacceptable loadings from contaminant infiltration of the sewers could take place. Discharge of contaminants from the outfall sewers is regulated by the Department under SPDES Permit No. NY0003336 (NYSDEC No. 9-2911-00112/00009-0). OCC must comply with that permit and must take whatever actions are necessary to ensure that infiltration of contaminated groundwater does not cause exceedances of the permitted discharge limits, and to respond to any exceedances associated with such infiltration as expeditiously as possible.

VI. Overburden Barrier Wall: Three barrier walls have been constructed south of the Plant; the NYPA intake wall, the Plant barrier wall, and the S-Area barrier wall. These walls form a continuous physical barrier to restrict Plant overburden groundwater from migrating to the upper Niagara River. The NYPA intake wall, which extends from the NYPA water conduits at the west end to the Plant barrier wall at the east end, was constructed between 1959 and 1960 as part of the intake structures and water conduits. The concrete NYPA intake wall was constructed from the ground surface and extends into the top of bedrock. The underlying bedrock was grouted to a depth of approximately 100 feet below the top of the bedrock. The Plant barrier wall, which extends from the NYPA intake wall at the west end to the S-Area barrier wall at the east end, was constructed between 1993 and 1994. The Plant barrier wall, which is a soil-bentonite slurry wall sandwiched between sheet pile walls, was constructed from near the ground surface to the clay/till confining layer or the top of bedrock. The southern segment of the S-Area barrier wall, which encircles the S-Area and the southern portion of the V-Area, was constructed in 1994. The S-Area barrier wall, which also is a soil-bentonite slurry wall sandwiched between sheet pile walls, was constructed from near the ground surface to the clay/till confining layer or the top of bedrock.

These barrier walls provide physical containment that restricts direct overburden groundwater flow to the Niagara River. In the event that future repair of the walls is necessary to continue their function as physical barriers, the Department may require OCC to repair or enhance the walls.

VII. Overburden DNAPL: An ongoing DNAPL collection program has been implemented at the Plant. DNAPL is monitored and collected from the Outfall 003 DNAPL collection trench, OW313, abandoned sewer manholes, and two DNAPL collection sumps in the N-Area. DNAPL is also collected from the Energy Boulevard Drain Tile System. The location of these collection points is shown on Figure II-12. The results of DNAPL collection, along with any proposed changes to the collection program, shall be submitted to the Department annually.

The Plant's Standard Operating Procedures (SOP) for construction activities must contain procedures to implement a DNAPL collection program. In addition, the SOP must contain provisions for notifying the Department in the event that DNAPL is encountered. Mobile DNAPL that is detected during construction activities will be extracted using either extraction wells or an extraction trench. The most suitable extraction method will be chosen depending on local conditions such as underground utility congestion, soil porosity and quantity of mobile DNAPL available for extraction. Extracted DNAPL will be treated either on-site at the Plant's LTDU or off-site at an approved facility. DNAPL encountered in sewers during maintenance or construction activities will be extracted and treated.

In June 1999, OCC conducted a comprehensive overburden DNAPL survey at the Plant. The survey included all existing Plant overburden wells. After the initial survey, the Plant overburden wells were categorized as either DNAPL-bearing wells or non-DNAPL-bearing wells. DNAPL-bearing wells were pumped to determine the quantity of DNAPL present in each well. The wells were then further categorized as either DNAPL-bearing wells with greater than one gallon of mobile DNAPL or DNAPL-bearing wells with less than one gallon of mobile DNAPL. All extracted DNAPL was treated either on-site at the Plant's LTDU or off-site at an approved facility. The results of the survey, along with recommendations for DNAPL collection, were submitted to the Department on July 21, 1999.

At a minimum, wells with greater than one gallon of mobile DNAPL will be pumped quarterly. If the quantity of mobile DNAPL in one of these wells is less than one gallon on each of two consecutive quarterly pumping events, the well will be categorized as a DNAPL-bearing well with less than one gallon of mobile DNAPL. Wells with less than one gallon of mobile DNAPL will be pumped semiannually. If a well contains no DNAPL after two consecutive semiannual pumping events, it will be categorized as a non-DNAPL-bearing well.

A second DNAPL survey will be conducted two years after the initial survey. Only non-DNAPL-bearing wells will be included in the second survey. If DNAPL is detected in a well during the second survey, the well will be categorized as a DNAPL-bearing well and pumping will be conducted according to the above schedule. If DNAPL is not detected in a well during the second survey, no further DNAPL monitoring, except as specified below, needs to be conducted at that well unless otherwise directed by the Department.

A. OCC shall check each of the wells in the overburden monitoring network for the presence of DNAPL on an annual basis. If DNAPL is observed in a well, OCC shall notify the agencies in writing within 30 days. A proposed DNAPL collection program for the well shall be included with the notification.

B. On an annual basis (due April 1), OCC shall submit a report that describes the results of the DNAPL pumping and observation program which OCC conducted, and includes recommendations for future DNAPL collection and monitoring.

VIII. Mercury Cell Area: Interim corrective measures for the Mercury Cell Area (former Building U-75) were completed in January 1992. A description of the interim corrective measures implemented is presented in the document entitled "Implementation Report, Building U-75 Interim Corrective Measure," August 1992. During the interim corrective measures, more than 33 tons of mercury were recovered from the area. The remaining trace amounts of mercury were contained within a sheet pile wall that encircled all of Building U-75 and were keyed into the native till confining unit. Although the Mercury Cell Area was considered as a potential contributor of mercury to the overburden groundwater, mercury presence has only been detected at low concentrations in the groundwater beneath this area. Therefore, it is assumed that the mercury presence in the soil beneath the Mercury Cell Area is no longer a significant potential source for elevated mercury concentrations in the surrounding soil or groundwater.

To confirm that additional SWMU-specific Corrective Measures are not needed in the Mercury Cell Area, OCC shall, within 30 days of the effective date of the permit, install and sample an overburden monitoring monitoring well immediately downgradient of the former Mercury Cell building (U75) for the presence of mercury.

The results of the monitoring shall be submitted to the Department no later than 30 days after they are received from the laboratory. Thereafter, the Department will determine whether additional investigation or corrective measures are required. At a minimum, the new well will be sampled for mercury on an annual basis.

IX. Natural Attenuation: The overburden groundwater remedial system components collect and treat overburden groundwater flow at the southern, western and northeastern (downgradient) boundaries of the Plant (Flow Zones 1 & 3). With the exception of the northwestern corner of the Plant (Wells OW304, BH10-88, OW317), concentrations of site-related chemicals in the overburden groundwater in the eastern, western and northwestern downgradient areas that are not captured by either the overburden groundwater drain tile systems or the sanitary sewer system are low and have been decreasing over time. Therefore, the Department has determined that monitored natural attenuation of the overburden groundwater in those areas is an appropriate remedial approach.

If, by April 2009, natural attenuation fails to reduce the measured concentration of SSI parameters in overburden groundwater by 50%, or, if by April 2014, natural attenuation fails to reduce the measured concentration of SSI parameters in overburden groundwater in that area of the facility by 75% (compared to OSI November 1993 sampling results, Figure II-16), the Department may require OCC to take additional measures to remediate overburden groundwater in that area of the facility.

On July 21,1999, OCC submitted for Department review and approval a plan and schedule of implementation to determine the extent to which overburden groundwater contamination migrates beyond the northwestern corner of the facility. The plan included an evaluation of the influence of the sanitary sewers and the 48" diversion sewer on groundwater flow in that area. The plan also included a groundwater and sewer sampling program, and a proposal for the installation of a sufficient number of overburden monitoring wells to clearly define the nature and extent of the overburden groundwater plume. The results of the evaluation will be submitted to the Department. Thereafter, the Department will determine whether additional investigation or corrective measures are required.

Overburden Soils

Overburden soil contaminant characteristics at the Plant are affected by localized conditions such as geology, hydrogeology, chemical source areas, surface conditions, varying chemical composition, and hydraulic influences. Therefore, different areas of the Plant may require specific remedial technologies to address the localized conditions encountered. Areas of DNAPL presence and elevated chemical concentrations for dioxin, elemental phosphorus, and mercury are of primary concern. The four chemical groupings encountered at the Plant can be divided into seven areas that must be addressed.

I. Containment: The Department has determined that a containment strategy, in conjunction with appropriate institutional controls, is an acceptable remedial approach for Overburden Soils. The areas which require remediation of overburden soils and the containment mechanism for those areas are depicted on Figure II-13 and are summarized as follows:

Area	***Chemical Group***	***Current Status of Area***	***Function***
C/D-Area	DNAPL and dioxin	Asphalt cap	separation, dust, infiltration control
Energy Blvd.	DNAPL	collection trench	containment
F-Area	DNAPL and dioxin	Asphalt cap gravel surface	separation, dust, infiltration control

Area	***Chemical Group***	***Current Status of Area***	***Function***
T-Area	DNAPL	Asphalt cap	separation & infiltration control
U-Area	DNAPL	Asphalt cap gravel surface	separation & infiltration control
N-Area	dioxin	Asphalt cap	separation & dust control
N-Area	mercury	Asphalt cap sheet pile wall	containment
N-Area	DNAPL	Asphalt cap	separation & infiltration control containment
N-Area	DNAPL	DNAPL collection trench/sump/wells	containment
X-Area	dioxin	Soil/grass cap	separation & dust control
V-Area	elemental phosphous	Asphalt cap gavel surface	separation & infiltration control

The containment surfaces described above must be maintained so as to function as designed. At a minimum OCC shall inspect these structures annually and shall make any repairs necessary to adequately maintain their integrity. Annually, a copy of the inspection report and a summary of any maintenance/repairs which were performed during the previous calendar year must be submitted to the Department by April 1. The same information must be kept on file at the facility. In addition, OCC must ensure that any use of the areas for storage/parking of vehicles or equipment will not impede the function of the containment surfaces.

II. Soil Stockpiles: Excess soils generated during construction of the Corrective Measures Implementation (CMI) activities, Plant maintenance activities, and Plant revitalization activities have been handled in accordance with the procedures described in the following reports:

- "Soil Management Plan for Corrective Measures Implementation Activities," dated January 1995; and
- "Soil Management Plan for Corrective Measures Implementation – Overburden Activities," dated November 1995, and an associated addendum submitted to NYSDEC under letter on July 17, 1997.

The Soil Management Plan procedures allowed handling of the soils was without actively managing the soils and thereby did not trigger any "land ban" restrictions.

Three soil classifications were used to categorize the soils:

Category A	≤10 ppm organic vapor concentration and no observable DNAPL present
Category B	≥10 ppm organic vapor concentration and no observable DNAPL
Category C	observable DNAPL present

Category C soils were hauled off-site for disposal; no Category C soils may be placed in the long-term stockpiles. As of October 1998, the volume of soils placed in each area of the soil stockpile was as follows:

Location	***Soil Category***	***Volume (cubic yards)***
West Pile	Category A	8,950
	Category B	2,120
Stores Enclosure Pad	Category A	2,040
East Pile	Category A	6,060
	Category B	1,310
Total		20,480

The existing and proposed extent of the long-term soil stockpiles is presented on Figure II-14. The total capacity of the long-term soil stockpiles is approximately 24,000 cubic yards. Future activities that may generate excess soils include:

- plant maintenance
- ongoing revitalization projects

Sediment transport and surface water runoff from the long-term Category A stockpile are controlled by the construction of low-profile soil berms constructed using Category A soils. Precipitation falling within the bermed area will infiltrate into the ground.

Sediment transport for the long-term Category B stockpiles is controlled by:

- lining the bottom of the stockpiles with polyethylene sheeting;
- constructing low-profile soil berms around the stockpiles using Category A soils; and
- covering the stockpiles with polyethylene sheeting to direct runoff onto the ground surface outside of the bermed area.

The long-term Categories A and B soil stockpiles were graded to promote positive drainage. The majority of the west stockpile was closed in September 1998. The stockpile was covered with six inches of soil capable of sustaining vegetative growth and then seeded in August and September 1998. The stores enclosure pad was covered with granular material to provide a structural base for equipment storage. Future stockpiled Categories A and B soil will be covered with six inches of soil capable of sustaining growth and will be seeded.

III. Bioremediation Pilot Project: In July 1994, OCC initiated a pilot-scale field study to treat chlorinated chemicals in soil using anaerobic biotechnology at the Plant. The pilot-scale treatability study began in August 1994 and continued for approximately 30 months. The pilot-scale study concluded in January 1997. The pilot-scale study closure was reported in the document entitled "Final Report, Pilot and Bench-Scale Treatment Study, Anaerobic/Aerobic Biodegradation of Chlorinated Chemicals in Soils," dated February 1998 (Closure Report). The results of the pilot-scale study showed that the concentration of chlorinated compounds in soil could be effectively reduced by anaerobic and aerobic degradation.

Based on the conclusions of the pilot-scale study, the Department has determined that a full-scale treatment demonstration study is warranted. The full-scale study will be conducted in the existing F-Area soil stockpile. The objective of the full-scale study will be to demonstrate the feasibility of using anaerobic followed by aerobic biotreatment techniques to degrade chlorinated benzenes and toluenes on a larger scale.

Due to higher than anticipated levels of hexachlorocyclohexanes (BHCs) in the stockpiled soils, OCC has commenced an additional laboratory testing program to determine if BHCs can be biodegraded during the full-scale study. The testing program will be complete and the results submitted to the Department within 30 days of the effective date of the permit. If the results show that BHCs can be biodegraded, a work plan for the full-scale study will be submitted to the Department within 60 days of the effective date of the permit.

IV. Institutional Controls:

A. SOP - In order to preclude unintended exposure to, or distribution of contaminated soils, OCC has developed and implemented a SOP for conducting subsurface excavations at the Plant. The SOP was submitted to the State in June 1997 and approved in a letter dated July 29, 1997. The SOP includes procedures for soil and water handling and presents plans showing the potential areal and vertical extent of DNAPL, dioxin, and elemental phosphorus, and procedures to reduce the potential for worker exposure. The SOP also contains procedures to ensure that the confining clay/till unit is not penetrated during construction activities. In order to restrict the potential for disturbance of the soils, prevent chemical migration, and to protect workers who may perform excavation activities, the SOP must be referred to and followed by Plant personnel and contractors before any subsurface work at the Plant is performed. As new information or conditions at the site arise, OCC must update the SOP to ensure that it functions properly. Any changes to the SOP must be submitted to the Department.

B. City of Niagara Falls Water Mains - An SOP has also been developed for repair of water mains. The SOP contains procedures to flush out any groundwater that may have entered the water main from an excavation during repair activities. In addition, OCC must notify the City of Niagara Falls whenever groundwater infiltration into the water mains is observed or suspected.

C. Security - The Plant perimeter fence and security system must be maintained to ensure that unauthorized people cannot access the Plant soil. This will ensure that people who are unaware of the chemical presence in the soil will not be exposed inadvertently.

V. Deed Restrictions: There are known areas of soil and groundwater contamination at the facility. Therefore, within 30 days of the effective date of the permit, OCC shall make a formal notation on the deed to the facility 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:

A. The land has been used to manage hazardous waste. The deed restrictions will include a description of the potential areal and vertical presence of hazardous waste constituents which have been detected in the soil and groundwater at the facility, typical properties of the chemicals, a list of the potential human exposure routes, a reference to the Plant Health and Safety Plan for Construction Activities (HASP), and to all SOPs described in (4) (a) above.

B. Use of certain areas of the facility may be restricted under 6 NYCRR Part 373-2.7, as if they were a "hazardous waste disposal facility."

C. OCC, for itself, and the State of New York, acting through the NYSDEC or its designee, retain the right of access to and use of the property, but without the right to interfere with, obstruct, or otherwise physically impact any structures now or hereafter erected thereon for the commercially useful life of any such structure, to the extent necessary to complete the work required to implement corrective measures, and any further work determined to be necessary as a result thereof, including but not limited to any groundwater monitoring or treatment, soil management, cap and cover installation or maintenance. Subsurface alterations, construction or changes in existing building foundations, sewers, utilities, and other subsurface structures, or excavation on the property should be made with appropriate caution.

D. Future use of the facility property is restricted to industrial or commercial use only; said use shall take into account the nature and distribution of hazardous waste constituents in the soil and groundwater at the facility.

VI. Off-Site Groundwater: The nature and extent of overburden and bedrock groundwater contamination north and west of the facility is described in the "Off-Site Investigation Summary Report," August 1992 and the "Off-Site Investigation (OSI) Program Phase 2 Report," November 1993. Additional information has also been collected as part of the Bedrock Groundwater Interim Corrective Measures monitoring program. The distribution of contamination in the Overburden groundwater is depicted on Figure II-4.

The distribution of contamination in the bedrock groundwater is depicted on Figure II-5.

Based upon the information collected to date, it appears that the magnitude of both overburden and bedrock groundwater contamination decreases substantially as groundwater flows from the facility.

A. Off-Site Overburden Groundwater: Because overburden groundwater contamination decreases substantially as groundwater flows from the facility, and because the Corrective Measures which have been implemented to address on-site overburden contamination should restrict further off-site migration of contaminated overburden groundwater in the future, the Department has determined that active remediation of the off-site overburden groundwater is not necessary at this time. The Department has also determined that monitored natural attenuation of the off-site overburden groundwater is an acceptable remedial approach.

   If, by April 2009, natural attenuation fails to reduce the measured concentration of SSI parameters in off-site overburden groundwater by 50%, or, if by April 2014, natural attenuation fails to reduce the measured concentration of SSI parameters in off-site overburden groundwater by 75% (compared to OSI November 1993 sampling results, Figure II-16), the Department may require OCC to take additional measures to remediate off-site overburden groundwater.

B. Off-Site Bedrock Groundwater: Off-site bedrock groundwater adjacent to the north Plant boundary flows toward and is collected by the bedrock groundwater extraction system. Bedrock groundwater beyond the capture zone of the groundwater extraction system north of the Plant is intercepted by the NYPA conduit drains and the Falls Street Tunnel which act as regional groundwater line sinks. Bedrock groundwater west of the Plant is in the capture zone of the NYPA conduit drains. The NYPA conduit drains act as a groundwater divide and prevent groundwater from flowing further to the west. To the north of the facility, groundwater from the NYPA conduit drains also discharges to the Falls Street Tunnel. All dry weather flow in the Falls Street Tunnel is treated in the City of Niagara Falls Wastewater Treatment Plant.

   Because bedrock groundwater contamination decreases substantially as groundwater flows from the facility, and because the Corrective Measures which have been implemented to address on-site bedrock contamination should restrict further off-site migration of contaminated bedrock groundwater in the future, and because most of the off-site bedrock groundwater contamination is ultimately captured by the Falls Street Tunnel and treated by the City of Niagara Falls, the Department has determined that active remediation of off-site bedrock groundwater on the part of OCC is not necessary at this time.

   Because OCC and the Department are relying in part on the Falls Street Tunnel and the City of Niagara Falls for collection and treatment of off-site bedrock groundwater, it is important that the City of Niagara Falls continues to be aware of the role of groundwater infiltration into the Falls Street Tunnel and is a willing participant in its treatment. Therefore, on an annual basis, OCC shall submit to the City of Niagara Falls and to the Department, a detailed estimate of the potential loadings of OCC-related chemicals to the Falls Street Tunnel via infiltration of off-site groundwater. OCC shall also request acknowledgment from the City of Niagara Falls that those potential loadings can be adequately treated by the City. In addition, if requested by the City, OCC shall reimburse the City for reasonable treatment costs associated with loadings of OCC-related chemicals to the Falls Street Tunnel.

In the event that the City of Niagara Falls formally notifies OCC that the rate of OCC related chemical loading into the Falls Street Tunnel is unacceptable, OCC must take appropriate actions to reduce unacceptable chemical loading into the Falls Street Tunnel. Should the City of Niagara Falls so notify OCC, the company must, within 30 days of receipt of said notice, submit for Department review and approval a Plan to evaluate the impacts associated with the anticipated changes in the Falls Street Tunnel infiltration rates, including a proposal for evaluating alternative remedial strategies for off-site groundwater.

Thereafter, the Department will work with OCC and with the City to implement any necessary enhancements to the off-site groundwater Corrective Measures program.

C. Off-Site DNAPL: The perimeter wells shown on Figure II-15 will be monitored for DNAPL on an annual basis to ensure the DNAPL is not migrating to off-site areas. Monitoring reports will be prepared and submitted to the EPA/State annually. The reports will contain a description of all monitoring conducted in the previous year and the monitoring results. These wells will be monitored for two years following the initial DNAPL survey. The program will be reevaluated after the two-year period and, based on previous monitoring results, the program may be modified or discontinued at the discretion of the Department.

If the Department determines that significant quantities of DNAPL exist off-site of the facility, OCC will be required to develop a remedial program to address the presence of off-site DNAPL.

VII. Performance Monitoring Program: On August 11, 1999, OCC submitted for Department review and approval, a Performance Monitoring Plan that will be used to evaluate the effectiveness of the Corrective Measures specified herein. The performance monitoring program included hydraulic monitoring to establish the extent of plume capture, and chemical monitoring to evaluate the changes in groundwater chemistry which take place through time. In addition, OCC should, to the extent practicable, coordinate the monitoring program with the monitoring program which has been implemented as part of the S Area remedial program. Once approved, modification of the Plan will require the written authorization of the Department.

All monitoring data must be obtained using the sampling and analysis protocols which have been previously approved by the Department. Modification of those protocols requires written authorization from the Department.

Evaluation of the Proposed Remedy

The Department, in consultation with the New York State Department of Health, has determined that the proposed corrective measures are sufficiently protective of human health and the environment. The Department will issue a permit which requires OCC to implement the proposed remedy.

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

- Overall Protection. The proposed remedy would extract groundwater and treat 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.

- 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.

- 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 would remove contaminated groundwater prior to reaching the facility boundary.

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

- 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.

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

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

- Implementability. The proposed remedy can be readily implemented.
- Cost. Historical operations of similar remedial systems in the Niagara Frontier indicate that the technology of the proposed remedy is cost effective. Due to the nature and extent of contamination at the facility, the permit contains a provision which requires OCC to provide appropriate financial assurance for the long-term (i.e. perpetual) operation of the remedial system.

Ancillary Permits/Approvals

Implementation of the proposed remedy may require OCC to obtain permits or approvals related to air and water discharges associated with the collection and treatment of contaminated groundwater. If any such permits or approvals are required, appropriate administrative procedures and public notifications will be provided.

Public Participation

The Department encouraged input from the community on the remedial method proposed. The public was also invited to provide comments on remedial alternatives not addressed in the CMS. The Department established a public comment period to solicit public participation in the remedy selection process. Aside from comments submitted by the permittee, no comments on the proposed remedial program were received by the Department.

The administrative record is available at the following locations:

Mr. James Strickland
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203
(716) 851 -7220

And

William Wertz, Ph.D.
New York State Department of Environmental Conservation
Division of Solid & Hazardous Materials
50 Wolf Road, Room 460
Albany, NY 12233-7252
(518) 457-9253

Comments were summarized and responses provided in the Response to Comments. The Response to Comments has been incorporated into the administrative record.

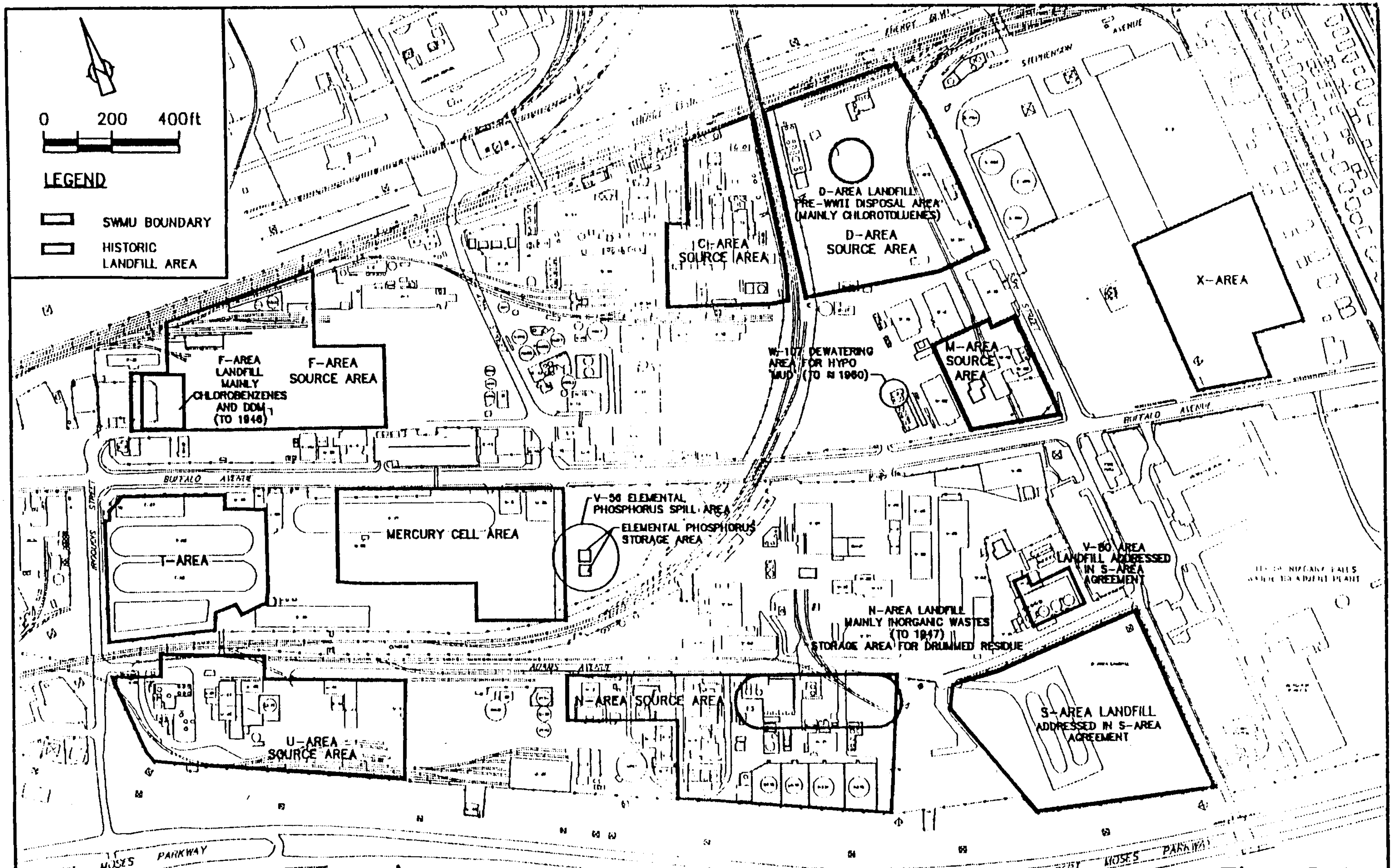


Figure II-1

SOLID WASTE MANAGEMENT UNITS

Occidental Chemical Corporation – Buffalo Avenue Plant

2583 (15B) JAN 23/95(W) REV.1 (P807)

FORMATION	COLUMNAR SECTION	THICKNESS IN FEET	CHARACTER
FILL		0–15	GRAVEL, SAND, SILT AND CLAY, DEMOLITION DEBRIS, FLYASH, CINDERS, CHEMICAL WASTE
ALLUVIUM		0–15	LIGHT BROWN SILT AND VEGETATION, GRADING INTO THIN BLACK AND DARK BROWN SILTY SAND, GRADING INTO BLACK IN THE LOWER PART
GLACIOLACUSTRINE CLAY		0–15	RED BROWN SILTY CLAY AND GRAY BROWN SANDY TO CLAYEY SILT
TILL		0–15	RED BROWN SANDY SILT, TRACE TO SOME CLAY AND GRAVEL
BEDROCK			LOCKPORT DOLOMITE

Figure II-2

OVERBURDEN STRATIGRAPHY

Modified From CRA *Buffalo Avenue Plant – Occidental Chemical Corporation*

02583–00(191)GN–WA003 NOV 13/98

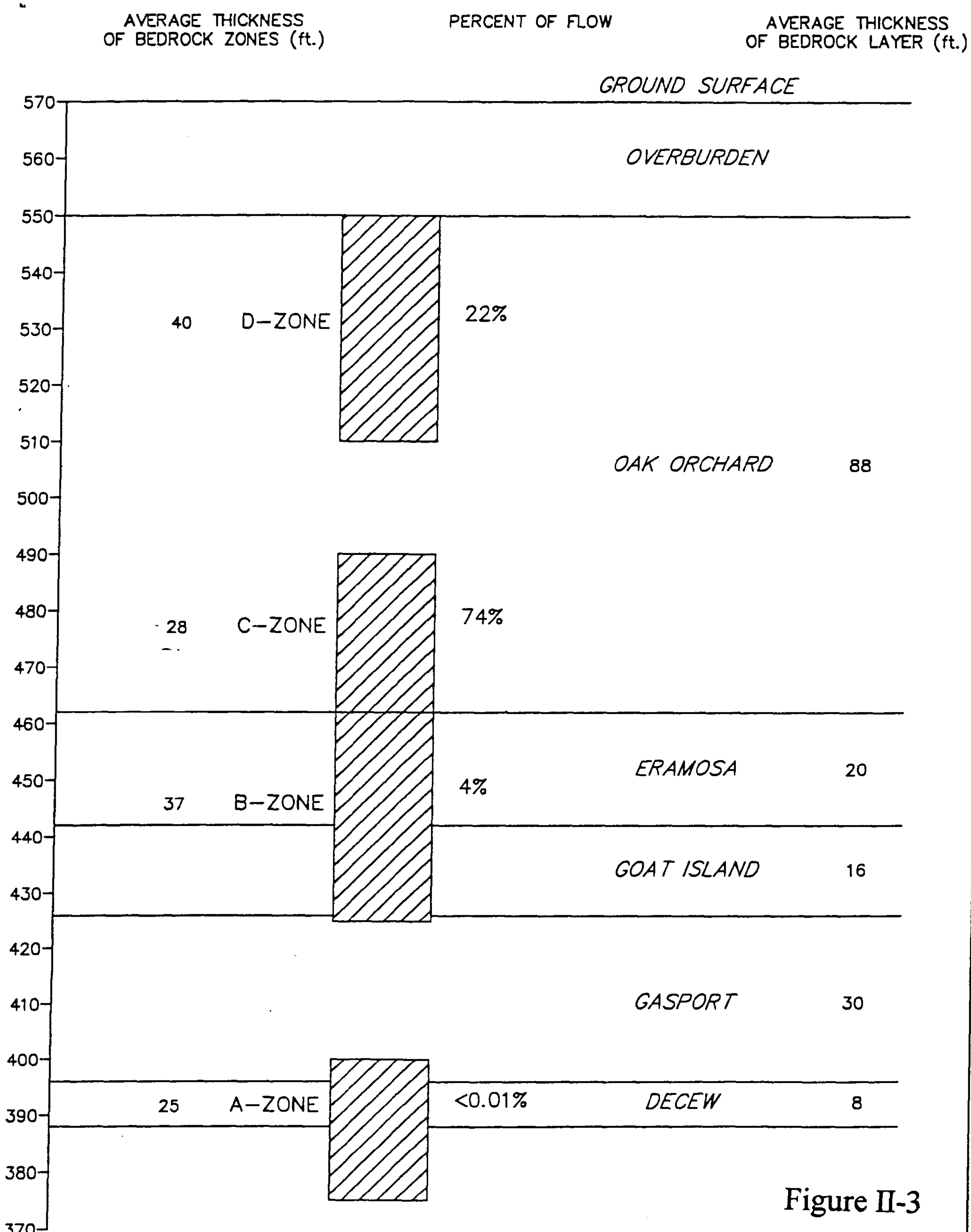


Figure II-3

BEDROCK STRATIGRAPHY

Modified From Buffalo Avenue Plant – Occidental Chemical Corporation

CRA

02583–00(191)GN–WA004 NOV 13/98

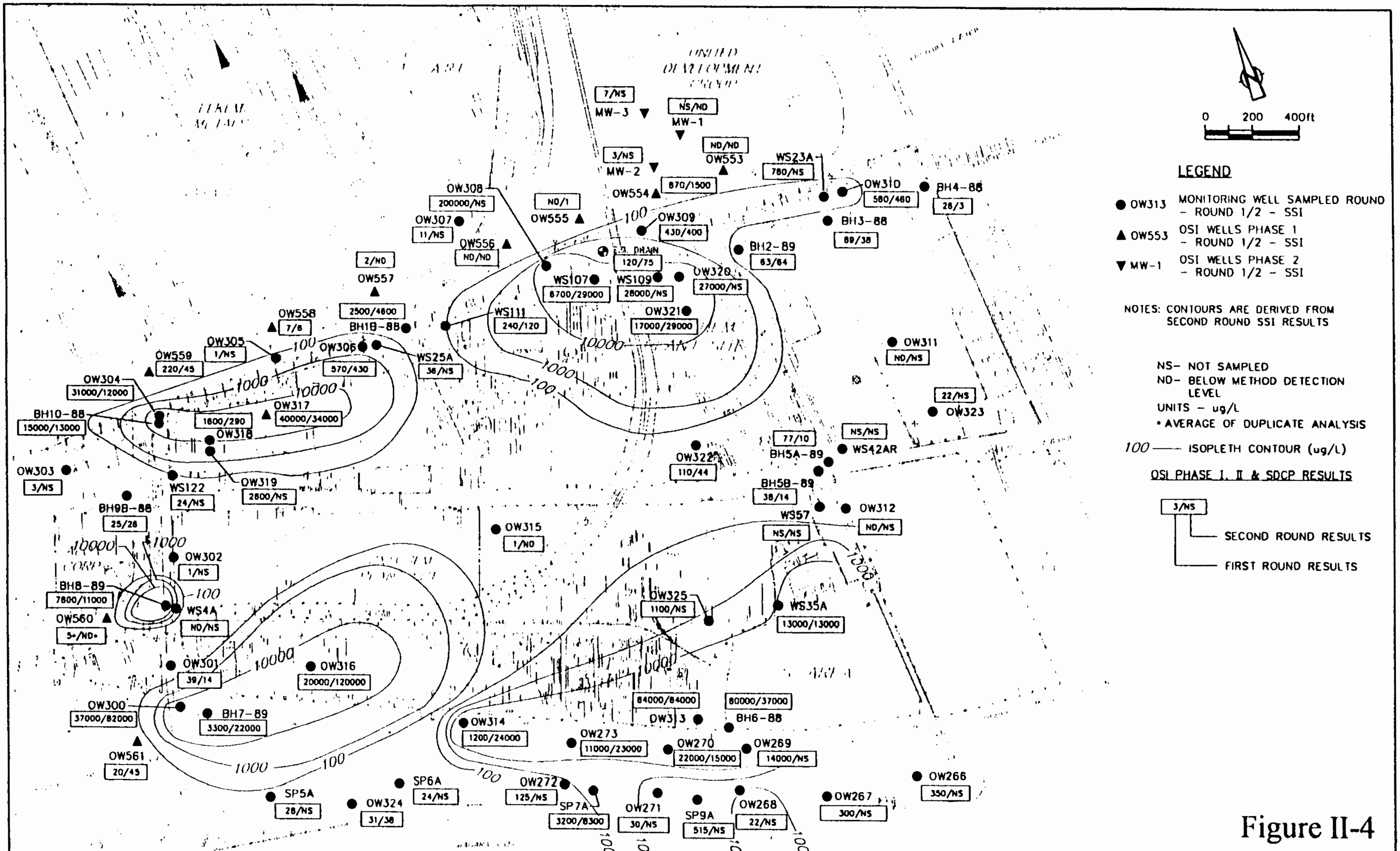


Figure II-4

ORGANIC CHEMICAL PRESENCE – OVERBURDEN GROUNDWATER

Buffalo Avenue Plant – Occidental Chemical Corporation

Modified From
CRA

02583-00(191)GN-WA014 NOV 13/98

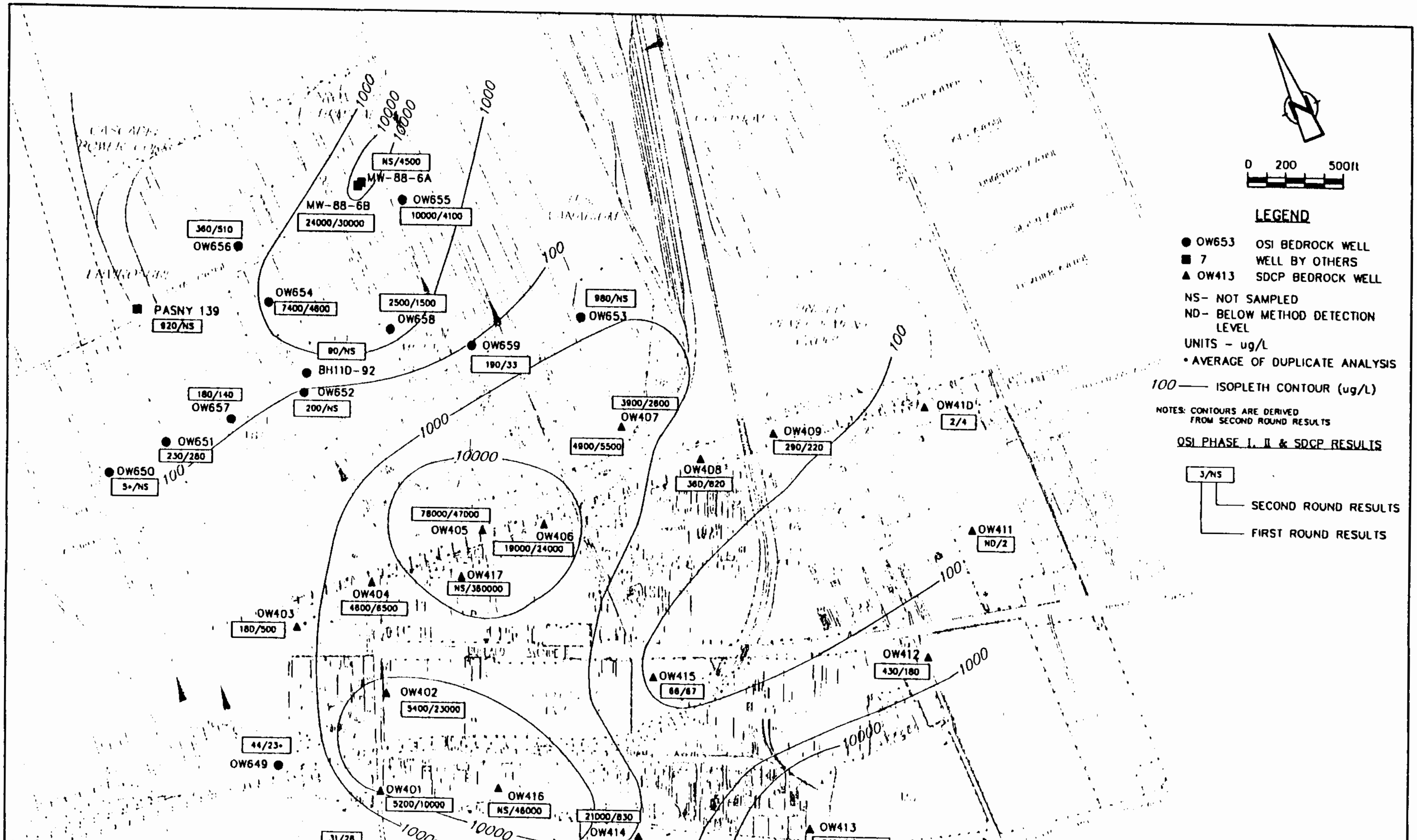


Figure II-5

D-ZONE BEDROCK ORGANIC COMPOUND PRESENCE

Buffalo Avenue Plant – Occidental Chemical Corporation

Modified From
CRA

02583-00(191)GN-WA008 NOV 13/98

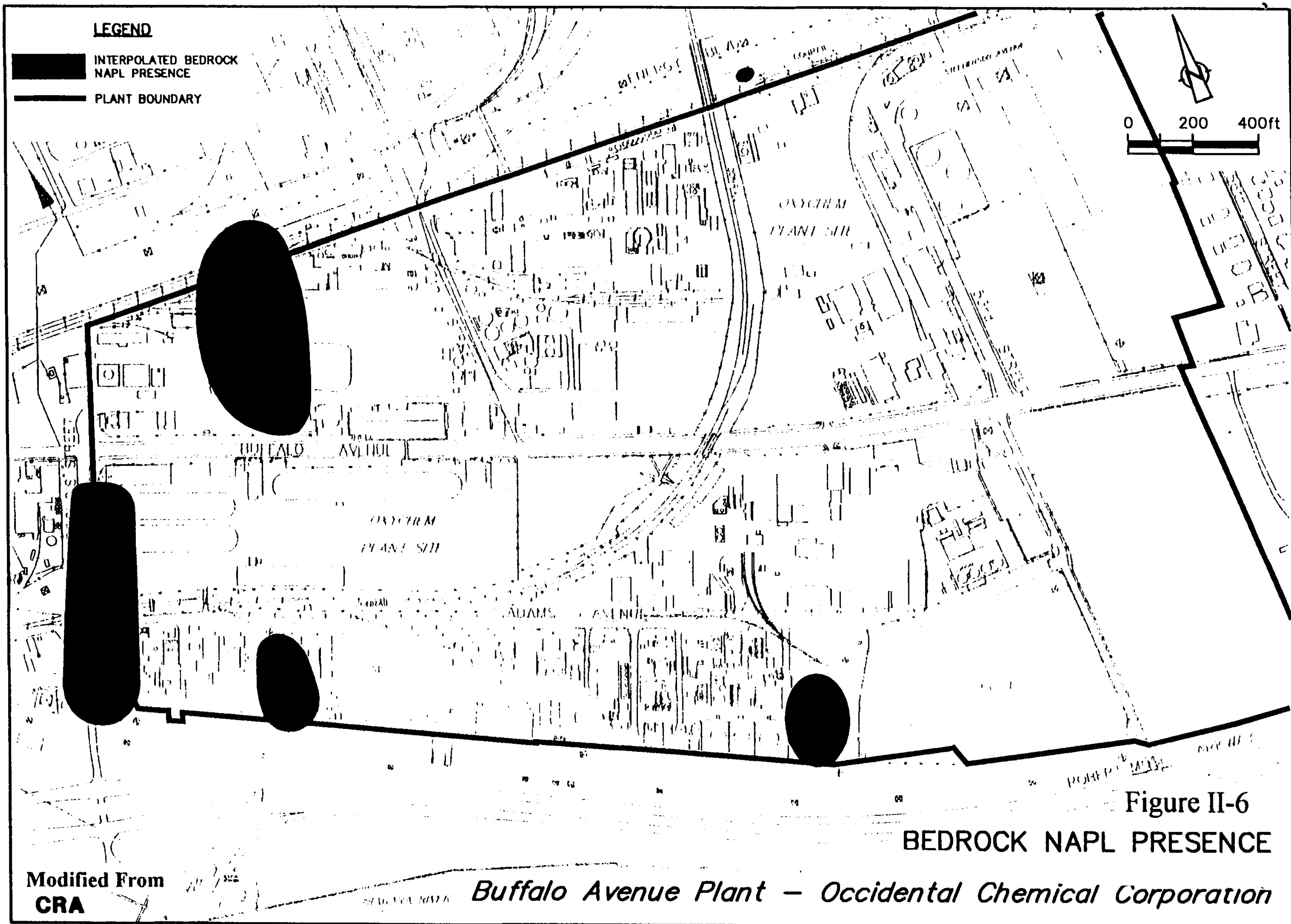


Figure II-6
BEDROCK NAPL PRESENCE
Buffalo Avenue Plant – Occidental Chemical Corporation

02583-00(191)GN-WA012 NOV 13/98

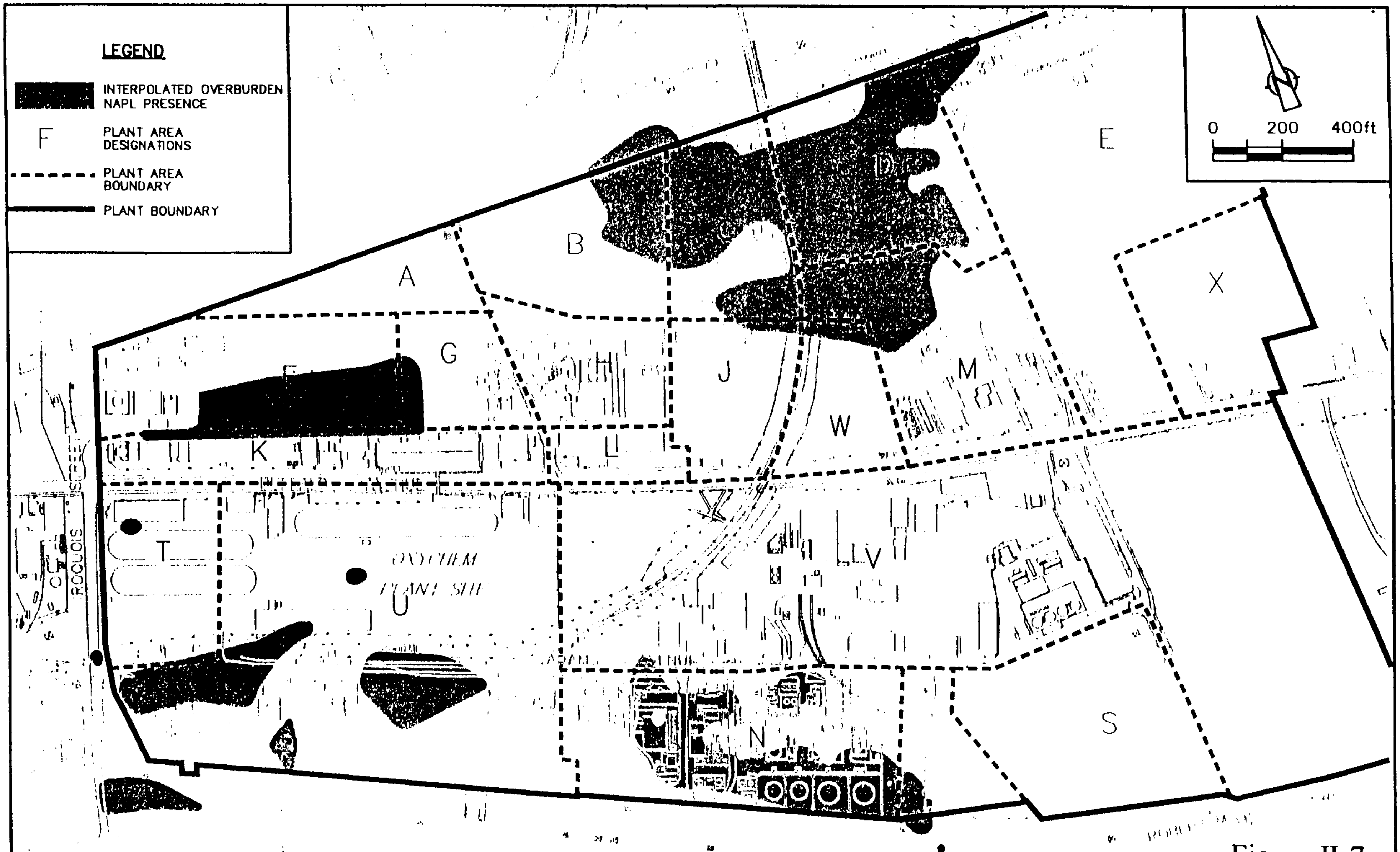


Figure II-7

NAPL PRESENCE – OVERBURDEN SOIL

Buffalo Avenue Plant – Occidental Chemical Corporation

Modified From
CRA

02583-00(191)GN-WA020 NOV 13/98

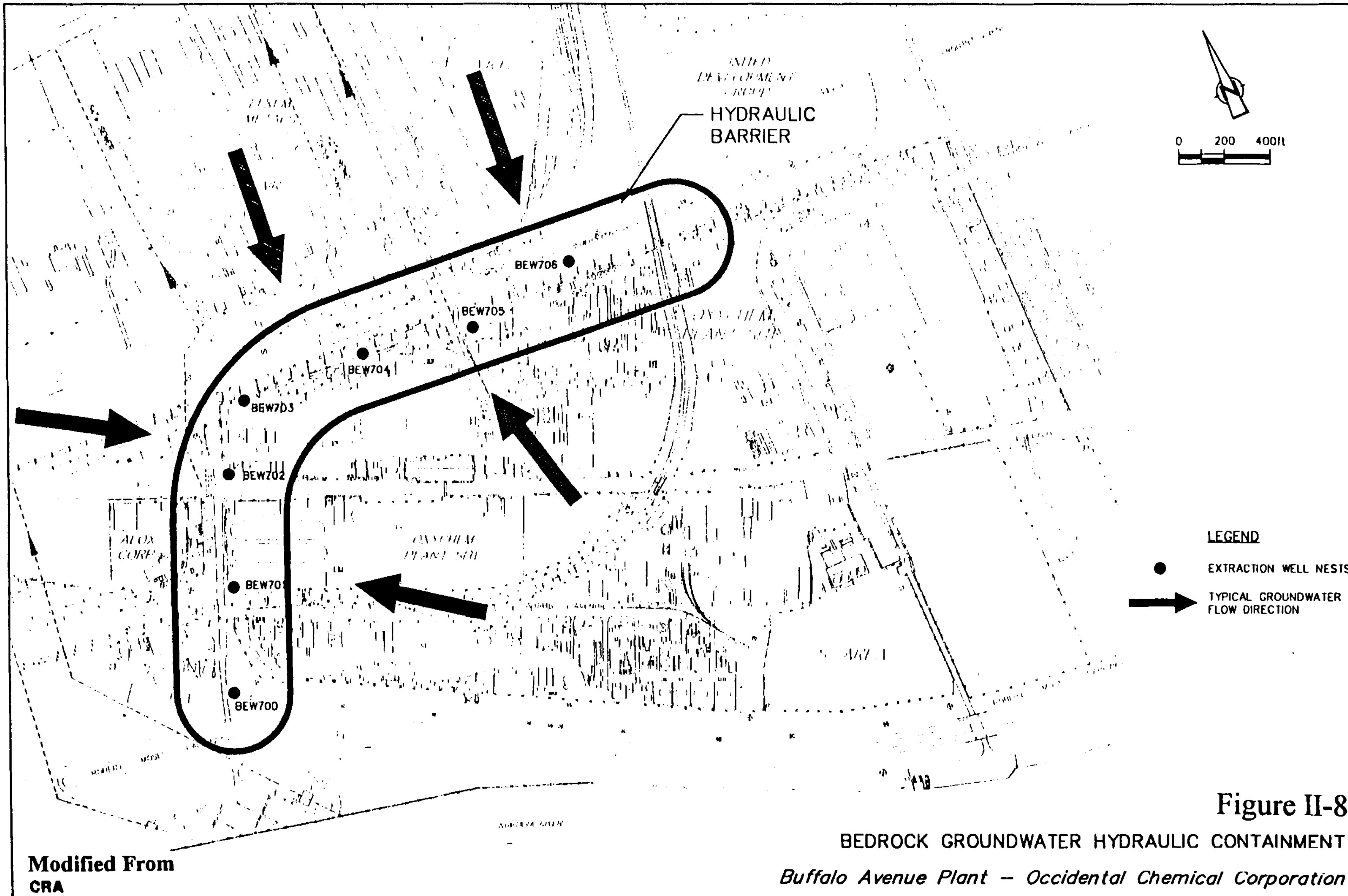
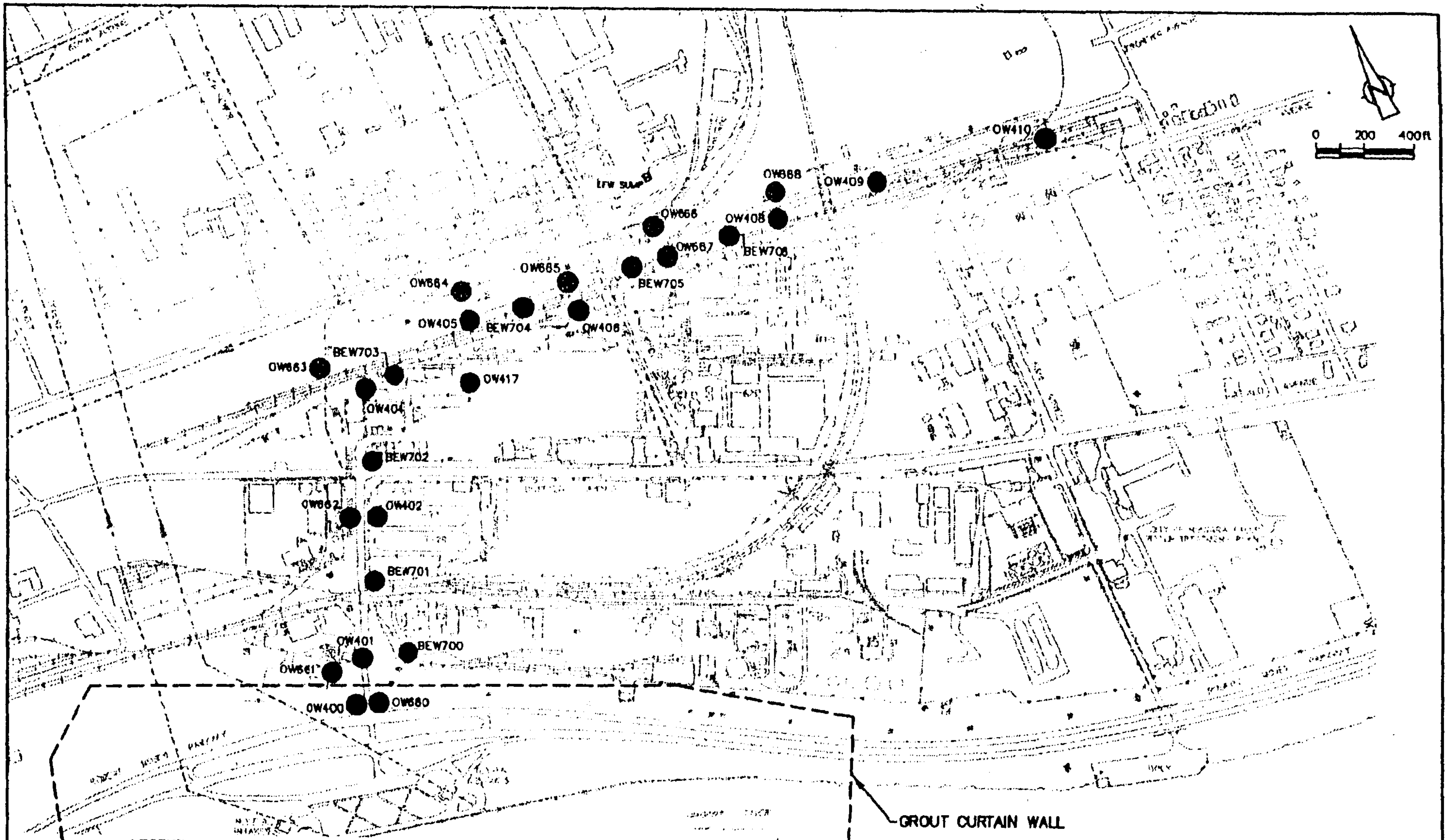


Figure II-8

BEDROCK GROUNDWATER HYDRAULIC CONTAINMENT

Buffalo Avenue Plant -- Occidental Chemical Corporation

02583-00(191)GN-WA026 NOV 13/98



Modified From CRA

Figure II-9

EXTRACTION AND HYDRAULIC MONITORING WELL LOCATIONS
BEDROCK GROUNDWATER REMEDIATION
Occidental Chemical Corporation–Buffalo Avenue Plant

6053 (11) NOV 22/95(W) REV.1 (P-36)

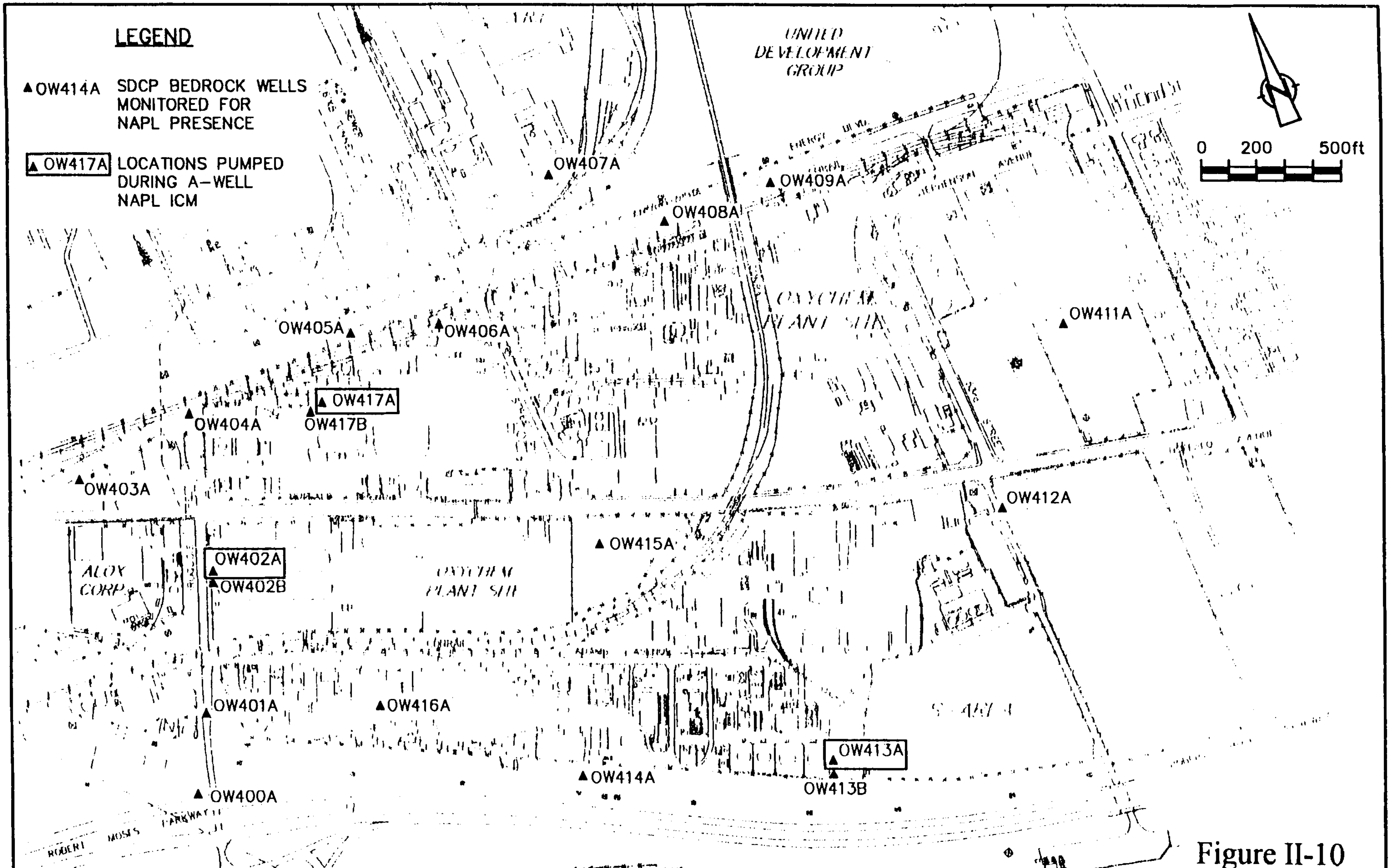
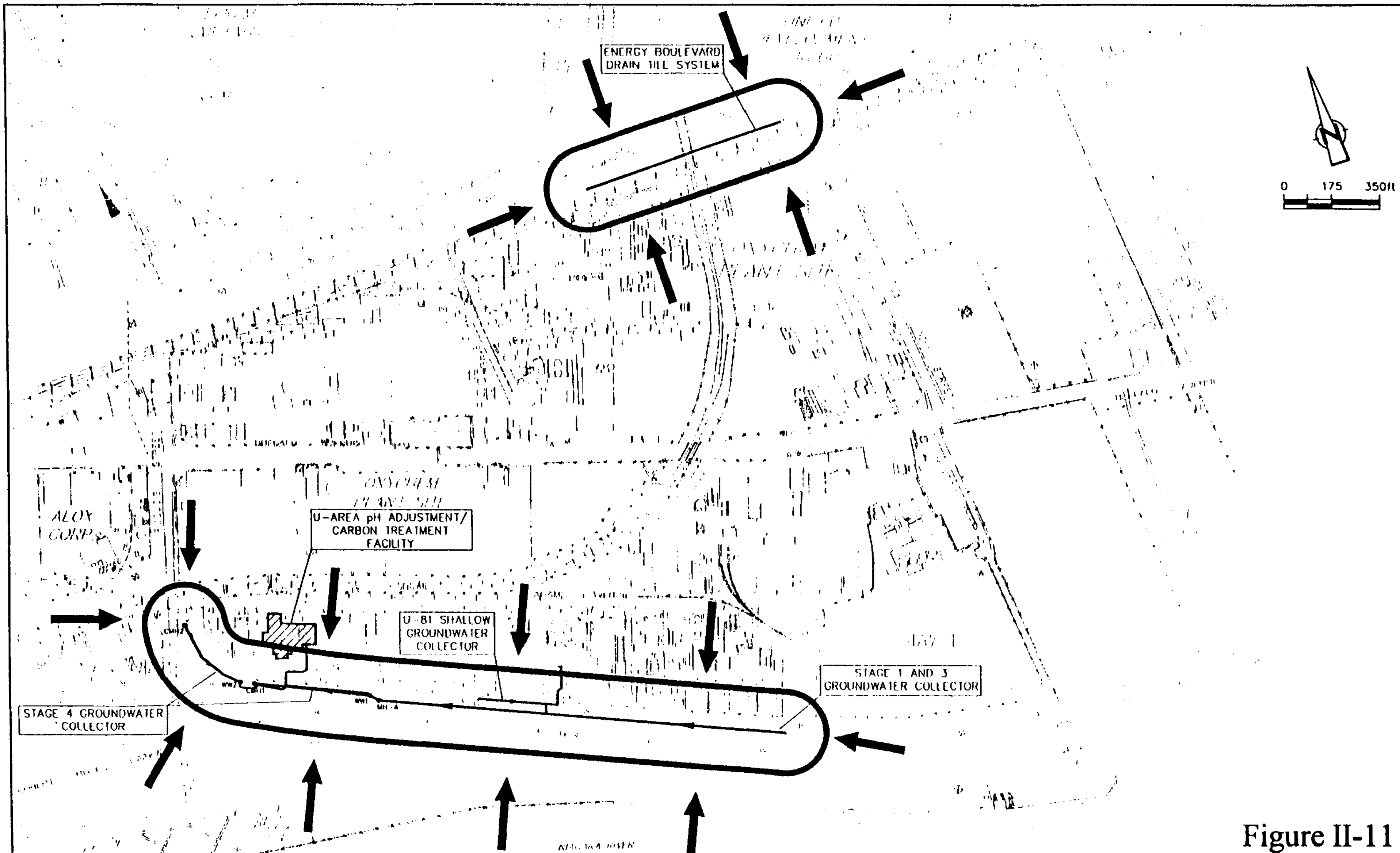


Figure II-10

BEDROCK NAPL COLLECTION LOCATIONS

Buffalo Avenue Plant – Occidental Chemical Corporation

02583-00(191)GN-WA039 NOV 13/98



Modified From CRA

Figure II-11

OVERBURDEN GROUNDWATER HYDRAULIC CONTAINMENT

Buffalo Avenue Plant – Occidental Chemical Corporation

02583-00(191)GN-WA027 NOV 13/98

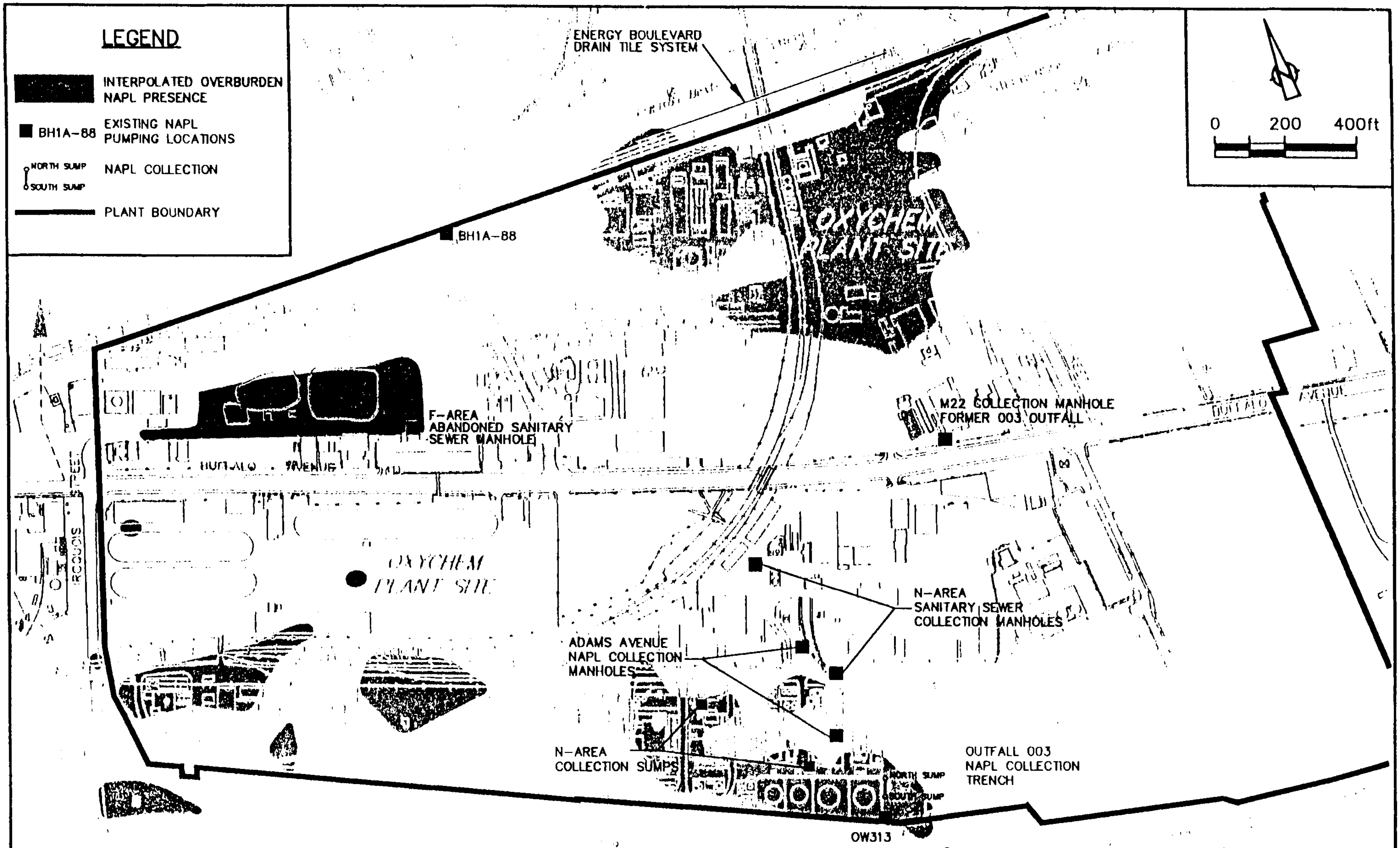


Figure II-12

OVERBURDEN NAPL COLLECTION LOCATIONS

Buffalo Avenue Plant – Occidental Chemical Corporation

Modified From
CRA

02583-00(191)GN-WA044 NOV 13/98

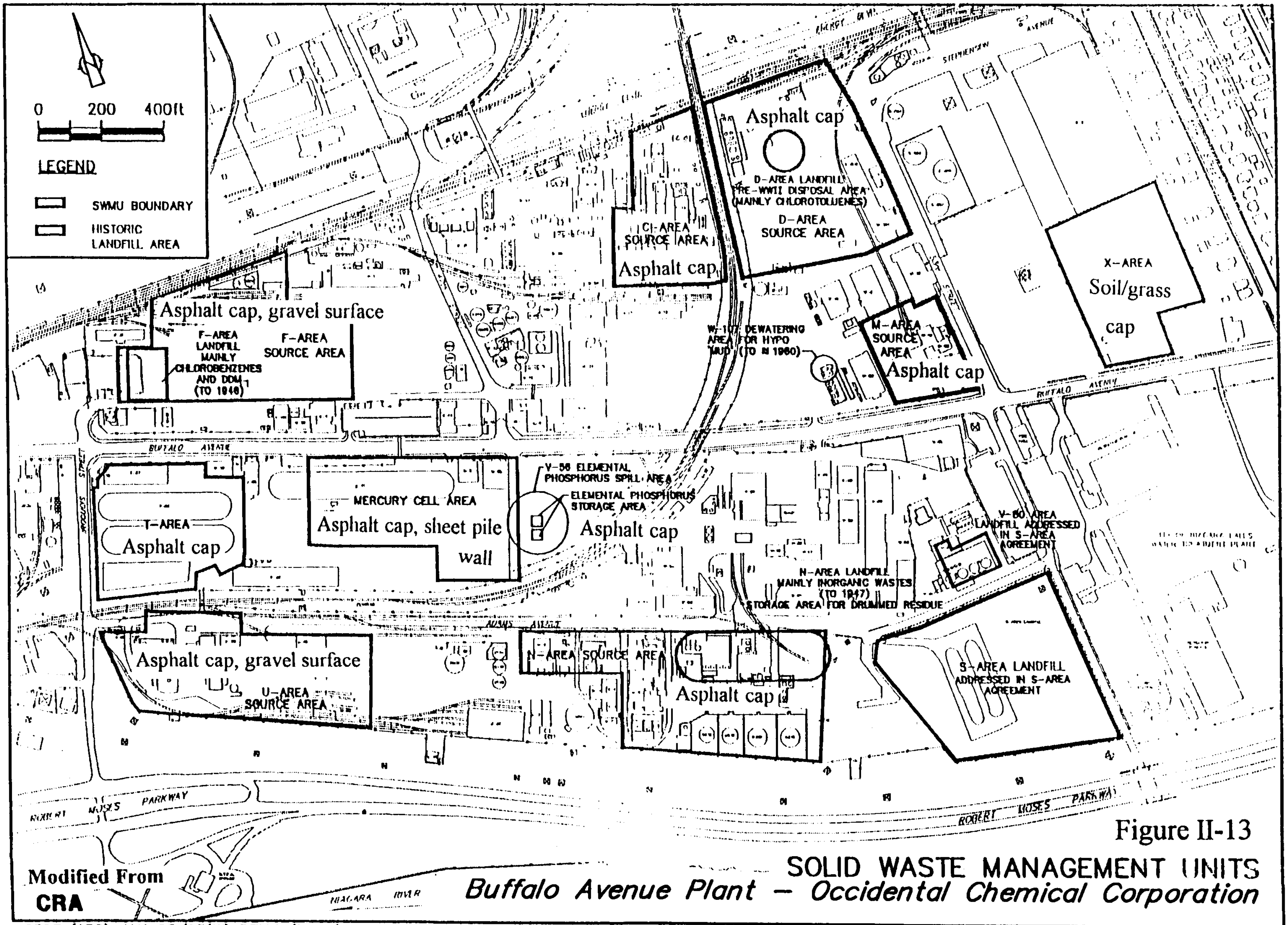


Figure II-13

SOLID WASTE MANAGEMENT UNITS

Buffalo Avenue Plant – Occidental Chemical Corporation

2583 (158) JAN 23/95(W) REV.1 (P807)

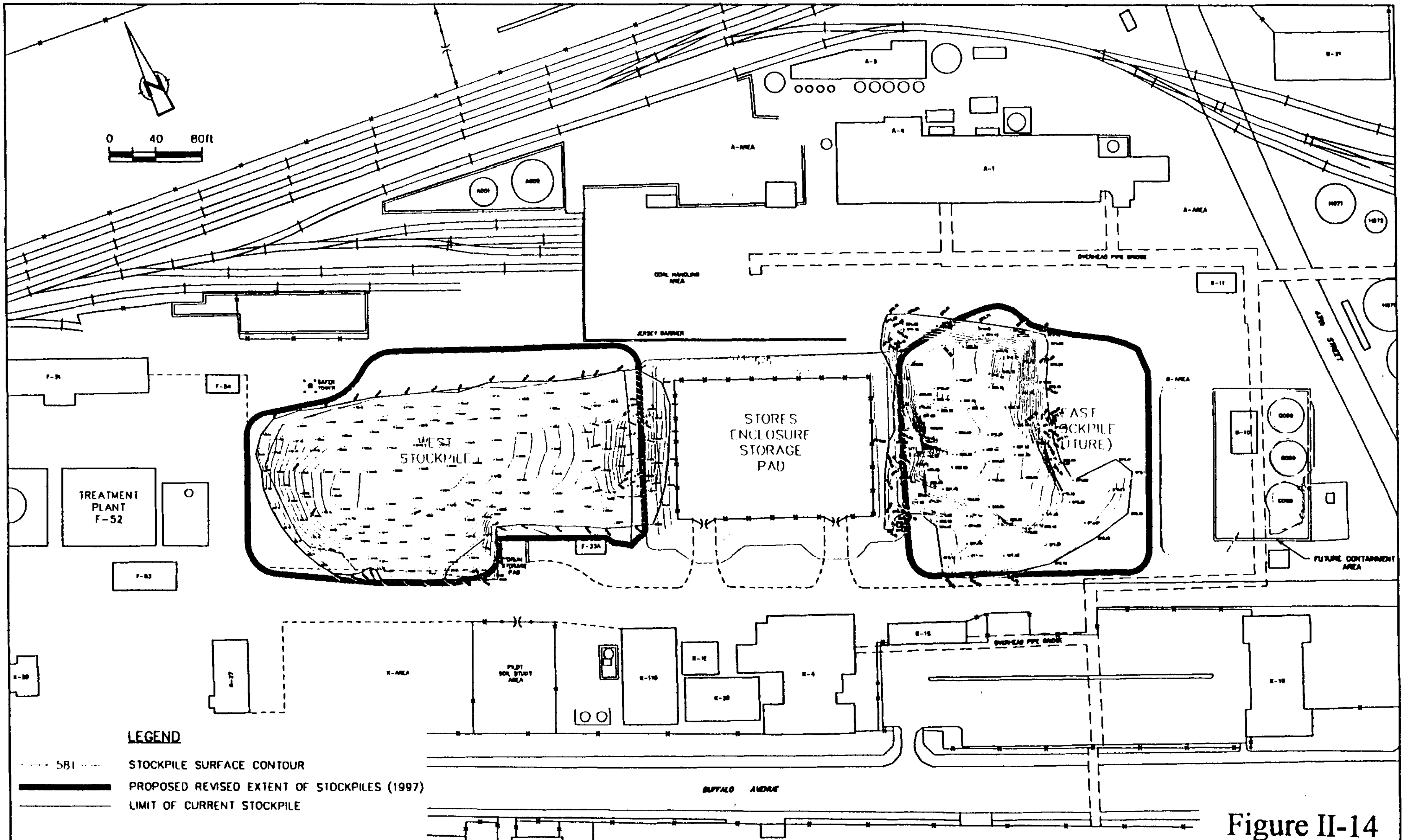


Figure II-14

F–AREA LONG–TERM SOIL STOCKPILE LOCATIONS

Buffalo Avenue Plant – Occidental Chemical Corporation

Modified From
CRA

02583-00(191)GN-WA055 NOV 13/98

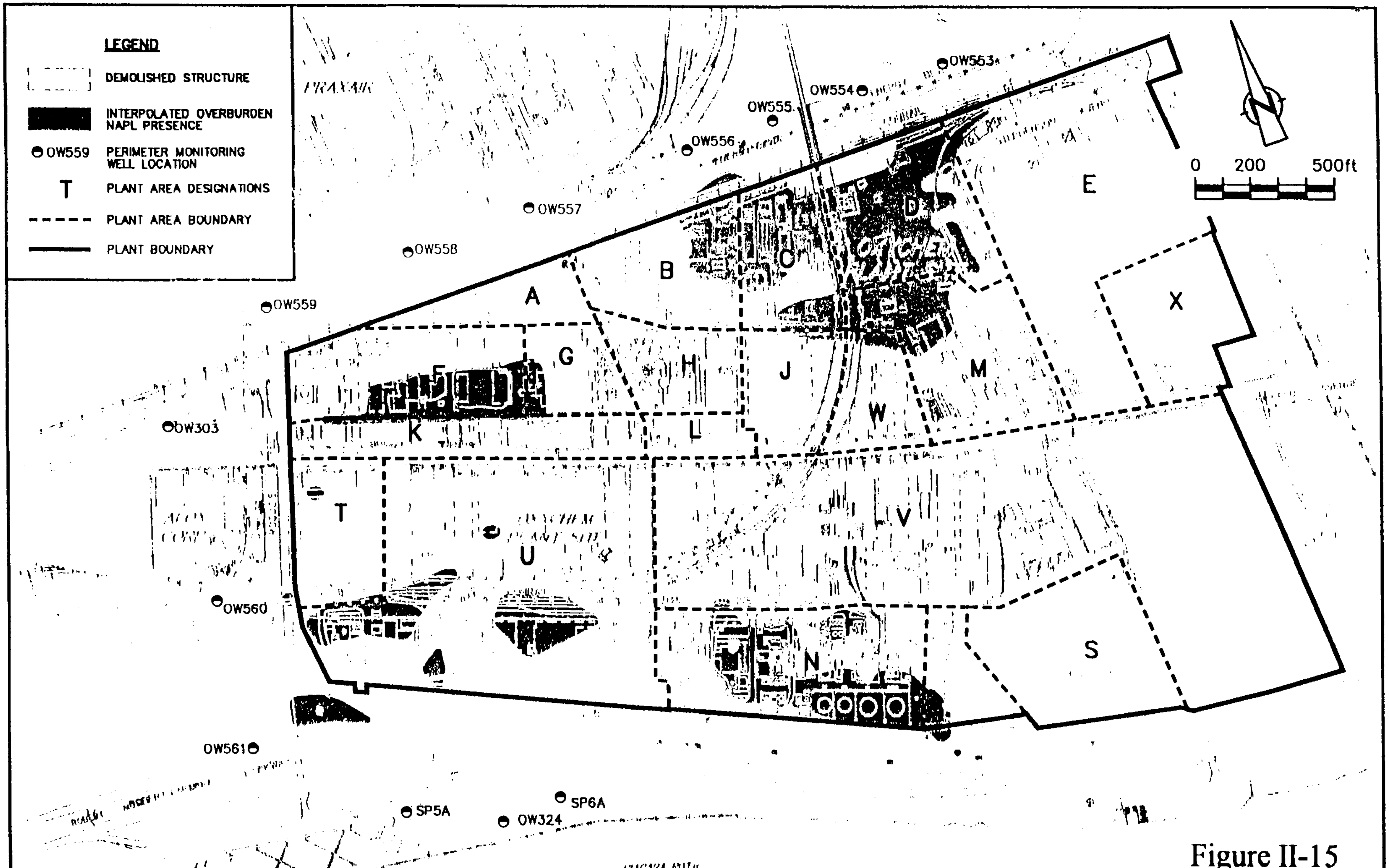


Figure II-15

PERIMETER MONITORING WELLS
CORRECTIVE MEASURES STUDY
Buffalo Avenue Plant – Occidental Chemical Corporation

Modified From
CRA

02583-00(191)GN-WA043 NOV 13/98

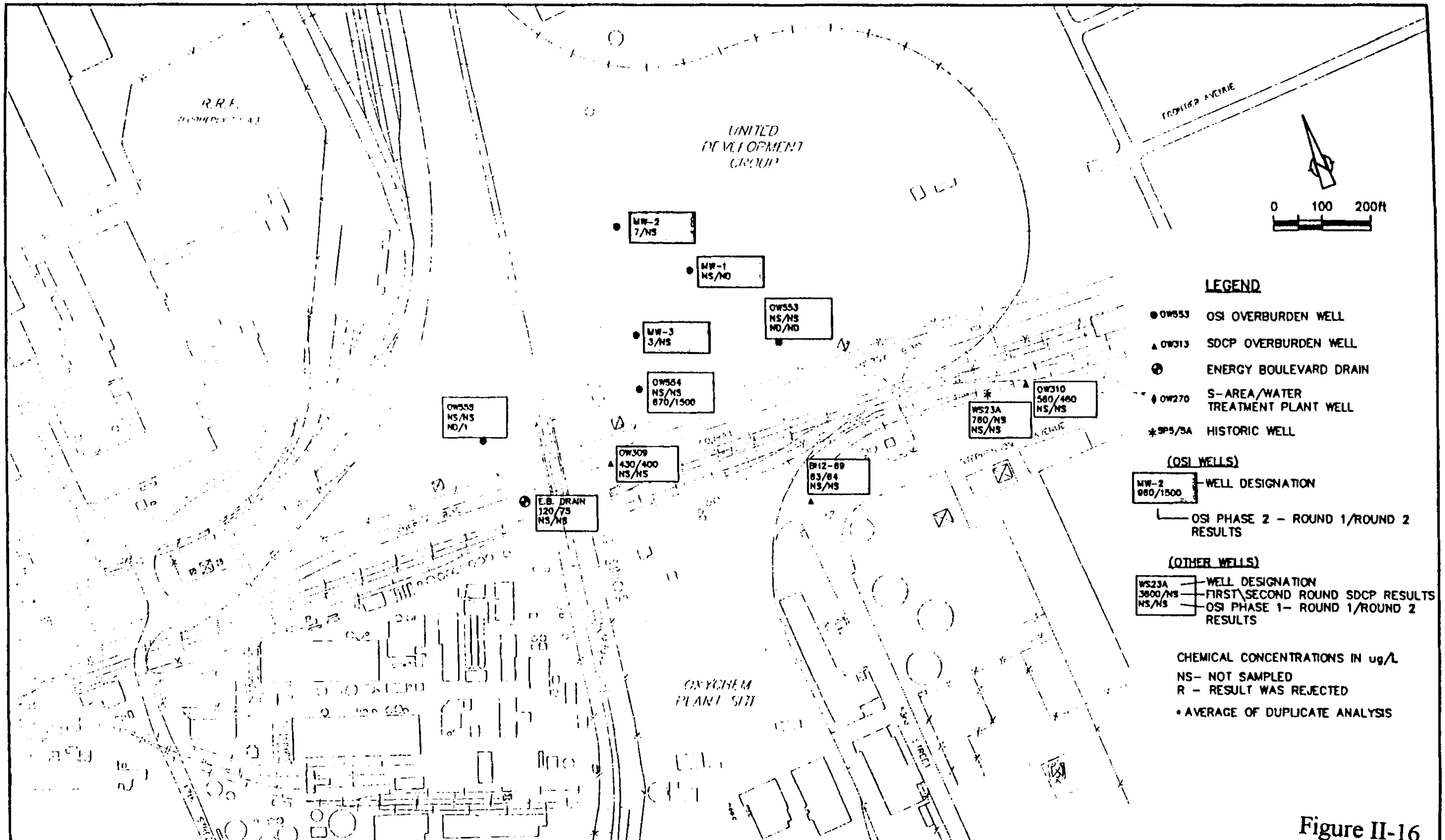


Figure II-16

TOTAL ORGANIC SSI CONCENTRATIONS
OFF-SITE OVERBURDEN WELLS – PHASE 2 – ROUNDS 1/2 SSI
OSI PROGRAM
Occidental Chemical Corporation – Buffalo Avenue Plant

CRA

2583 (11B) NOV 17/93(W) REV.0 (P491)

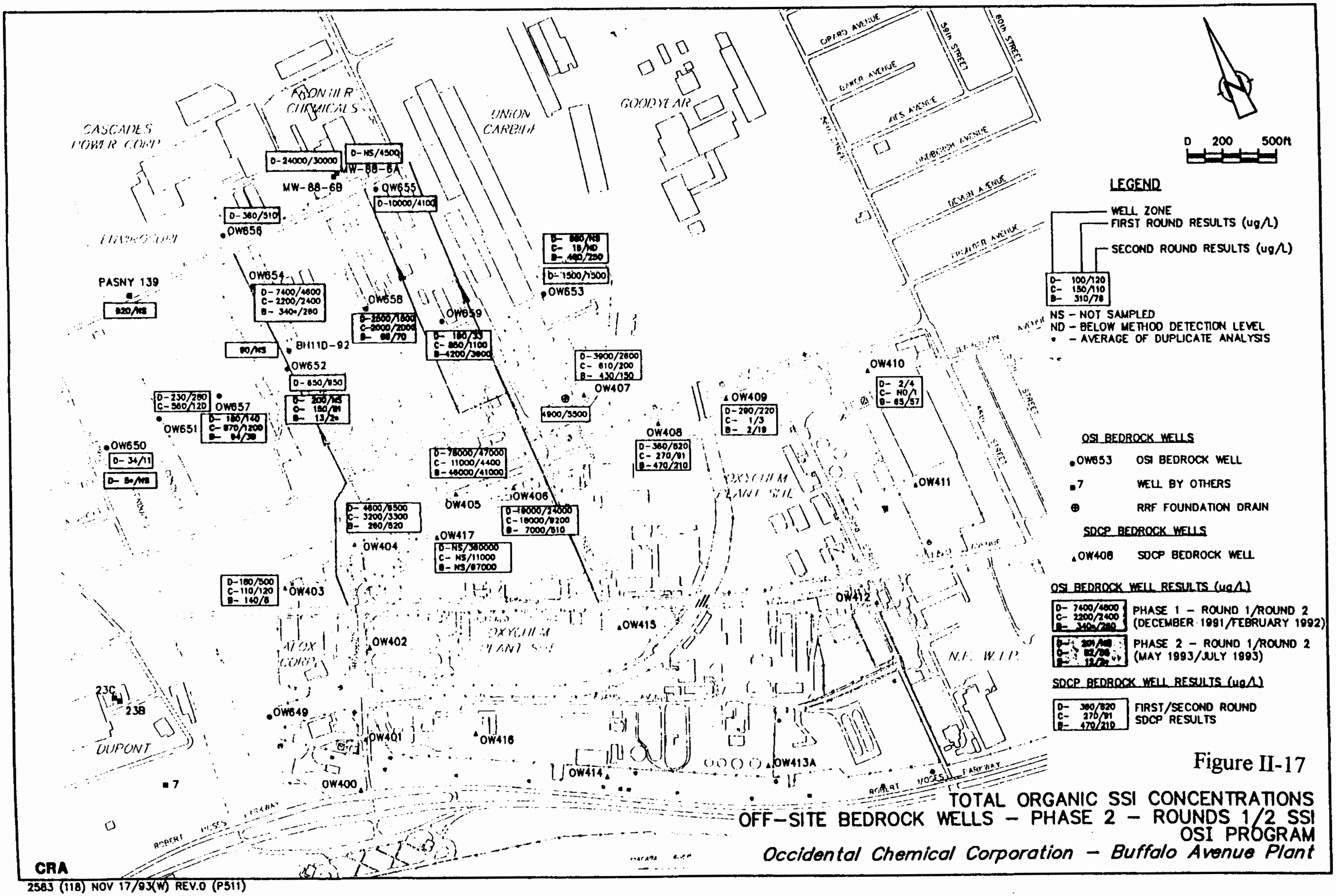


Figure II-17

TOTAL ORGANIC SSI CONCENTRATIONS
OFF-SITE BEDROCK WELLS - PHASE 2 - ROUNDS 1/2 SSI
OSI PROGRAM
Occidental Chemical Corporation - Buffalo Avenue Plant