D. FOSTER

OXY

Occidental Chemical Corporation

Industrial & Specialty Chemicals

HISTORICAL DATA BASE
Buffalo Avenue Plant

prepared for:
New York State Settlement Discussions
August 1, 1984

Volume I
Text

Occidental Chemical Corporation

Industrial & Specialty Chemicals

HISTORICAL DATA BASE

Buffalo Avenue Plant

prepared for:

New York State Settlement Discussions

August 1, 1984

Volume I

Text

Ref. No. 0626

CONESTOGA-ROVERS & ASSOCIATES LIMITED

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF APPENDICES (VOLUME II)

LIST OF TABLES

LIST OF MAPS

LIST OF FIGURES

1.0 INTRODUCTION

This report presents a history of Occidental Chemical Corporation's Buffalo Avenue Plant (hereinafter Niagara Plant) in Niagara Falls, New York, and data collected during extensive investigations which were undertaken to detail the overburden and upper bedrock geologic strata and groundwater hydrology.

2.0 GENERAL PLANT BACKGROUND

2.1 PLANT LOCATION

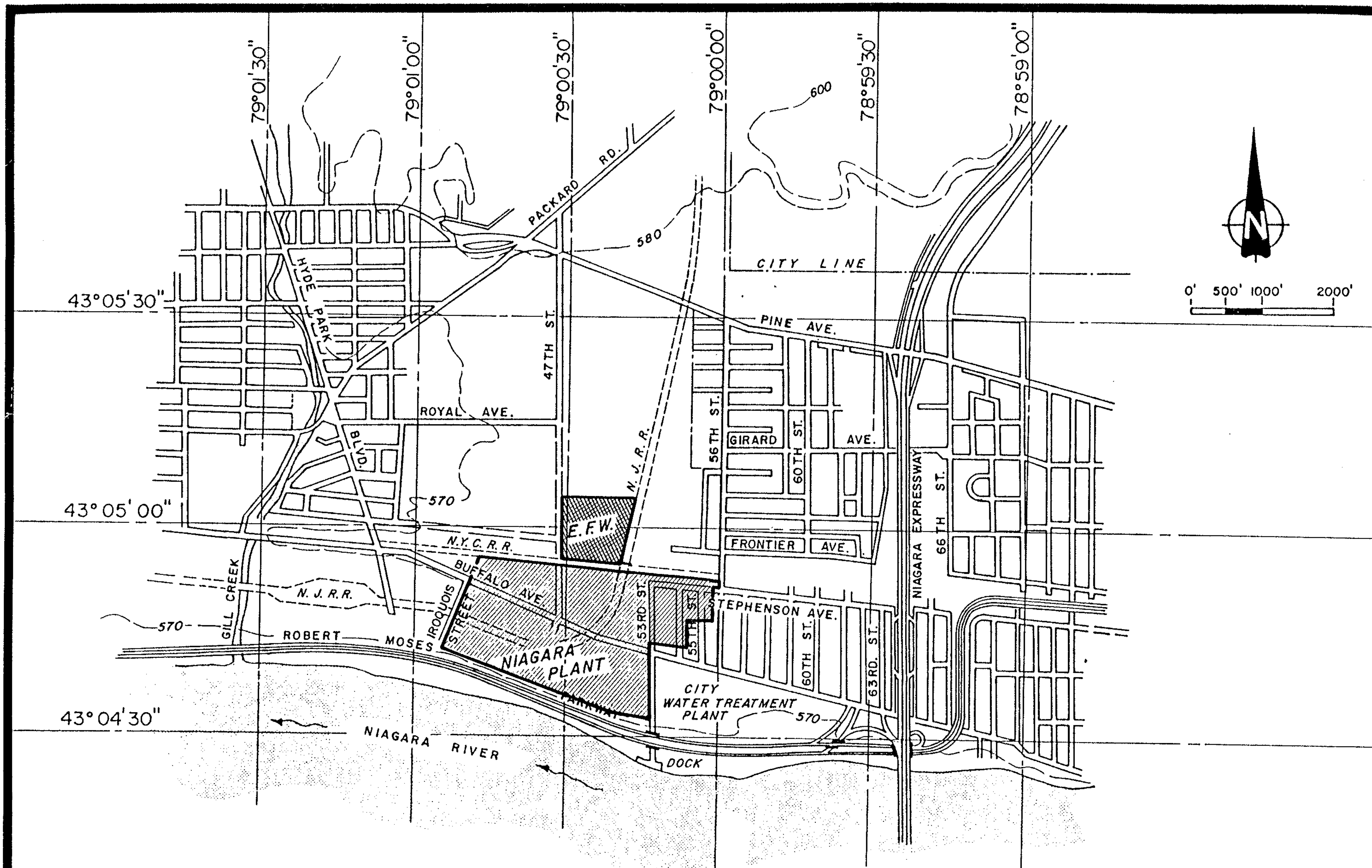
The Niagara Plant is located along the north shore of the Niagara River, approximately 3.3 miles upstream of the Falls in the City of Niagara Falls. Figure 1 shows a key map identifying the plant site in relation to the surrounding area of the City.

The main Niagara Plant property is bounded by the following:

North - Energy Boulevard and Conrail tracks
West - Iroquois Street
South - Niagara Mohawk Power Co. Transmission R.O.W.
East - 53rd Street on the South Side of Buffalo Avenue
- 53rd to 56th Street on the North Side of Buffalo Avenue.

OCC's Energy From Waste facility (EFW) is located north of the Conrail tracks and east of 47th Street.

The Niagara Plant is bisected from east to west by Buffalo Avenue which cuts across the center of the plant. Figure 2 presents



U.S.G.S. GRID REFERENCE

E.F.W. PLANT SITE	NIAGARA PLANT SITE
LAT. - 43° 05' 00"	LAT. - 43° 04' 45"
LONG. - 79° 00' 25"	LONG. - 79° 00' 30"

CRA

figure I

KEY MAP

Occidental Chemical Corporation – Niagara Plant

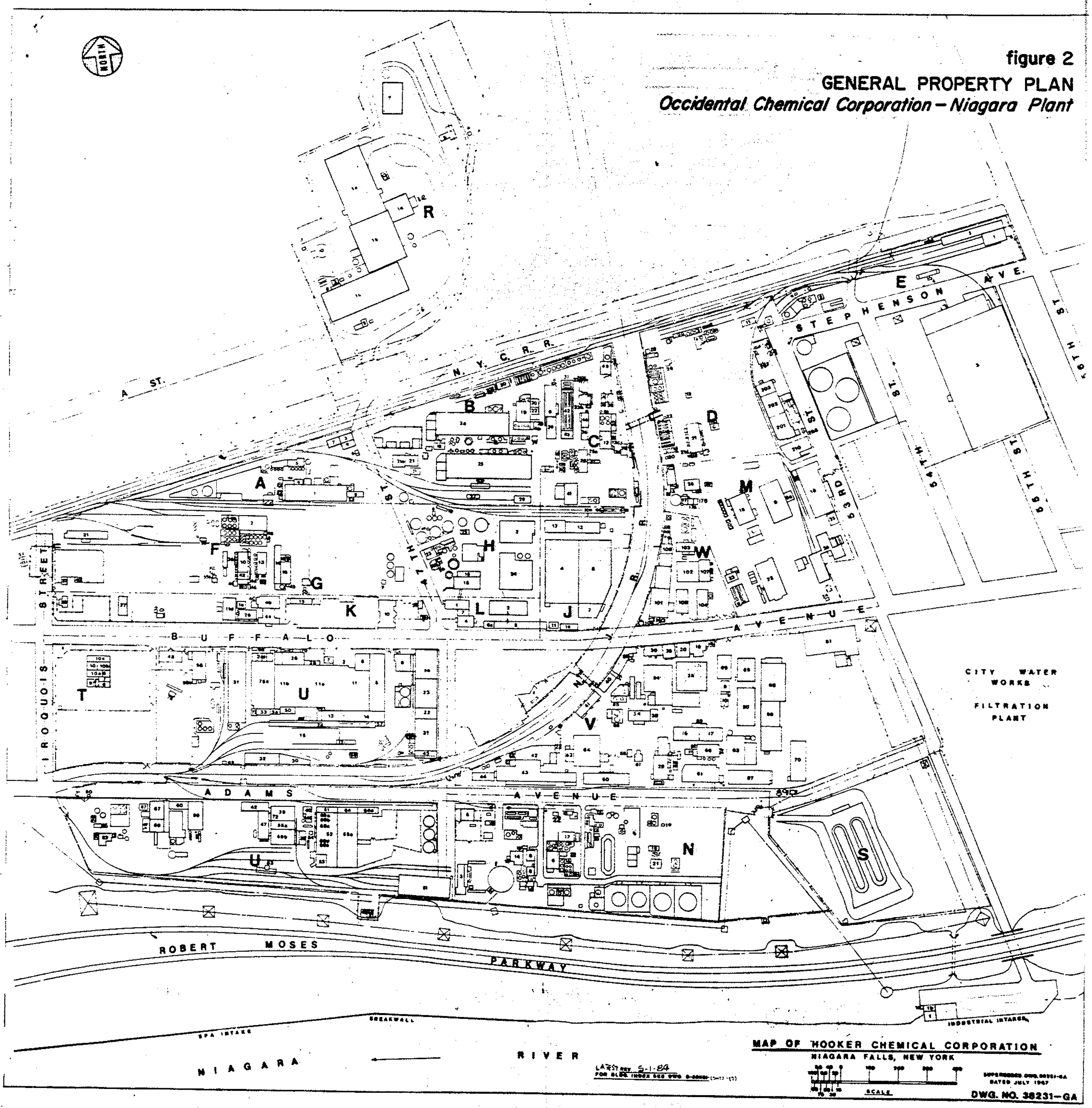


figure 2
GENERAL PROPERTY PLAN
Occidental Chemical Corporation – Niagara Plant

a general property plan indicating the local features at the plant. Enclosed Map 1 presents an aerial photograph of the plant taken in May 1984.

2.2 PLANT HISTORY

The original plant site was approximately 7 acres in size and was purchased in 1911 from Niagara Falls Power Company. This plant was located on the north side of Buffalo Avenue and was bounded on the east by the Niagara Junction Railroad, on the west by 47th Street, and on the north by the Niagara Falls Power Company. At this time the company was called Hooker Electrochemical Company.

Hooker Electrochemical continued to expand along the north side of Buffalo Avenue. By 1927 the plant site was approximately 29 acres in size and was bounded on the west by Iroquois Street, on the east by approximately 52nd Street and on the north by railroad property. This plant area is shown on Figure 3 "Hooker Electrochemical Co., Niagara Falls, New York, Layout of Plant & Adjacent Territory - 1927".

As can be seen on the 1927 plant map, the adjacent property on the south side of Buffalo

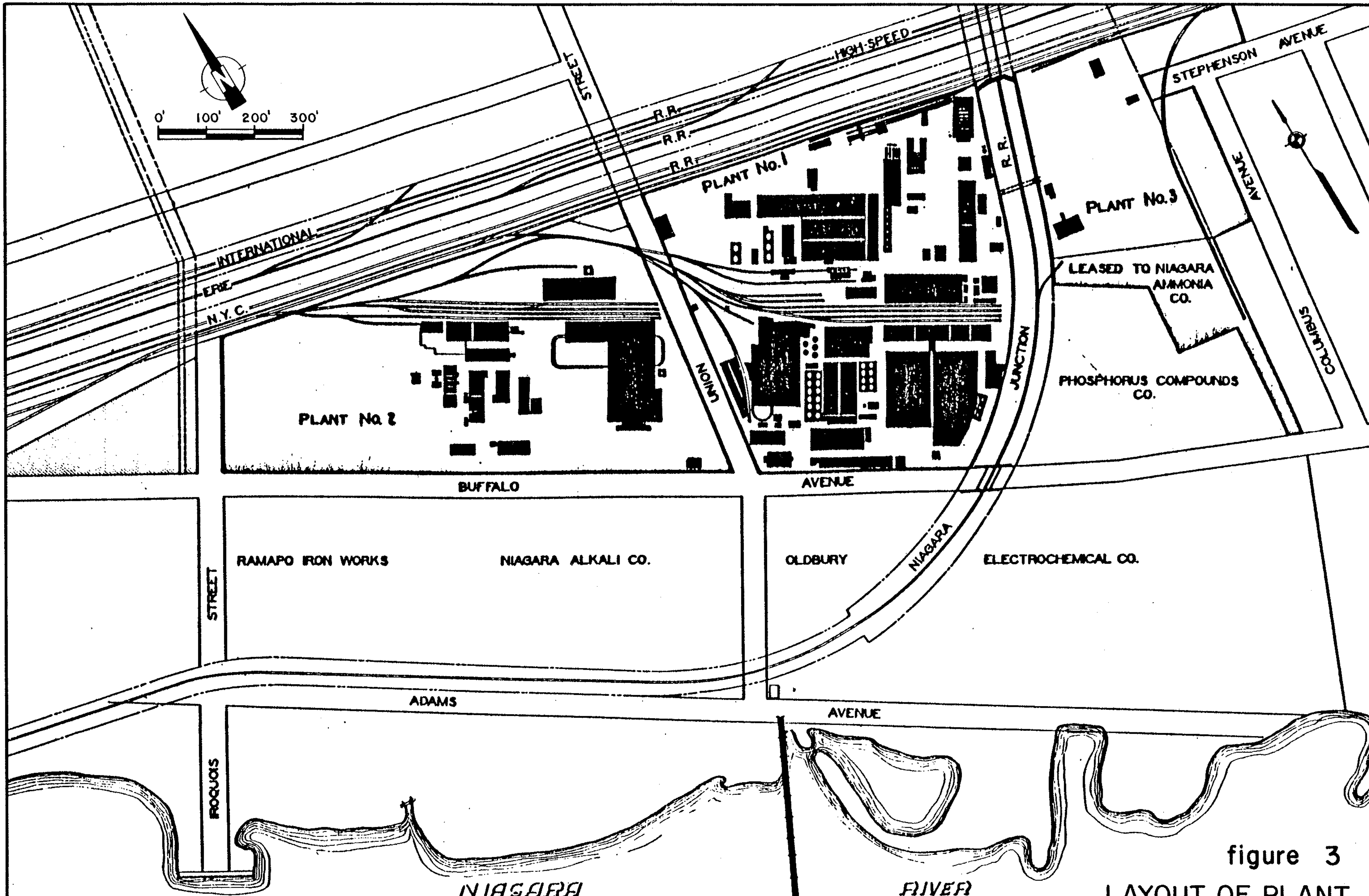


figure 3

LAYOUT OF PLANT AND ADJACENT TERRITORY - 1927

Occidental Chemical Corporation — Niagara Plant

CRA

0626 - 17/05/84

Avenue was occupied mainly by Niagara Alkali Co. and Oldbury Electrochemical Co. These companies were acquired by Hooker on November 30, 1955 and November 30, 1956 respectively.

Additional parcels of land have been obtained by Hooker through the years. The Niagara Plant site at the present time encompasses approximately 100 acres bounded on the north by Energy Boulevard and the Conrail tracks, south by the Niagara Mohawk Power Co. Transmission R.O.W, west by Iroquois Street, and east by 53rd Street on the south side of Buffalo Avenue and 53rd to 56th Street on the north side of Buffalo Avenue. This current site layout can be seen on Figure 4 "Location Plan, Occidental Chemical Corporation, Niagara Plant".

The major portion of property obtained by Hooker over the years was previously owned by Niagara Falls Power Company (Niagara Mohawk). This is also true of the lands which comprised Oldbury and Niagara Alkali. Figure 5 shows "Historical Property Ownership, Niagara Plant".

In addition, an OCC affiliate acquired adjacent property of 11.78 acres in 1978 and another 0.89 acres in 1981, both purchased from Union

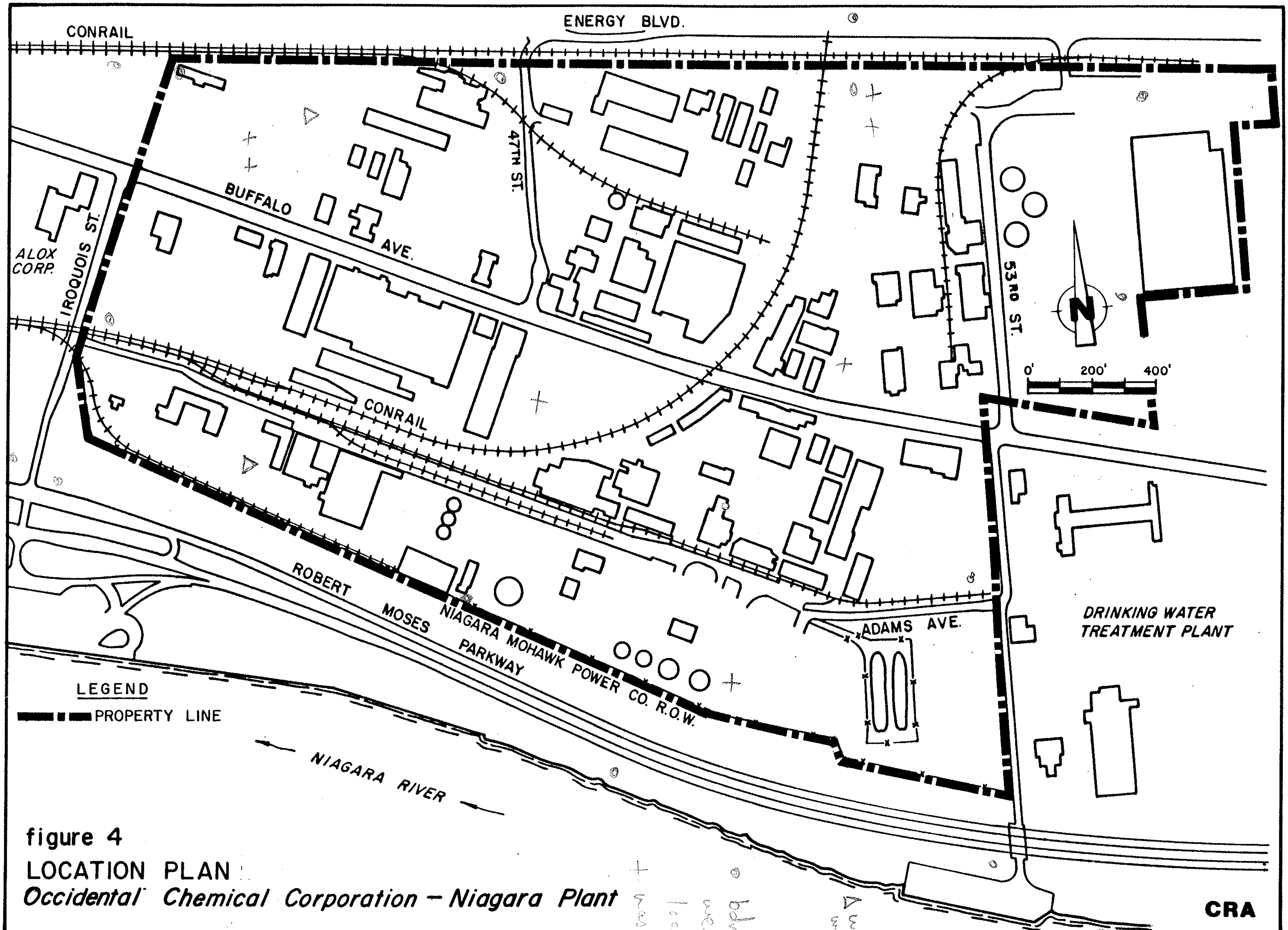


figure 4
LOCATION PLAN
Occidental Chemical Corporation — Niagara Plant

626 - 28/05/84

+ waste wells (ob)
○ bldg well locns
Δ waste wells (ob)

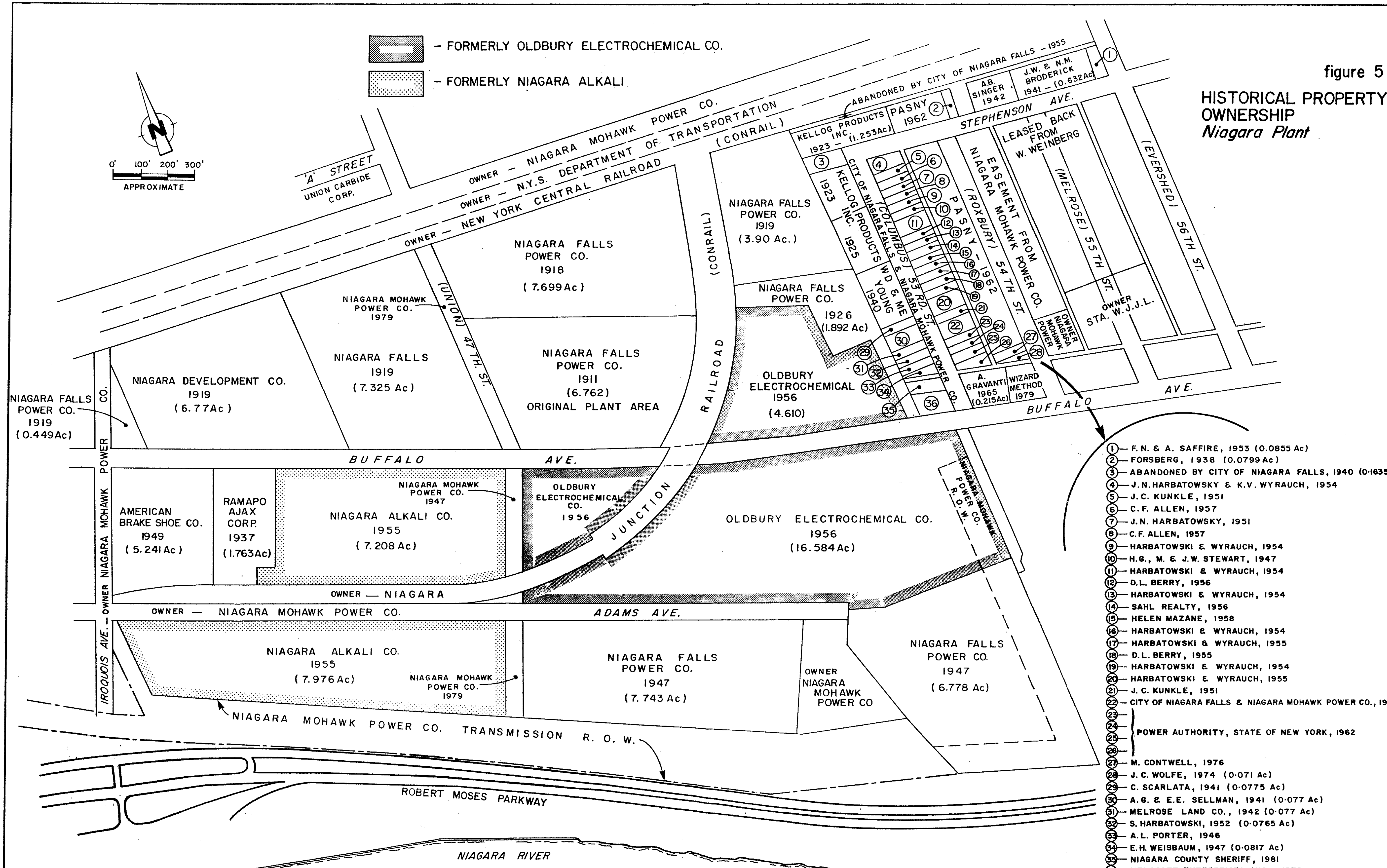


figure 5
HISTORICAL PROPERTY OWNERSHIP
Niagara Plant

Carbide. This property which is bounded on the west by 47th Street, on the south and east by railroad properties and on the north by Union Carbide, was purchased for the development of the Energy From Waste Plant (EFW). The EFW plant produces steam for use in the Niagara Plant processes and plant heating and for the generation of electrical power. The steam is generated through the burning of municipal refuse.

2.3 PLANT NAMES

Over the years, the ownership of the Niagara Plant has been changed to reflect corporate title changes. These changes have included:

Hooker Electrochemical Company	November 6, 1909
Hooker Chemical Corporation	May 29, 1958
Hooker Chemicals & Plastics Corp.	January 17, 1974
Occidental Chemical Corporation	April 1, 1982

2.4 PLANT ZONES

The present plant facilities are geographically divided into alphabetical areas for ease of identification.

2.5 VISUAL IMPROVEMENT PROGRAM

Beginning in 1978, a visual improvement program (VIP) was initiated at the plant to upgrade the appearance of the plant. The program included general landscaping and surface improvements as well as an ongoing demolition program.

The demolition program was initiated to remove unused buildings from the Niagara Plant. Since 1978, approximately 90 buildings have been demolished. The V, D and F-Areas have been most affected by this program.

Buildings were removed to ground level and the areas typically covered and graded with crushed stone. In some cases (i.e. D-Area) the surface is paved to facilitate access or to address other concerns such as improved drainage.

At the time of demolition, sections of the sewer line(s) servicing the demolished buildings were severed and a 2-foot section removed between the building and adjacent to manhole. The remaining stub sections were plugged with concrete.

3.0 SITE CONDITIONS

3.1 SITE TOPOGRAPHY

The Niagara Plant site generally slopes from the north to south toward the Niagara River. The entire property is relatively flat with little observable topographical relief. The only on-site exception to the flat topography is the S-Area which was used as a disposal area for waste materials and the lagoon facilities which currently exist on the S-Area. The Robert Moses Parkway along the southern property line is elevated and thus offers some off-site topographical relief. The plant surface area is primarily covered by buildings, paved roadways, and crushed stone surfaces. As part of the visual improvement program, some areas of the plant have been vegetated and trees have been planted. In order to facilitate the bulk transport of chemicals both to and from the plant, there are railroad tracks throughout the plant.

Ground surface contours are shown at 1-foot intervals on the enclosed Map 2 entitled "Niagara Plant Ground Contours", prepared by Abrams Aerial Survey Corporation in 1982. The photography for the contouring was completed in April 1982.

3.2 IN-PLANT LANDFILL, DEWATERING AND SPILL AREAS

Within the boundaries of the Niagara Plant there are several areas of varying size which have, in the past, been used as landfill areas or dewatering areas or where significant spills are likely to have occurred as a result of general site operations. These areas, shown on Figure 6, are briefly described in the following:

3.2.1 Landfill Areas

Historic in-plant landfill areas are shown on Plate 7 (enclosed), entitled "Major Operations and Landfill Areas".

The landfill locations are listed below:

D-Area:

- D-Area: mainly from the chlorination of toluenes (pre-World War II)
- <1 acre but actual size uncertain
- pre-World War II
- 4200 tons of waste consisting of;

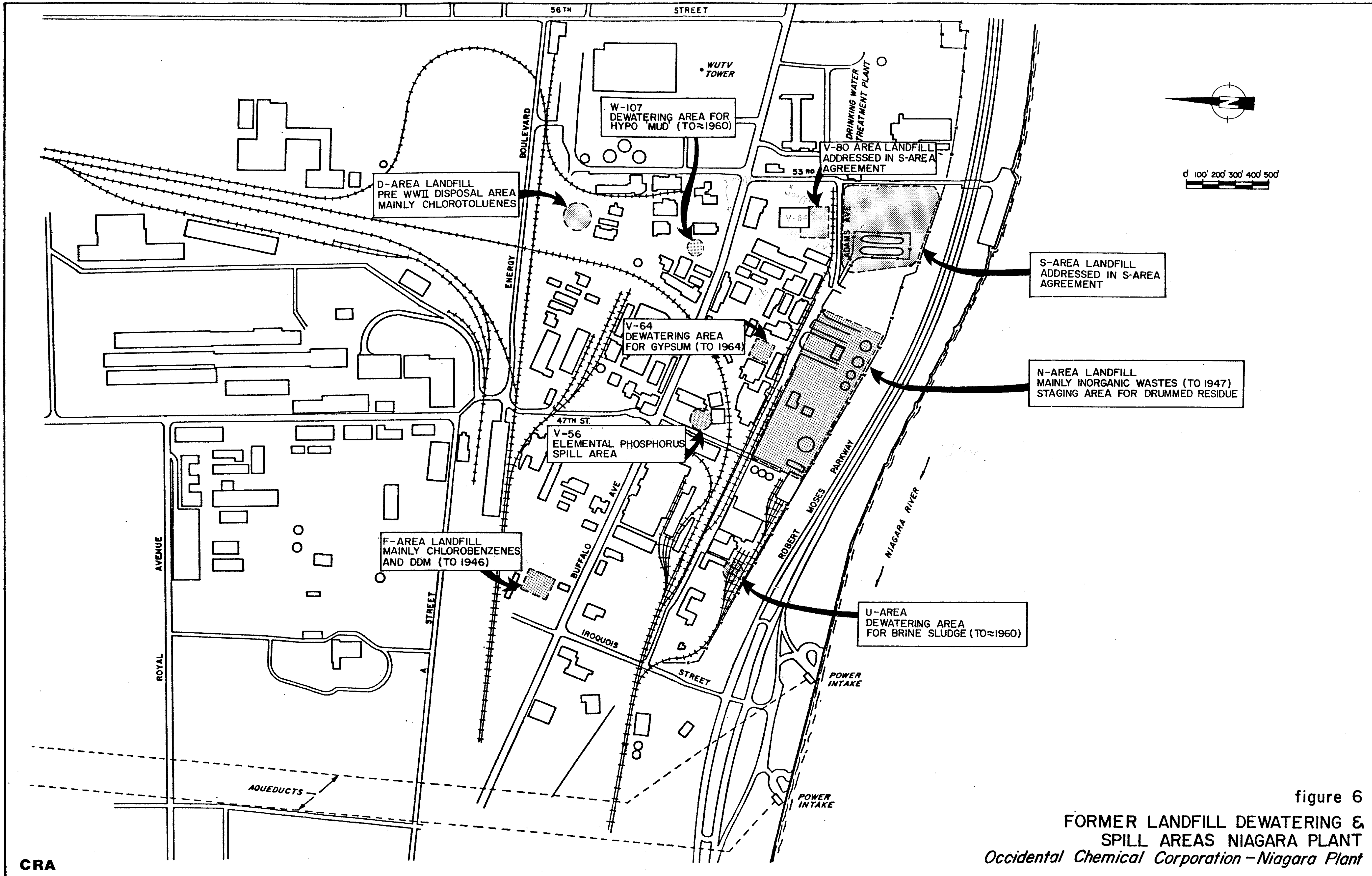


figure 6

FORMER LANDFILL DEWATERING & SPILL AREAS NIAGARA PLANT

Occidental Chemical Corporation – Niagara Plant

0626 - 11/07/84

200 tons miscellaneous acid chlorides,
100 tons thionyl chloride process waste (an additional 300 tons was incinerated),
800 tons benzoyl chloride waste,
500 tons miscellaneous chlorinations,
800 tons of LDS/MCT (liquid disulphide/monochlorotoluene),
100 tons of metal chlorides,
800 tons of benzyl chloride,
200 tons of sulfides, and
400 tons of miscellaneous chemicals.

- the expected chemicals in the D-Area environment today from the disposal of the above waste would include benzyl alcohol, benzoic acid, chlorobenzoic acid, toluene, sulfonated toluenes, acetic acid, butyric acid, heptanoic acid, heavy metals (Al, As), chlorinated toluenes, sulfur containing organics and chlorinated aliphatic waxes.

F-Area:

- F-Area, west end: mainly from the chlorination of benzenes and DDM (Dodecyl Mercaptans) (to 1946)
- <1 acre although actual size unknown
- 1500 tons of waste of which 1400 tons is chlorobenzene waste

- during construction of Building F-28, some disposed waste moved to S-Area
- the expected chemicals in the F-Area environment today from the disposal of the above waste would include benzene, chlorinated benzenes, C_{10}, C_{12} and C_{14} 1945 alcohols, chlorides, mercaptans, benzene hexachlorides, chlorinated napthalenes and anilines.

N-Area:

- N-Area: mainly inorganic wastes (to 1947) and staging area for drummed residue
- approximately 7 acres
- filled prior to aquisition of property in 1947 with inorganic waste such as flyash - no organic disposal , when ?
- staging area for drummed residue
- small amount of excavated chlorobenzene waste in 1967, during construction of present production facilities taken to 102nd Street landfill site
- some BHC waste (300 tons) excavated and moved to 102nd Street landfill
- no landfilling since 1967
- single emergency spill pond exists (backup for S-Area lagoons)

- the expected chemicals in the N-Area environment today from the disposal of the above waste would include chlorinated benzenes, chlorinated toluenes, benzene hexachlorides, phosphorus and heavy metals

S-Area:

- S-Area: mainly C-56 and chlorobenzenes (to 1961) (addressed by S-Area Agreement)

V-Area:

- V-Area, South of V-80: inorganic phosphorous and derivatives (to 1978) (addressed by S-Area Agreement)

3.2.2 Dewatering Areas

There are several areas of the plant that have been used as dewatering areas for plant processes. These areas include:

U-Area:

- U-Area, south of U-47: dewatering area for brine sludge (to approximately 1960).

The U-Area was utilized until about 1960 for the collection of brine sludge (primarily calcium sulfate and magnesium hydroxide). This sludge was stored on the ground and allowed to dewater prior to disposal at the 102nd Street landfill site. This sludge was produced from diaphram cells by Niagara Alkali Co. Since the chlor-alkali cell construction in this period frequently contained heavy metals including lead, heavy metals contamination could be suspected.

V-Area:

- V-Area, east of V-64: dewatering area for gypsum (to 1964).

The V-64 area was used for the surface storage of by-product calcium sulfate, from the production of oxalic acid. Calcium sulfate is a non-hazardous material. EP toxicity?

W-107:

- W-107: hypo-mud dewatering.

The Sodium Hypophosphite process in Building W-104 produced the by-product Calcium Phosphite ("hypo-mud"). This waste was produced in Building W-102 and dewatered on the ground east of Building W-107.

Hypo-mud is currently produced by essentially the same process as existed prior to 1964. The hypo-mud has been determined to be non-hazardous by the EP toxicity test and is disposed of at a sanitary landfill. Therefore, the hypo-mud dewatered at W-107 would similarly be considered to be non-hazardous.

by whom?

3.2.3 Spill Areas

It is to be expected that chemicals have been inadvertently spilled at the plant during the course of production, storage and shipping. For example, at V-56, elemental phosphorous has been found to have been spilled in the area of the former phosphorous storage facilities.

3.3 NIAGARA RIVER

The proximity of the Niagara River to the Niagara Plant is important to the site in several ways:

i) The River provides a reliable local source of cooling water to the Niagara Plant (30 to 50 million gallons per day).

ii) The River provides a reliable local source of water for fire protection.

iii) Stormwater runoff and non-contact cooling water is collected in an outfall sewer system (consisting of five outfall sewers) and discharged to the Niagara River and permitted by the NYSDEC under the State Pollutant Discharge Elimination System (SPDES).

The Niagara River has been separated from the plant by the construction of the Robert Moses Parkway in the late 1950's and early 1960's. Although the general direction of the River is northward between Lake Erie and Lake Ontario, the River flows in an east-west direction as it passes the Niagara Plant.

Presently, the River is approximately 8,000 feet wide in the plant area. Although wider at one time, the northern Niagara River shoreline (Niagara Plant shoreline) has been steadily extended southward since 1927 and thus the River has narrowed by as much as 800 feet at points in the area of the Niagara Plant. Figure 7 shows the shoreline progression in this area.

The Niagara River in the plant area is subject to a cyclic fluctuation in water level elevation on a daily basis. This is the result of water resource management practices implemented by the American and Canadian hydroelectric power authorities.

The power authorities (Power Authority of the State of New York and Ontario Hydro) manipulate the water level in the upper Niagara River by opening and closing a series of sluice gates located approximately one mile upstream of the Falls. Operation of the sluice gates regulate the flow of River water to the Falls. When the sluice gates are closed, water is forced to back up in the Chippawa-Grass Island Pool. This back up raises the River water level thus allowing additional River water to be diverted to the hydroelectric power stations.

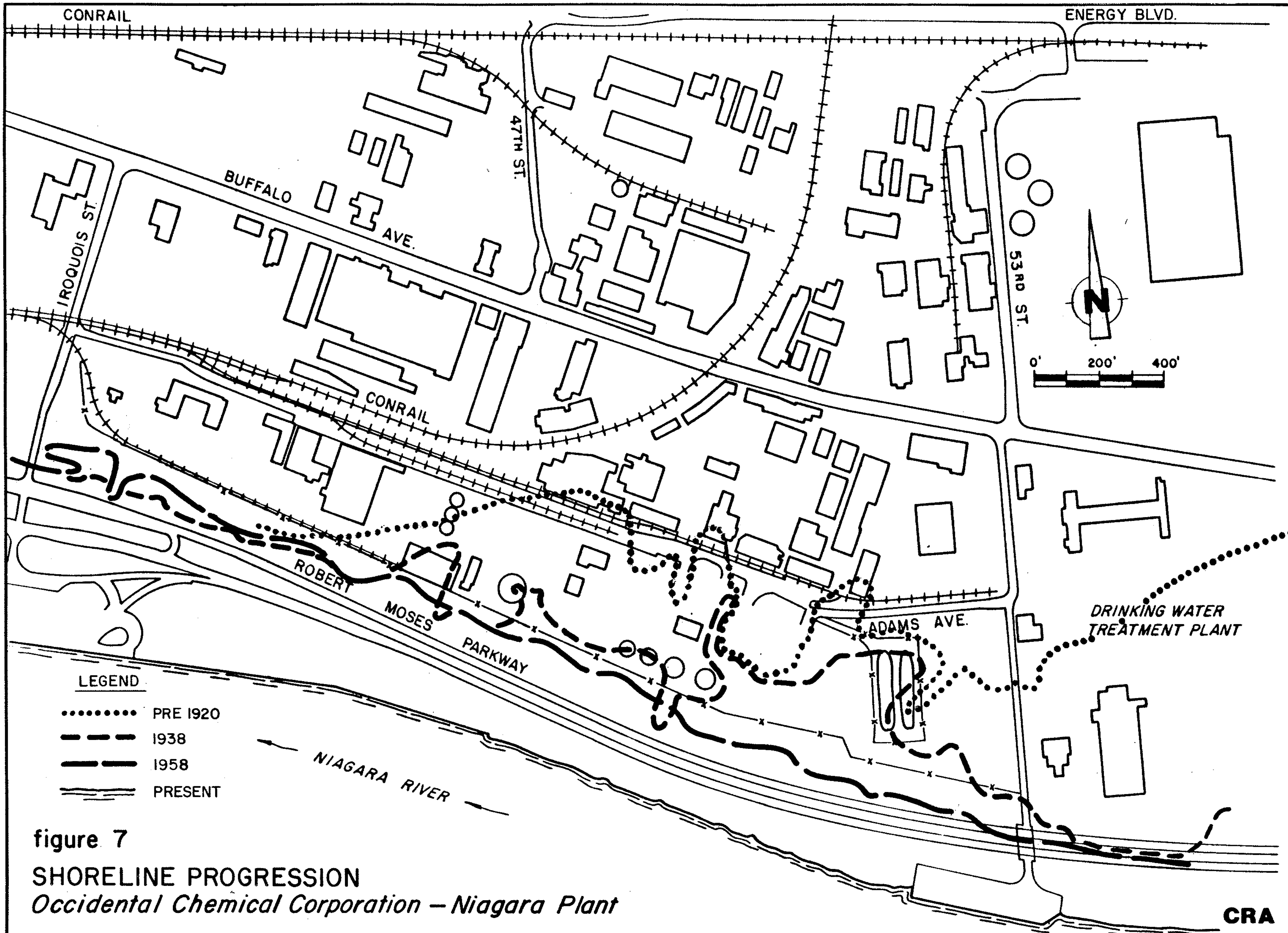


figure 7

SHORELINE PROGRESSION

Occidental Chemical Corporation – Niagara Plant

CRA

0626-17/05/84

There are, however, restrictions on the volume of water that can be diverted from Niagara Falls in order to accommodate tourists visiting the area. These restrictions are detailed in Tables 1 and 2.

In addition to these regulations, a daily restriction is also imposed on the Pool's operating elevation. In no case is the variance between maximum and minimum water elevation, as measured on the hour, allowed to exceed one and one half feet over any given 24-hour period.

PASNY maintains a continuous recorder for measurement of the River water level elevation. The recorder is located in a well adjacent to the water intakes. The two PASNY water intakes are located along the River extending from south of the U-Area to a point 480 feet west of Iroquois Street.

TABLE 1

SCHEDULE OF FLOW OVER NIAGARA FALLS

Date	Time	Flow
April 1 - Sept 15	8:00 AM - 10:00 PM	100,600 cfs
	10:00 PM - 8:00 AM	50,600 cfs
Sept. 16 - Oct. 31	8:00 AM - 8:00 PM	100,600 cfs
	8:00 PM - 8:00 AM	50,600 cfs
Nov. 1 - Mar. 31	24 hours	50,600 cfs

TABLE 2

CHIPPAWA-GRASS ISLAND POOL
WATER ELEVATION RESTRICTIONS

	International Great Lakes Datum	United States Coast and (Geodetic Survey ([illegible]) Datum
Minimum Pool Elevation	559.5	557.7
Maximum Pool Elevation	562.5	560.7
*Maximum Pool Elevation - Special Conditions	563.0	561.2
**Minimum Pool Elevation - Special Conditions	559.0	557.2

* Water levels in the range of 562.5 to 563.0 (IGLD) are allowable only after four (4) consecutive hours of flow off Lake Erie in excess of 270,000 cfs. Water must be restored to a level below 562.5 within twelve (12) hours.

** Water levels in the range of 559.0 to 559.5 (IGLD) are allowable only after four (4) consecutive hours of flow from Lake Erie is less than 150,000 cfs.

4.0 HYDROGEOLOGIC STUDY PROGRAMS

Over the years, at least 186 monitoring wells and boreholes have been installed on Niagara Plant property for the purposes of defining local geology, hydrogeology and soil conditions. The locations of the documented borings and installations are shown on Figure 8 - "Installed Monitoring Wells & Boreholes". Stratigraphic and/or drilling logs for all installations are included in Appendix A (Volume II).

4.1 EARLY INSTALLATIONS

The first recorded boreholes are EM-9, EM-10 and EM-18 installed south of the current U-Area. These were installed by Electro-Metalurgical Co. The fact that the geologic logs show these boreholes to be under water indicates that they were installed prior to 1938 although the specific date is unknown. The drilling logs appear on PASNY drawings PA7-13G-101 and -102 prepared in 1958. No other information is given as to the purpose or installation method for these boreholes and the nature or location of Electro-Metalurgical Co. has not been determined.

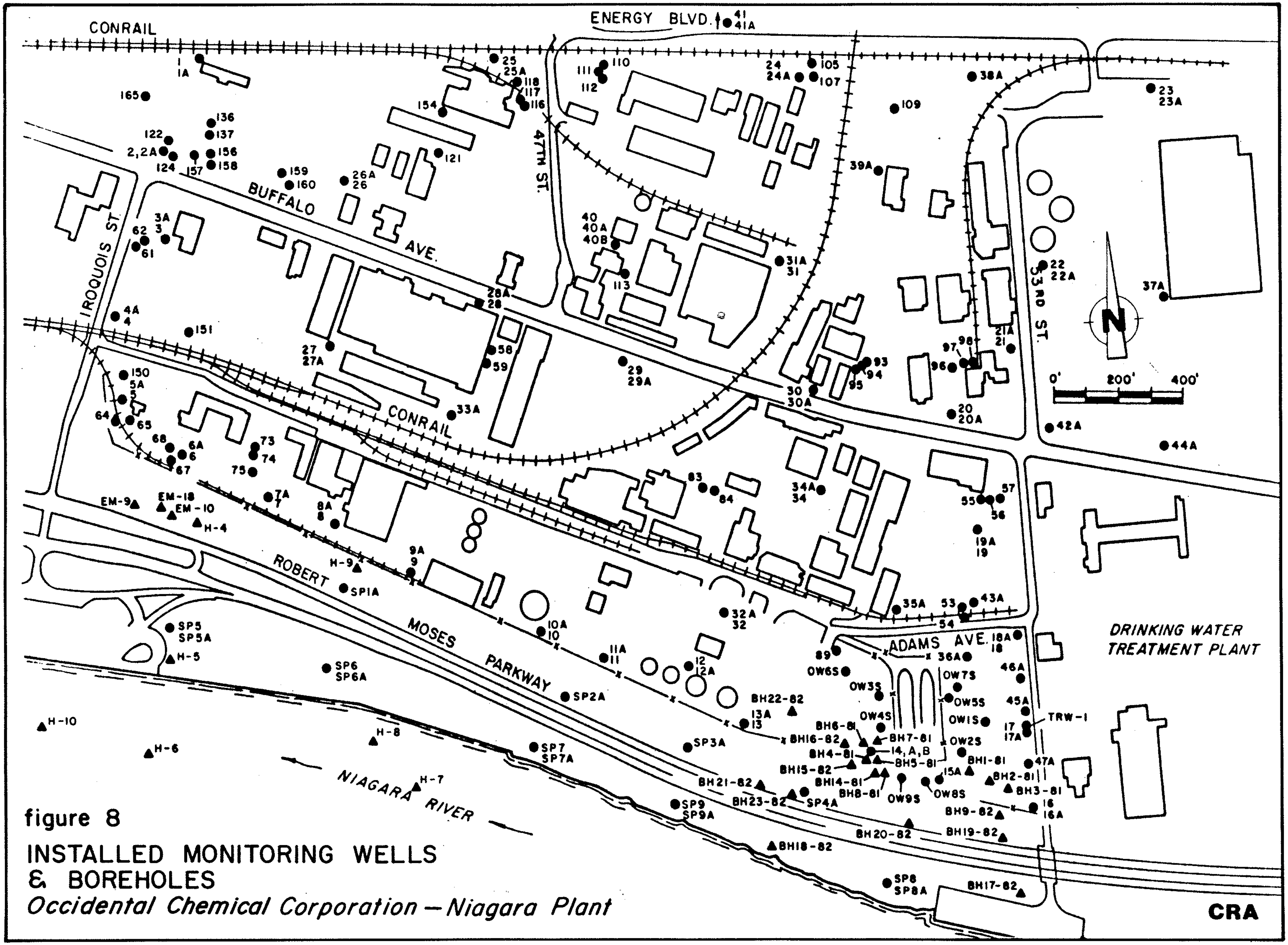


figure 8

INSTALLED MONITORING WELLS
& BOREHOLES

Occidental Chemical Corporation — Niagara Plant

626 - 23/05/84

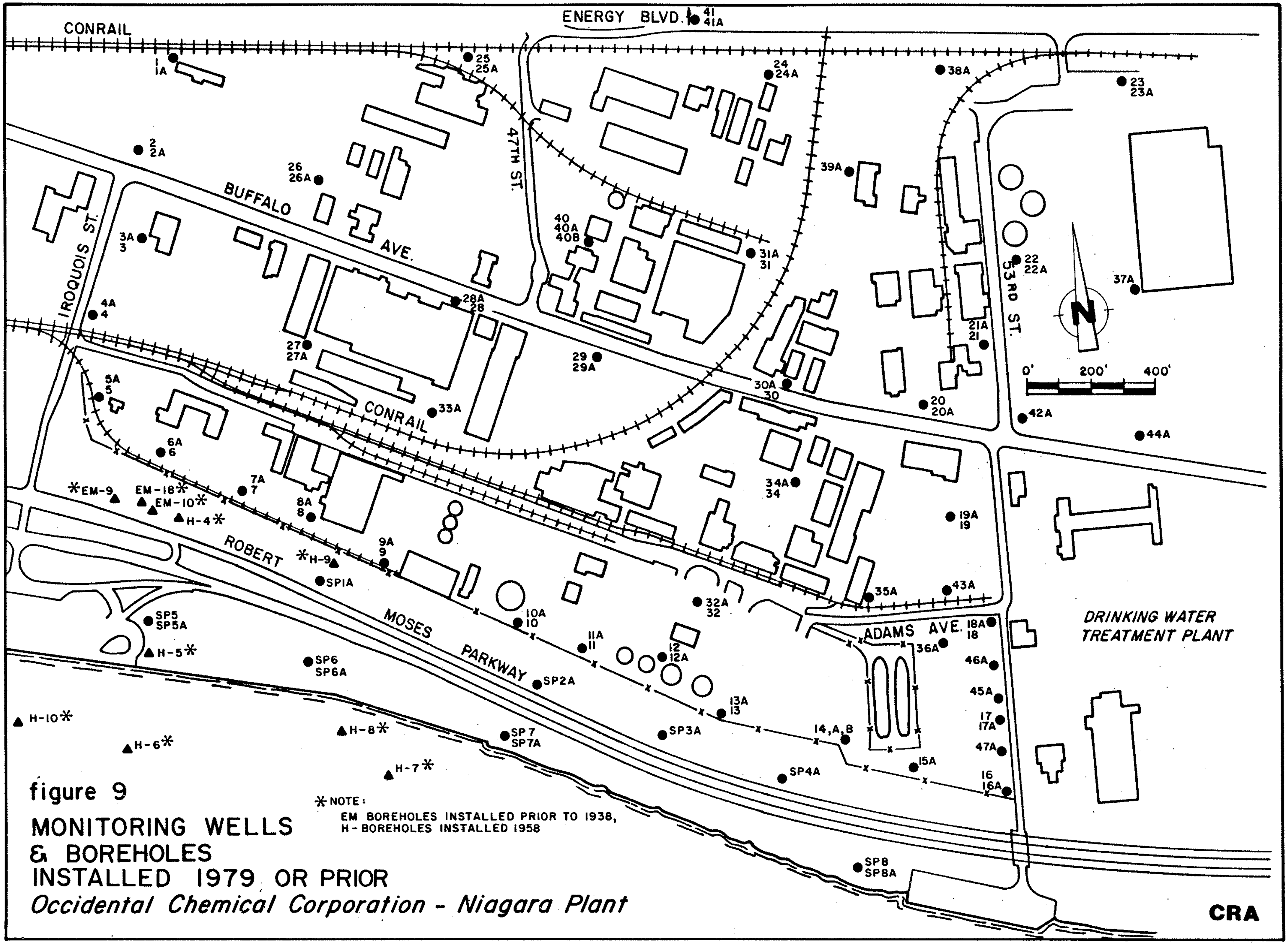
Boreholes H-4, H-5, H-6, H-7, H-8, H-9, H-10 and H-16 were installed during construction of the Robert Moses Power Project by PASNY. They were also underwater at the time of installation and are described on the PASNY drawings mentioned above.

4.2 1979 INSTALLATIONS

In 1979, Hooker embarked on a drilling program designed to determine the geologic structure and water bearing characteristics at the Niagara Plant.

The original proposal for this drilling project (dated December 1978) was for 32 sites. As drilling progressed, the proposal was revised until a total of 112 installations were included on the Niagara Plant, City Drinking Water Treatment Plant and Robert Moses Parkway properties. Ninety-five of these wells were on Niagara Plant and Robert Moses Parkway property and are shown on Figure 9 "Monitoring Wells & Boreholes Installed in 1979 or Prior".

The consulting geologist for this program was Leggette, Brashears & Graham, Inc. (LBG) of



*NOTE:
EM BOREHOLES INSTALLED PRIOR TO 1938,
H-BOREHOLES INSTALLED 1958

figure 9

MONITORING WELLS
& BOREHOLES
INSTALLED 1979 OR PRIOR
Occidental Chemical Corporation - Niagara Plant

Westport, Connecticut. Rochester Drilling Company of Rochester, New York was contracted to perform the drilling. The project began in January 1979 and ended in July 1979.

Hollow stem augers were used to advance through the overburden. Continuous samples were taken with a split spoon. The bedrock was drilled using a tricone drill bit, and therefore no cores were taken.

Wells were constructed of 1 1/2-inch diameter galvanized steel pipe connected to a 1 1/2-inch diameter stainless steel, #10 slot well screen. The screen lengths varied from 5 feet to 20 feet. Well screens were sandpacked followed by a 1-foot bentonite plug. The remaining annular space was grouted to the surface. Those wells installed below grade were encased in a valve box with cover. All wells were topped with lockable caps.

For identification purposes, overburden wells were labelled with a suffix (i.e. Well #20A or #20B) to distinguish them from bedrock well installations (i.e. Well #20).

4.3 1980 INSTALLATIONS

Fifty-one additional wells were installed in 1980 to further define the hydrogeologic character of the overburden materials at the site. These installations are shown on Figure 10, "Monitoring Wells & Boreholes Installed 1980".

The first nine (9) of these wells (numbered OW1S-80 to OW9S-80) were installed in the S-Area in February 1980. The drilling contractor for this work was Empire Soils Investigation, Inc. of Orchard Park, New York and the consultants were LBG and Conestoga-Rovers & Associates (CRA) of Waterloo, Ontario.

Wells were drilled using 7-inch diameter hollow stem augers to the top of clay or till whichever was first encountered. Continuous split spoon samples were taken over the entire drilled interval. A grout plug was typically placed to backfill the borehole to the top of clay or till prior to installing the well. A 5-foot length of 2-inch diameter stainless steel well screen was attached to 2-inch diameter steel riser pipe, set in the hole and sandpacked over the identified saturated interval.

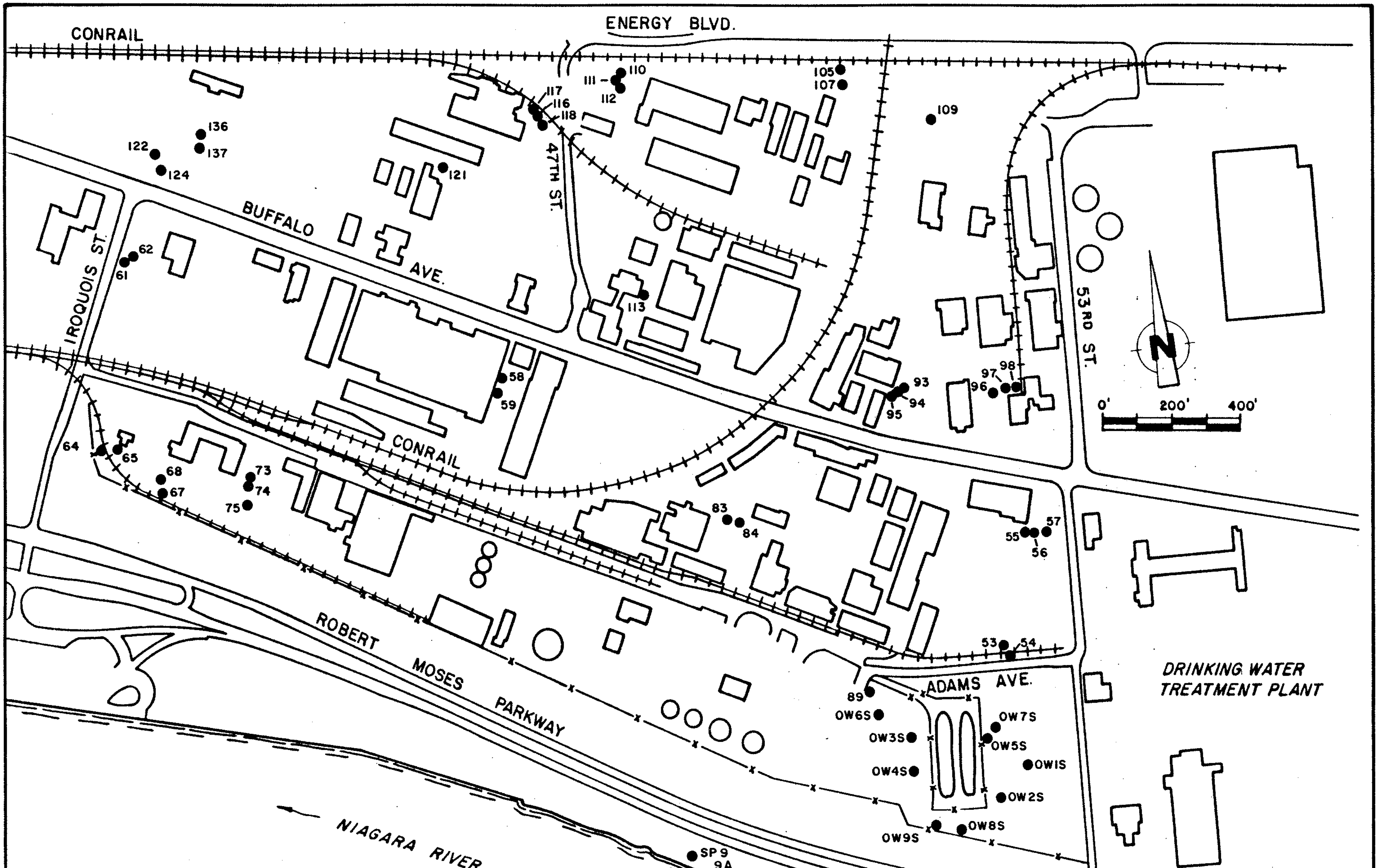


figure 10

MONITORING WELLS & BOREHOLES
INSTALLED 1980
Occidental Chemical Corporation- Niagara Plant

CRA

626 - 28/05/84

Layered on top of the sandpack was a 1-foot bentonite plug. The remaining annular space was grouted to the surface.

During the installation of these nine wells, four soil samples were submitted to Pittsburgh Testing Laboratory for grain size distribution analysis. The results of these analyses are presented in Appendix B (Volume II).

During June and July 1980 a series of shallow wells (number 53-137) were installed throughout the Niagara Plant. These wells were installed as part of the "SPDES" investigation which was designed to detail the physical characteristics of the existing outfall sewer system, sewer hydraulics, and shallow groundwater hydrology and chemistry. The monitoring wells installed were designed to assist in the definition of the overburden groundwater characteristics and groundwater quality.

Once the overall designation of wells had been defined, several proposed locations were found to in fact prohibit drilling due to the interference of underground and overhead utilities. As a result, the overall numbering system is not consecutive. The drilling Contractor was Empire Soils Investigation, Inc. with CRA, the consultant.

Drilling during June and July was undertaken using 7-inch diameter hollow stem augers. Well screens were 2 feet in length, 1 1/4-inch diameter galvanized Redheads and well riser pipe was 1 1/2-inch diameter black steel. A sandpack was added around the well followed by a 1-foot bentonite plug and grout backfill to the surface. Split spoon samples were taken from each well site, although not continuously.

Those wells installed below grade are surrounded by a permanent protective casing with cover.

A pair of wells (SP-9 and SP-9A) were installed along the Robert Moses Parkway in August 1980. These were also installed by Empire Soils and CRA. Eight-inch diameter hollow stem augers were used in the overburden and a 6-inch diameter tricone was used in the bedrock. Split spoon samples were taken at site SP-9 from the ground surface to top of bedrock. The well screens were 2 feet in length, 1 1/4-inch diameter Redheads with 1 1/2-inch diameter black steel riser pipe. Sandpack, bentonite plug and grout were used to backfill the hole to the ground surface. Since both wells were installed below grade, protective casings with lids were added. ~~All~~ Both wells were topped with lockable caps.

4.4 1981 INSTALLATIONS

Two separate investigations were undertaken in 1981; one in May and the second in December. In May of 1981, nine additional shallow overburden wells (150-165) were installed to augment the available information concerning the shallow groundwater hydrology and chemistry. Once again, for the reasons previously described, the wells are not numbered sequentially. Installation details for these wells are identical to those described for wells 53-137 (1980).

In December 1981, CRA commissioned Empire Soils Investigation to conduct a soil boring program in the S-Area. The purpose of this soil boring program was to collect overburden stratigraphic information and to determine the depth to the interface between the sand to silty sand deposits with the relatively impermeable clay or till strata. This included a detailed study of the area surrounding monitoring wells 14a and 14b (installed in January 1979) in the southwest corner of the S-Area. It should be noted that no groundwater monitoring wells were installed under this program.

A total of nine (9) boreholes were drilled within the S-Area's fenced boundary. Three (3) of the locations are southeast of the S-Area lagoons while the remaining six (6) borehole locations surround monitoring wells 14a and 14b.

During the soil investigation, continuous split spoon samples were collected in advance of the augering operation. The blowcounts and soil stratigraphy were recorded and the soil samples placed in glass jars for storage. Three (3) undisturbed shelby tube samples were taken of the native sand-silt deposits.

Upon completion of the boring, each borehole was grouted with a cement-bentonite mixture using a tremie tube to insure positive placement of the grout. Approximately 3 percent bentonite was added to the grout to prevent shrinkage.

After these initial nine boreholes were installed, the soil investigation program was temporarily suspended until 1982 so that applicable permits could be obtained for the planned boreholes adjacent to the Hooker property.

All wells installed in 1981 are shown on Figure 11 "Monitoring Wells & Boreholes Installed - 1981".

4.5 1982 INSTALLATIONS

In March 1982, CRA and Empire Soils completed the second phase of the S-Area overburden investigation. The purpose of continuing this investigation was to provide additional information on the soil stratigraphy and, in particular, the clay or till strata underlying the S-Area and surrounding properties. This program also provided information on the volume and characteristics of the shot rock used to construct the Robert Moses Parkway.

The locations of these ten (10) additional boreholes are shown on Figure 12 "Monitoring Wells & Boreholes Installed 1982".

As was the case with the December 1981 phase of the soil investigation, no groundwater monitoring wells were installed under this program. The installation procedures were identical to those used in the December 1981 phase of the program.

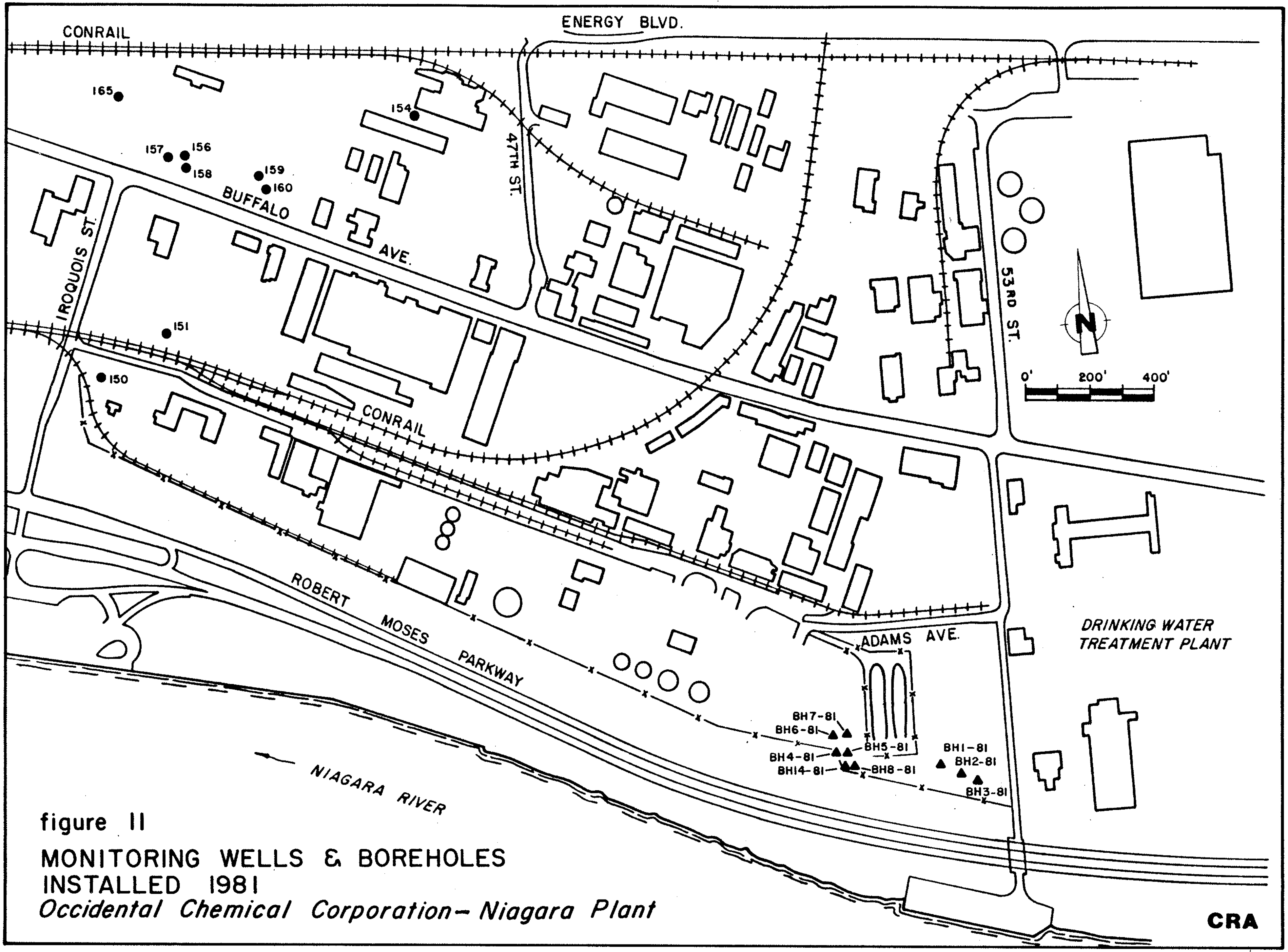


figure II

MONITORING WELLS & BOREHOLES INSTALLED 1981

Occidental Chemical Corporation– Niagara Plant

626-28/05/84

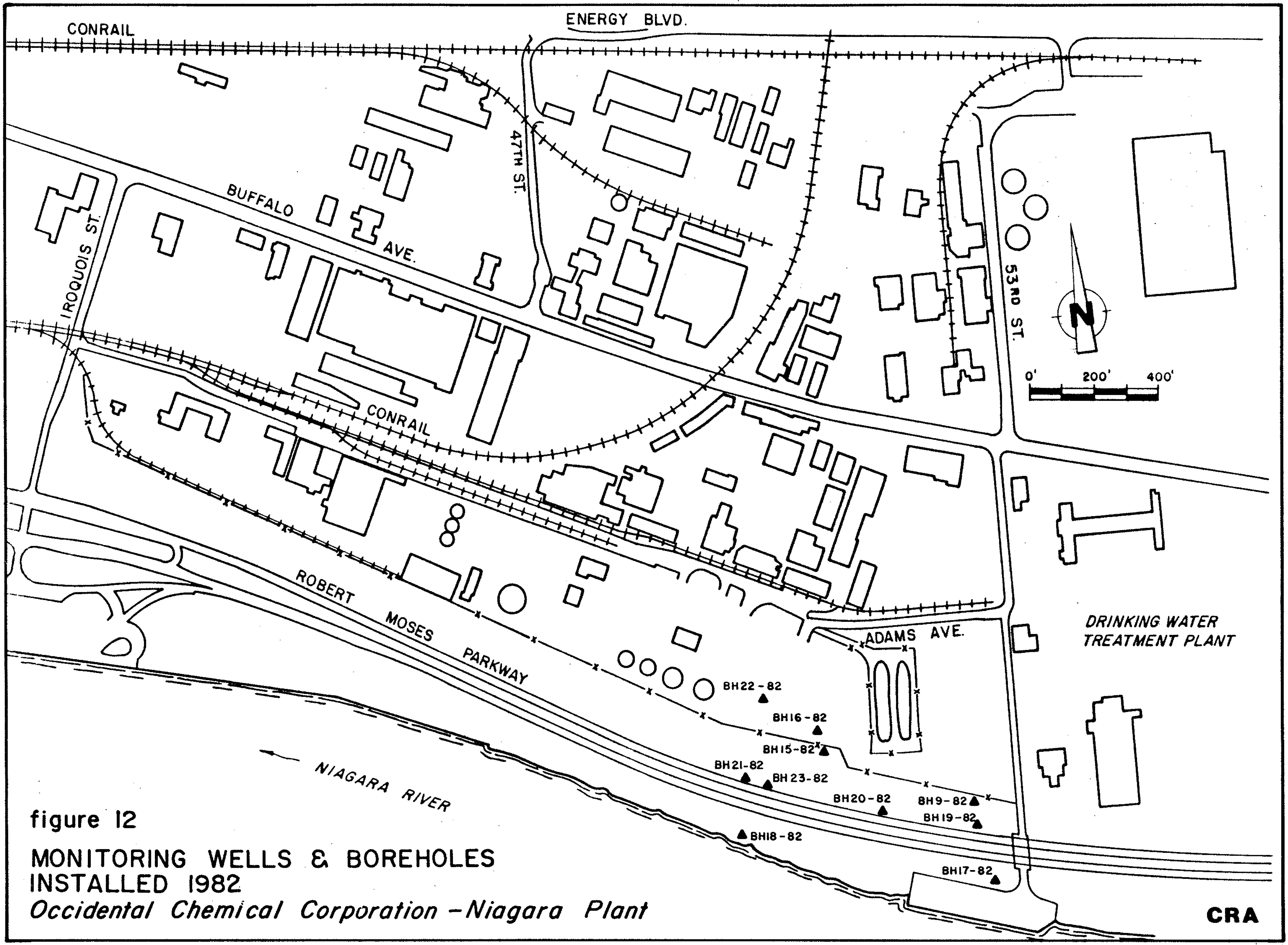


figure 12

MONITORING WELLS & BOREHOLES INSTALLED 1982

Occidental Chemical Corporation - Niagara Plant

626-28/05/84

In some cases where shot rock was encountered, it was not possible to obtain continuous split spoon samples. As a result, some of the shot rock was augered through without sampling, as was the case with BH20-82 and BH21-82. On BH19-82, the shot rock was too massive and hard to auger through. Therefore, it was necessary to core through the shot rock with a 4 3/8-inch diameter diamond bit.

5.0 GEOLOGY

As stated earlier, one of the primary reasons for undertaking the various drilling programs was to define the surficial geology of the Niagara Plant area. This was done through notation of blow counts as the split spoon sample tube was advanced, visual examination of the soil and rock samples and some physical testing.

In general, the stratigraphy overlying the bedrock follows a consistent pattern of basic types. Surface materials are typically fill, consisting of gravel, sand, silt, clay, stone, brick, and other foreign materials. Immediately below this are deposits of fine to very fine sand followed by red clay. Resting on the bedrock is a till consisting of cobbles and gravel, fine to coarse sand, silt, and red clay. Typical overburden soil horizon cross-sections for representative areas north and south of Buffalo Avenue are presented in Figure 13.

The typical defined pattern is different in the S-Area where the fill is very deep and till, especially in the southwest corner, very thin. It is postulated that this was the result of kettle formations and River erosion.

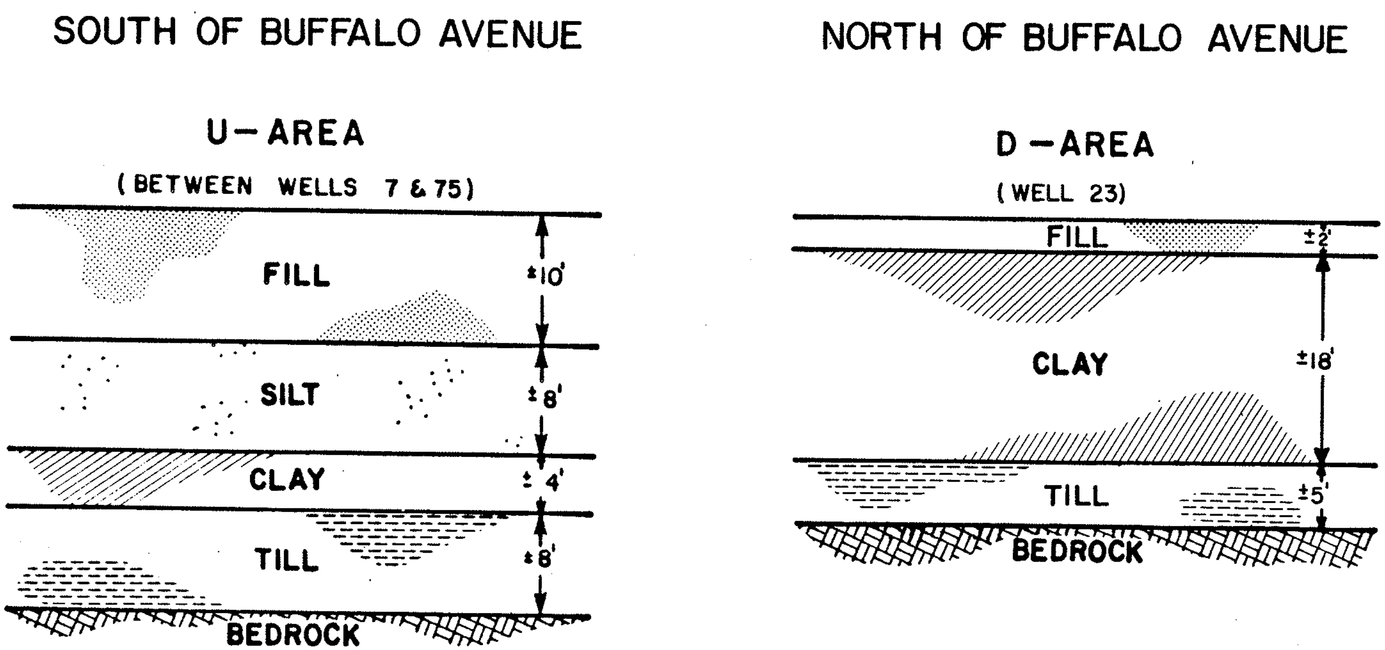


figure 13

TYPICAL OVERBURDEN SOIL HORIZONS

Occidental Chemical Corporation-Niagara Plant

CRA

0626-11/07/84

Detailed descriptions of surficial geology in the Plant area are included in Appendices C, D and E (Volume II).

Table 3 details the thickness of the clay/till layer and the overburden throughout the Niagara Plant. Figures 14 and 15 illustrate the top of clay/till and top of bedrock contours. Figure 16 presents an isopach map of the thickness of the clay/till layer.

Through interpretation of geologic data collected at the various well sites throughout the plant site, seven geologic cross-sections have been developed. Figures 17 and 18 are site plans illustrating the locations of the cross-sections. The cross-sections are presented in Figures 19 through 25.

5.1 PHYSICAL TESTING

Physical property tests including liquid limit, plastic limit and plasticity index (Atterberg Limits) and grain size distribution were performed on selected samples taken during the overburden investigation in the S-Area.

TABLE 3

STRATIGRAPHIC INFORMATION - NIAGARA PLANT

Well #	Ground Elevation	Depth to Clay/Till (feet)	Clay/Till Elevation	Clay/Till to Bedrock (feet)	Bedrock Elevation
1	571.0	7.5	563.5	15.0	548.5
2	571.2	9.7	561.5	14.8	546.7
3	568.4	6.0	562.4	15.5	546.9
4	567.8	6.0	561.8	14.3	547.5
5	569.4	9.7	559.7	14.8	544.9
6	569.1	12.0	557.1	15.0	542.1
7	569.7	17.5	552.2	13.3	538.9
8	569.6	18.5	551.1	9.5	541.6
9	570.1	18.5	551.6	9.5	542.1
10	569.7	15.7	554.0	9.8	544.2
11	567.4	15.0	552.4	9.0	543.4
12	568.6	21.0	547.6	5.5	542.1
13	567.3	21.0	546.3	6.0	540.3
14	573.2	--	--	--	540.5
15A	572.9	29.0	543.9	--	--
16	570.4	25.5	544.9	5.5	539.4
17	571.7	20.2	551.5	12.8	538.7
18	571.3	17.5	553.8	16.0	537.8
19	571.6	8.5	563.1	22.0	541.1
20	572.2	8.0	564.2	17.5	546.7
21	572.9	8.2	564.7	19.3	545.4
22	573.2	7.5	565.7	16.5	549.2
23	572.5	1.5	571.0	22.5	548.5
24	573.6	9.0	564.6	13.5	551.1
25	571.3	9.5	561.8	13.0	548.8
26	571.2	8.0	563.2	11.5	551.7
27	571.6	10.5	561.1	12.5	548.6
28	570.1	6.0	564.1	16.5	547.6
29	570.8	5.5	565.3	15.5	549.8
30	571.9	7.3	564.6	17.7	546.9
31	571.8	6.0	565.8	17.5	548.3
32	568.5	11.7	556.8	12.8	544.0
33A	570.3	9.0	561.3	--	--
34	569.9	7.5	562.4	16.5	545.9
35A	569.4	10.5	558.9	--	--
36A	575.2	20.0	555.2	--	--
37A	571.9	8.0	563.9	--	--
38A	572.2	4.5	567.7	--	--
39A	572.5	5.5	567.0	--	--
40	572.1	7.5	564.6	14.5	550.1
41	571.8	3.0	568.8	16.0	552.8
42A	572.8	9.5	563.3	--	--
43A	568.2	7.5	560.7	--	--
44A	573.2	9.5	563.7	--	--
45A	571.6	19.2	552.4	--	--

continued....

TABLE 3

STRATIGRAPHIC INFORMATION - NIAGARA PLANT

Well #	Ground Elevation	Depth to Clay/Till (feet)	Clay/Till Elevation	Clay/Till to Bedrock (feet)	Bedrock Elevation
46A	572.2	15.0	557.2	--	--
47A	572.0	27.0	545.0	--	--
53	569.1	--	--	--	--
54	570.4	--	--	--	--
55	571.9	6.7	565.2	--	--
56	571.9	8.0	563.9	--	--
57	571.9	8.0	563.9	--	--
58	570.0	6.0	564.0	--	--
59	570.0	6.0	564.0	--	--
61	570.9	8.0	562.9	--	--
62	568.5	--	--	--	--
64	567.8	7.0	560.8	--	--
65	569.5	--	--	--	--
67	568.2	9.0	559.2	--	--
68	569.0	9.0	560.0	--	--
73	569.6	--	--	--	--
74	569.5	--	--	--	--
75	569.4	--	--	--	--
83	568.7	7.0	561.7	--	--
84	568.9	7.0	561.9	--	--
89	569.5	--	--	--	--
93	572.8	7.5	565.3	--	--
94	572.5	7.7	564.8	--	--
95	572.3	8.0	564.3	--	--
96	573.3	7.0	566.3	--	--
97	573.3	7.0	566.3	--	--
98	573.3	7.0	566.3	--	--
105	572.7	7.2	565.5	--	--
107	573.6	6.0	567.6	--	--
109	572.3	8.0	564.3	--	--
110	573.4	7.5	565.9	--	--
111	573.4	7.2	566.2	--	--
112	573.4	7.5	565.9	--	--
113	571.5	7.5	564.0	--	--
116	570.9	7.0	563.9	--	--
117	570.9	7.1	563.8	--	--
118	571.4	7.0	564.4	--	--
121	572.3	--	--	--	--
122	571.6	6.5	565.1	--	--
124	570.6	--	--	--	--
136	572.1	8.0	564.1	--	--
137	571.5	7.3	564.2	--	--
150	569.8	10.0	559.8	--	--
151	568.6	7.5	561.1	--	--
154	572.7	8.7	564.0	--	--
156	571.4	9.0	562.4	--	--

continued....

TABLE 3

STRATIGRAPHIC INFORMATION - NIAGARA PLANT

Well #	Ground Elevation	Depth to Clay/Till (feet)	Clay/Till Elevation	Clay/Till to Bedrock (feet)	Bedrock Elevation
157	571.3	8.3	563.0	--	--
158	571.0	8.8	562.2	--	--
159	571.8	8.0	563.8	--	--
160	572.0	7.4	564.6	--	--
165	570.3	6.5	563.8	--	--
OW-1S	575.9	22.5	553.4	--	--
OW-2S	575.0	31.7	543.3	--	--
OW-3S	572.9	22.8	550.1	--	--
OW-4S	572.1	26.0	546.1	--	--
OW-5S	578.5	22.3	556.2	--	--
OW-6S	571.4	15.7	555.7	--	--
OW-7S	578.7	22.3	556.4	--	--
OW-8S	570.2	27.0	543.2	--	--
OW-9S	569.5	26.0	543.5	--	--
SP-1A	571.5	24.5	547.0	--	--
SP-2A	573.4	24.0	550.4	--	--
SP-3A	573.9	28.0	545.9	--	--
SP-4A (2)	573.4	30.0	543.4	1.0	542.4
SP-5	569.1	27.0	542.1	2.5	539.6
SP-6	568.0	25.0	543.0	1.0	542.0
SP-7	572.5	25.0	547.5	5.5	542.0
SP-8	570.1	26.0	544.1	9.0	535.1
SP-9	573.8	29.0	544.8	0.0	544.8
TRW-1	571.8	--	--	--	538.8
BH-1	576.2	33.0	543.2	--	--
BH-2	573.5	31.3	542.2	--	--
BH-3	572.9	27.7	545.2	--	--
BH-4	573.2	31.4	541.8	0.3	541.5
BH-5	573.4	31.5	541.9	0.3	541.6
BH-6	571.4	29.0	542.4	--	--
BH-7	572.9	27.8	545.1	--	--
BH-8	573.1	29.5	543.6	--	--
BH-14	572.7	31.3	541.4	0.2	541.2
BH-9	569.6	26.8	542.8	5.0	537.8
BH-15	568.1	23.5	544.6	4.7	539.9
BH-16	568.6	25.5	543.1	3.1	540.0
BH-17	567.8	20.0	547.8	3.7	544.1
BH-18	574.8	28.3	546.5	7.1	539.4
BH-19	585.6	39.0	546.6	9.5	537.1
BH-20	583.1	34.5	548.6	9.7	538.9
BH-21	579.9	33.2	546.7	8.0	538.7
BH-22	568.5	23.7	544.8	5.0	539.8
BH-23	580.1	32.5	547.6	9.4	538.2

Note:

1) All elevations are based on Hooker Datum.
2) The refusal noted at the time of drilling is postulated not to have been bedrock based on data obtained at BH21-82 and BH23-82.

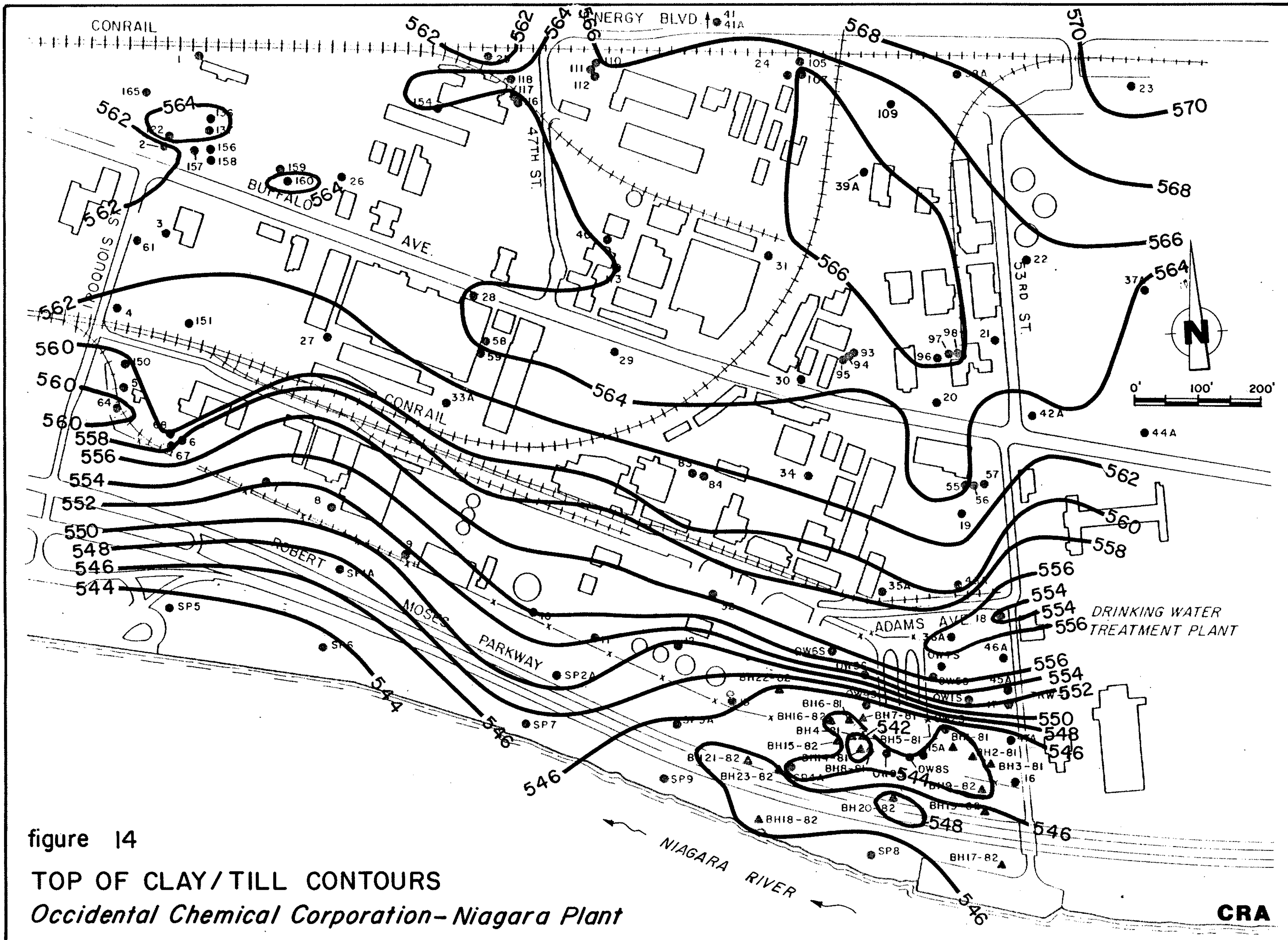


figure 14

TOP OF CLAY/TILL CONTOURS

Occidental Chemical Corporation- Niagara Plant

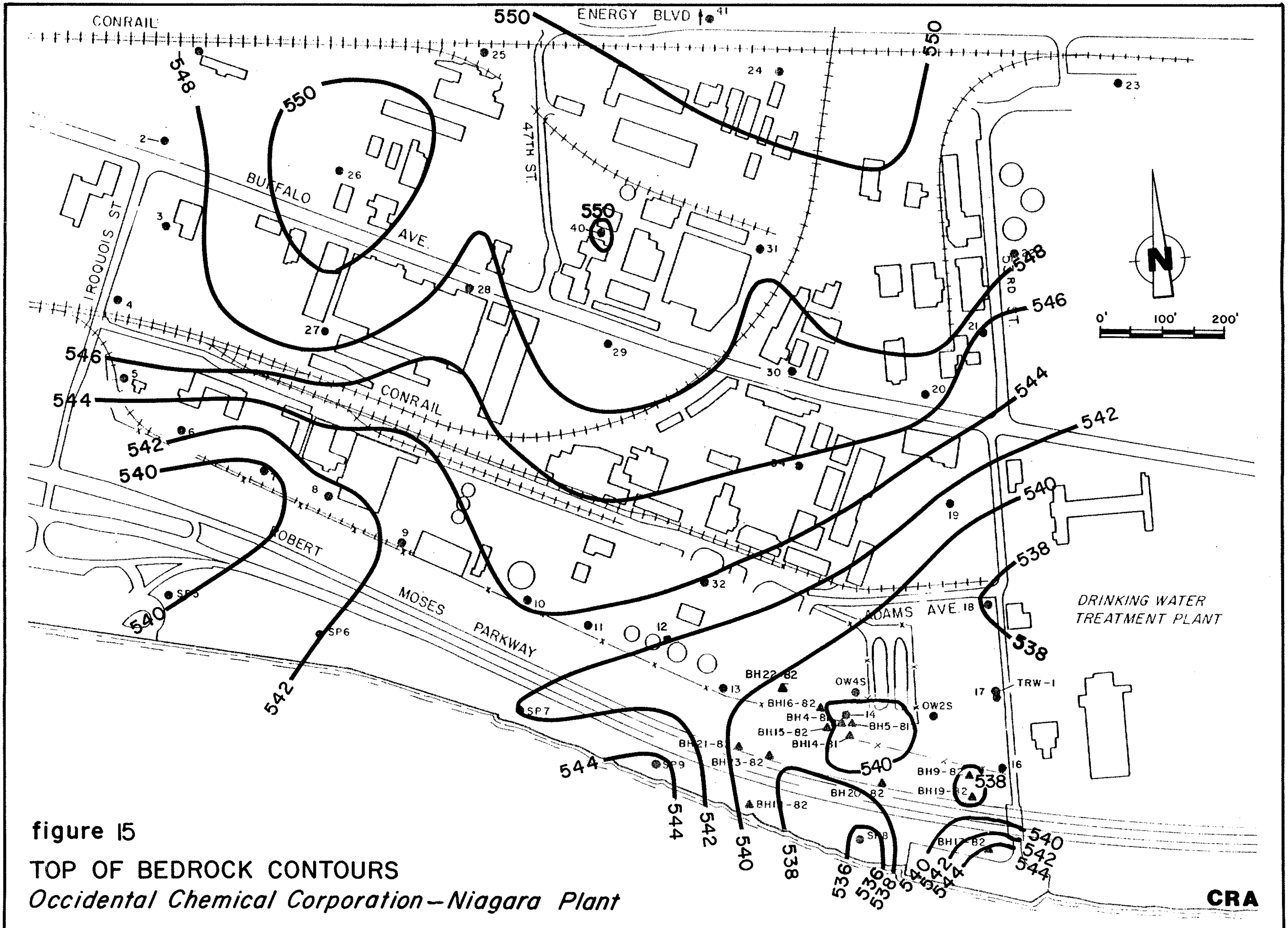


figure 15

TOP OF BEDROCK CONTOURS

Occidental Chemical Corporation—Niagara Plant

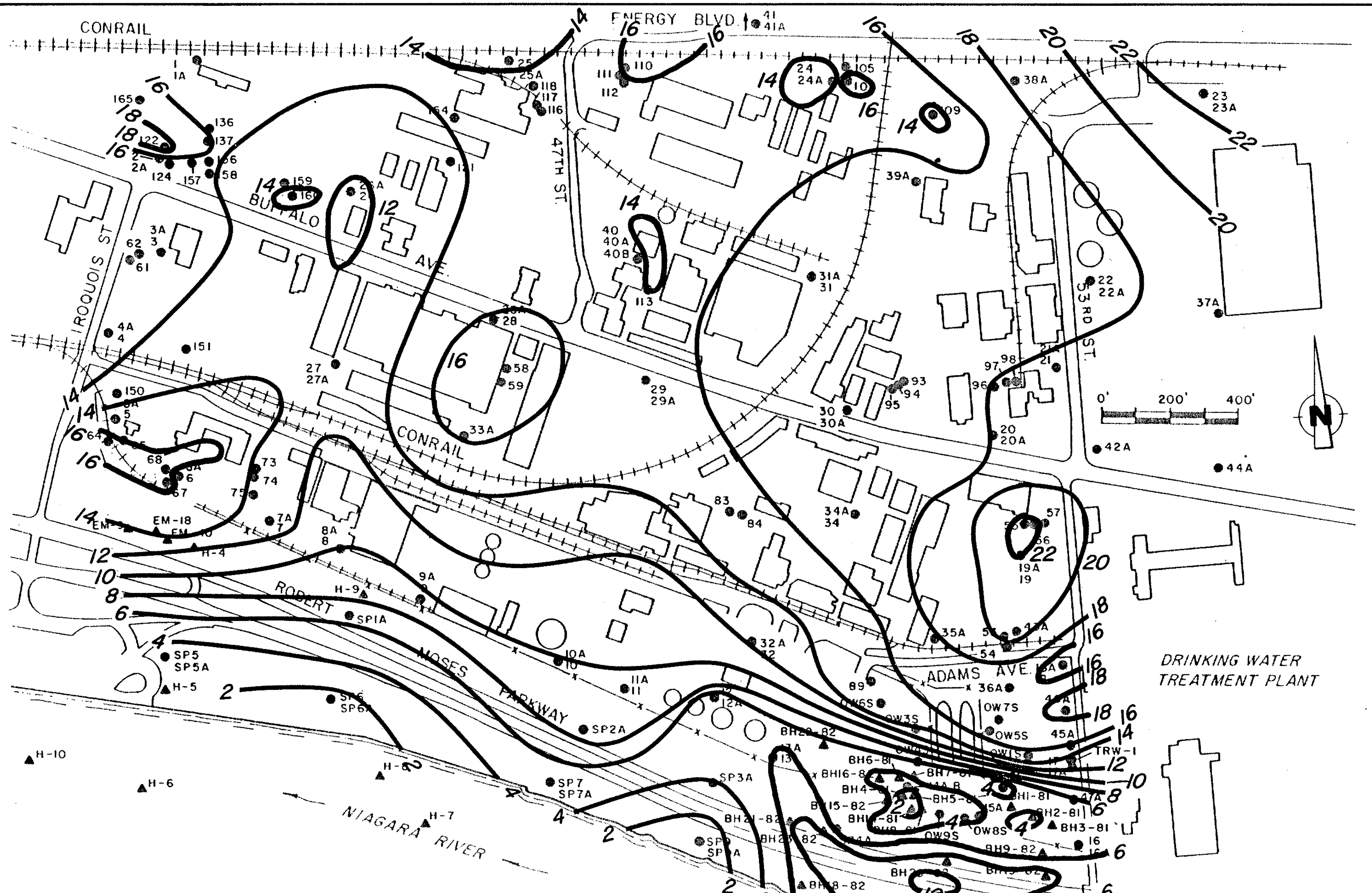


figure 16

CLAY/TILL ISOPACH

Occidental Chemical Corporation - Niagara Plant

CRA

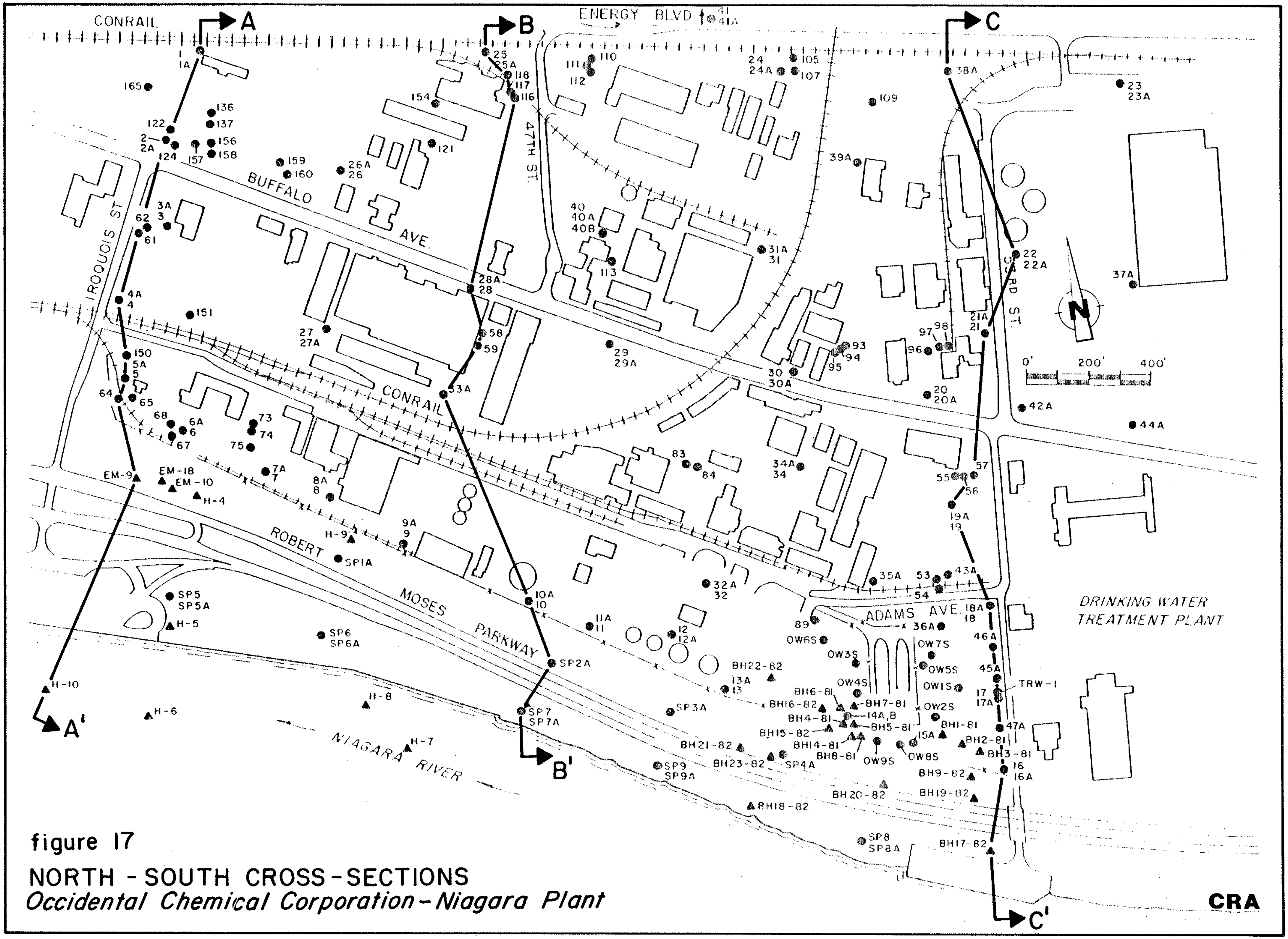


figure 17

NORTH - SOUTH CROSS-SECTIONS

Occidental Chemical Corporation - Niagara Plant

CRA

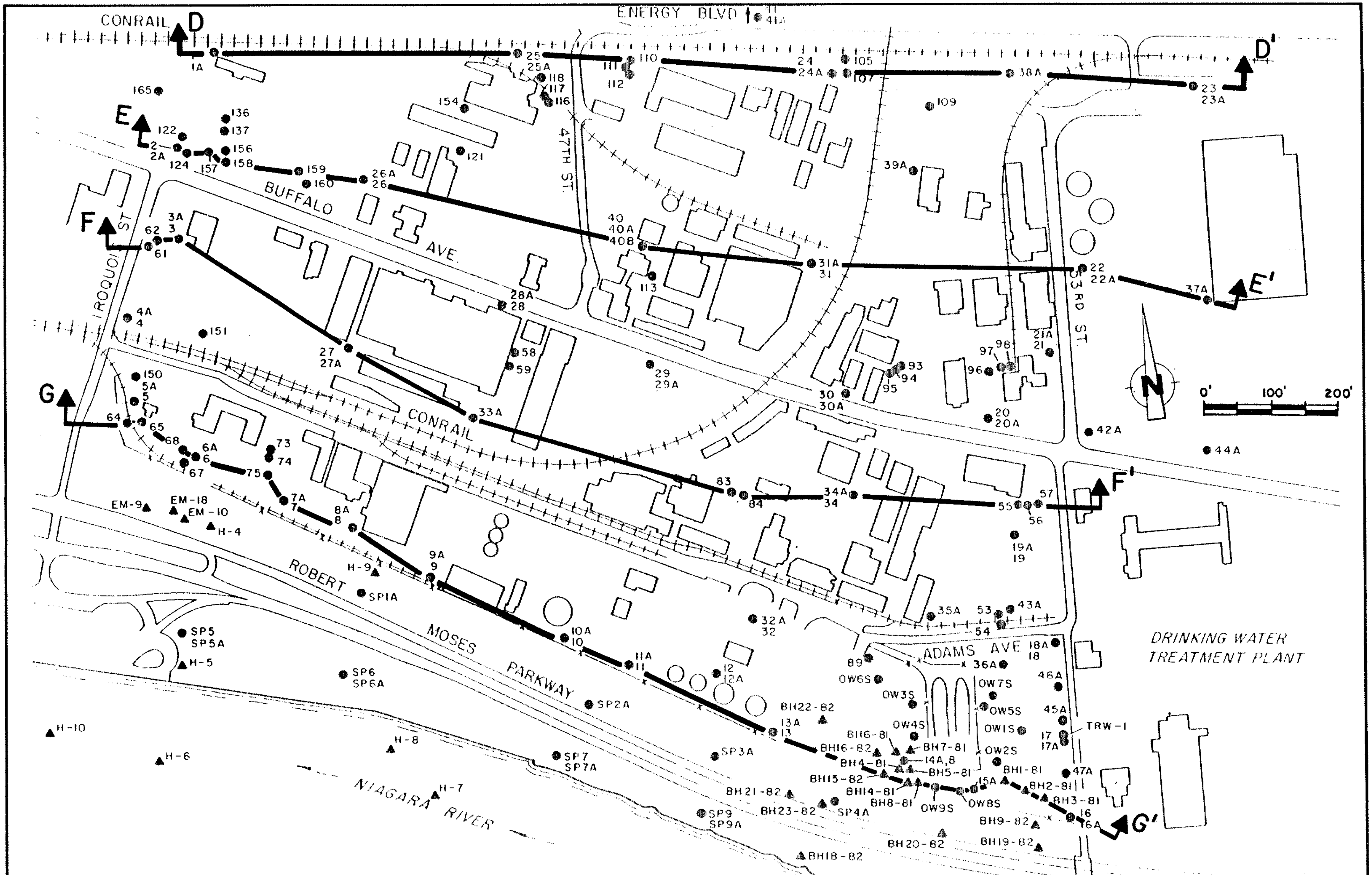


figure 18

WEST - EAST CROSS - SECTIONS

Occidental Chemical Corporation Niagara Plant

CRA

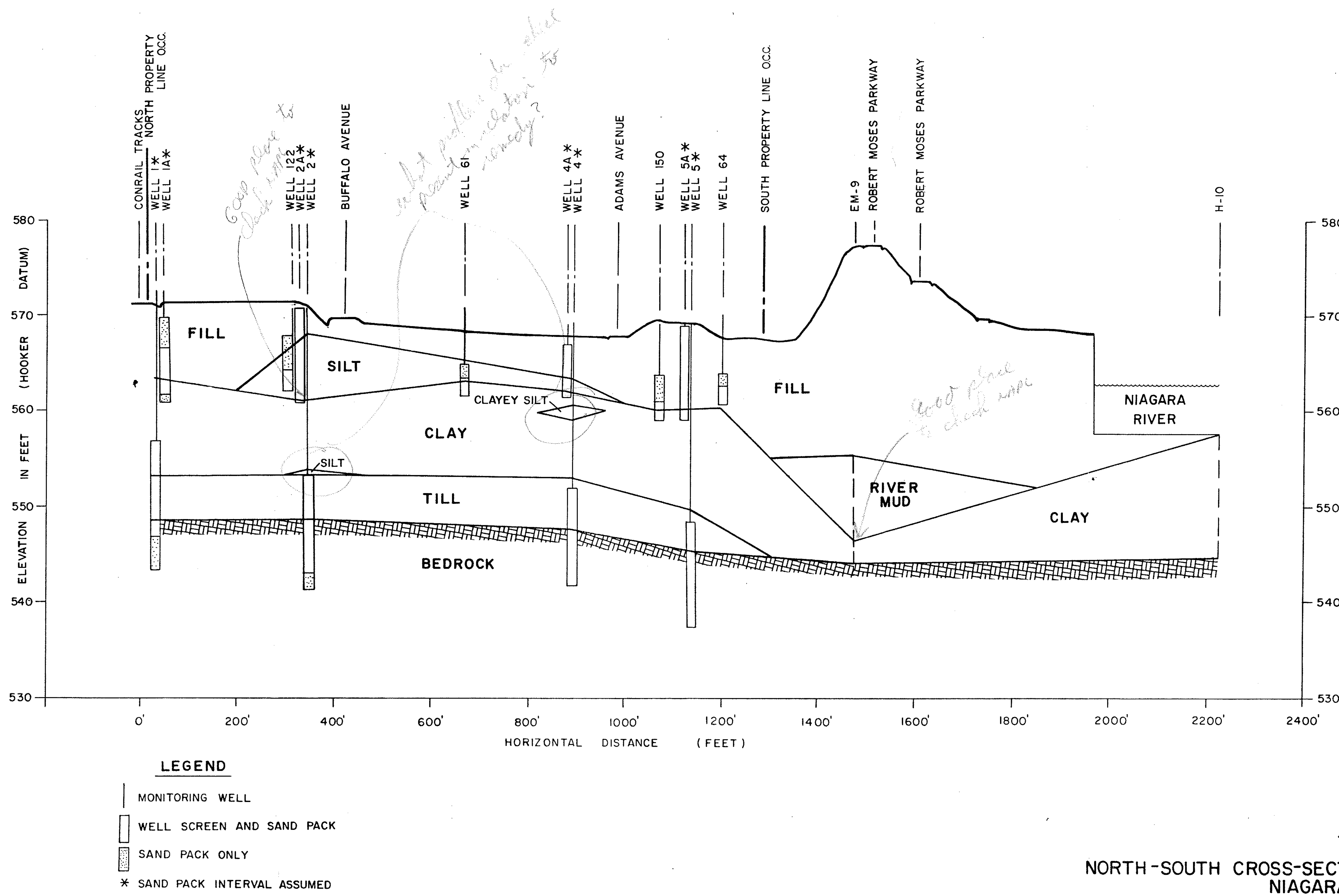
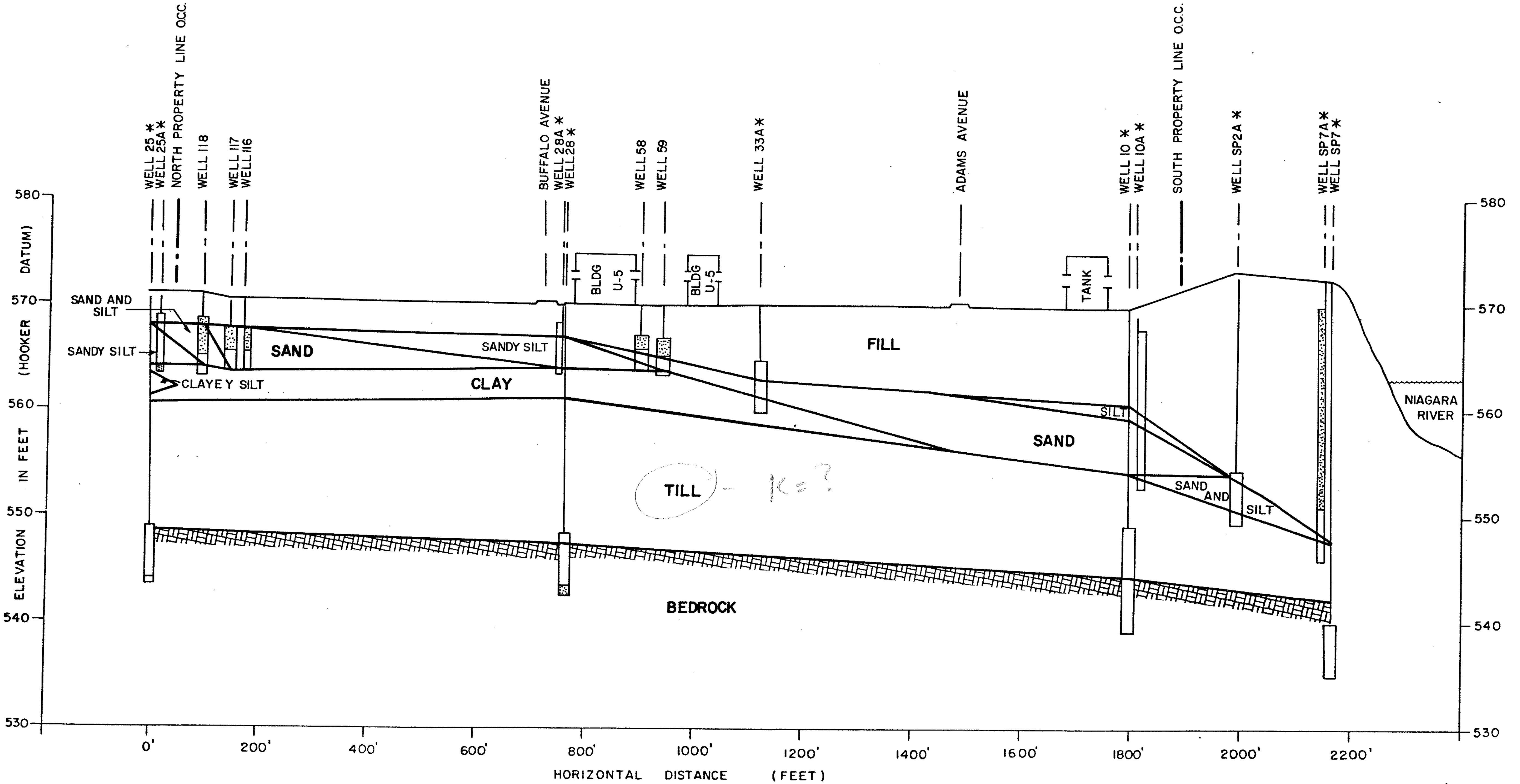


figure 19

NORTH-SOUTH CROSS-SECTION A-A'
NIAGARA PLANT
Occidental Chemical Corporation

CRA

0626 – 1/06/84



LEGEND

MONITORING WELL

WELL SCREEN AND SAND PACK

SAND PACK ONLY

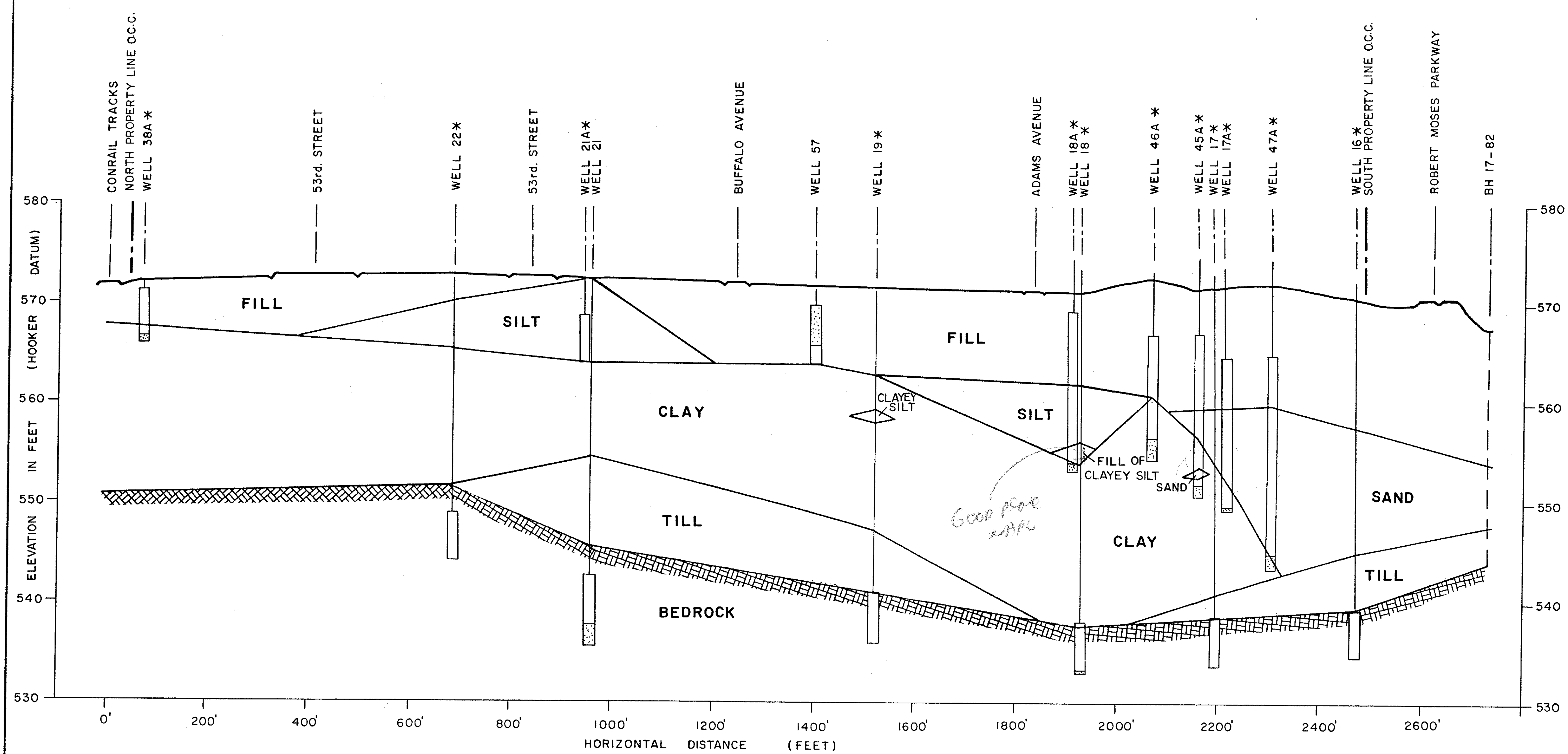
* SAND PACK INTERVAL ASSUMED

figure 20

NORTH-SOUTH CROSS-SECTION B-B'
NIAGARA PLANT
Occidental Chemical Corporation

CRA

0626 - 1/06/84



LEGEND

- MONITORING WELL
- WELL SCREEN AND SAND PACK
- SAND PACK ONLY
- * SAND PACK INTERVAL ASSUMED

figure 21

NORTH-SOUTH CROSS-SECTION C-C'
NIAGARA PLANT
Occidental Chemical Corporation

CRA

0626 - 1/06/84

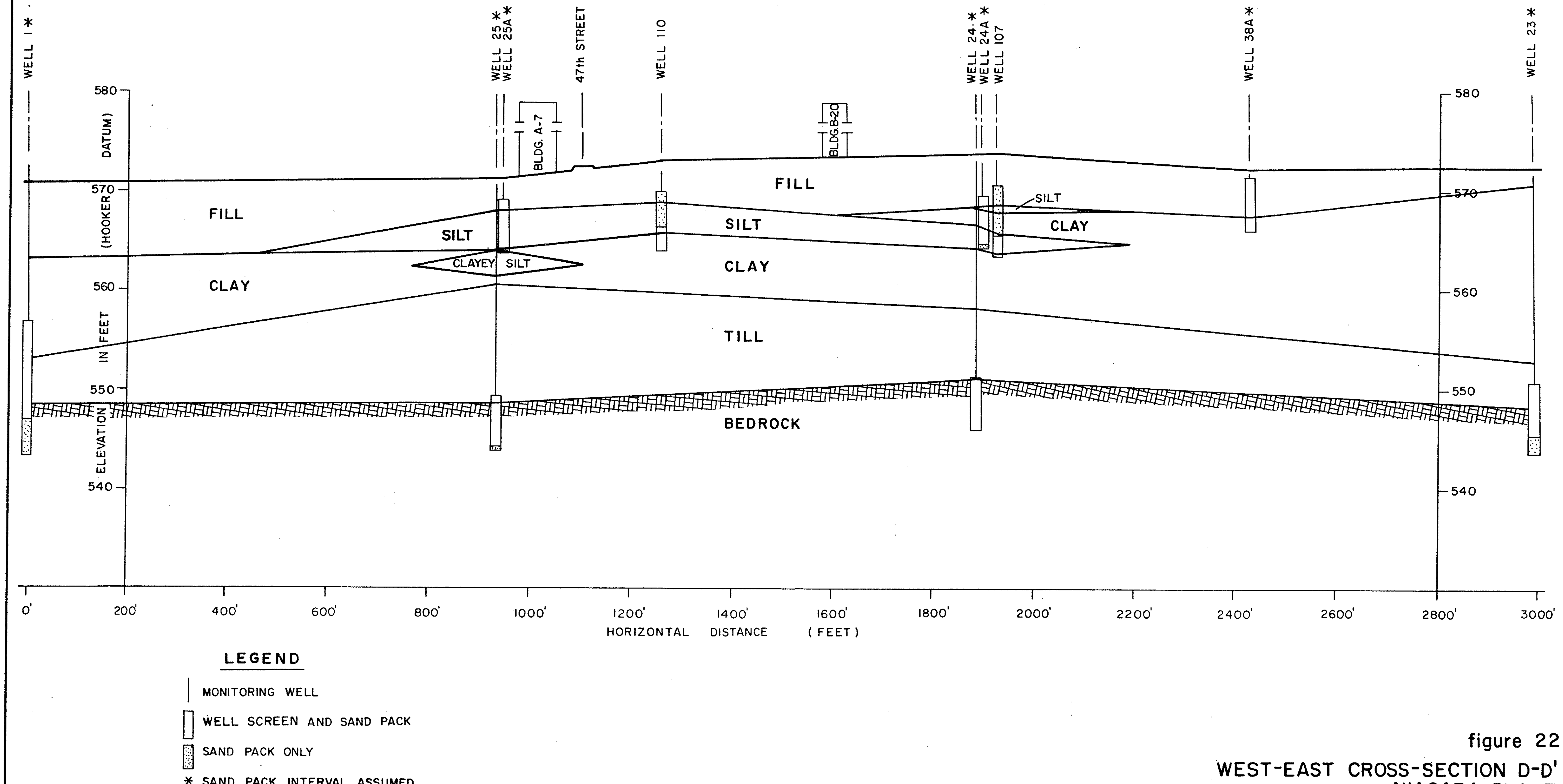


figure 22

WEST-EAST CROSS-SECTION D-D'
NIAGARA PLANT
Occidental Chemical Corporation

CRA

0626 – 1/06/84

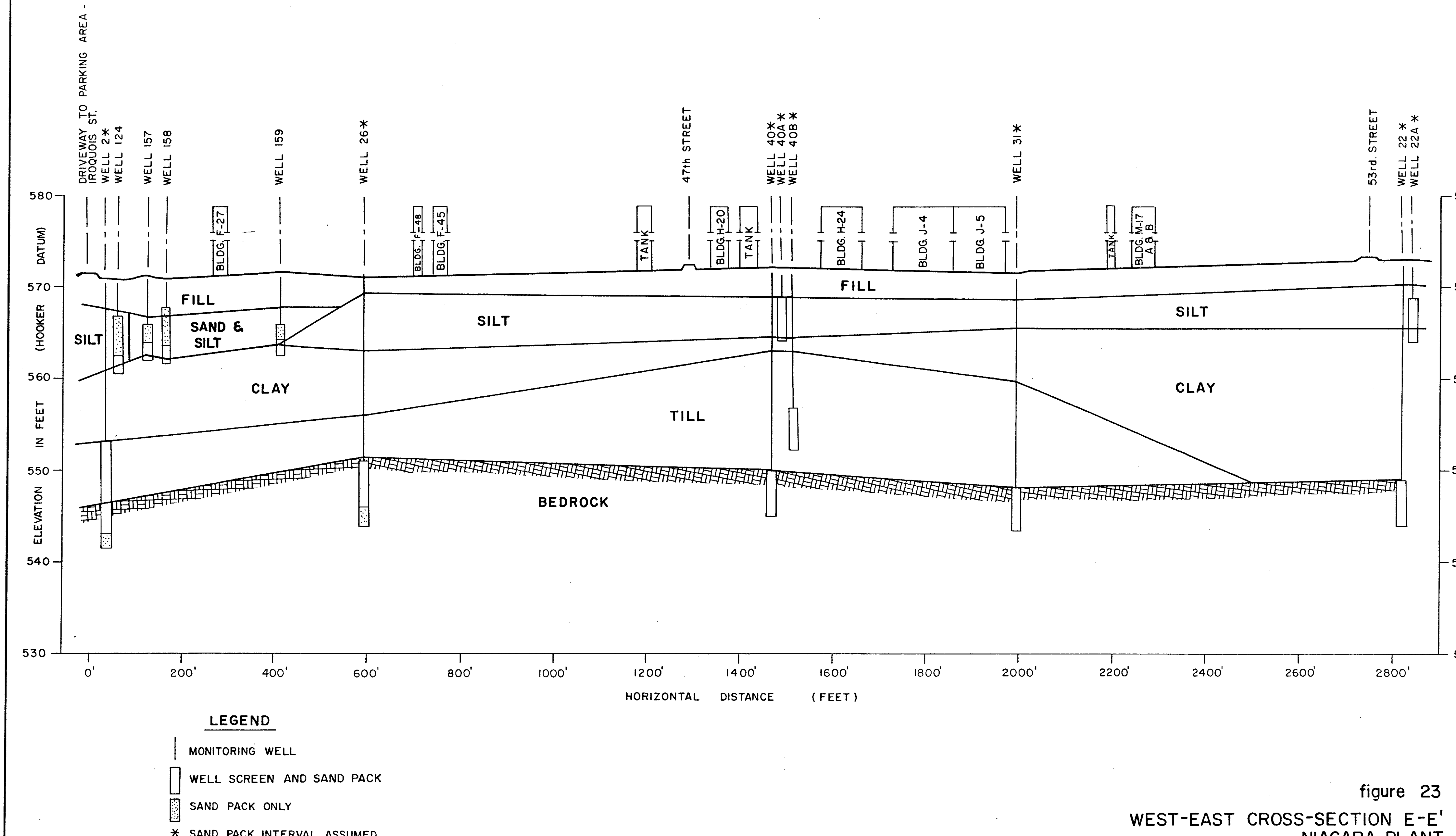


figure 23

WEST-EAST CROSS-SECTION E-E'
NIAGARA PLANT
Occidental Chemical Corporation

CRA

0626 – 1/06/84

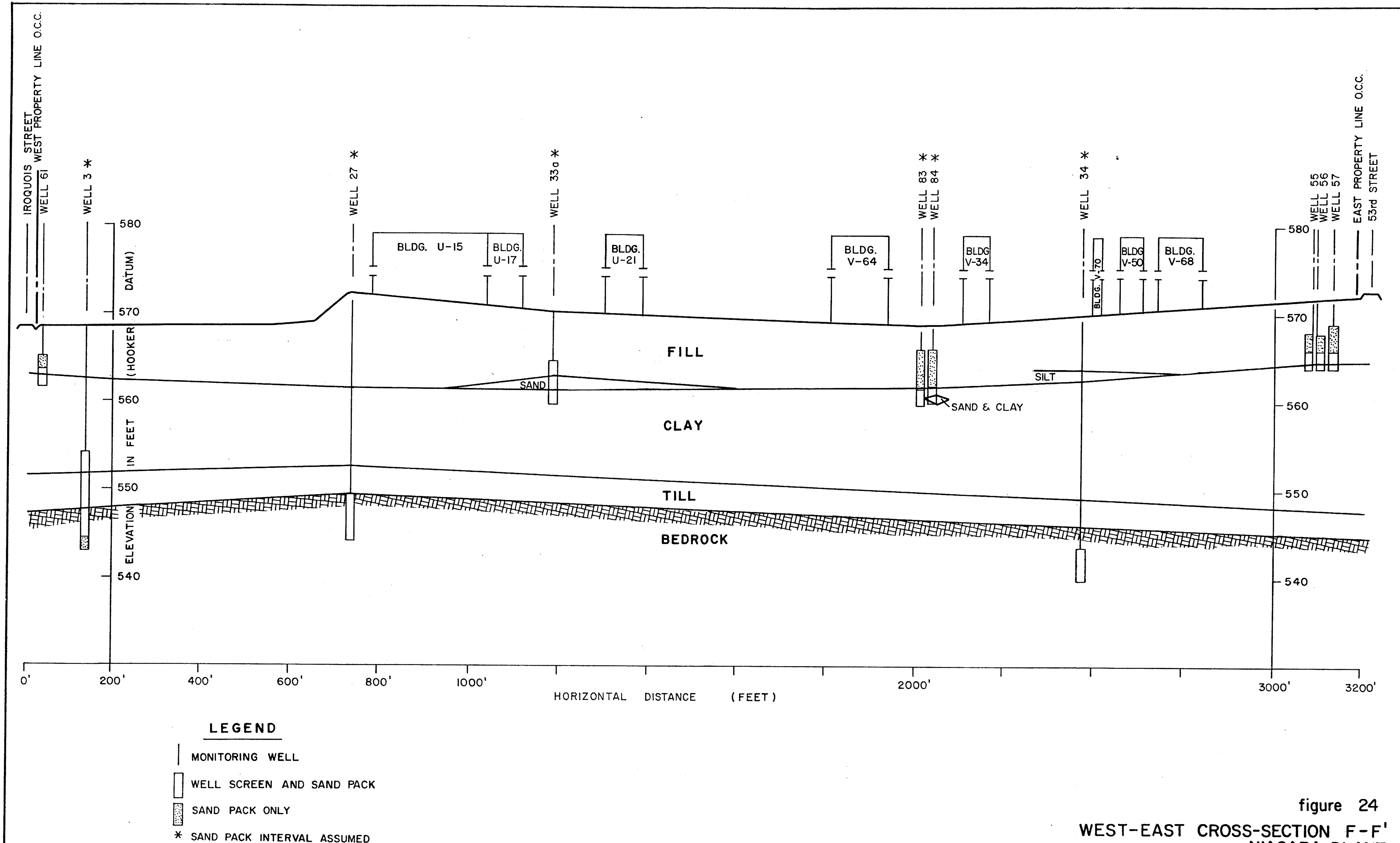
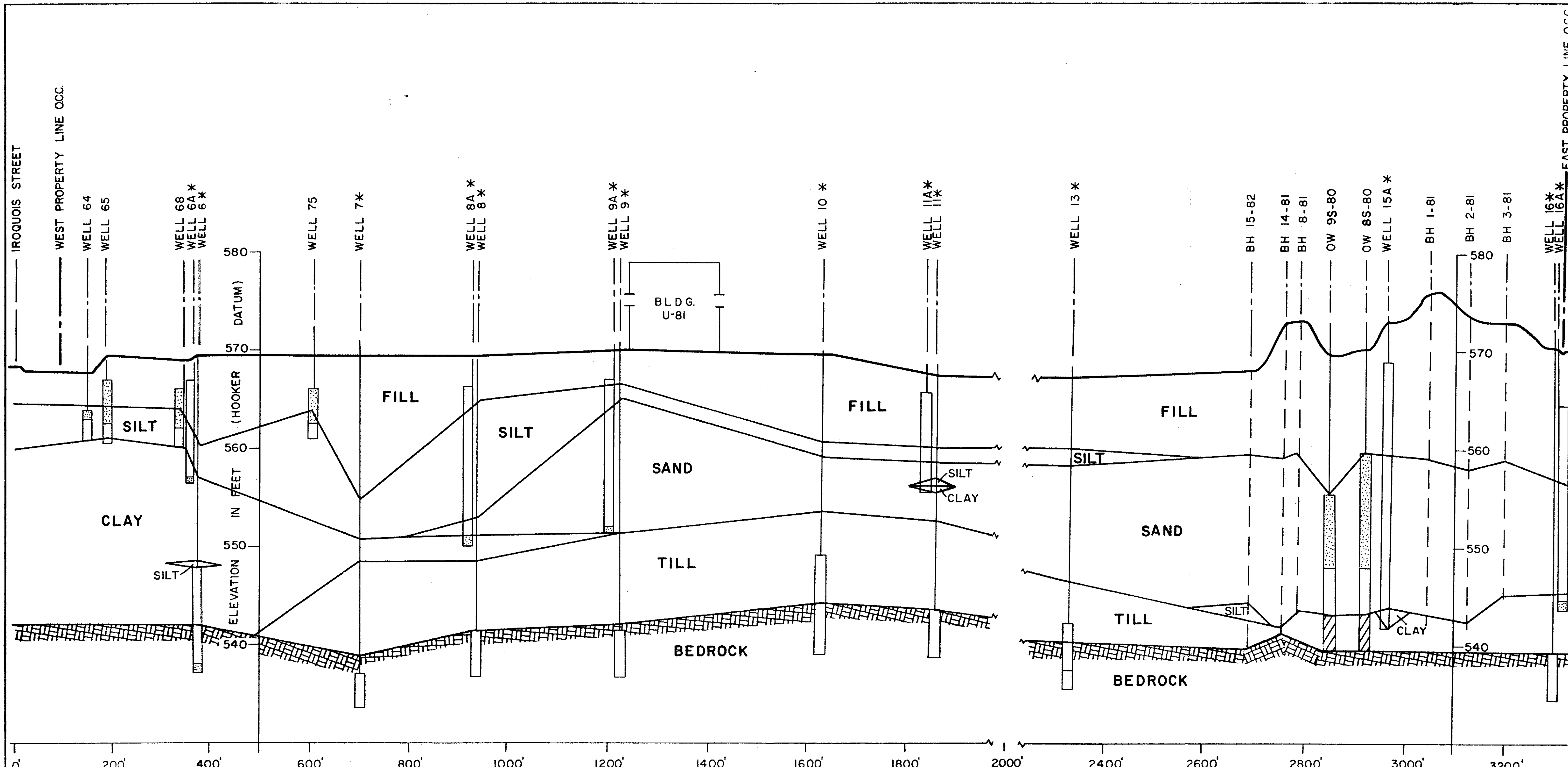


figure 24

WEST-EAST CROSS-SECTION F-F'
NIAGARA PLANT
Occidental Chemical Corporation

CRA

0626-1/06/84



LEGEND

- BOREHOLE - NO WELL INSTALLED
- MONITORING WELL
- WELL SCREEN AND SAND PACK
- SAND PACK ONLY
- GROUT PLUG
- * SAND PACK INTERVAL ASSUMED

figure 25

WEST-EAST CROSS-SECTION G-G'
NIAGARA PLANT
Occidental Chemical Corporation

CRA

0626 – 1/06/84

Boreholes chosen for testing were BH1-81, 2-81, 3-81, 4-81, 6-81, 7-81, 8-81, and 14-81. Testing was conducted by Woodward-Clyde Consultants. Results of this testing are in Appendix B (Volume II).

Mineralogical analysis was performed on two samples from the S-Area by the University of Waterloo, Department of Earth Sciences, Waterloo, Ontario. The two samples were from wells 13 and 18. The report of this testing is presented in Appendix F (Volume II).

6.0 GROUNDWATER HYDROLOGY

Data for use in defining the groundwater hydrology in the Niagara Plant area has been gathered from various types of tests and measurements performed on the monitoring well installations.

Generally, the shallow groundwater flow regimes are controlled by the presence of underground sewers, utilities and structures. Major influencing structures include the power conduits and River intake structures.

6.1 PERMEABILITY TESTING

6.1.1 Pump Tests

The first pump test conducted at the Niagara Plant was July 25, 1979. This was performed in a recovery well installed in the overburden on the east side of the S-Area (TRW-1a).

The well was pumped at a rate of 2 gpm for 5 hours while water levels were measured in 12 nearby overburden observation wells.

The results of this test indicated an overburden transmissivity on the order of 554 gallons per day per foot and a coefficient of storage of 1.4×10^{-1}. The data presented in the progress reports prepared by LBG is contained in Appendix G (Volume II).

Recovery well TRW-1 was installed in the bedrock near well TRW-1a in the S-Area. A pumping test was performed at this location in September 1979. This well was pumped for 4 days beginning September 13 and ending September 18, 1979. The rate of pumping for this test was 105 gpm.

Water level measurement devices were installed in 14 bedrock monitor wells and one near the industrial river intakes (to record river fluctuations). The results of this test are also presented in Appendix G (Volume II) and can be summarized as follows:

Bedrock transmissivity = $\pm$ 30,900 gal/day/ft. 8609 /d/ft²

Storage coefficient = $\pm$ 2.8×10^{-3}. 4×10^{-3} cm/sec

6.1.2 "Slug" Testing

A "Slug" test consists of rapidly evacuating or adding fluids or a volume to a monitoring well and measuring the rate of recovery or dissipation.

During 1980 this test was performed in 50 overburden wells at the Niagara Plant as well as 8 of the "SP-" wells and 13 wells on the City Drinking Water Treatment Plant area.

A summary of these test results is presented in Appendix H (Volume II).

6.2 INOPERABLE/DESTROYED MONITORING WELLS

Thirty-five of the monitoring well installations have been damaged in such a way as to make them non-functional, lost altogether or unusable. Figure 26 shows the monitoring wells which are still in use.

Water level measurements are periodically taken throughout the entire plant. The results of these measurements are presented in Appendix I (Volume II).

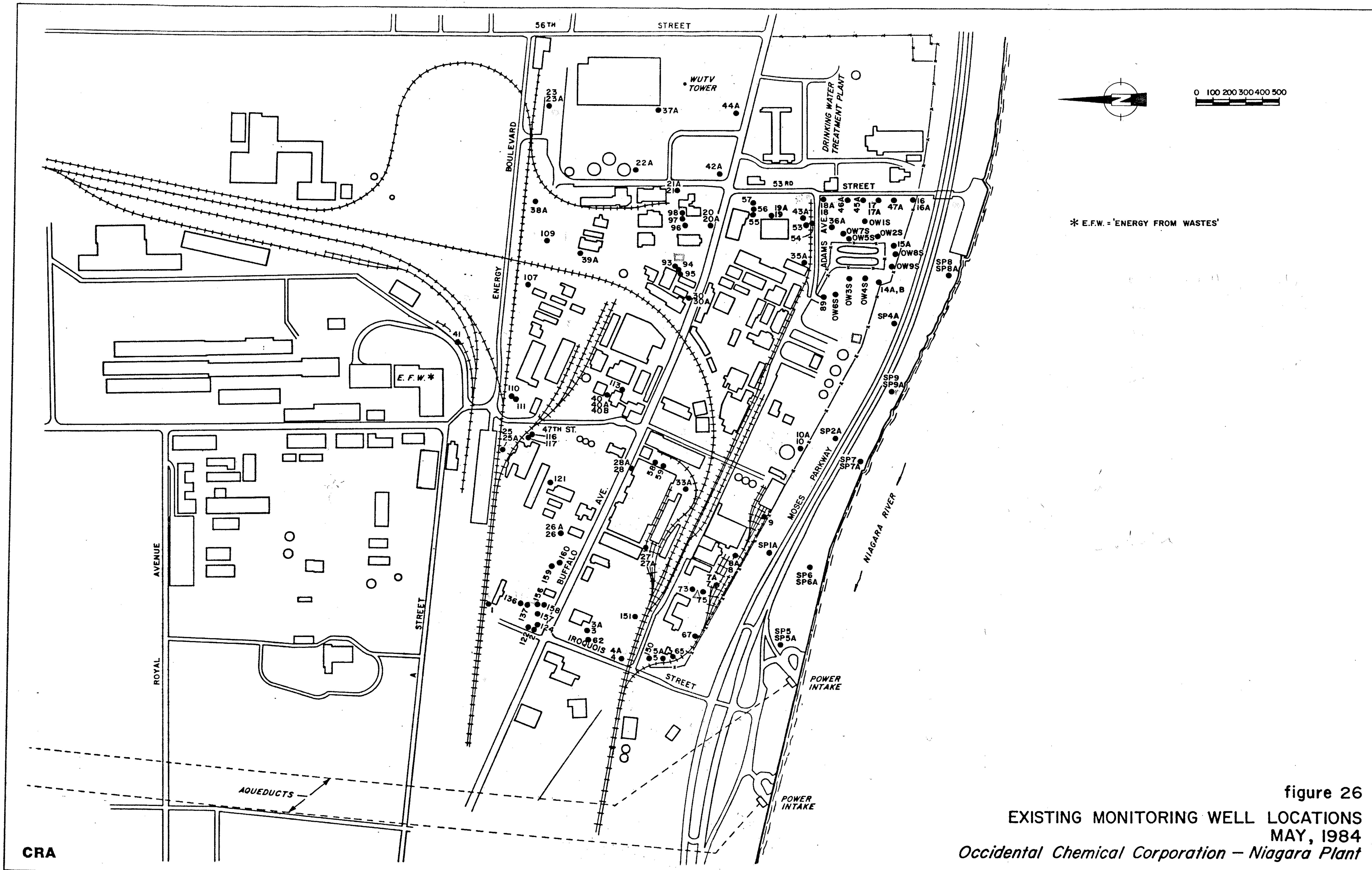


figure 26

EXISTING MONITORING WELL LOCATIONS
MAY, 1984

Occidental Chemical Corporation – Niagara Plant

626 – 29/06/84

6.3 FACTORS AFFECTING GROUNDWATER HYDROLOGY

The groundwater hydrology at the Niagara Plant is affected by several local structures and natural appurtenances. These include:

i) The Niagara River and its cyclic variation,
ii) Buildings and plant facilities,
iii) Underground utilities,
iv) The bedrock grouting program undertaken for the power conduit intakes,
v) Intake wall for power conduits,
vi) Power conduits and
vii) Industrial intakes and sewers.

Figure 27 shows the location of these hydraulic-influencing factors based on records which have been reviewed to date.

6.3.1 Cyclic Fluctuations

The Niagara River has considerable impact on the movement of groundwater in both the overburden and bedrock flow regimes. Typically, the River acts as a receiver of overburden groundwater from the plant area.

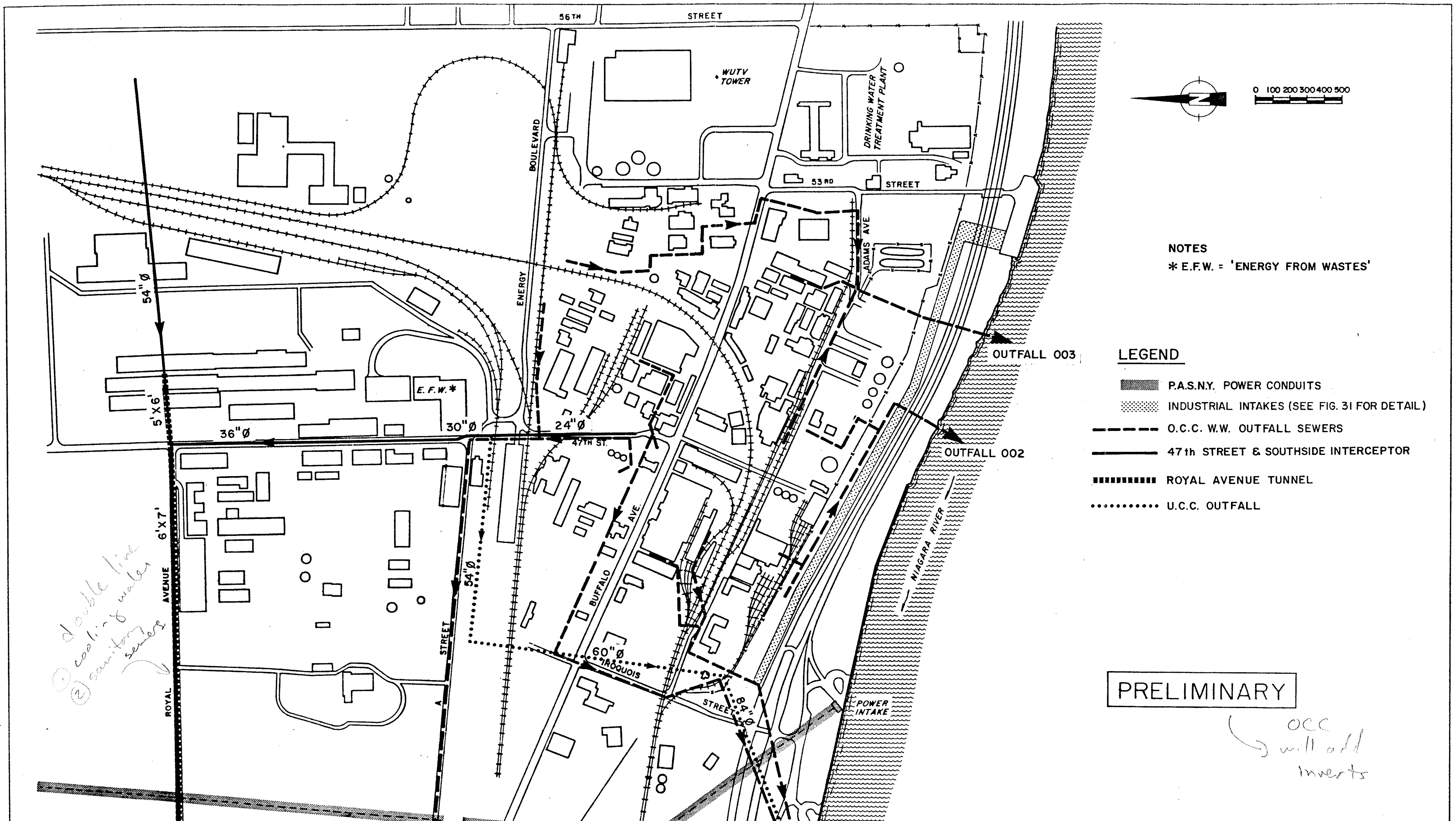


figure 27

MAJOR FACTORS AFFECTING HYDRAULIC CONDITIONS

Occidental Chemical Corporation — Niagara Plant

626 — 29/06/84

However, the opposite is true in the area immediately surrounding the PASNY power intakes and conduits. Not only is the River itself a factor in the local groundwater hydrology, but the manipulation of the River level by the Power Authority also influences the groundwater regime.

It has been determined through continuous measurement of the river level in conjunction with water levels in monitoring wells that the groundwater level in the bedrock fluctuates with the cyclic variation of the River.

6.3.2 Plant Buildings and Structures

Another factor which significantly influences local groundwater hydrology in the overburden regime is the presence of building and structure foundations. These buildings and structures are present over the entire plant as can be seen on Plates 1-8 (Volume IV). Typically, the dewatering systems installed around buildings remove water from the upper overburden groundwater regime thus creating localized flow patterns around each building.

In addition to building dewatering systems, the construction of building and structure foundations results in the disturbance of native soils which also can affect the local overburden groundwater flow regime. Foundation construction includes:

a) Building and Structure Foundations,
b) Electric Power Tower Foundations, and
c) Driven Pile Foundations.

6.3.3 Utility Conduits

The presence of underground sewers and utilities can affect the flow characteristics of the shallow overburden groundwater regime. The bedding of these sewers and utilities are preferential pathways for groundwater movement as these areas provide lesser resistance to groundwater flow than the native material. These utilities and sewers are present over the entire plant area as can be seen on Plates 1 through 8 (Volume IV).

Of particular concern to the upper groundwater regime are the deep sewers through the area which include the 47th Street sewer and connections to the Royal Avenue Sewer and the power conduits (see Figure 27). Due to the depth of these installations, it is assumed that the clay/till aquitard has been disturbed. As well these installations may cause bedrock dewatering.

Plate 9 (Volume IV) shows the groundwater contours as found in August 1980. Plate 9 shows the influence on groundwater flow by the utilities.

6.3.4 Bedrock Grouting Program

A grout curtain wall was installed by PASNY during construction of the power project. This curtain wall completely surrounds the PASNY water intakes south of Iroquois Street. The curtain wall grouted approximately the upper 100 feet of bedrock to reduce groundwater infiltration during the intake construction program.

Appendix J (Volume II) contains a report which details the construction of this curtain wall. Figure 28 shows the curtain wall installation as this relates to the plant.

6.3.5 Intake Wall

The water intake structure for the PASNY power project significantly alters overburden groundwater flow characteristics along the southwestern portion of the plant site. The intake structure consists of a reinforced concrete wall which is keyed into the top of bedrock, thus restricting overburden flow between the River and alluvial deposits beneath the plant in the southwest corner. Figure 29 presents a plan, profile and typical section of the intake structures.

In addition to the construction of the Intake Wall, the adjacent River bed was reshaped at the time of the wall construction to divert water towards the intakes. This reshaping included the construction of training dykes which increased the effectiveness of the intake structure.

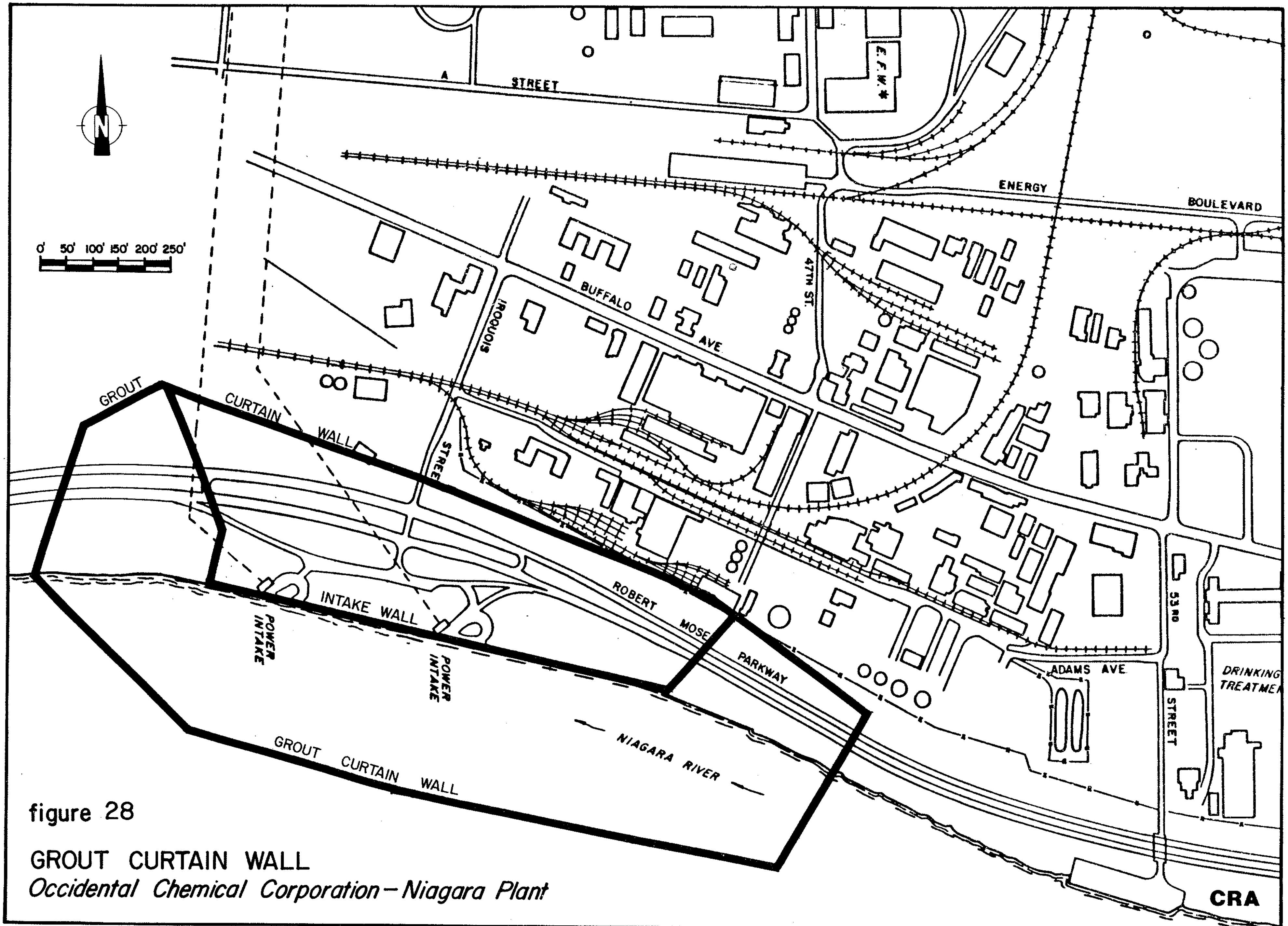


figure 28

GROUT CURTAIN WALL

Occidental Chemical Corporation – Niagara Plant

0626–

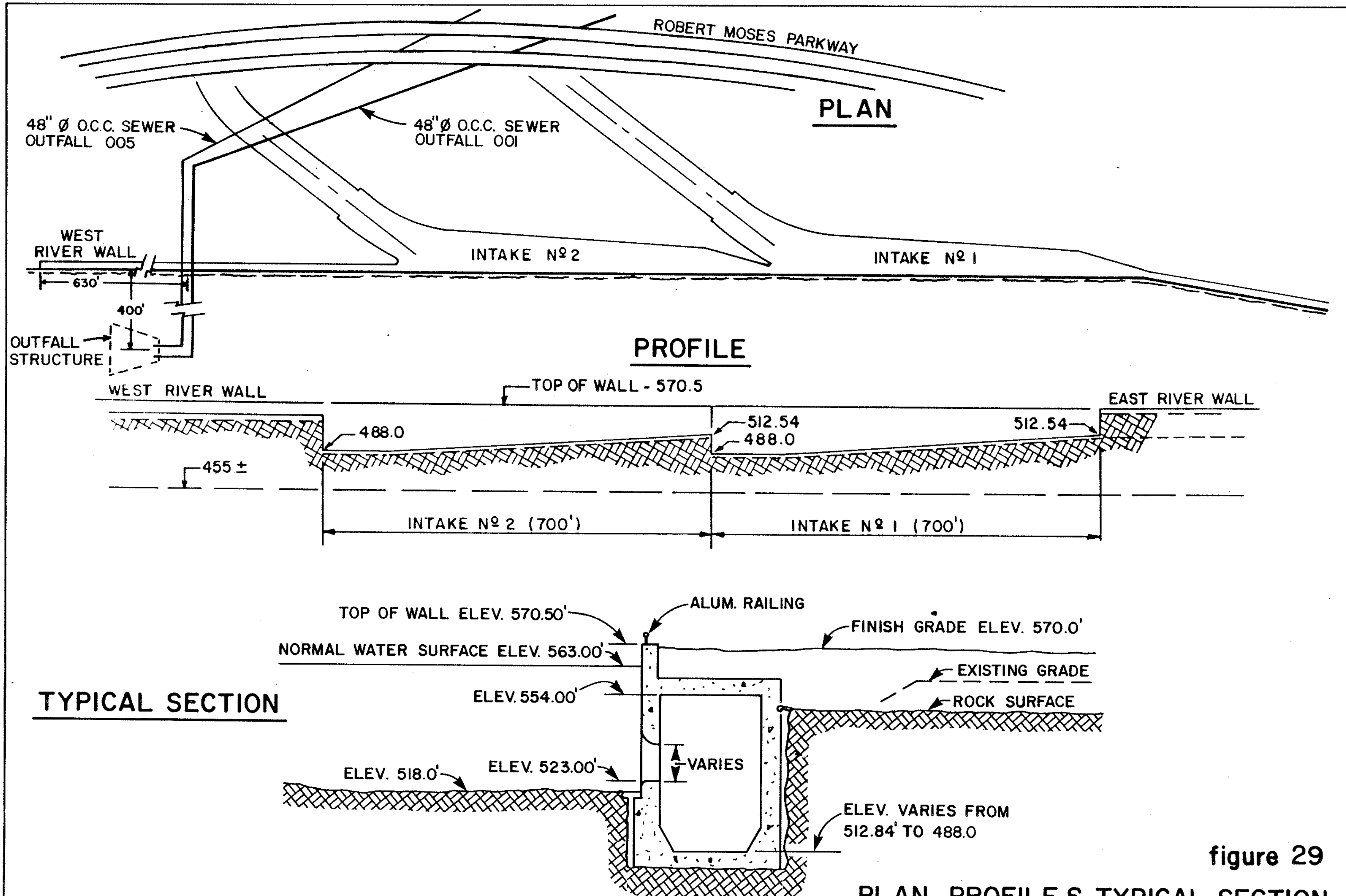


figure 29

PLAN, PROFILE & TYPICAL SECTION
P.A.S.N.Y. INTAKE STRUCTURES
Occidental Chemical Corporation

CRA

626 – 29/06/84

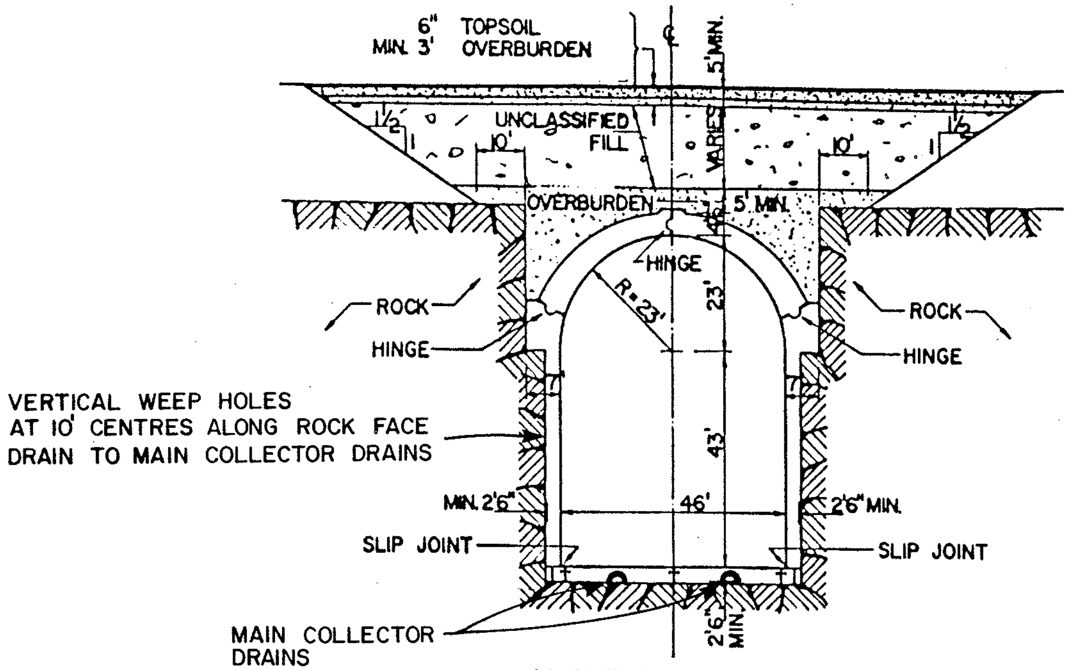
6.3.6 Power Conduits

The twin power conduits which divert the water from the upper Niagara River to the Robert Moses Generating Station are considered to affect the bedrock groundwater regime. The conduits are constructed with dewatering channels along the exterior wall to protect the conduit structure. The dewatering system includes ungrouted vertical passages located at 10-foot centers along the entire length of the conduits. These vertical passages are in contact with the rock excavation face. They drain to one of two main collector drains which lie beneath the conduit and extend the entire length of the conduits. As a result of the dewatering system, the groundwater regimes are partially drawn toward the conduits.

A typical conduit cross-section is presented in Figure 30.

6.3.7 Industrial Intakes and Sewers

An industrial intake pipe trench containing seven pipelines of various sizes is



CONDUIT CROSS SECTION

NOTE:-CONDUIT IS TWINNED

-STRUCTURE DEWATERING PROTECTION CONSISTS OF VERTICAL WEEP HOLES ALONG LENGTH OF CONDUIT AT 10' CENTERS.

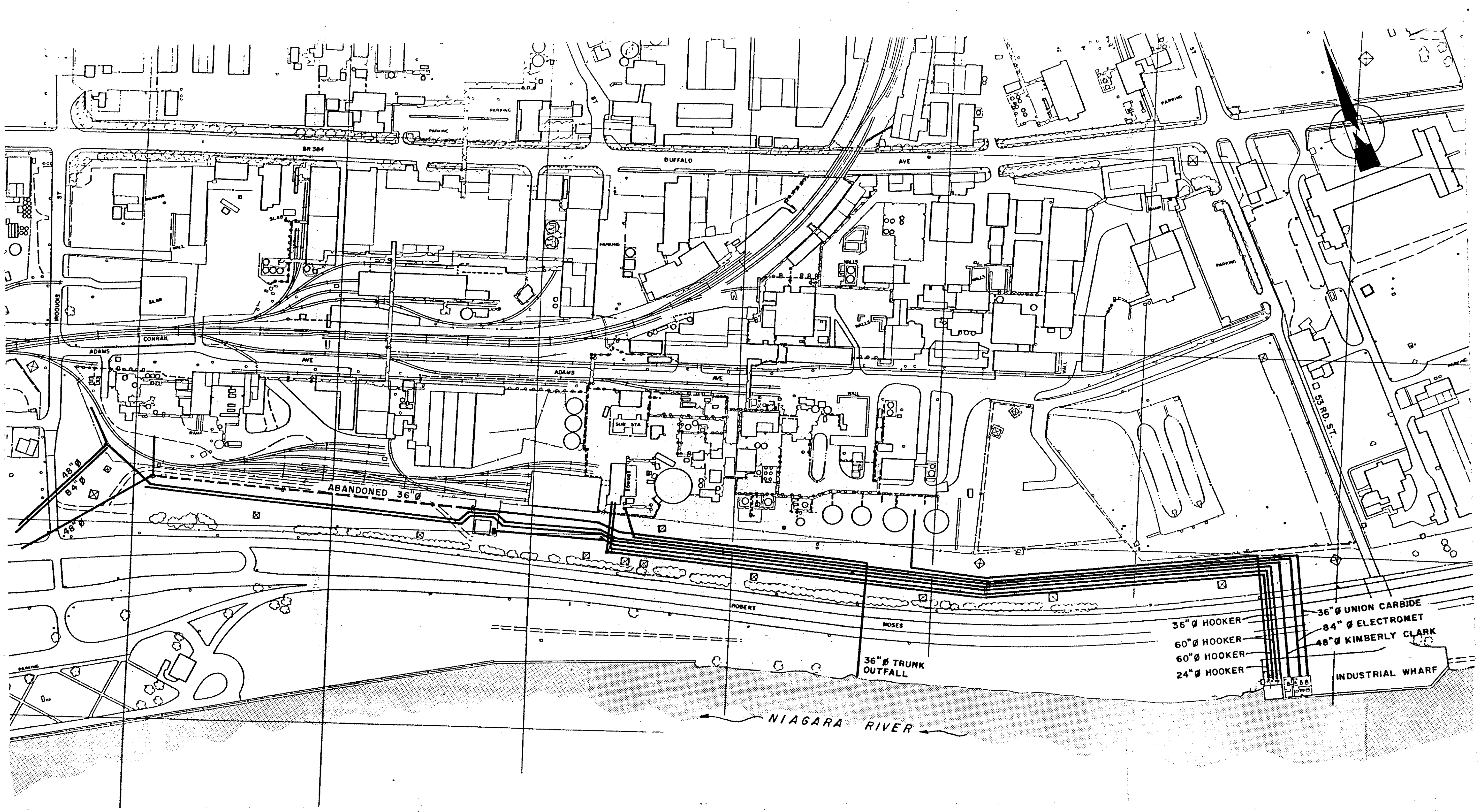
ILLUSTRATION SOURCE: COPIED FROM P.A.S.N.Y. DRAWINGS.

CRA

figure 30

TYPICAL CONDUIT CROSS-SECTION

Occidental Chemical Corporation - Niagara Plant located along the south plant property boundary. The pipelines supply river water to various industries including OCC. The pipelines travel north from the industrial wharf area up to the Niagara Plant boundary south of the S-Area. This trench then turns west and travels along the southern Niagara Plant boundary as shown on Figure 31. A cross-section of the industrial intake pipe trench is presented in Figure 32. This trench is a major preferential pathway for groundwater movement.

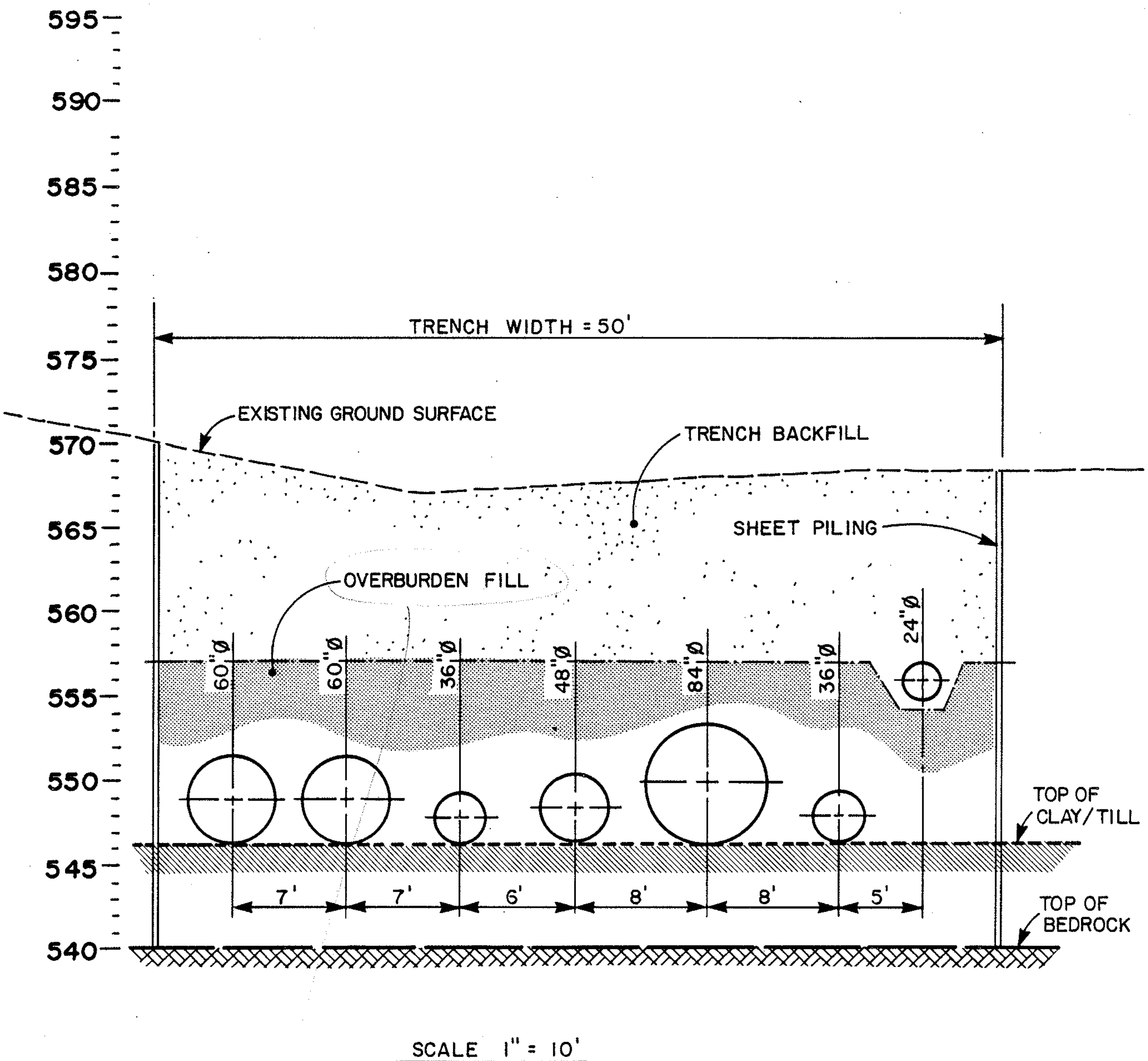


PRELIMINARY

figure 31

INDUSTRIAL INTAKE ALIGNMENT

Occidental Chemical Corporation – Niagara Plant



what is this stuff?

figure 32

INDUSTRIAL INTAKE
PIPE TRENCH CROSS SECTION
Occidental Chemical Corporation—Niagara Plant

CRA

7.0 CHEMICAL DATA

Chemical analyses have been conducted on soil, groundwater and sewer outfall samples collected in the Niagara Plant.

7.1 SOIL SAMPLING

Seventeen (17) selected soil samples from installed wells were supplied to Arthur D. Little, Inc. (ADL) in 1981 for the analysis of 11 selected chemicals.

A report of these analyses is contained in Volume III, Section 1.

7.2 GROUNDWATER SAMPLES

From the initial well installations in 1979, water samples were periodically taken for about one year for the analysis of general parameters including: pH, chloride, alkalinity, conductivity, total organic carbon, and total organic halide.

what period? where's data?

During the months of February, April, June, July, and September 1979, samples were taken for determination of "priority pollutants".

In addition to these priority pollutant sampling programs, overburden monitoring wells were sampled during the Comprehensive Wastewater Management Study (SPDES investigation) conducted in 1980 and 1981. At this time samples were analyzed for the 11 organic compounds which account for the major (94%) portion of the total measured outfall loading.

Table 4 lists wells sampled in each of the above mentioned programs.

Compilations of all data are located in Volume III, Sections 2 and 3.

7.3 OUTFALL SAMPLING

As part of the Comprehensive Water Management Study, effluent samples were collected in manholes in all five (5) of the Niagara Plant outfall systems. Samples were analyzed for the same 11 compounds referenced in Section 7.2. Sampling was conducted in rounds during five separate weeks between

TABLE 4

GROUNDWATER SAMPLING PROGRAMS

Agency	Date	Wells
OCC	Feb. 1979	14a, 16a, 18a
USEPA	*April 1979	14a, 15a, 16, 16a, 17, 18a
	*June 1979	14a, 15a, 16, 16a, 17, 18a
NEIC (USEPA)	*July 1979	17, 17a
NYS	*July 1979	18a
NYSDOH	*Sept. 1979	1, 1a, 2, 3, 3a, 14a, 15a, 16, 16a, 17, 18, 19a, 23, 23a, 25, 25a, SP 1a, SP 2a, SP 4a, SP 5, SP 5a, SP 6, SP 6a, SP 7, SP 7a, SP 8, SP 8a.
CRA/ADL	May-Aug. 1980	1a, 2a, 4a, 5a, 7a, 8a, 10a, 13a, 19a, 20a, 25a, 26a, 27a, 35a, 39a, 40a, 53, 54, 55, 56, 57, 58, 59, 62, 63, 65, 68, 73, 74, 75, 83, 84, 89, 93, 94, 95, 96, 97, 98, 105, 107, 109, 110, 111, 112, 113, 116, 117, 118, 121, 136, 137, SP 5a, SP 6a, SP 7a, SP 9a.
	March & May 1981	1a, 5a, 7a, 26a, 64, 65, 68, 73, 75, 121, 122, 136, 137, 150, 151, 154, 156, 157, 158, 159, 160

* These samples split with OCC.

May and August of 1980. There were additional samplings in March and May of 1981. The monitoring well groundwater samples referenced in Section 7.2 of this report and these effluent samples were collected at the same time for comparison purposes.

The outfall system is detailed on Plate 1 (Volume IV) "Study Area - Wastewater - Outfall Sewers & Monitoring Wells."

Samples are collected regularly from wastewater and sanitary sewers to satisfy the conditions of the Niagara Plant State Pollution Discharge Elimination System (SPDES Permit No. 0003336). Annual summaries of this data are prepared by OCC's Environmental Control Department and are listed below:

Chlorocarbon Source Investigation Program
Niagara Plant
March 1979

Wastewater Effluent 1979 Summary
Niagara Plant
January 1980

1980 Outfall and Sanitary Performance
March 1980

1981 Discharge Report Outfall and Sanitary Sewer Networks
March 16, 1982

1982 Outfall and Sanitary Effluent Report
Niagara Plant
January 1983

1982 Outfall and Sanitary Effluent Report
Niagara Plant
Appendices A-E

1983 Outfall and Sanitary Sewer Effluent Report
Niagara Plant

The data from these reports indicates that the outfall effluent contains both currently produced chemicals and non-production chemicals and that the average concentration levels of both types of chemicals have been significantly reduced since 1979.

7.4 SUMMARY OF ANALYTICAL DATA

A review of chemical data collected in the overburden to date indicates that elevated chemical concentration levels have been identified at a number of widespread locations of the plant.

Although chemical data in the bedrock is less extensive, the data indicate the presence of chemicals in the bedrock beneath the plant.

8.0 NIAGARA FALLS WEATHER CONDITIONS

8.1 TEMPERATURE

The closest weather station base with accessible information in the Niagara Falls area is located at the Buffalo Weather Station. Based on the information obtained from this station, a set of mean monthly temperatures has been compiled. Table 5 presents this information.

Typically, the months of December, January and February are the freezing months. During the month of March, the temperature hovers around the freezing point with daily lows generally below freezing. April and November are transitional months as the temperature normally stays above freezing. The remainder of the year is above freezing and is considered to be the prime construction season for most activities.

8.2 PRECIPITATION

The average annual precipitation for the Niagara Falls area is on the order of 36 inches.

TABLE 5

MEAN MONTHLY TEMPERATURE

Month	Average Monthly Temperature (°F)
January	23.7
February	24.4
March	32.1
April	44.9
May	55.1
June	65.7
July	70.1
August	68.4
September	61.6
October	51.5
November	39.8
December	27.9

Annual Average = 47°F

Information from Buffalo Weather Station -
Data Years 1939 - 1978

The wettest months of the year are normally November and August with average rainfalls of 3.7 inches and 3.5 inches per month respectively. April and September follow as the next wettest months with an average 3.2 inches of rain per month each. The remaining months generally receive less than 3 inches of rain per month.

It is to be noted that the month of April is also affected by the volume of melting snow.

Average monthly precipitation information from the Buffalo Weather Station is presented in Table 6.

TABLE 6

MEAN MONTHLY PRECIPITATION

Month	Average Monthly ~~Temperature~~ Precipitation (~~°F~~) inches
January	2.90
February	2.55
March	2.85
April	3.15
May	2.97
June	2.23
July	2.93
August	3.53
September	3.25
October	3.01
November	3.74
December	3.00

Annual Average = 36 inches

Precipitation expressed in terms of inches of equivalent rainfall

Information from Buffalo Weather Station - Data Years 1939 - 1978

NOTE

Map 1 (Niagara Plant Vicinity Aerial Photo)
and
Map 2 (Niagara Plant Ground Contours)

missing from original document