ENGINEERING REPORT
CONTAMINATED WELL WATER SUPPLY

OLIN CORPORATION
NIAGARA FALLS, NEW YORK

APRIL 15, 1983

David L. Cummings
Senior Specialist, Environmental Affairs

TABLE OF CONTENTS

I. INTRODUCTION

In late 1978, Olin Corporation found that the well water supply at its Niagara Falls plant was contaminated with low levels of organic compounds. Upon confirmation, through additional sampling and analysis, the situation was reported to the Niagara County Health Department and the New York State Department of Environmental Conservation (DEC). Because the mass of organics might be significant, Olin was requested to further investigate the situation and prepare an engineering report setting forth a proposed course of action to "eliminate such discharges to the greatest extent practicable".

The National Pollutant Discharge Elimination System (NPDES) permit (Permit Number NY 0001635) for the Niagara Falls plant had an expiration date of March 31, 1980 and application was made for a renewed permit under the State Pollutant Discharge Elimination System (SPDES). Preparation and submission of a preliminary engineering report on the contaminated water supply was made a condition of the draft SPDES permit.

The preliminary engineering report, submitted on October 10, 1980 included all available analytical data, reviewed potential abatement methods and provided initial, rough cost estimates for abatement. The conclusion of the report was that two wells should be pumped continuously. Such continued pumping would lead to stabilized performance with a steadily reduced organics output and would, over a period of time, cleanse the contaminated aquifer. The approach was approved by the DEC with a recommendation for continued investigation of abatement methods.

The concentrations of low level organics did reduce substantially; however, the receiving water quality considerations as developed by governmental agencies required reductions in a shorter period of time than was being accomplished in the pumping process.

The recently issued SPDES permit includes an abatement schedule for reduction of organic discharges to a maximum of 10 lb/day. The first step in that draft abatement schedule calls for submission of a preliminary engineering report by April 15, 1983. Submission of this report fulfills that permit condition.

II. THE INDUSTRY

A. General Statement

Historically, the Olin-Niagara Falls plant has been a basic producer of chlorine and caustic soda. Almost all chlorine (Cl_2) is made by electrolysis, principally from sodium chloride (NaCl) brine, accounting for 95% of the production. The co-product is caustic soda. As early as 1789, Cl_2 produced from MnO_2 and HCl was bubbled into potash to produce potassium hypochlorite, KClO, and used to bleach textiles. The commercial production of Cl_2 by electrolysis, discovered by Cruickshank in 1800 and described in principle by Faraday in 1834, had to await the development of adequate electric power generation.

The first mercury cell to operate commercially started up July 4, 1895, in Saltville, Virginia. This was the Castner Rocking Cell, named for its inventor, Hamilton Y. Castner, who was born in Brooklyn but developed his cell in England in order to produce caustic soda for the manufacture of aluminum. Before the cell could be commercialized, the aluminum process for which it was designed became obsolete. Thomas Mathieson founded the Mathieson Alkali Works (a predecessor of the Olin Corporation) and built at Saltville a 1 ton/day chlorine caustic plant based on the Castner cell. It was soon discovered that more power than anticipated was required for operation, and the cells were moved to Niagara Falls to take advantage of the abundant, cheap power from a new hydroelectric plant. The new installation was designed for a production of approximately 30 tons/day. The cells were called "rocking cells" because a slow back-and-forth tilting motion was imparted to the cells to move the mercury from the electrolyzer to the decomposer and back again.

At about the time that Castner was developing his version of the rocking cell, Carl Kellner of Vienna made several important inventions in the field of mercury cells, among them the device of short-circuiting the soda cell. This principle is utilized in the amalgam decomposers of modern mercury cell installations.

Shortly thereafter Kellner designed a mercury cell featuring a long, slightly inclined trough down which mercury and salt brine flowed by gravity. The denuded mercury from the decomposer was returned to the inlet of the cell by a pump. This design, progressively improved, is the configuration of most modern mercury cells.

B. Process Description

1. General Description and History of Plant

The Niagara plant began operation in November, 1897 under the name of Castner Electrolytic Company. Rated capacity for the one cell room containing 580 cells was 17.5 tons per day of chlorine and 19.5 tons of dry caustic soda. The gaseous chlorine was converted to bleaching powder in lead-lined chambers. In 1901, two additional cell rooms were built and in 1915 a half cell room was added making a total of 2030 Castner rocking cells. Liquid chlorine was produced for the first time in 1909.

Over a period of 60 years, there were few changes in the cell operations except that the electrolytic load was gradually increased to 1750 amperes and the rated daily production to 125.0 tons of chlorine and 139.0 tons of caustic soda.

Research on stationary mercury cells was carried out at Niagara by Olin and the first commercial installation was the E-4 cell, rated at 10,000 amps, at the Aluminum Company of Canada in Arvida, Quebec in 1948. The E-11 cell room at Niagara was put in operation in 1961 with 58 cells rated at 95,000 amperes and 186 tons of chlorine per day. The Castner cells were removed. A fifth rectifier was added in 1965 and production is now rated at 252 tons of chlorine per day and 277 tons of caustic soda per day with a load of 135,000 amperes. The power supply was changed from 25 cycle to 60 cycle at this time.

HTH® Dry Chlorinator (calcium hypochlorite) production was started on a small scale in 1927 and by 1945 had attained a rate of 6.0 tons per day. Production was increased in 1961 to 36 tons per day and now is rated at 60 tons per day. Hydrated HTH® has been produced since May, 1976.

Sodium chlorite production was started on a commercial scale in 1941 at a rate of 2000 lbs per day. The original process used calcium chlorate and muriatic acid for generation of chlorine dioxide and caustic and carbon black for reduction to chlorite. Sodium chlorate and sulfur dioxide were used for chlorine dioxide generation in 1951 and sodium peroxide reduction was started in 1957 with hydrogen peroxide and caustic substituted in 1972. Production capacity is now 16,000 lbs per day. This is the only sodium chlorite plant in the United States.

Sodium methylate production also started in 1941 using metallic sodium and methyl alcohol. Production was 1000 lbs per day using one vacuum dryer. As additional dryers were added, production increased to 10,000 lbs per day. The first amalgam reactor was installed in 1965 and metallic sodium was discontinued in 1966. The reactor was relocated to the cell room in 1968 and the second reactor was installed in 1973. Total reactor capacity is now 20,000 lbs/day and dryer capacity 13,000 lbs/day.

Niagara production items that were produced but have been discontinued include, tin tetrachloride in 1906, sulfur monochloride in 1908, bleaching powder 1897-1945, benzene hexachloride (BHC) and trichlorobenzene 1950-1956, trichlorophenol 1954-1956, and GX (diglycollic dihydrizide) and Omset 1957-1959. The explosion of the BHC plant on August 6, 1956 marked the end of organic chemical production. In 1922, the first synthetic ammonia plant in North America was started with a capacity of one ton per day. This was enlarged to a capacity of 20 tons per day in 1926 and shutdown in 1962.

The production facilities are currently located on 22.161 acres on Buffalo Avenue in Niagara Falls, a portion of which is the original Castner Electrolytic Company site. The facilities consist of two (2) sites separated by a portion of the E. I. DuPont de Nemours Company. Plant 1 consists of the HTH® Dry Chlorinator production facility, administration offices and warehousing. Plant 2 consists of the chlorine/caustic soda, sodium methylate and sodium chlorite production facilities plus the powerhouse, maintenance facilities and additional warehousing.

B. Production Processes

Caustic Soda (Sodium Hydroxide) and Chlorine

Worldwide, slightly more than 50% of electrolytic Cl_2 production is by the mercury-cell process. In the United States, mercury cells account for about 30% of the production.

Most modern mercury cells are similar in appearance and construction. Modern cells may operate above 300,000 A and at a current density at the cathode of over 10,000 A/m^2. Among the cells in operation in the United States are those by de Nora, Olin, Uhde, Solvay, and Krebs.

Production of Cl_2 by the mercury-cell process involves two cycles: the brine cycle and the mercury cycle. Brine is normally sodium chloride brine. The brine is partially depleted of its sodium chloride in the electrolyzer and must be fortified using a source of dry salt. The brine must be purified to ensure that harmful impurities from the salt do not build up and cause operating problems. The extent of the need for purification depends upon the impurities in the salt and the operating conditions which have been established.

The mercury cycle is part of the operation of the cell itself. Mercury flows by gravity in a thin layer along the bottom of the steel trough of the electrolyzer. Brine flows concurrently on top of the mercury. The amalgam, containing up to 0.3% sodium, is removed at the end of the cell. It then goes to the decomposer (or denuder) where it is reacted with water. Caustic soda is normally produced at a concentration of 50%. The denuded mercury is then collected in a sump where it is pumped back to begin its cycle over again.

Chlorine gas, saturated with water vapor and containing traces of organic impurities and hydrogen, collects in the cell chamber above the anodes. The chlorine gas goes from there to the drying and liquefaction part of the plant.

Where specific description or numbers are used in this article, they are based on the Olin E-510 cells as typical of most modern mercury cells.

The electrolyzer is a long rectangular steel chamber with rubber-lined sides, top, and end boxes. It is about 4 ft wide x 40 ft long. It is supported on adjustable, insulated structural pedestals along the length. The bottom has a pitch of about 10 mm/m. The cell itself is 8-10 inches deep. The cell cover can be lifted from the cell by a crane to permit renewal of the anodes and cleaning of the cells. When in place, a gas tight seal is made all around the edges with soft rubber gaskets and clamping devices.

The Olin cell uses metallic anodes. Flexible rubber seals and a flexible section in the anode bus permit a group of five anodes to be raised and lowered in a single operation. A recent development scans the voltage drop continuously over all the cells in a cell room and uses a computer program to adjust the anode/cathode gap for optimum performance.

The first step in processing gaseous chlorine is to cool it. This is done by direct contact in a packed tower or in a water-cooled titanium heat exchanger. A demister is then used to eliminate as much brine mist as possible. From the demister, the chlorine goes to the dryers. These are usually two-to-four packed towers over which sulfuric acid is pumped to contact the chlorine counter currently. Spent sulfuric acid is discharged at about 70% concentration. Chlorine gas is dried so that it contains 50 parts per million moisture or less.

The overhead gas is then compressed to the pressure at which it is liquefied. Dry air is usually added during liquefaction to replace the chlorine as it liquefies so as to maintain the gaseous mixture below 4% hydrogen. Non-condensable gases, principally air, hydrogen, and carbon dioxide, are purged from the condenser system. The vent or sniff gas may be variously treated in order to remove the chlorine. In the Niagara Falls plant, it is converted to sodium hypochlorite. Condensed chlorine is then transferred to storage tanks from which it may be loaded into transportation containers.

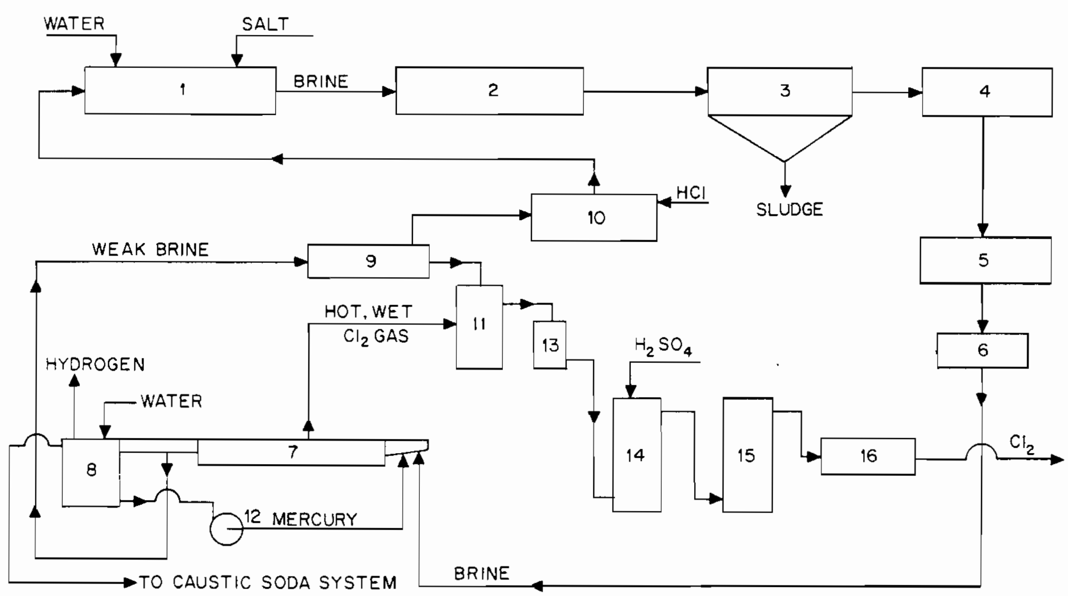


Fig. C-18. Simplified representation of materials flow in production of chlorine by mercury-cell process. (1) Salt dissolving, (2) brine treatment, (3) settling, (4) filtration, (5) brine storage, (6) heating, (7) electrolyzer, (8) decomposer, (9) dechlorination, (10) pH adjustment, (11) cooling, (12) mercury pump, (13) demisting, (14) drying, (15) scrubbing, (16) liquefaction.

Liquid chlorine is usually transferred by compressed air. Compressed air is dried in chlorine-producing plants to a dew point of -60°F or less. This is to prevent pickup of moisture in the transfer operation. Since pressures of 150 psig are not uncommon for transfer purposes, it is clear that tanks must be vented to permit the admission of fresh chlorine. These are vented normally to the plant sniff gas system. In some cases where high transfer rates are required, submerged pumps designed for this service can be used. This is commonly the case when transferring from storage tanks to barges.

Calcium Hypochlorites

Bleaching powder (prepared by passing chlorine gas over slaked lime) was the first way that chlorine was made generally available commercially (the technique was patented in 1799). The product usually contained about 30% available chlorine. Although it was unstable and difficult to use, it was of enormous importance in bleaching of textiles and later for sanitizing.

Bleaching powder has largely been supplanted in the United States by an improved calcium hypochlorite product containing about 65% available chlorine. Several commercial routes are available for its production. In the HTH® Dry Chlorinator process, a caustic solution is chlorinated to form sodium hypochlorite which is then filtered. The solution is mixed with lime and enters a second chlorinator where a triple salt is formed. The solution is filtered to remove sodium chloride crystals and stored. The triple salt is filtered from the solution and mixed with chlorinated lime. The paste formed (high test hypochlorite) is filtered, pre-dried, pre-formed, granulated, dried, crushed, screened and packaged.

The largest use of the product is for swimming pool sanitation, but substantial quantities are used for water purification and algae control. Because of its relative stability, it is an ideal product as an emergency standby for chlorine. It is particularly useful for sanitation at times of floods or other disasters.

Sodium Methylate

In the sodium methylate manufacturing operation, a sodium/mercury amalgam from the chlor-alkali cells is fed to a reactor along with methyl alcohol to form sodium methylate ($NaOCH_3$). The denuded mercury is returned to the decomposers of the electrolyzing cells. The sodium methylate/methyl alcohol solution is passed through filters and pumped to storage. From storage, part of the solution enters dryers where powdered sodium methylate is produced. The methyl alcohol evaporated in the dryer is condensed and recycled for reuse in the reactor. The remaining solution is sold as such.

Sodium Chlorite

In the sodium chlorite manufacturing operation, a sodium chlorate/sodium chloride solution, sulfuric acid, and a sulfur dioxide/air mixture are added to a generator vessel. The chlorine dioxide produced, along with some chlorine and sulfur dioxide gas leaving the generator, enters a reducer (absorber) along with hydrogen peroxide and caustic soda, where an aqueous sodium chlorite solution is formed. This solution is filtered to produce liquid product and also dried to produce solid sodium chlorite product.

3. Plant Operations

a. Finished Products - Rated Capacity

Liquid Chlorine - 284 tons/day
Caustic Soda - 277 tons/day
HTH® - 57.5 tons/day
Sodium Chlorite - 5.95 tons/day
Sodium Methylate - 5.25 tons/day

b. Principal Raw Materials

Sodium Chloride (Rock Salt)
Sulfuric Acid
Water
Electricity

Lime
Water

Methanol

Sodium Chlorate
Hydrogen Peroxide
Sulfur Dioxide
Water

c. Shifts, Operating Hours, Number of Employees

Shifts - 3
Operating Hours - 24 hrs/day, 7 days/week
Employees - 393 (total hourly and exempt)

d. Expansion - There are no current plans for expansion of operations at the Niagara Falls plant. Production of HTH® was temporarily shutdown due to business conditions on October 30, 1982. The shutdown is for an indefinite period with no estimate of a future startup date. This report is prepared with the understanding that the HTH® facility will operate in the future.

Plant Description

a. Company

Olin Corporation
Olin Chemicals Group
120 Long Ridge Road
Stamford, Connecticut 06904

b. Plant Location

Olin Corporation
Olin Chemicals Group
Niagara Falls Plant
2400 Buffalo Avenue
Niagara Falls, New York 14302

c. Mailing Address

Olin Corporation
Olin Chemicals Group
Niagara Falls Plant
P. O. Box 748
Niagara Falls, New York 14303

d. Name of Responsible Individuals

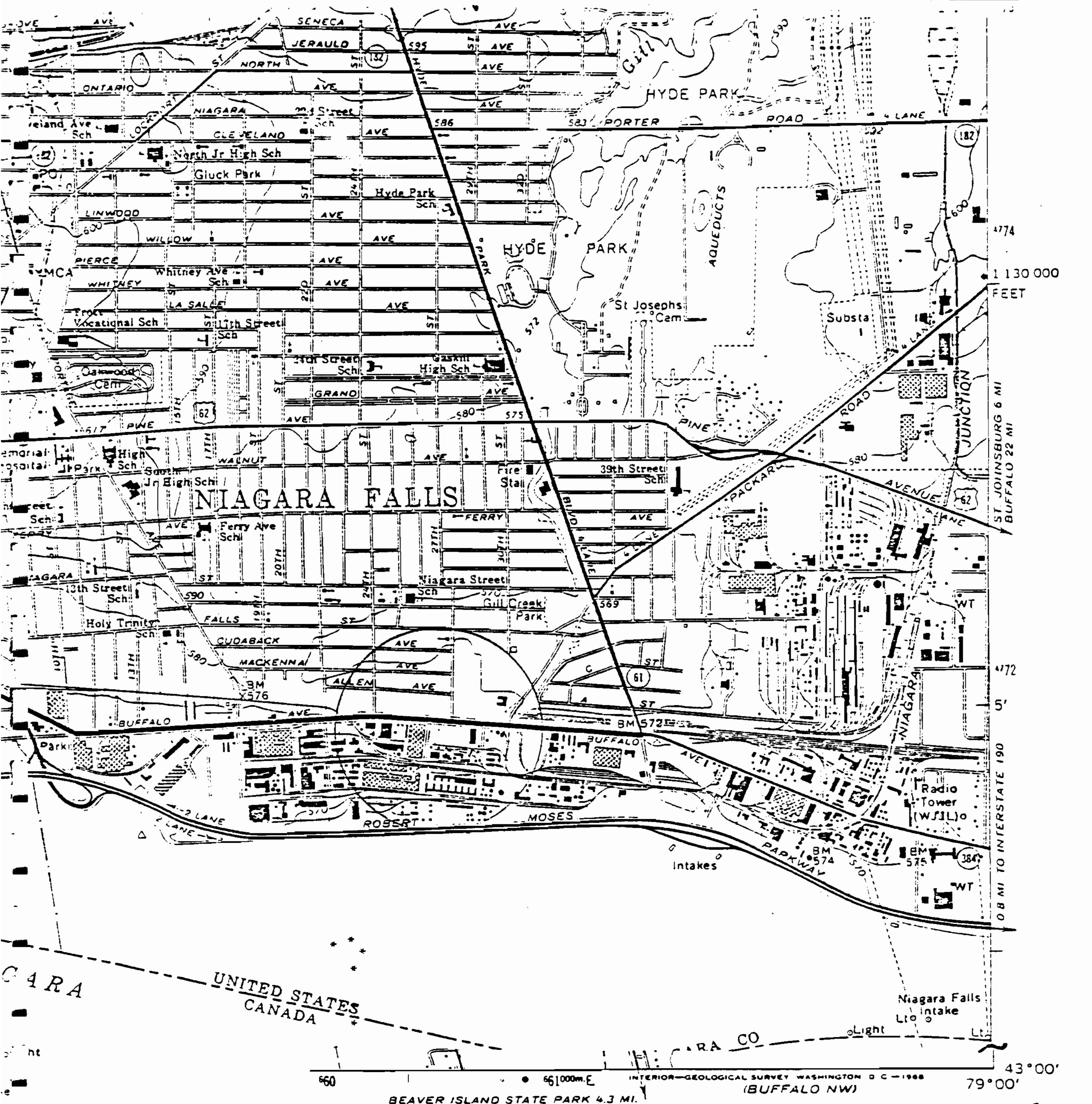
M. L. Norsworthy	Plant Manager P. O. Box 748 Niagara Falls, New York 14303
A. F. Kapteina	Environmental & Quality Assurance Mgr. P. O. Box 748 Niagara Falls, New York 14303
D. L. Cummings	Senior Specialist, Environmental Affairs P. O. Box 248 Charleston, Tennessee 37310

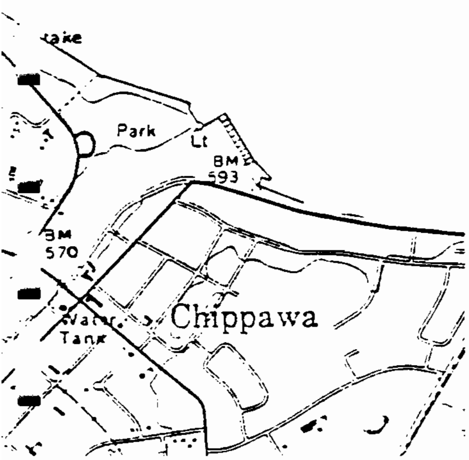
e. Map of Environment - Following Page.

U.S.G.S. Topographical Map. Niagara Falls, Ontario - New York, SE/4, Niagara Falls 15' Quadrangle, 1965.

f. Sewer Map and Process Connections - See enclosed Olin Drawing Numbers:

Number D-0000-840-10-2
Number D-1592-830-5-1
Number D-1592-830-5-2





QUADRANGLE LOCATION

ROAD CLASSIFICATION

Heavy-duty
Light-duty
Medium-duty
Unimproved dirt

Interstate Route
U. S. Route
State Route

NIAGARA FALLS, ONT.–N.Y.

SE/4 NIAGARA FALLS 15' QUADRANGLE

N4300—W7900/7.5

1965

AMS 5170 II SE–SERIES V821

C. Water Supply and Receiving Water

1. Water Supply

The Niagara Falls plant operates with three (3) sources of water supply. Since the primary use of water is for cooling and the heat load and temperature of the Niagara River water vary with the seasons, there is a seasonal variation in consumption figures:

Source	Flow (mgd)	
	Winter	Summer
Niagara River	2.02-2.95 2.48 avg.	2.88-4.90 3.89 avg.
Well Water	2.88-3.74 3.31 avg.	3.74-5.18 4.46 avg.
City Water (City of Niagara Falls)	0.43	0.43

3100 gpm

2. Water Quality Requirements

Among the several uses of raw water at the Niagara Falls plant (e.g., boiler feed water, product, cooling, etc.), cooling is by far the major usage of river and well water.

As noted previously, the plant can use in excess of 8 million gallons of water per day in the summer months. Ninety percent of this is for cooling purposes, mainly in "once-through" systems. In once-through systems, the initial temperature is of considerable importance. Generally, the lower the initial temperature of such a water, the more desirable it is as cooling water. Of similar importance is the consistency of temperature and the Olin process wells produce a supply at 53-55°F, summer and winter. The real value of the wells lies in the combination of low temperature and high volume.

> Wells in an area about a half mile wide adjacent to the Niagara River above the falls have substantially higher yields than wells elsewhere in the area. The higher yields in this area are caused by two conditions: (1) the Lockport Dolomite is thickest in the area, and (2) more importantly, conditions are favorable for the infiltration of water from the Niagara River. The greatest thickness of the Lockport provides the maximum number of water-bearing zones to supply water to the wells. The Niagara River provides an unlimited source of recharge to the water-bearing zones.

> Evidence that a substantial part of the water pumped is supplied by induced infiltration from the Niagara River is indicated by the high yields, which exceed 2000 gpm at some wells, and the chemical character of the water. The chemical composition of the water in well 304-901-6 (Olin) (which has been pumped at 2100 gpm) is more similar to Niagara River water than "typical" groundwater in the Lockport.[2]

The Niagara River water is returned via "clear water" sewers to the river after use. Important considerations with this supply are screening of debris, prevention of growth of aquatic organisms, fouling of conduits and heat exchangers. The major problem is lack of consistency in temperature. River water can actually be too cold in the winter months. Treatments for prevention of slime and scale must be inexpensive on a once-through system and substances cannot be added which would prove deleterious to its further uses or be in contravention of water quality or discharge standards.

In short, cooling waters should have appropriate initial temperatures and should not deposit scale, be corrosive, or encourage the growth of slimes. Among the constituents of natural water that may prove detrimental to its use for cooling purposes are hardness, suspended solids, dissolved gases, acids, and oil and slime-forming organisms. One of the most definitive lists of quality requirements for cooling waters gives the following recommended limiting concentrations:

Turbidity	50 mg/l
Hardness	50 mg/l
Iron	0.5 mg/l
Manganese	0.5 mg/l
Iron and manganese	0.5 mg/l

The Olin process wells provide a source of supply which is slightly harder than desired but in all other respects, is an ideal cooling water supply. No raw water treatment has been required for control (chemical addition or filtration) and the temperature is a uniform 53-55°F.

---

[2] Johnston, Groundwater in the Niagara Falls Area, New York, NYS Conservation Department, Bulletin GS-53, (1964) p. 30.

3. Description of Production Wells

The Mathieson Chemical Company originally had one well at the Plant 1 site. The well was 18 inches in diameter, 125 feet deep, and was originally drilled in 1937. In a search for additional water in 1947, two additional wells were drilled approximately 50 feet west of the original No. 1 well. Also at this time, an 8 inch diameter test well was drilled between the two new wells (Number 2 and 3). Wells 2 and 3 (the wells in use at present) are 24 inches in diameter and 125 feet deep. In approximately this time period (1947), Olin discontinued use of the No. 1 well and later sold the property where the well was located to E. I. DuPont de Nemours Company. Plant records indicate that DuPont also had several wells on their property ranging in diameter from 6 to 24 inches in diameter and all approximately 125 feet deep. Field investigations carried out in 1948 concluded that "all the accessible DuPont and Mathieson operating and observation wells are cross connected either directly or indirectly" in the aquifer. Reports at the time also noted the consistent recording of crevices and broken limestone at the 45-50 foot level. This was a major water bearing layer.

Repair and remedial work was performed on Olin wells 2 and 3 in late 1978. This included plugging the 8 inch test well with concrete to a depth of 38 feet and relining the two production wells with new steel casings. The casings were 16 inches in diameter and were grouted in place from the 38 foot level to the surface. Any contamination reaching the wells must be entering from below the 38 foot level.

4. Receiving Water

All process waters are discharged to the City of Niagara Falls Municipal Wastewater Treatment Facility (POTW). Process contaminated wastewaters are pretreated in one or more on-site pretreatment processes, as needed, prior to discharge to the POTW. The POTW is a physical/chemical treatment facility which is intended to utilize activated carbon filters for the removal of organic compounds prior to ultimate discharge to the Niagara River. Difficulties have been experienced with the carbon beds and they are currently out of service. However, they are scheduled for rehabilitation and reactivation in 1984.

The cooling water, or "clear water" sewers (SPDES discharges 002, 004 and 005) discharge directly to the City-owned diversion sewer on Buffalo Avenue. The Diversion Sewer receives other industrial treated and untreated wastewaters prior to discharge to the Niagara River. The Niagara River (NYS 0-158) is classified by the New York State Department of Environmental Conservation as Class A Special (International Boundary Waters).

Classifications and Standards of Quality and Purity (Parts 700, 701 and 702 of Title 6, Chapter X of the Codes, Rules and Regulations of the State of New York) provide the current State water quality standards. Applicable portions are enclosed as Appendix I.

The NYSDEC has proposed additional water quality standards which provide for specific concentration limitations on a variety of organic compounds. (Proposed revisions to Parts 701 and 702, December, 1978). These proposed standards were remanded by the Commissioner of Environmental Conservation and have not been reproposed or promulgated to date.

The USEPA has promulgated water quality criteria[1] for most of the 127 priority pollutants. These criteria were not promulgated as fixed limitations or standards. Rather, they were provided by the USEPA as guidelines to the states and other standard settling authorities. The criteria promulgated in November 1980 replaced the criteria for the same pollutants previously published in the "Red Book".[2]

The United States of America entered into an agreement with the government of Canada in 1972 on Great Lakes Water Quality (GLWQA). The agreement was reaffirmed and expanded in 1978 (Appendix I) and is currently in effect. No clear definition has been made within the USA regarding enforcement power for the 1978 agreement and no specific regulations have been promulgated which specifically address the agreement. The agreement was signed by Ms. Barbara Blum, Deputy Administrator of the USEPA. The USEPA has promulgated various regulations regarding water quality primarily under the Clean Water Act (CWA). It must be presumed that the EPA, in addressing its responsibility for assuring "clean water", believes that its promulgated regulations satisfy the obligations of the GLWQA.

The NYSDEC has no regulations which specifically address the GLWQA. Again, the NYECL and NYCRR sections on water quality must address the issues of the GLWQA. NYS is prohibited from attempting to enforce the GLWQA without have NYS promulgated statutes and regulations.

The GLWQA is in existence, however, it is not currently enforceable per se. It is only through existing NYS and US statutes and regulations that its objectives can be obtained.

Since the Niagara River is a drinking water supply, USEPA primary drinking water standards and NYS Health Department drinking water standards would apply and are enclosed in Appendix I.

---

[1] 45 FR 231, November 28, 1980.

[2] Quality Criteria for Water

III. DEVELOPMENT OF DESIGN CRITERIA

A. Industrial Waste Survey

In 1978, Olin Chemical Group, on the recommendation and direction of the Environmental Affairs Department, carried out a program of characterization of all Chemicals Group plant discharges. Each discharge was analyzed for the U. S. Environmental Protection Agency list of 129 priority pollutants. Preliminary results for the Niagara Falls plant surprisingly showed the presence of a series of organic compounds. The contaminants were totally unexpected as the identified chemicals were not and, for the most part, had not been used or produced at the plant.

An immediate check of Niagara River water supply showed some contamination by several of the compounds in question but not at levels sufficient to account for the discharge levels detected. Process well water was subsequently sampled and was found to be the source. The total of the organics concentrations was 3.132 ppm. Further analyses were performed to confirm the initial results (see Appendix II for analytical data).

The first three sampling results showed a general downward trend (11/1/78, 3/5/79, and 5/27/79). The next sampling (6/27/79) showed a substantial increase in organics concentration, to 41.173 ppm. A sampling program was instituted which resulted in approximately monthly samples during the period of June, 1979 through March, 1980. Weekly samples were collected and analyzed from March, 1980 to the present.

B. Evaluation of Survey Results

The significant compounds identified in the analytical program were not used or produced by Olin. Several chlorinated benzene compounds were produced by Olin at the Plant 2 site in the period from 1950-1956, but the compounds identified in the well water were generally chlorinated methanes, ethanes, and ethenes.

Comparison of the organic compounds found in the production wells (125 ft. deep) versus the compounds found near Gill Creek (monitoring wells 7.2 to 18 ft. deep) reveals that the character of the two conditions are completely different. It can further be shown (2) that the primary source of water for the deep production wells is infiltration from the Niagara River.[1]

Two apparently separate natural hydrologic system exist at the Niagara Falls plant. The soil-water system is the water in the lower part of the soil/fill (5 to 10 feet thick) and uppermost, fractured part of the bedrock (1 to 5 feet thick); this water probably moves slowly eastward to Gill Creek and south toward the Niagara River.

---

[1] Johnston, R. H., Groundwater in the Niagara Falls Area, New York, p. 30.

The ground water system is the water in the limestone-dolomite bedrock (Lockport Formation) underlying the fill. The base of the formation is about 140 feet below the surface. Water in the bedrock moves mostly through solution-widened horizontal openings (bedding-joints or bedding planes), although some water moves through more or less vertical fractures. If no water were being pumped in the Buffalo Avenue industrial area, water would probably move slowly from the Niagara River above the falls to the outcrop of the formation in the Niagara Gorge below the falls. Because of relatively large pumping rates, especially at Olin, the movement of water is locally reversed. The heavy pumping has already served to further induce infiltration from the Niagara River into the bedrock near the plant; in fact, most of the water being pumped from the Olin wells comes fairly directly from the River. Water levels in the bedrock away from pumping centers is probably slightly below the river stage, and near the wells the levels are drawn down, as low as 50 feet below the surface at Olin.

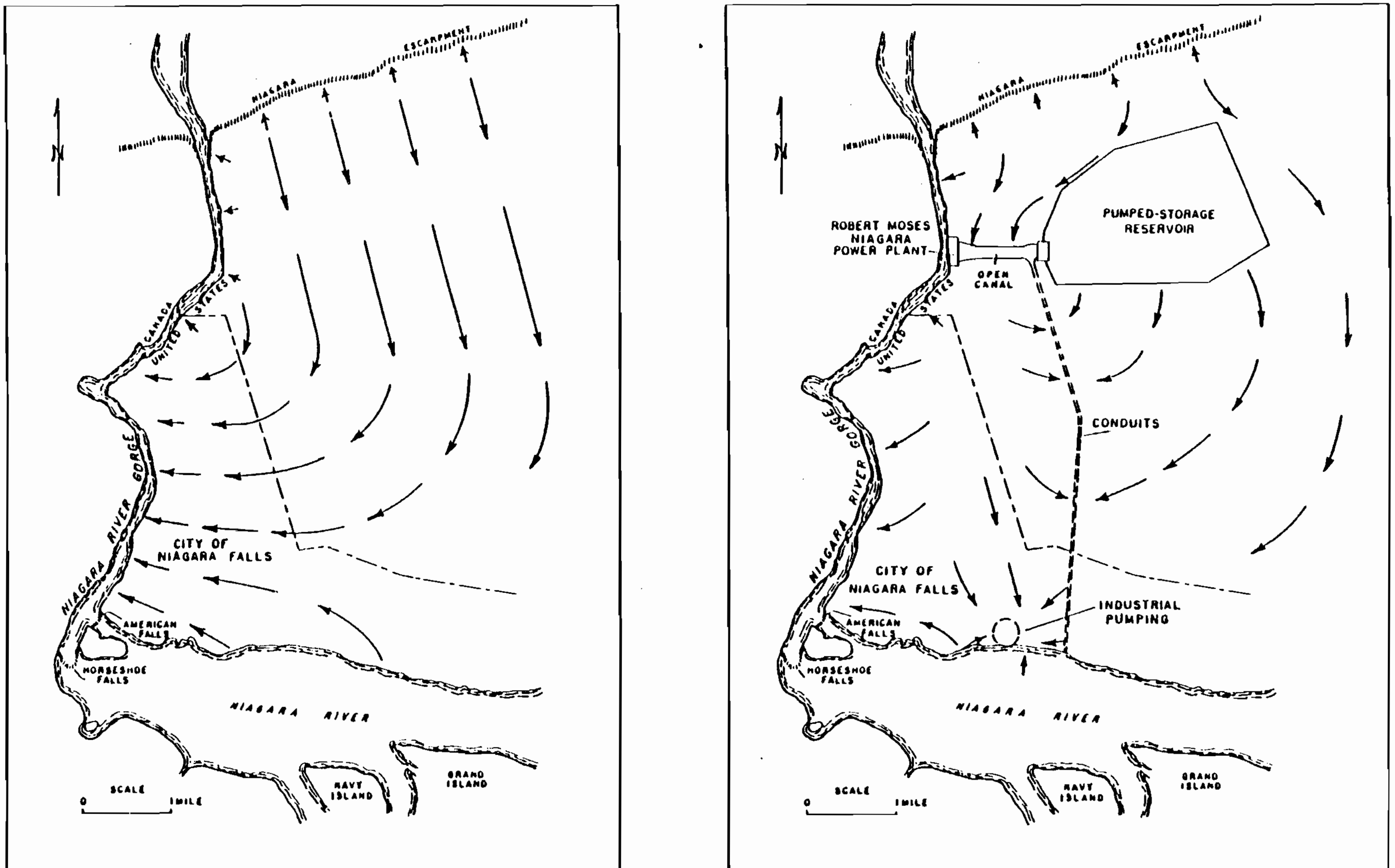
The two water systems are apparently separated by at least 15 to 20 feet of hard, impermeable bedrock except that vertical fractures, or joints do occur at irregular spacing in the bedrock.

> Infiltration from the river can occur where pumping has lowered groundwater levels below river level to such an extent that a hydraulic gradient is created between the river and the wells. The amount of the infiltration depends on the gradient and the nature of the hydraulic connection between the river and Lockport. The hydraulic connection is controlled by the character of the river bottom. Throughout most of its length in the Niagara Falls area, the bottom of the river is covered by a layer of unconsolidated deposits including both till and clay and silt. This layer was found to be from 10 to 20 feet thick in the vicinity of the Niagara Falls water-system intake. In the section of the river occupied by rapids, extending a half mile or more above the falls, the bottom has been scoured clean by the river. Where the layer of unconsolidated deposits is present, its low permeability greatly retards infiltration. Where the layer is thin or absent, infiltration can readily occur. [1]

Analysis of the potential sources of the identified pollutants in Olin well water revealed that >98% were product, by-product, or raw material for chlorinated solvents manufacture (see following pages). Manufacture of chlorinated solvents has never been an Olin activity. Further, methanol was identified in the well water and it also was produced by some chlorinated solvent manufacturers.

Greater than 95% of the compounds identified were characterized as volatile and the analysis program was modified after the first few samplings to reflect this fact. Analyses after May, 1979 were generally for volatile organics only, i.e., Volatile Organics Analysis or VOA as described in the USEPA Priority Pollutant Analysis protocol.

[1] Ibid. p. 30



NATURAL CONDITION
(BEFORE CONSTRUCTION OF INDUSTRIAL WELLS AND NIAGARA POWER PROJECT)

PRESENT CONDITION
(AFTER CONSTRUCTION OF INDUSTRIAL WELLS AND NIAGARA POWER PROJECT)

Inferred direction of ground-water movement in the upper water-bearing zones of the Lockport Dolomite in the vicinity of Niagara Falls.

From Johnston, Ground Water in the Niagara Falls Area, New York, NYS Conservation Department, p. 54, Bulletin GW-53 (1964).

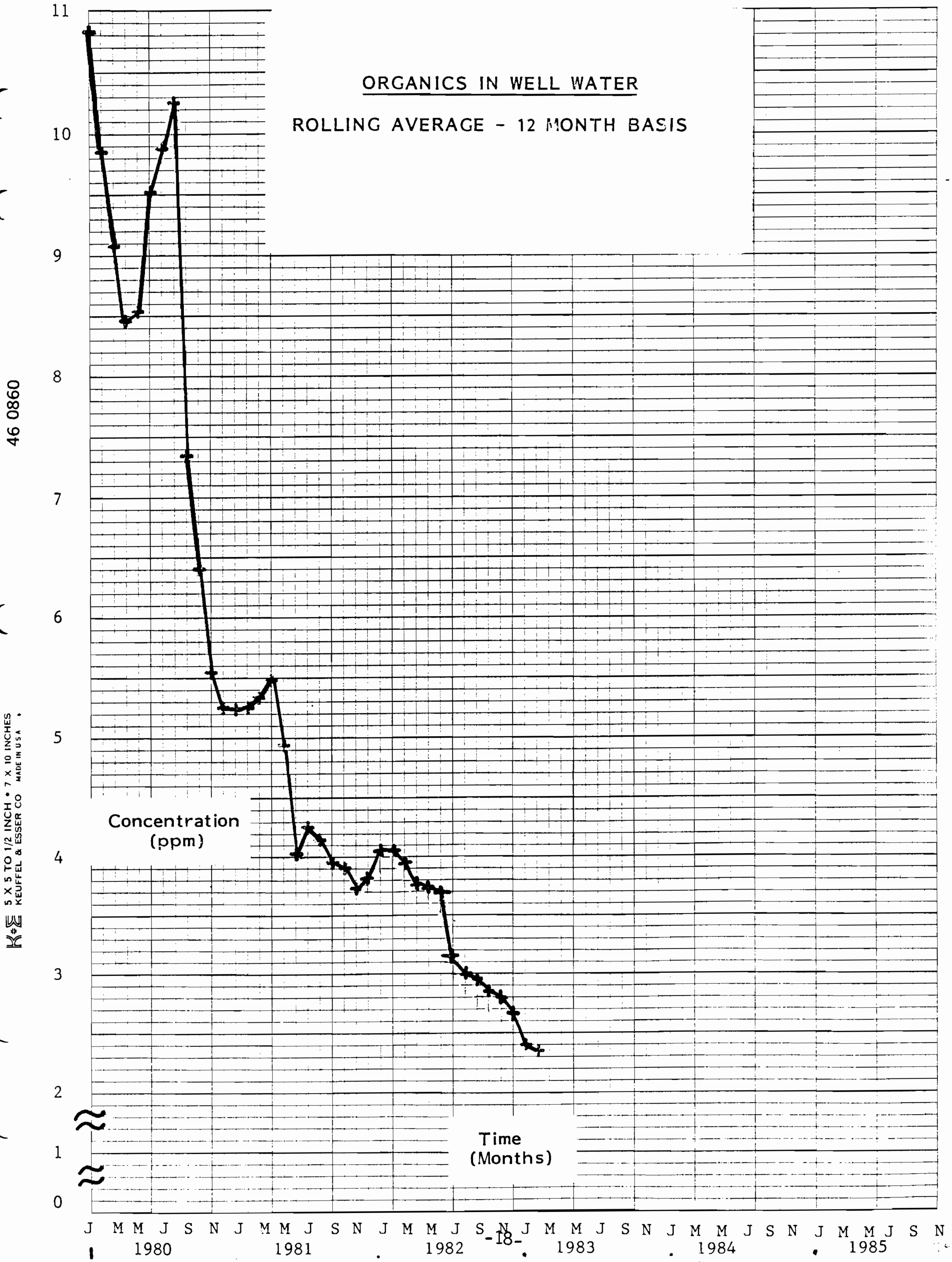
The analytical data has shown a continual overall drop in concentration since the monitoring program began. A plot of the 12-month rolling average of total organics concentration versus time (p. 18) clearly exhibits the downward trends in organics concentration. There have been several temporary increases in concentration that are related to well pumping variations, soil retention characteristics, and/or seasonal variations. These temporary increases in concentration have also decreased in intensity with continual pumping. Actual plots of organics concentration versus time are also provided on page 19.

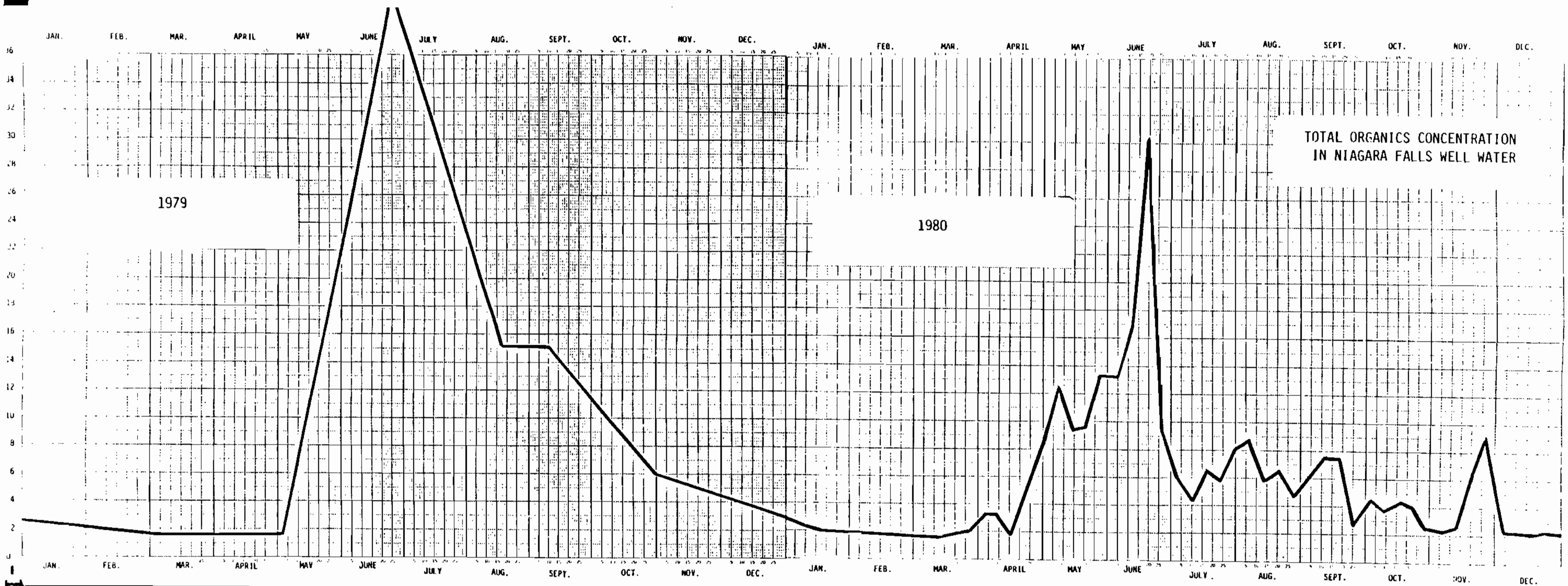
It has been previously shown (Engineering Report - Contaminated Well Water Supply - October 2, 1980) that an average of >98% of the detected compounds are found in the VOA analysis fraction. Further, it has been shown that the top five compounds found in any given sample consists of nine compounds. Considerations of potential treatment specifications concentrated on these nine compounds.

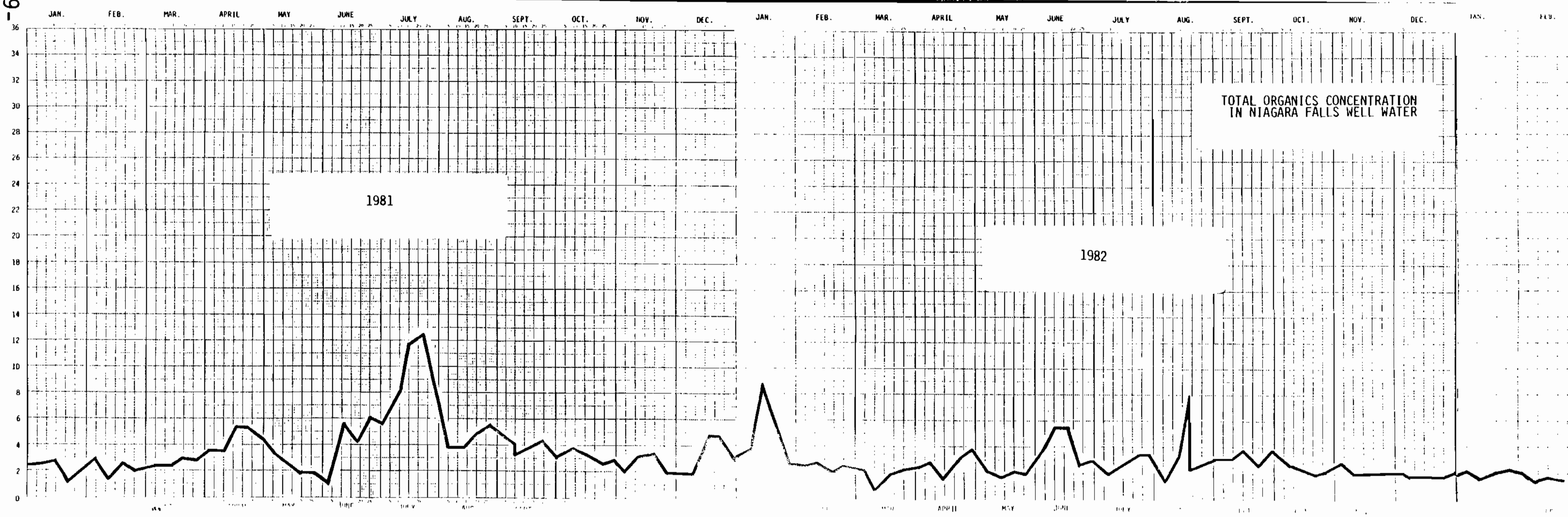
AVERAGE ORGANIC CONCENTRATIONS
PROCESS WELL WATER - PAST 12 MONTHS
(3/82 - 2/83)

		AVERAGE CONCENTRATION				
	COMPOUND	(ppb)-Overall	(ppb)-2 Wells North	(ppb)-2 Wells South	(ppb)-1 Well North	(ppb)-1 Well South
1.	Carbon Tetrachloride	54	31	93	46	25
2.	Chloroform	270	399	184	210	190
3.	Dichloroethenes	≤148	166	150	133	114
4.	Methylene Chloride	≤ 66	≤ 16	≤ 1	0	0
5.	1,1,2,2-Tetrachloroethane	118	123	136	97	72
6.	Tetrachloroethene	938	1091	1084	787	748
7.	Trichloroethene	1063	1249	1119	797	614
8.	Vinyl Chloride	21	≤ 16	≤ 18	5	≤ 12
	TOTAL OF TOP NINE	2678	≤3091	≤2785	2070	≤1775

It was also observed that in general the north well yielded higher concentrations of organics than did the south well. This observation held true with one well and two well operation.


ORGANICS IN WELL WATER
ROLLING AVERAGE - 12 MONTH BASIS
Concentration (ppm)
Time (Months)
0
1
2
3
4
5
6
7
8
9
10
11
J M M J S N J M M J S N J M M J S N J M M J S N J M M J S N J M M J S N
1980
1981
1982
1983
1984
1985
46 0860
K+E 5 X 5 TO 1/2 INCH • 7 X 10 INCHES KEUFFEL & ESSER CO MADE IN USA


TOTAL ORGANICS CONCENTRATION
IN NIAGARA FALLS WELL WATER
1979
1980
JAN. FEB. MAR. APRIL MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.


TOTAL ORGANICS CONCENTRATION
IN NIAGARA FALLS WELL WATER
1981
1982
JAN. FEB. MAR. APRIL MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

SUMMARY OF ORGANIC CONTAMINANTS
(Total Number of Analyses - 276)
(Total Number of Complete Characterizations - 7)
(Data Through February 1983)

COMPOUND	NUMBER OF TIMES DETECTED/276	NUMBER OF TIMES DETECTED/7	MAXIMUM VALUE (ppb)	CHLORINATED SOLVENT MANUFACTURE(6)	OLIN USAGE
1,1,2,2-Tetrachloroethane	260	--	26887	Known Intermediate	(1)
Tetrachloroethene	285	--	16000	Known Product/By-Product	(1)
Trichloroethene	265	--	14000	Known Product	
Dichloroethenes	269	--	2006	Known Product/By-Product	
Chloroform	283	--	1400	Known Product	
Carbon Tetrachloride	282	--	1200	Known Co-Product	(2)
Methylene Chloride	108	--	670	Known Product/By-Product	
Methanol	1(5)	--	485	Known Product	(3)
Vinyl Chloride	227	--	440	Believed By-Product	
1,1,1-Trichloroethane	202	--	140	Believed By-Product	
1,1,2-Trichloroethane	106	--	53	Believed By-Product	
Hexachloroethane	--	7	29.6	Known to be Present	
Trichlorofluoromethene	4(7)	--	27		
Monochlorobenzene	46	--	24		(2)
Tetrachlorobutadiene	--	2	22.2	Known Intermediate	
Benzene	33	--	19		(2)
Ethylbenzene	2	1	18		
Dioctylphthalate	--	2	18	(5)	
Hexachloro-1,3,-butadiene	--	6	16	Believed By-Product	
Pentachlorobutadiene	--	2	13.4	Known to be Present	
Dichloroethane	8	--	10		
Pentachloroethane	--	3	8.6		
Diisooctylphthalate	--	3	5.9	(5)	
Trichlorobenzene	--	6	5		(2)
Phenanthrene/Anthracene	--	3	4		
Pyrene	--	5	2		
BHC (hexachlorocyclohexane)	--	5	1.21		(2)
Toluene	4	--	1.8		
Dioctyladipate	--	2	1.7	(5)	
Dichlorobenzenes	--	2	1.2		(4)
Fluoranthene	--	5	1		
Hexachlorobenzene	--	1	1	Believed By-Product	(4)

(1) Known to have been used; small, non-production quantity.
(2) Used or produced in quantity at Plant 2 site.
(3) Used in quantity, past and present, at Plant 2 site.
(4) Potential by-product, Plant 2 site.
(5) Presence of both phthalates and adipates at least partially due to contamination in analysis.
(6) Non-Olin processes.
(7) Compound from 4/7/82 sample identified as dichlorodifluoromethane.

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
4/11/83

SUMMARY OF ORGANIC CONTAMINANTS - PAST 12 MONTHS
(Total Number of Analyses - 93)
(Data March 1982-February 1983)

COMPOUND	NUMBER OF TIMES DETECTED/93	MAXIMUM VALUE (ppb)	CHLORINATED SOLVENT MANUFACTURE(4)	OLIN USAGE
Trichloroethene	93	4000	Known Product	
Tetrachloroethene	93	3900	Known Product/By-Product	(1)
Chloroform	93	810	Known Product	
1,1,2,2-Tetrachloroethane	93	560	Known Intermediate	(1)
Dichloroethenes	93	≤ 460	Known Product/By-Product	
Carbon Tetrachloride	92	440	Known Co-Product	(2)
Methylene Chloride	9	330	Known Product/By-Product	
Vinyl Chloride	65	210	Believed By-Product	
Trichlorofluoromethene	1(5)	27		
Monochlorobenzene	7	24		
1,1,1-Trichloroethane	57	24	Believed By-Product	
Ethylbenzene	1	18		
Benzene	14	14		(2)
1,1,2-Trichloroethane	34	11	Believed By-Product	

(1) Known to have been used; small, non-production quantity.
(2) Used or produced in quantity at Plant 2 site.
(4) Non-Olin processes.
(5) Compound from 4/7/82 sample identified as dichlorodifluoromethane.

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
4/11/83

C. Waste Characterization

1. Standards

The USEPA has proposed but not yet promulgated BAT effluent guidelines for the organic contaminants in question. BAT effluent guidelines cannot be applied to the Olin cooling water effluent.[1] BAT guidelines apply to the process discharges only. Consequently, the only standards which apply are receiving water quality criteria and drinking water standards (See Appendix I). Except for two (2) compounds, the receiving water standards are written in general terms. The characterization of the discharge streams must be examined from the point of view of their effect on the receiving water and its usage.

2. Concentrations

The maximum and average concentrations of the major compounds as determined over the past year have been utilized to calculate equivalent concentrations in the diversion sewer and in the Niagara River (assuming zero background).

BASIS - 4.46 mgd well water output (2 wells)
- 80 mgd Diversion Sewer Flow (including 60 mgd from POTW)
- 32,313.6 mgd Minimum River Flow (50,000 cfs)
- Average and Maximum Organic Concentrations

CONCENTRATION (ppb)
(March 1982-February 1983 Data)

	COMPOUND	IN WELL WATER		IN DIVERSION SEWER		IN NIAGARA RIVER	
		avg.	max.	avg.	max.	avg.	max.
1.	Carbon Tetrachloride	54	440	3	24	0.007	0.061
2.	Chloroform	270	810	15	45	0.037	0.111
3.	Dichloroethenes	≤148	460	8	26	0.020	0.064
4.	Methylene Chloride	≤ 66	330	4	18	0.009	0.045
5.	1,1,2,2-Tetrachloroethene	118	560	7	31	0.017	0.077
6.	Tetrachloroethene	938	3900	52	217	0.130	0.538
7.	Trichloroethene	1063	4000	59	223	0.147	0.552
8.	Vinyl Chloride	≤ 21	210	1	12	0.003	0.029

[1] 45 FR 144 Thurs, July 24, 1980, p. 49465

The most definitive applicable standard is the 0.10 mg/l trihalomethane drinking water supply limit. The average of chloroform discharges would contribute to the Niagara River 0.000037 mg/l (0.037 ppb) or approximately 1/2800th of the limit. The maximum chloroform level would be equivalent to 0.1 ppb or approximately 1/1000th of the drinking water standard. Chloroform levels in the river, when compared to the drinking water standard, should present no threat to human health. It also should be considered that the 50000 cfs Niagara River flow used in the calculation only exists from the upstream power intakes to the power plant discharges below the falls. There is substantially more dilution below the power plant discharges. In addition, the calculation assumes 100% of the discharge goes to the diversion sewer (i.e., no flow to the POTW) and there are no losses of organics due to volatilization. This is certainly conservative since both assumptions are not completely correct. Discharges to the POTW are 8-10% and losses due to volatilization of organics could be 20% or greater.

The highest organic concentration noted in the past year (trichloroethylene) would be equivalent to 0.55 ppb in the Niagara River. The USEPA water quality criteria listed 45,000 ppb as the appropriate level for protection of aquatic life. Similarly, for those other compounds for which the USEPA and the NYSDEC proposed water quality criteria.

	MAX. CONCENTRATION LEVEL IN NIAGARA RIVER (as per Part 700;NYCRR) (ppb)	USEPA WATER QUALITY CRITERIA FOR PROTECTION OF AQUATIC LIFE (ppb)	NYS PROPOSED WATER QUALITY STANDARDS (ppb)
1. Carbon Tetrachloride	0.061	32,200	5.0
2. Chloroform	0.111	28,900	10
3. Dichloroethenes	0.064	11,600	----
4. Methylene Chloride	0.045	11,000*	----
5. 1,1,2,2-Tetrachloroethane	0.077	9,320/2,400	----
6. Tetrachloroethene	0.538	5,280/840	----
7. Trichloroethene	0.552	45,000	10
8. Vinyl Chloride	0.029	NA	----

* Halomethanes would include some other compounds but not carbon tetrachloride or chloroform.

It can be concluded, therefore, that based on the EPA and NYSDEC Water Quality Criteria, there is no threat to aquatic life posed by the continued discharge of the compounds in question. In fact, the average well water concentration meets the USEPA water quality criteria for all but as pumped from the well with no river dilution.

As additional support for this conclusion, bioassays on the discharge streams and the raw well water have shown that the streams are not acutely toxic under 24-hour static bioassay conditions. Olin carried out tests on the streams in August 1981 (Appendix V) with fathead minnow (Pimephales promelas) as the test species. All of the minnows were alive at the end of the 24-hour test period. The NYSDEC carried out additional tests (Appendix V) in October 1981 with both fathead minnows and Daphnia magna. As with the Olin tests, there were no fatalities at the end of the 24-hour period.

D. Combination with Domestic Waste

One concept for treatment to remove organics is to discharge all well water to the POTW. The Niagara Falls POTW is a physical/chemical facility which is equipped with activated carbon adsorption for the removal of organic compounds. The carbon beds are not expected to be operational until 1984. The Olin plant has a contractual discharge limit of 770,000 gpd to the city treatment facility. Current discharges average approximately 429,000 to 584,000 gpd leaving approximately 260,000 gpd available. Well water usage at full production ranges from 2.88-5.18 mgd.

An additional problem is that the POTW is already hydraulically overloaded. The plant was designed to process 48 mgd and is presently handling approximately 55 mgd. The excess hydraulic load is due to infiltration and excessive volume discharges by some participants. It is expected that when the POTW is fully operational and fully evaluated that an influent in excess of 48 mgd may be allowed. The timetable for such an upgrading is over two years away, however, leaving little possibility of raising the contractual limit. The treatability of the well water in the POTW activated carbon system has not been addressed.

E. Investigations of Treatment Methods

Several observations are pertinent prior to any evaluation of specific treatment methods.

1. The well water contaminants are most concentrated at the source. The well water is distributed to two (2) plant sites and five (5) separate wastewater discharges. It is reasonable, therefore, to consider treatment only at the well head. Treatment at the discharge(s) is not practical. Costs for piping to segregate and return the well water to a common point for carbon treatment, have been estimated at $760,000-1,064,000 (1980 dollars).

2. The usage of the well water is as cooling water. Any potential treatment method must maintain the water temperature as withdrawn from the ground. Methods such as steam stripping would be useless in processing cooling water.

Investigations of treatment methods and systems began with a literature search and a review of the accepted treatment methodologies for removal of organics from water. Six data bases were searched resulting in over 100 references. The literature search and review yielded six (6) accepted technologies for consideration. Specifically, these technologies were:

1. Steam stripping;

2. Oil-Water separation;

3. Filtration (diatomaeous earth or dual media);

4. Biochemical oxidation;

5. Air stripping; and

6. Activated carbon adsorption - Our investigative program concluded that carbon adsorption was the only technically feasible approach to treatment for this application. Detailed evaluations of activated carbon adsorption was carried out in several stages.

   a) Theoretical Calculations - In 1980, the Olin Process Technology Group calculated the potential carbon usage and cost to reduce the organics to 15 ppb. A worst case assumption was made, i.e., 41 ppm organics in the well water supply, and an unreasonable carbon consumption figure of 530 tons/day resulted. An alternate calculation, with an objective of 98% removal of organics to approximately 100 ppb, resulted in a carbon replacement requirement of 5.30 tons/day with an estimated replacement cost of $3.75-4.50 million per year (1980 dollars). Calculations were also carried out based on an assumed stabilized organic concentration of 2.0 ppm. This resulted in a carbon requirement of 26.5 tons/day to attain a 98% reduction in the organics levels. Carbon costs for the 98% reduction were estimated at $2,000,000/year (1980 dollars). While this cost is substantially below the worst case estimates, it is still unreasonable economically.

   b) Bench Scale Isotherm - Again in 1980, Calgon Corporation performed bench scale activated carbon isotherm studies on well water with approximately 2.0 ppm organics. Their results, based on total organic carbon (TOC) only, resulted in an estimated 0.4-1.6 tons of carbon consumption/day and a carbon replacement cost of $450,000-600,000/(1980 dollars) year. This study reduced the TOC to a non-detectable level. The approved TOC analysis procedure is only recommended for levels greater than 1 mg/l. The isotherm study started with a sample level of 2 mg/l which was reduced to a non-detectable level. The total TOC level, however, is made up of eight specific compounds of interest which may be in the concentration of the low ppb range to several ppm (mg/l). The bench scale isotherm did not show the resultant (treated) levels of each compound nor did it truly show the resultant total organics level. The isotherm did show a technical potential for activated carbon adsorption treatment.

F. Alternative Proposals

1. Mechanical Refrigeration Systems - The process wells are an important and valuable resource as a constant temperature cooling water supply, and are essential to the operation of the Niagara Falls plant. However, an obvious alternative is to replace the wells with a mechanical refrigeration system and eliminate the discharge of organics. Olin Engineering reviewed this concept and estimated that appropriate mechanical equipment could be provided at a one-time capital cost of $2.2 million with operating costs estimated at $100,000/yr.

2. Selective Sealing - A potential method of reducing or eliminating the contamination from the withdrawn water is to partially seal the well shaft to exclude the contaminated groundwater. To be a viable consideration, the contaminated groundwater must be in a discrete and isolatable section and the remaining or unsealed portion of the draft must still produce sufficient water to be usable. Olin carried out tests on the wells which consisted of isolating successive sections of the well shaft and chemically characterizing the water pumped from each section. Briefly, results showed very little contamination in the south well with the north well pumping and relative by high contamination in the north well with the south well pumping. It has been calculated that a packer installed in the north well at the 50 foot level will reduce the organics concentration in the withdrawn water by 25-50% and available potential flow would reduce 10-20%. A temporary packer could be installed at the 50 foot level to test the conclusion. Conditions could develop which would decrease the gain from packer installation. Continued pumping could result in a drawing up the contaminated water to a higher level above the packer.

G. Conclusions - 1980

1. Treatment (Activated Carbon Adsorption) - High capital cost, extremely high operating cost and questionable effectiveness and need.

   A comparison of the estimated treatabilities with the concentrations actually found in the well water (for those compounds which coincide) reveals that only eight compounds would be expected to be reduced from their maximum concentration and five compounds would be reduced from their average concentrations. Actual pilot tests on well water could provide solid data, compound by compound.

2. Mechanical Refrigeration - High capital cost, high effectiveness, but questionable need.

   Mechanical refrigeration is a proven, standard technology and discontinuing well usage would be 100% effective in preventing discharge of organic contamination to surface water. Continued pumping of the wells has the advantage in retarding or preventing the natural groundwater aquifer movement towards the Lower Niagara Gorge, it is minimizing the areal distribution of the contamination. In time, the contamination should be reduced or cleared completely, particularly if surficial sources are eliminated.

3. Reduce Well Water Demand to One Well Only - High capital cost, effective but questionable need.

   A review of potential areas where the demand for well water could be reduced was undertaken. It was determined that the plant presently has the capability to operate at the full load with one well for 8-9 months of the year. Complete elimination of one well can only be accomplished with an as yet undefined reduction of plant production capacity during the summer months.

4. Maintain Well Water Usage at Two Wells Year-Round - Reasonable cost, and effective.

   It can be seen from the data that consistency in organic concentration is maintained with either one or two wells. Slugs of organic concentrations can develop when a second well is activated after a period of shutdown.

   It is believed that continuous two-well operation would contribute a lower mass of organics if the operation is allowed to stabilize. The effect of continuous pumping will be monitored over the next few months to confirm this concept. Two-well operation would expedite flushing of the aquifer.

   Re-examination of the true conditions reveals that the existing situation is not as serious as is indicated by a superficial examination of the data. The organic concentrations are in the ppb/ppm ranges.

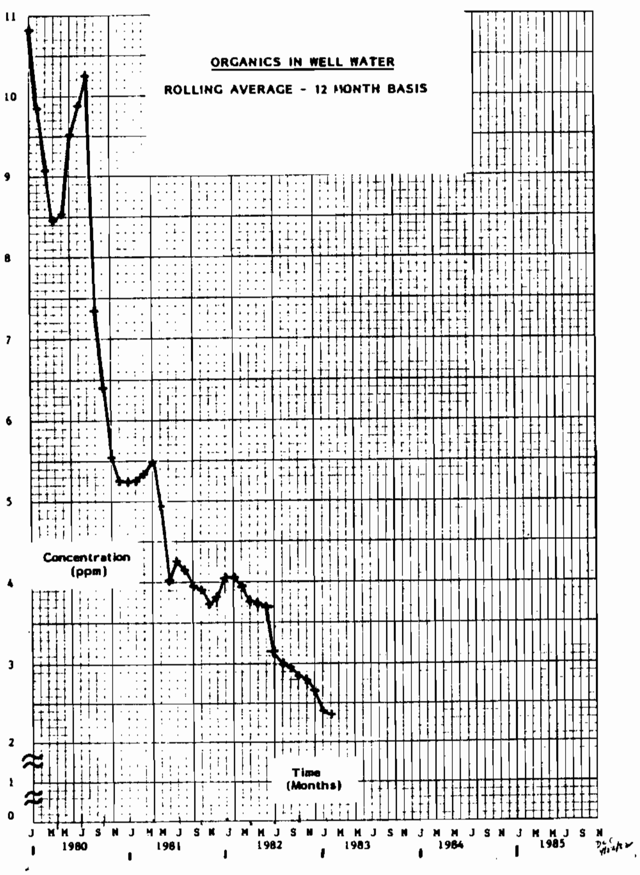
   Levels of the various contaminants found in well water will not exceed any of the numerical standards listed when discharged into the Niagara River. The ambient river levels would not be sufficient to cause taste, odor or color problems or be injurious to aquatic life. It can also be seen in a review of the data that there is a trend toward lower concentrations during two-pump operations. It would seem reasonable that since the disposal operations which caused the problem have ceased, that the contaminant concentrations would have to continue to reduce over a period of time. Further, since remedial operations on the waste disposal areas presumed to be affecting the well water contaminant levels will be carried out, the reduction in organics concentrations should be accentuated. In addition, approximately 8-10% of the well water flow is discharged to the POTW and by 1981, will be processed through an activated carbon system which will further reduce the organic loading on the Niagara River.

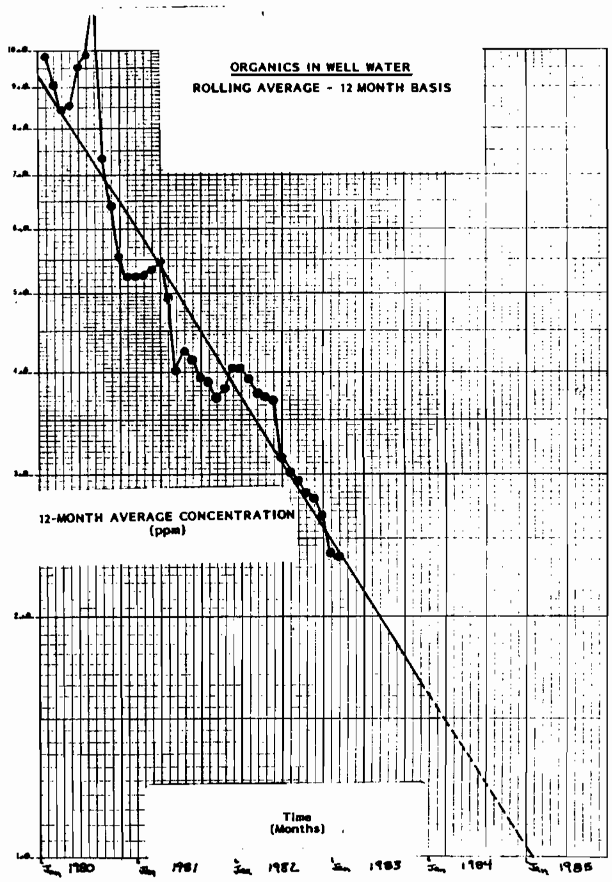
H. Abatement Plans

In view of the 1980 conclusions above, Olin proposed to continue monitoring the well water supply on a monthly basis (VOA analyses) and perform a complete organic characterization on a semi-annual basis. These analyses were summarized and reported quarterly.

Continued pumping of the wells at the lower concentrations coupled with the remedial surficial action will result in flushing of the aquifer and a return in time to an uncontaminated state. If pumping is not continued, natural groundwater flow will carry the organics to the Lower Niagara Gorge where they would enter the river anyway. The DEC concurred with the continuous plan as noted in a comment letter dated March 16, 1981 (Appendix III).

The concept of continuous pumping has proven the theory of continued reductions in organics concentration. As shown in the figures below, the 12-month rolling average has dropped from 11.8 ppm in 1980 (based on very few analyses) to 2.4 ppm in February 1983 (based on approximately 52 samplings).





Olin continues to believe that continued pumping and completion of surficial remedial actions at contributing non-Olin hazardous waste disposal sites was and is the appropriate abatement plan. Several events of the past three years affect that belief, however, the events are beyond Olin's control and require that additional abatement efforts be carried out.

IV. DESIGN CRITERIA - JULY 1, 1984 OBJECTIVES

A. Receiving Water

Several events in 1981 served to focus additional attention on the Niagara River and the municipal and industrial discharges to the River. The intense public interest resulted in the establishment of policies and imposition of standards which were politically and sociologically based and have little or no scientific or technical basis and have no basis in law or regulation. The policies regarding ambient river water quality standards, mixing zones, and discharge allocations were first developed in the preparation of the SPDES discharge permit for the City of Niagara Falls POTW. Those policies and standards have been applied to other industrial dischargers even though some have been legally challenged[1] and have not yet been established as valid criteria for setting SPDES permit limitations. Notable among these are:

1) Inappropriate legal and factual bases upon which effluent limitations have been set.

2) Failure to account for sampling, analytical and operating variability of laboratory analyses.

3) Using water quality criteria which are inappropriate for developing permit limits.

4) Relying on unpublished rules and regulations.

5) Reliance on data which was not available to the public.

The SPDES permit issued to Olin Corporation and effective March 1, 1983 utilized the above policies and standards in developing the effluent limitation of 10 lb/day of total organics. A successful legal challenge to the policies[1] may result in a re-evaluation and reissuance of the Olin permit, however, the current requirement is 10 lb/day total organics. While the organics concentration in well water has been shown to be dropping, it appears, based on extrapolation of historical data, that natural reductions by mid-1984 will not be sufficient to meet the new permit requirement (i.e., at 4.46 mgd two-well output; concentration limited to 269 ppb and at 3 mgd one-well output; concentration limited to 400 ppb). It is apparent, therefore, that the original concepts of well water replacement through mechanical refrigeration or activated carbon must be reconsidered.

In early 1982, Calgon Corporation was engaged to carry out a feasibility study activated carbon adsorption treatment of well water to reduce the organics concentrations. The initial aspect of the Calgon work was a "mini-column" or Accelerated Column Test (ACT). The results of this study have been previously reported to the DEC[2]. Conclusions of the ACT test were as follows:

---

[1] Petition for Public Hearing, November 3, 1982.

[2] Letter to G. Pallante, NYSDEC; April 26, 1982; and letter to W. Loveridge, NYSDEC, March 6, 1982.

1. A discharge limit of 0.010 ppm for each Volatile Organic Compound (including methylene chloride) is not practical physically or economically. [1.45 truckloads of carbon per day; $7,145,000/yr. in carbon costs]. Carbon treatment is not a viable option with such effluent limitations.

2. A discharge limit of 0.050 ppm for each compound is also totally infeasible. When methylene chloride breaks through the concentration rapidly rises to >0.060 ppm. Carbon regeneration rate and costs are approximately the same as for a 0.010 ppm limit.

3. An average discharge limit of 0.300 ppm total halogenated organics (THO) approaches more reasonable physical and economical consideration. [One truckload/5.7 days; $862,000/yr]. Chloroform can be 1.5 to 2.0 times the 0.300 ppm test level at times and chloroform breakthrough can be closer to 0.500 ppm THO than 0.300 ppm THO.

4. A discharge limit of 0.500 ppm makes carbon adsorption somewhat more reasonable option for consideration. [One truckload carbon/8.3 days; $591,000/yr carbon cost]. A discharge concentration of 0.500 ppm would be equivalent to 20.8 lb/day with two-well operation. Effluent concentrations are difficult to predict at this point particularly with the proposed start/stop method of operation. We would expect that with a 0.500 ppm THO limit, methylene chloride (0.042 ppm average when present) and chloroform (0.400 ppm average) would be discharged at their influent concentrations. Effluent could also contain small amounts of dichloroethylene, vinyl chloride, 1,1,1-Trichloroethane and carbon tetrachloride. All other compounds detected in well water should be retained on the bed at nearly 100% efficiency.

The ACT test was sufficiently encouraging to consider a field pilot study. Calgon Corporation provided the equipment and guidance for the study while Olin carried out the test. Test data was evaluated by Calgon and summarized in their report dated March 29, 1983 (Appendix IV). The pilot column study verified that a 10-minute contact time was sufficient to contain the mass of priority pollutant organics below a total discharge limit of 10 pounds per day at a well water flow rate of 5 mgd. With 6 adsorbers operating in parallel and a 7 day staggered start-up of each adsorber, 52 truckloads (1,040,000 pounds of activated carbon) would be required to treat 5 mgd per year. A proportionally lower carbon usage rate is required at lower flow rates.

Meeting the 10 lbs. organics/day effluent limitation via activated carbon will be extremely expensive. Operating cost for the 5 mgd/6 adsorber/52 truckload situation was projected at $688,000 per year for carbon regeneration and service charges. Capital costs for a facility to house the equipment had been previously estimated in the range of $570,000-870,000.

B. Abatement Plans - 1983

Several aspects of the contaminated well water supply problem are unresolved to date. These are:

a) Effect of the actual packer (selective sealing) and net reduction in organics levels attainable. Test results are very promising.

b) Status of the temporary shutdown of the HTH® manufacturing facility and the degree of water treatment capability to be provided at this time.

c) The effect of the recently discovered groundwater contamination on adjoining property.

d) The degree of continued overall reductions in organics concentration through the next 15 months.

With the above points in mind:

1) Olin will pursue installation of a temporary packer in the south well. It is presently estimated that this will reduce the organics contamination from the well water supply by 25-50%. As such, we expect the level of contamination to be approximately 1.2 ppm (based on a 12-month rolling average). At 1.2 ppm, 5 mgd would produce approximately 50 lbs. of organics/day. Reduction in well water consumption to 3.0 mgd would result in an organics load of 30 lbs/day.

2) Olin will continue to pump two wells with continued weekly monitoring of VOA concentrations. Monitoring will show any continued overall reductions in well water concentrations, the effect of the packer and the permanence of those effects (i.e., water from the deeper aquifer may be drawn up to the higher levels and/or the south well may pick up contamination and show a rise in organics level).

3) Olin will implement a well water replacement project, i.e., cooling for the Frick Ammonia Compressors used in the liquification of chlorine. Currently, these compressors utilize recycled river water in winter and well water during the summer. A closed-loop cooling water system (cooling tower) will be installed to replace the river/well water system and will eliminate the consumption of approximately 0.7 mgd of well water.

4) Olin will continue to investigate an activated carbon adsorption system which will maintain net total organic discharge levels at ≤10 lbs/day. Currently, installation of six adsorbers to treat up to 5 mgd is envisioned. However, Olin is considering the four points noted above and may design a carbon adsorption system for a lower flow and/or lower organics concentration. Operation of the carbon adsorption system will be varied from 100% treatment to a fractional treatment/bypass system to maintain the ≤10 lbs/day discharge limitation as the concentration in the well water decreases.

We have the ability to utilize carbon adsorption equipment presently existing at another Olin facility. Design and construction would involve site preparation (maximum 3,750 ft^2) and piping. We do not expect the design problems which could exist with a new facility or the delivery problems which might be expected with newly manufactured equipment. Consequently, we do not require the amount of time for these phases of the project as might typically be expected. We will also continue to investigate mechanical refrigeration for well water replacement and other options. We believe the projects necessary to meet the $\leq$10 lb/day limitation can be completed by the required July 1, 1984 date.

REFERENCES

Black, Hayse H., Planning Industrial Waste Treatment, NYS Department of Health, Division of Pure Waters, New York, 1968.

Codes, Rules and Regulations of the State of New York, Chapter X, Title 6, Parts 700, 701 and 702.

Considine, Douglas M. (Ed.); Chemical Process Technology Encyclopedia, New York, 1974, pp. 273-279.

Cummings, D. L. and R. B. Dow; Engineering Report - Contaminated Well Water Supply, October 2, 1980.

Federal Register, Volume 40, Number 141, December 24, 1975 as amended through March 11, 1980.

Federal Register, Volume 48, Number 55, March 21, 1983.

Federal Register, Volume 45, Number 231, November 28, 1980.

Johnston, Richard H., Groundwater in the Niagara Falls Area, New York, State of New York Conservation Department, Water Resources Commission, Bulletin GW-53, 1964.

McKee, J. E. and H. W. Holf, (Eds.), Water Quality Criteria, State Water Control Board, State of California, Pub. 3-A, 1963, 94-8.

New York State Sanitary Code, Chapter I, Part 5.

Petition for Public Hearing, State Discharge Elimination System (SPDES) Permit NY0026336, November 3, 1982.

"Pollutant Treatability: A Molecular Engineering Approach", Environmental Science and Technology, Volume 14, Number 1 (January, 1980), pp. 28-31.

Quality Criteria for Water, USEPA (EPA-440/9-76-023) Washington, D.C., July 1976.

Strier, Murray P., Treatability of Organic Priority Pollutants - Part C - Their Estimated (30 day average) Treated Effluent Concentrations - By Means of a Molecular Engineering Approach, Office of Quality Review, Effluent Guidelines Division, USEPA, June, 1978.

APPENDIX I

APPLICABLE WATER QUALITY STANDARDS

1. NYS Classifications and Standards of Purity, Part 700, 701 and 702.
2. USEPA National Primary Drinking Water Standards, Part 141.
3. NYS Drinking Water Supplies, Part 5.
4. USEPA Water Quality Criteria, 45 FR 231, Friday, November 28, 1980, Selected Sections.
5. NYS Proposed Amendments to Parts 701 and 702.
6. Great Lakes Water Quality Agreement as amended in 1978, Selected Sections.

PART 700
CHAPTER X OF TITLE 6

CODES, RULES AND REGULATIONS
OF THE STATE OF NEW YORK

Section 700.1 Collection of Samples.

In making any tests of analytical determinations to determine compliance or non-compliance of sewage, industrial wastes or other waste discharges with established standards, samples shall be collected in such manner and at such locations as are approved by the commissioner. In approving such locations the commissioner shall be guided by the fact that :

(a) there must be prompt mixing of the discharge with the receiving waters;

(b) that the mixing will not interfere with biological communities to a degree which is damaging to the eco-system;

(c) that the mixing will not diminish other beneficial uses disproportionately.

PART 701

CHAPTER X OF TITLE 6
CODES, RULES AND REGULATIONS OF THE STATE OF NEW YORK
CLASSIFICATIONS AND STANDARDS OF QUALITY AND PURITY

701.2 Conditions applying to all classifications and standards. (a) In any case where the waters into which sewage, industrial wastes or other wastes effluents discharge are assigned a different classification than the waters into which such receiving waters flow, the standards applicable to the waters which receive such sewage or wastes effluents shall be supplemented by the following: "The quality of any waters receiving sewage, industrial wastes or other wastes discharges shall be such that no impairment to the best usage of waters in any other class shall occur by reason of such sewage, industrial wastes or other wastes discharges."

701.4 Classes and standards for fresh surface waters. The following items and specifications shall be the standards applicable to all New York fresh waters which are assigned the classification of AA, A, B, C, or D, in addition to the specific standards which are found in this section under the heading of each such classification.

QUALITY STANDARDS FOR FRESH SURFACE WATERS

ITEMS	SPECIFICATIONS
1. Turbidity	No increase except from natural souces that will cause a substantial visible contrast to natural conditions. In cases of naturally turbid waters, the contrast will be due to increased turbidity.
2. Color	None from man-made sources that will be detrimental to anticipated best usage of waters.
3. Suspended, colloidal or settleable solids.	None from sewage, industrial wastes of other wastes which will cause deposition or be deleterious for any best usage determined for the specific waters which are assigned to each class.
4. Oil and floating substances.	No residue attributable to sewage, industrial wastes or other wastes nor visible oil film nor globules of grease.
5. Taste and odor-producing substances, toxic wastes and deleterious substances.	None in amounts that will be injurious to fishlife or which in any manner shall adversely affect the flavor, color or odor thereof, or impair the waters for any best usage as determined for the specific waters which are assigned to each class.
6. Thermal discharges.	(See Part 704 of this title).

PART 702
SPECIAL CLASSIFICATIONS AND STANDARDS

Section 702.1 Class A - Special (International Boundary Waters).

(GREAT LAKES WATER QUALITY AGREEMENT OF 1972)

Best Usage of Waters. Source of water supply for drinking, culinary or food processing purposes, primary contact recreation and any other usages.

Conditions Related to Best Usage. The waters, if subjected to approved treatment, equal to coagulation, sedimentation, filtration and disinfection with additional treatment, if necessary, to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

QUALITY STANDARDS FOR CLASS A-SPECIAL WATERS
(INTERNATIONAL BOUNDARY WATERS)

ITEMS	SPECIFICATIONS
1. Coliform	The geometric mean of not less than five samples taken over not more than a thirty-day period should not exceed 1,000 per 100 ml total coliform nor 200 per 100 ml fecal coliform.
2. Dissolved Oxygen	In the rivers and upper waters of the lakes not less than 6.0 mg/l at any time. In hypolimnetic waters, it should be not less than necessary for the support of fishlife, particularly cold water species.
3. Total Dissolved Solids	Should not exceed 200 milligrams per liter.
4. pH	Should not be outside the range of 6.7 to 8.5.
5. Iron	Should not exceed 0.3 milligrams per liter as Fe.
6. Phosphorus	Concentrations should be limited to the extent necessary to prevent nuisance growths of algae, weeds and slimes that are or may become injurious to any beneficial water use.
7. Radioactivity	Should be kept at the lowest practicable levels and in any event should be controlled to the extent necessary to prevent harmful effects on health.
8. Taste and odor-producing substances, toxic wastes and deleterious substances	None in amounts that will interfere with use for primary contact recreation or that will be injurious to the growth and propagation of fish, or which in any manner shall adversely affect the flavor, color or odor thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

9. Suspended, colloidal or settleable solids	None from sewage, industrial wastes or other wastes which will cause deposition or be deleterious for any best usage determined for the specific waters which are assigned to this class.
10. Oil and floating substances	No residue attributable to sewage, industrial wastes or other wastes nor visible oil film nor globules of grease.
11. Thermal Discharges	(See Part 704 of this title).

To meet water quality objectives referred to in the "Great Lakes Water Quality Agreement of 1972," the standards listed above shall be subject to revision from time to time after further hearings on due notice.

NOTE: With reference to certain toxic substances affecting fishlife, the establishment of any single numerical standard for waters of New York State would be too restrictive. There are many waters, which because of poor buffering capacity and composition will require special study to determine safe concentrations of toxic substances. However, most of the non-trout waters near industrial areas in this State will have an alkalinity of 80 milligrams per liter or above. Without considering increased or decreased toxicity from possible combinations, the following may be considered as safe stream concentrations for certain substances to comply with the above standard for this type of water. Waters of lower alkalinity must be specifically considered since the toxic effect of most pollutants will be greatly increased.

Ammonia or Ammonium Compounds	Not greater than 2.0 milligrams per liter expressed as NH, at pH of 8.0 or above.

TITLE 40, PART 141

CODE OF FEDERAL REGULATIONS

141.2 Maximum contaminant levels for organic chemicals.

(141.12 revised by 44 FR 68641, November 29, 1979).

The following are the maximum contaminant levels for organic chemicals. The maximum contaminant levels for organic chemicals in paragraphs (a) and (b) of this section apply to all community water systems. Compliance with the maximum contaminant levels in paragraphs (a) and (b) is calculated pursuant to § 141.24. The maximum contaminant level for total trihalomethanes in paragraph (c) of this section applies only to community water systems which serve a population of 10,000 or more individuals and which add a disinfectant (oxidant) to the water in any part of the drinking water treatment process. Compliance with the maximum contaminant level for total trihalomethanes is calculated pursuant to § 141.30.

	LEVEL mg/l
(a) Chlorinated hydrocarbons:	
Endrin - (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,endo, endo-5,8 - dimethane naphthalene).	0.0002
Lindane - (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer).	0.004
Methoxychlor - (1,1,1-Trichloro-2,2-bis(p-methoxyphenyl) ethane).	0.1
Toxaphene - ($C_{10}H_{10}Cl_8$-Technical chlorinated camphene, 67-79 percent chlorine.	0.005
(b) Chlorophenoxys:	
2,4-D, (2,4-Dichlorophenoxyacetic acid).	0.1
2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid).	0.01

(c) Total trihalomethanes (the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform)) 0.10 mg/l.

Part 5 - 1.52 Organic Chemicals.

Maximum contaminant levels; sampling and analytical requirements; notification (a) the following maximum contaminant levels.

ORGANIC CHEMICAL	MAXIMUM CONTAMINANT LEVEL (milligrams per liter)
(1) Chlorinated hydrocarbons:	
Endrin (1,2,3,4,10,hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octa-hydro-1,4-3ndo, endo-5,8-dimethano naphthalene	0.0002
Lindane (1,2,3,4,5,6-hexachloro-cyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2,2-bis p-methoxyphenyl ethane)	0.1
Toxaphene ($C_{10}H_{10}Cl_8$ - Technical chlorinated camphene, 67-68 percent chlorine	0.005
(2) Chlorophenoxys:	
2,4-D (2,4-Dichloropheoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichloro-phenoxypropionic acid)	0.001

Carbon Tetrachloride

Freshwater Aquatic Life

The available date for carbon tetrachloride indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 35,200 μg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of carbon tetrachloride to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for carbon tetrachloride indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 50,000 μg/l and would occur at lower concentrations among species that are more sensitive that those tested. No data are available concerning the chronic toxicity of carbon tetrachloride to sensitive saltwater aquatic life.

Chlorinated Ethanes

Freshwater Aquatic Life

The available freshwater data for chlorinated ethanes indicate that toxicity increases greatly with increasing chlorination, and that acute toxicity occurs at concentrations as low as 118,000 μg/l for 1,2-dichloroethane 18,000 μg/l for two trichloroethanes, 9,320 μg/l for two tetrachloroethanes, 7,240 μg/l for pentachloroethane, and 980 μg/l for hexachloroethane. Chronic toxicity occurs at concentrations as low as 20,000 μg/l for 1,2-dichloroethane, 9,400 μg/l for 1,1,2-trichloroethane, 2,400 μg/l for 1,1,2,2,-tetrachloroethane, 1,100 μg/l for pentachloroethane, and 540 μg/l for hexachloroethane. Acute and chronic toxicity would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available saltwater data for chlorinated ethanes indicate that toxicity increases greatly with increasing chlorination and that acute toxicity to fish and invertebrate species occurs at concentrations as low as 113,000 μg/l for 1,2-dichloroethane, 31,200 μg/l for 1,1,1-trichloroethane, 9,020 μg/l for 1,1,2,2-tetrachloroethane, 390 μg/l for pentachloroethane, and 940 μg/l for hexachloroethane. Chronic toxicity occurs at concentrations as low as 281 μg/l for pentachloroethane. Acute and chronic toxicity would occur at lower concentrations among species that are more sensitive than those tested.

Chloroform

Freshwater Aquatic Life

The available data for choloroform indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 28,900 μg/l, and would occur at lower concentrations among species that are more sensitive than the three tested species. Twenty-seven-day LC50 values indicate that chronic toxicity occurs at concentrations as low as 1,240 μg/l, and could occur at lower concentrations among species or other life stages that are more sensitive than the earliest life cycle stage of the rainbow trout.

Saltwater Aquatic Life

The data base for saltwater species is limited to one test and no statement can be made concerning acute or chronic toxicity.

Dichloroethylenes

Freshwater Aquatic Life

The available data for dichloroethylenes indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 11,600 μg/l and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of dichlorethylenes to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for dichlorethylenes indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 224,000 μg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity dichloroethylenes to sensitive saltwater aquatic life.

Halomethanes

Freshwater Aquatic Life

The available data for halomethanes indicate that acute toxicity to freshwate aquatic life occurs at concentrations as low as 11,000 μg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of halomethanes to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for halomethanes indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 12,000 and 6,400 μg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested. A decrease in algal cell numbers occurs at concentrations as low as 11,500 μg/l.

Tetrachloroethylene

Freshwater Aquatic Life

The available data for tetrachloroethylene indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 5,280 and 840 μg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for tetrachloroethylene indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations low as 10,200 and 450 μg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Vinyl Chloride

Freshwater Aquatic Life

No freshwater organisms have been tested with vinyl chloride and no statement can be made concerning acute or chronic toxicity.

Saltwater Aquatic Life

No saltwater organisms have been tested with vinyl chloride and no statement can be made concerning acute or chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of vinyl chloride through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-5}, 10^{-6}, and 10^{-7}. The corresponding criteria are 20 μg/l, 2.0 μg/l, and .2 μg/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 5,246 μg/l, 525 μg/l, and 52.5 μg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

EXCERPTS FROM
THE
GREAT LAKES WATER QUALITY AGREEMENT
OF 1978

ARTICLE II

PURPOSE

Consistent with the provisions of this Agreement, it is the policy of the Parties that:

(a) The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated;

ARTICLE VI

PROGRAMS AND OTHER MEASURES

1. (b) Pollution from Industrial Sources. Programs for the abatement, control and prevention of pollution from industrial sources entering the Great Lakes System. These programs shall be completed and in operation as soon as practicable and in any case no later than December 31, 1983, and shall include:

    (i) Establishment of waste treatment or control requirements expressed as effluent limitations (concentrations and/or loading limits for specific pollutants where possible) for all industrial plants, including power generating facilities, to provide levels of treatment or reduction or elimination of inputs of substances and effects consistent with the achievement of the General and Specific Objectives and other control requirements, taking into account the effects of waste from other sources;

    (ii) Requirements for the substantial elimination of discharges into the Great Lakes System of persistent toxic substances;

ANNEX 1

SPECIFIC OBJECTIVES

I. CHEMICAL

A. Persistent Toxic Substances

1. Organic

(a) Pesticides

Lindane

The concentration of lindane in water should not exceed 0.01 microgram per litre for the protection of aquatic life. The concentration

Unspecified Organic Compounds

For other organic contaminants, for which Specific Objectives have not been defined, but which can be demonstrated to be persistent and are likely to be toxic, the concentrations of such compounds in water or aquatic organisms should be substantially absent, i.e., less than detection levels as determined by the best scientific methodology available.

B. Non-Persistent Toxic Substances

1. Organic Substances

(b) Other Substances

Unspecified Non-Persistent Toxic Substances and Complex Effluents

Unspecified non-persistent toxic substances and complex effluents of municipal, industrial or other origin should not be present in concentrations which exceed 0.05 of the median lethal concentration in a 96-hour test for any sensitive local species to protect aquatic life.

(c) Substances entering the water as the result of human activity that cause tainting of edible aquatic organisms should not be present in concentrations which will lower the acceptability of these organisms as determined by organoleptic tests.

APPENDIX II

ANALYTICAL DATA

When reviewing the following analytical data, the follow points must be kept in mind:

1. The first three (3) samples (11/1/78; 3/5/79; 5/27/79) were characterized completely. That is, each MS response was identified within the limits of the instrumentation.

2. The majority of the analyses are VOA or Volatile Organics Analysis, only. Consequently, some of the high boiling compounds such as flourene would not be detected.

3. Analyses from 1/9/80, 1/17/80, 2/12/80, and 3/12/80 were analyzed by two (2) laboratories. Data from the second laboratory is shown in parentheses. If two numbers do not appear for a given compound, that compound was not detected by one laboratory.

4. Samples from 4/15-17/80, 3/12/80 and 6/12/80 were performed by a third laboratory and included the USEPA list of 129 priority pollutants only. Samples from 4/15-17/80 and 3/12/80 were 72-hour composite samples.

TABLE I

SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	11/1/78 WELL (1pump)	3/5/79 WELL (1pump)	5/27/79 WELL (1pump)	6/27/79 WELL (2pumps) VOA	8/13/79 WELL (2pumps) VOA	9/10/79 WELL (1pump) VOA	10/31/79 WELL (2pumps/2samples) VOA N	S	(4) 1/9/80 (5) WELLS (2pumps/2samples) N	S	1/17/80 (6) WELL (1pump) VOA S	2/12/80 WELL (1pump) VOA S	3/12/80 WELL (1pump) VOA N
*BHC(Hexachlorocyclohexane)	0.8	-	-	-	-	-	-	-	0.6(1.21)	0.7(1.2)	-	-	-
*Carbon Tetrachloride	33	19	12.8	225	98	22	15	54	41	45	65(4.3)	26(13)	20(17)
* loroform	426	191	174	362	276	103	165	102	365	140	168	261	97(300)
* butylphthalate	x	0.6	-	-	-	-	-	-	0.2	0.2	-	-	-
*Dichloroethenes	103	196	161	-	351.2	120	148	112	404	203	189	154.45(110)	145(113)
* ethylphthalate	x	x	-	-	-	-	-	-	0.04	-	-	-	-
octyladipate	1.7	x	-	-	-	-	-	-	-	-	-	-	-
* octylphthalate	1.2	-	-	-	-	-	-	-	-	-	-	-	-
*Fluoranthene	x	x	0.1	-	-	-	-	-	1	0.1	-	-	-
*Hexachloro-1,3-butadiene	8.1	-	x	-	-	-	-	-	14(-)	16(11)	-	-	-
xachlorobutene	x	-	-	-	-	-	-	-	-	-	-	-	-
* xachloroethane	29.6	13.8	10.8	-	-	-	-	-	8(x)	9(12)	-	-	-
*Methylene Chloride	111	19	10	46	64	0.3	12	ND	238	82	670	68	14(7.4)
*Monochlorobenzene	x	-	-	1.5	1.4	-	2	2	0.9	0.1	0.2	-	0.5
Pentachlorobutadiene	13.4	-	x	-	-	-	-	-	-	-	-	-	-
ntachlorobutene	x	-	-	-	-	-	-	-	-	-	-	-	-
Pentachloroethane	8.6	-	-	x	-	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	x	-	-	-	-	-	-	-	4	2	-	-	-
Phenylnaphthalene	x	-	-	-	-	-	-	-	-	-	-	-	-
yrene	x	x	0.1	-	-	-	-	-	2	0.3	-	-	-
Tetrachlorobutadiene	22.2	-	x	-	-	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	x	37	-	26887	10376	5820	6373	1134	-	-	-	-	-
*Tetrachloroethene	1147	692	410	7333	2535	6010	1287	1442	991	540	375(280)	785(700)	877(1000)
oluene	x	-	1.8	0.9	0.3	-	-	-	-	-	-	-	-
richlorobenzene	1.5	-	0.8	-	-	-	-	-	4	3	-	-	-
*1,1,1-Trichloroethane	7.5	0.5	1.2	17	11	-	4	ND	11	2	-	5.3	(4.2)
,1,2-Trichloroethane	53	x	1.2	inter	8	-	-	-	3	1	-	1.4	-
,1,2-Trichloroethene	1164	431	464	6290	1616	3130	1403	2	1283	411	570(230)	627(670)	732(810)
Benzene	-	0.3	0.6	11	5	4	3	ND	3	0.6	2.5	2.0	0.2(3)
Benzenedicarboxcylic Acid	-	x	-	-	-	-	-	-	-	-	-	-	-
yclohexenol	-	x	-	-	-	-	-	-	-	-	-	-	-
ichlorocyclohexane	-	x	-	-	-	-	-	-	-	-	-	-	-
Diisoctylphthalate	-	5.9	-	-	-	-	-	-	0.6	0.3	-	-	-
Ethylphenol	-	x	-	-	-	-	-	-	-	-	-	-	-
Heptanoic Acid	-	x	-	-	-	-	-	-	-	-	-	-	-
exanoic Acid	-	x	-	-	-	-	-	-	-	-	-	-	-
Methylphenol	-	x	-	-	-	-	-	-	-	-	-	-	-
*Phenol	-	0.01	0.001	-	-	-	-	-	0.04	0.03	-	-	-
*2,4,6-Trichlorophenol	-	0.01	-	-	-	-	-	-	-	-	-	-	-
imethoxymethane	-	-	x	-	-	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	485	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Acetone	-	-	-	x	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	x	-	-	-	-	-	-	-	-	-
thylbenzene	-	-	-	-	-	-	ND	0.4	-	-	-	-	-
ichlorobenzenes	-	-	-	-	-	-	-	-	1.2	0.21	-	-	-
Fluorene	-	-	-	-	-	-	-	-	0.4	0.08	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	1	-	-	-	-
aphthalene	-	-	-	-	-	-	-	-	0.1	-	-	-	-
ichloroethane	-	-	-	-	-	-	-	-	-	-	1.1	-	-
hloroethane	-	-	-	-	-	-	-	-	-	-	-	0.15	-
Vinyl Chloride	-	-	-	-	-	-	-	-	-	-	-	-	(30)
TOP 5	3131.6 94.2%	1606.12 96.3%	1733.401 97.7%	41173.4 99.9%	15341.9 98.7%	15209.3 99.8%	6101.7 Average		2416.85 Average		2060.8 96.7%	1950.30 98.2%	1885.7 99.2%

DLC/cjb
1/3/80

FOOTNOTES

* Priority Pollutant

\- Not Identified

x Identified But Not Quantified

(1) Sample from 6/27/79 through 10/31/79 analyzed for volatile components only.

(2) Presence of both Phthalates and Adipates is at least partially due to contamination in analysis.

(3) Procedure used would not detect methanol.

(4) Procedure identified priority pollutants only, specific VOA sample not collected.

(5) Numbers in parentheses indicated second source laboratory data, duplicate samples.

(6) Converted to 1 well on the sample day.

SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	3/27/80 WELL (1pump) VOA S	4/3/80 WELL (1pump) VOA S	4/9/80 WELL (1pump) VOA S	4/16/80 WELL (1pump) VOA S	4/15-17/80(1) WELL (1pump) S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-
*Carbon Tetrachloride	29	35	34	220	12
*Chloroform	47	65	49	-	214
*Dibutylphthalate	-	-	-	-	-
*Dichloroethenes	≤141	≤221	≤190	152	122
*Diethylphthalate	-	-	-	-	-
Dioctyladipate	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-
*Fluoranthene	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-
Hexachlorobutene	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-
*Methylene Chloride	-	-	-	≤3	-
*Monochlorobenzene	-	≤1	-	≤1	-
Pentachlorobutadiene	-	-	-	-	-
Pentachlorobutene	-	-	-	-	-
Pentachloroethane	-	-	-	x	-
*Phenathrene/Anthracene	-	-	-	-	-
Phenylnaphthalene	-	-	-	-	-
*Pyrene	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	-	-	-	-	-
*Tetrachloroethene	1200	1500	1600	1500	782
*Toluene	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-
*1,1,1-Trichloroethane	28	32	46	6.8	-
*1,1,2-Trichloroethane	-	-	-	3.0	-
*1,1,2-Trichloroethene	890	1000	950	30	718
*Benzene	-	-	-	-	-
Benzenedicarboxcylic Acid	-	-	-	-	-
Cyclohexenol	-	-	-	-	-
Dichlorocyclohexane	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-
Ethylphenol	-	-	-	-	-
Heptanoic Acid	-	-	-	-	-
Hexanoic Acid	-	-	-	-	-
Methylphenol	-	-	-	-	-
*Phenol	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-
Dimethoxymethane	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)
Acetone	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-
Ethylbenzene	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-
Fluorene	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-
Naphthalene	-	-	-	-	-
Dichloroethane	-	-	-	-	-
Chloroethane	-	-	-	-	-
Vinyl Chloride	280	440	440	15	-
	2615	3294	3310	1930.8	1848
	97.8%	97.9%	97.6%	99.3%	100.0%

(1) Mead Results; priority pollutants only

TABLE III
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	5/1/80 WELL (1pump) VOA S	5/8/80 WELL (1pump) VOA N	5/12-14/80 (1) WELL (1pump) PP N	5/15/80 WELL (1pump) VOA N	5/21/80 WELL (1pump) VOA N	5/28/80 WELL (2pumps) VOA N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-
*Carbon Tetrachloride	60	160	30	84	79	160	160
*Chloroform	220	290	358	180	200	460	270
*Dibutylphthalate	-	-	-	-	-	-	-
*Dichloroethenes	≤150.5	201.2	351	130.7	140.6	222	≤270.5
*Diethylphthalate	-	-	-	-	-	-	-
Dioctyladipate	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	18	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-
*Hexachloro-1,3-butadien	-	-	-	-	-	-	-
Hexachlorobutene	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-
*Methylene Chloride	x	x	16	≤5	x	-	-
*Monochlorobenzene	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-
Pentachlorobutene	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-
Phenylnaphthalene	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	-	-	-	x	-	-	x
*Tetrachloroethene	4900	7700	764	5900	6000	9500	3200
*Toluene	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	4.4	13	-	4.2	7.1	46	16
*1,1,2-Trichloroethane	≤1	-	-	x	1.8	7.1	5.6
*1,1,2-Trichloroethene	3100	4000	670	3200	3300	7000	3400
*Benzene	-	-	-	x	-	-	-
Benzenedicarboxcylic Acid	-	-	-	-	-	-	-
Cyclohexenol	-	-	-	-	-	-	-
Dichlorocyclohexane	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-
Ethylphenol	-	-	-	-	-	-	-
Heptanoic Acid	-	-	-	-	-	-	-
Hexanoic Acid	-	-	-	-	-	-	-
Methylphenol	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-
Dimethoxymethane	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Acetone	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-
Dichloroethane	x	-	-	x	x	x	-
Chloroethane	-	-	-	-	-	-	-
Vinyl Chloride	-	-	-	12	12	≤5	≤5
1,2-Dichloropropane	-	x	-	-	-	-	-
	8435.9	12364.2	2207	9515.9	9740.5	17400	7327.1
	99.9%	99.9%	98.5%	99.8%	99.8%	99.7%	99.6%
						Ave. 12363.6	

(1) Mead Results; Priority Pollutants Only

DLC/cjb
7/23/80

TABLE IV
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	6/5/80 WELL (2pumps) VOA		6/11/80 WELL (2pumps) VOA		6/12/80 (1) WELL (2pumps) VOA		6/19/80 WELL (2pumps) VOA	
	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	150	53	125	420	38	90	200	1200
*Chloroform	420	67	380	160	593	294	710	490
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	222.9	≤36.5	222.1	69	2006	1154	342.6	163.9
*Diethylphthalate	-	-	-	-	-	-	-	-
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
Hexachlorobutene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	x	x	≤5	6.4	163	94	95	52
*Monochlorobenzene	-	-	-	-	-	-	x	x
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachlorobutene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-	-
Phenylanaphthalene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	690	190	440	1100	-	511	260	3900
*Tetrachloroethene	11000	1300	10000	6700	1931	875	16000	15000
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	53	2.9	35	44	39	54	77	140
*1,1,2-Trichloroethane	≤3	x	-	-	-	-	11	x
*1,1,2-Trichloroethene	8400	1800	7000	6800	2446	1239	11000	14000
*Benzene	-	-	-	-	12	-	-	-
Benzenedicarboxcylic Acid	-	-	-	-	-	-	-	-
Cyclohexenol	-	-	-	-	-	-	-	-
Dichlorocyclohexane	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
Ethylphenol	-	-	-	-	-	-	-	-
Heptanoic Acid	-	-	-	-	-	-	-	-
Hexanoic Acid	-	-	-	-	-	-	-	-
Methylphenol	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Dimethoxymethane	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Acetone	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	x
Chloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	-	32	47	7.7	116	86	x	x
Trichlorofluoromethane	-	-	-	-	-	11	-	-
	20938.9	3481.4	18211.8	15307.1	7344	4410	28695.6	34945.9
	99.0%	98.0%	98.8%	99.2%	97.2%	92.4%	98.7%	99.0%
	12210.15 average		16759.45 average		5877 average		31820.75 average	

(1) Mead Results; Priority Pollutants only.

DLC/cjb
8/12/80

TABLE V
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	6/26/80 WELL (2 pumps) VOA N	6/26/80 WELL (2 pumps) VOA S	7/2/80 WELL (2 pumps) VOA N	7/2/80 WELL (2 pumps) VOA S	7/10/80 WELL (2 pumps) VOA N	7/10/80 WELL (2 pumps) VOA S
*BHC (Hexachlorocycloehxane)	—	—	—	—	—	—
*Carbon Tetrachloride	160	960	73	270	52	260
*Chloroform	480	340	370	16	200	130
*Dibutylphthalate	—	—	—	—	—	—
*Dichloroethenes	661	292	457.3	153	660	742.7
*Diethylphthalate	—	—	—	—	—	—
Dioctyladipate	—	—	—	—	—	—
*Dioctylphthalate	—	—	—	—	—	—
*Fluoranthene	—	—	—	—	—	—
*Hexachloro-1,3-butadiene	—	—	—	—	—	—
Hexachlorobutene	—	—	—	—	—	—
*Hexachloroethane	—	—	—	—	—	—
*Methylene Chloride	x	x	—	—	—	—
*Monochlorobenzene	—	≤1	—	—	—	—
Pentachlorobutadiene	—	—	—	—	—	—
Pentachlorobutene	—	—	—	—	—	—
Pentachloroethane	—	—	—	—	—	—
*Phenathrene/Anthracene	—	—	—	—	—	—
Phenylanaphthalene	—	—	—	—	—	—
*Pyrene	—	—	—	—	—	—
Tetrachlorobutadiene	—	—	—	—	—	—
*1,1,2,2-Tetrachloroethane	—	—	—	—	—	—
*Tetrachloroethene	3000	5600	2700	2200	1800	1800
*Toluene	—	—	—	—	—	—
*Trichlorobenzene	—	—	—	—	—	—
*1,1,1-Trichloroethane	40	80	21	27	17	27
*1,1,2-Trichloroethane	—	8.4	—	—	—	—
*1,1,2-Trichloroethene	3200	4000	2900	2700	1600	2000
*Benzene	—	x	—	—	—	—
Benzenedicarboxcylic Acid	—	—	—	—	—	—
Cyclohexenol	—	—	—	—	—	—
Dichlorocyclohexane	—	—	—	—	—	—
*Diishoctylphthalate	—	—	—	—	—	—
Ethylphenol	—	—	—	—	—	—
Heptanoic Acid	—	—	—	—	—	—
Hexanoic Acid	—	—	—	—	—	—
Methylphenol	—	—	—	—	—	—
*Phenol	—	—	—	—	—	—
*2,4,6-Trichlorophenol	—	—	—	—	—	—
Dimethoxymethane	—	—	—	—	—	—
Methanol	(3)	(3)	(3)	(3)	(3)	(3)
Acetone	—	—	—	—	—	—
1,1,1,2-Tetrachloroethane	—	—	—	—	—	—
Ethylbenzene	—	—	—	—	—	—
Dichlorobenzenes	—	—	—	—	—	—
Fluorene	—	—	—	—	—	—
Hexachlorobenzene	—	—	—	—	—	—
Naphthalene	—	—	—	—	—	—
Dichloroethane	—	x	—	—	—	—
Chloroethane	—	—	—	—	—	—
Vinyl Chloride	280	200	43	310	120	24
Trichlorofluoromethane	—	—	—	—	—	—
	7821	11189.4	6364.3	5676.0	4449	4383.7
	97.4%	97.4%	98.6%	99.2%	98.4%	98.8%
	9505.2 average		6120.2 average		4416.4 average	

DLC/cjb
9/9/80

TABLE VI
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	7/17/80 WELL (2pumps) VOA		7/24/80 WELL (2pumps) VOA		7/31/80 WELL (2pumps) VOA		8/7/80 WELL (2pumps) VOA	
COMPOUND	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	48	280	210	150	46	280	68	420
*Chloroform	520	390	520	250	460	300	510	310
Dibutylphthalate	-	-	-	-	-	-	-	-
Dichloroethenes	130	76	122	51	127	87	127	93
Dioctyladipate	-	-	-	-	-	-	-	-
Dioctylphthalate	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
Methylene Chloride	-	8	-	-	-	-	-	-
Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
Phenathrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	180	540	170	210	130	360	140	150
Tetrachloroethene	2600	2800	3200	2000	3000	3800	3600	5300
Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	14	18	21	9.8	11	12	11	16
1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
*1,1,2-Trichloroethene	2600	2900	2800	2100	3700	4000	2100	4800
*Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	82	64	29	21	78	78	100	60
Trichlorofluoromehtane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-
TOTAL	6174	7068	7072	4791.8	7552	8917	6656	11149
	91.1%	97.6%	97.6%	98.3%	98.2%	98.0%	97.3%	98.5%
	6621 average		5931.9 average		8234.5 average		8902.5 average	

3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

LC/cjb
2/4/80

TABLE VII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	8/14/80 WELL (2pumps) VOA N	S	8/21/80 WELL (2pumps) VOA N	S	8/28/80 WELL (2pumps) VOA N	S	9/4/80 WELL (2pumps) VOA N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	73	540	94	46	68	260	77	260
*Chloroform	280	340	580	330	470	220	540	300
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	77	80	158	70	81	62	180	65
Diocytladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,8-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	-	-	-	10	14	16	110	35
*Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	70	340	180	360	170	220	160	170
*Tetrachloroethene	1800	3200	2500	3200	1900	2000	2300	2400
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	14	15	10	15	15	13	11	10
*1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
*1,1,2-Trichloroethene	2000	2800	2800	2800	2300	2100	2800	2600
*Benzene	-	-	-	-	≤3	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	180	72	32	20	12	18	230	140
Trichlorofluoromethane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	6	-	4	-	3	-
TOTAL	4494 96.5%	7387 97.7%	6360 97.8%	6851 98.7%	5037 97.8%	4909 97.8%	6411 94.4%	5980 95.8%
	5940.5 average		6605.5 average		4973 average		6195.5 average	

(3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

DLC/cjb
12/4/80

TABLE VIII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	9/11/80 WELL (2pumps) VOA N	S	9/18/80 WELL (2pumps) VOA N	S	9/25/80 WELL (2pumps) VOA N	S	10/2/80 WELL (2pumps) VOA N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	40	230	20	140	28	37	49	110
*Chloroform	160	110	160	120	290	110	280	170
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	87	50	97	59	353	130	306	242
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	41	12	42	12	22	8	22	10
*Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	32	60	34	56	62	63	35	58
*Tetrachloroethene	4800	5700	4900	5500	930	540	1300	1700
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	8	9	7	8	16	7	26	19
*1,1,2-Trichloroethane	-	x	-	-	-	-	-	8
*1,1,2-Trichloroethene	1800	1900	1900	1900	1700	1000	2200	2000
*Benzene	-	-	-	-	-	-	8	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	100	94	110	84	130	20	320	250
Trichlorofluoromethane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	2	-	3	-	2	1
TOTAL	7068	8165	7272	7879	3534	1915	4548	4568
	98.3%	98.4%	99.1%	98.3%	96.4%	96.2%	96.9%	95.5%
	7616.5 average		7575 average		2724.5 average		4558 average	

(3) Procedure used will not detect methanol.
NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

DLC/cjb
11/20/80

TABLE IX
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	10/8/80 WELL (2pumps) VOA		10/17/80 WELL (2pumps) VOA		10/23/80 WELL (2pumps) VOA		10/29/80[1] WELL (2pumps) VOA	
	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	39	110	37	190	12	33	10	31
*Chloroform	220	150	260	150	510	200	64	94
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	305	≤192	295	264	120	73	66	79
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	30	19	30	10	190	76	53	6
*Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	31	56	36	51	150	200	100	120
*Tetrachloroethene	1200	1200	1200	1400	1300	1100	630	1000
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	21	19	21	24	4	≤4	-	≤4
*1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
*1,1,2-Trichloroethene	1900	1800	2100	2100	2400	1600	1200	1700
*Benzene	-	-	10	-	≤10	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Ethylbenzene	4	-	≤3	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	300	170	300	48	34	-	-	-
Trichlorofluoromethane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-
TOTAL	4050	3714	4292	4669	4730	3286	2123	3034
	96.9%	94.5%	96.8%	93.9%	96.2%	96.6%	97.0%	97.1%
	3882 average		4480.5 average		4008 average		2578.5 average	

(1) North well sampled 10/29/80; South well sampled 10/30/80.

(3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

DLC/cjb
12/9/80

TABLE X
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	11/6/80 WELL (2pumps) VOA		11/13/80 WELL (2pumps) VOA		11/20/80 WELL (2pumps) VOA		11/26/80 WELL (2pumps) VOA	
	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	30	60	44	51	110	130	140	210
*Chloroform	240	120	380	180	1200	410	1300	610
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	92	63	130	100	456	220	456	394.8
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	400	340	93	29	160	17	42	35
*Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	56	33	82	57	530	130	520	320
*Tetrachloroethane	900	600	1100	530	3300	1700	3600	2400
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	9	4	10	-	42	19	42	19
*1,1,2-Trichloroethane	-	-	-	-	19	-	-	-
*1,1,2-Trichloroethene	1100	640	1800	680	5100	2000	5100	2500
*Benzene	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	23	32	-	-	44	330	48	110
Trichlorofluoromethane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-
TOTAL	2850	1892	3639	1627	7991	4956	11248	6598.9
	95.6%	93.2%	96.3%	95.1%	95.5%	94.0%	98.8%	94.3%
	2371 average		2633 average		6473.5 average		8923.4 average	

(1) North well sampled 10/29/80; South well sampled 10/30/80.

(3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

DLC/cjb
1/9/81

TABLE XI
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	12/4/80 WELL (2pumps) VOA N	12/4/80 WELL (2pumps) VOA S	12/10/80 WELL (2pumps) VOA N	12/10/80 WELL (2pumps) VOA S	12/17/80 WELL (2pumps) VOA N	12/17/80 WELL (2pumps) VOA S	12/23/80 WELL (2pumps) VOA N	12/23/80 WELL (2pumps) VOA S	12/31/80 WELL (2pumps) VOA N	12/31/80 WELL (2pumps) VOA S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	31	33	28	42	29	33	25	32	31	26
*Chloroform	390	170	370	160	350	130	430	140	390	120
*Dibutylphthalate	-	-	-	-	-	-	-	-	-	-
*Dichloroethenes	66	≤ 56	77	≤ 51	71	50	82	≤ 52	73	43
Dioctyladipate	-	-	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-	-	-
*Methylene Chloride	-	-	-	-	-	-	24	12	37	10
*Monochlorobenzene	-	-	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	180	90	160	79	130	62	240	58	200	50
*Tetrachloroethene	910	570	960	620	1000	490	1000	470	970	420
*Toluene	-	-	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	12	2	12	2	11	2	11	2	11	2
*1,1,2-Trichloroethane	-	-	-	-	-	-	-	-	-	-
*1,1,2-Trichloroethene	1500	560	1400	570	1400	480	1600	470	1600	400
*Benzene	-	-	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-	-	-
Dichlorobenzene	-	-	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	59	80	69	89	66	60	66	78	68	64
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
TOTAL	3148	1561	3076	1613	3057	1307	3478	1314	3380	1135
Top 5	96.8%	94.2%	96.5%	94.1%	96.5%	93.5%	96.4%	92.5%	95.6%	92.9%
	2354.5 average		2344.5 average		2182 average		2396 average		2257 average	

(3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

DLC/cjb
1/27/81

TABLE XI
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	1/8/81[1] WELL (2pumps) VOA		1/14/81 WELL (2pumps) VOA		1/21/81[1] WELL (2pumps) VOA		1/28/81 WELL (2pumps) VOA	
COMPOUND	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	30	20	36	43	2	20	32	30
*Chloroform	60	200	530	190	300	100	160	120
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	72	≤ 62	89	≤ 60	≤ 42	≤ 42	63	37
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	-	-	-	-	-	-	-	-
*Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenathrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	200	50	170	51	80	40	83	17
*Tetrachloroethane	1000	600	1800	570	200	400	1200	420
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	8	2	12	2	2	-	14	2
*1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
*1,1,2-Trichloroethene	2000	400	1300	440	400	300	1400	340
*Benzene	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-
Dichlorobenzenes	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Dichloroethane	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	80	200	120	180	10	80	76	130
Trichlorofluoromethane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-
TOTAL	3450 97.2%	1534 95.3%	3757 96.4%	1536 93.8%	1036 98.6%	982 93.9%	3028 96.4%	1098 95.5%
	2492 average		2646.5 average		1009 average		2063 average	

(1) Due to a computer malfunction, the original data from the analyses of the 1/18/81 and 1/21/81 samples was irretrievably lost. The original samples were reanalyzed but since the sample vials had headspace, the actual values may be somewhat greater than those reported. The values listed for these samples are reported with one significant figure to indicate a decreased level for confidence in their accuracy.

(3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

DLC/cjb
3/24/81

TABLE XII

SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES

(ppb)

COMPOUND	2/4/81[1] WELL (2pumps) VOA N	S	2/11/81 WELL (2pumps) VOA N[2]	S	2/18/81 WELL (2pumps) VOA N	S	2/25/81 WELL (2pumps) VOA N	S
*BHC (Hexachlorocyclohexane)	-	-		-	-	-	-	-
*Carbon Tetrachloride	33	36		32	34	34	31	30
*Chloroform	230	150		160	430	160	160	370
*Dibutylphthalate	-	-		-	-	-	-	-
*Dichloroethenes	≤65	≤10		≤10	≤10	≤10	≤10	≤10
Dioctyladipate	-	-		-	-	-	-	-
*Dioctylphthalate	-	-		-	-	-	-	-
*Fluoranthene	-	-		-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-		-	-	-	-	-
*Hexachloroethane	-	-		-	-	-	-	-
*Methylene Chloride	-	-		-	-	≤5	6	-
*Monochlorobenzene	-	-		-	-	-	-	-
Pentachlorobutadiene	-	-		-	-	-	-	-
Pentachloroethane	-	-		-	-	-	-	-
*Phenoathrene/Anthracene	-	-		-	-	-	-	-
*Pyrene	-	-		-	-	-	-	-
Tetrachlorobutadiene	-	-		-	-	-	-	-
*1,1,2,2-Tetrachloroethane	90	49		65	230	76	58	180
*Tetrachloroethane	610	490		480	860	490	490	870
*Toluene	-	-		-	-	-	-	-
*Trichlorobenzene	-	-		-	-	-	-	-
*1,1,1-Trichloroethane	≤5	≤5		≤5	13	≤5	≤5	9.2
*1,1,2-Trichloroethane	-	-		-	-	-	-	-
*1,1,2-Trichloroethene	1100	460		520	1600	730	540	1300
*Benzene	-	-		-	-	-	-	-
*Diisoctylphthalate	-	-		-	-	-	-	-
*Phenol	-	-		-	-	-	-	-
*2,4,6-Trichlorophenol	-	-		-	-	-	-	-
Methanol	(3)	(3)		(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-		-	-	-	-	-
Ethylbenzene	-	-		-	-	-	-	-
Dichlorobenzenes	-	-		-	-	-	-	-
Fluorene	-	-		-	-	-	-	-
Naphthalene	-	-		-	-	-	-	-
Dichloroethane	-	-		-	-	-	-	-
Chloroethane	-	-		-	-	-	-	-
Vinyl Chloride	93	86		100	78	110	120	77
Trichlorofluoromethane	-	-		-	-	-	-	-
Chlorobenzene	-	-		-	-	-	-	-
TOTAL	2226	3512		1372	3272	1620	1420	2846.2
	95.4%	98.6%		96.6%	98.3%	96.7%	96.3%	98.3%
	2869 average				2446 average		2133.1 average	

(1) North well sampled 2/4/81; South well sampled 2/5/81; South well shutdown 2/4/81 through 9:30 a.m. on 2/5/81.

(2) Lost sample for North well - 2/11/81.

(3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quantitated have been omitted.

DLC/cjb
3/30/81

TABLE XIV
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	3/5/81[1] WELL (2pumps) PP		3/12/81 WELL (2pumps) VOA		3/18/81 WELL (2pumps) VOA		3/25/81[2] WELL (2pumps) VOA	
	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	0.83	1.18	-	-	-	-	-	-
*Carbon Tetrachloride	28	29	55	22	60	52	91	80
*Chloroform	350	140	870	120	1010	350	1400	380
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	≤10	≤10	≤20	≤5	≤5	≤5	30	≤10
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	13	10	-	-	-	-	-	-
*Hexachloroethane	19	12	-	-	-	-	-	-
*Methylene Chloride	3	11	-	7	≤5	7	≤5	7
*Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenoanthrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	190	82	320	38	720	130	490	200
*Tetrachloroethene	940	540	1100	260	2000	570	1200	720
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	5	≤ 5	-	-	-	-	-	-
*1,1,1-Trichloroethane	13	≤ 5	16	-	18	-	14	-
*1,1,2-Trichloroethane	-	-	-	-	-	-	≤10	-
*1,1,2-Trichloroethene	1400	530	1700	380	1700	700	1800	870
*Benzene	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methanol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
*Ethylbenzene	-	-	-	-	-	-	-	-
*Dichlorobenzene	-	-	-	-	-	-	-	-
*Fluorene	-	-	-	-	-	-	-	-
*Naphthalene	-	-	-	-	-	-	-	-
*Dichloroethane	-	-	-	-	-	-	-	-
*Chloroethane	-	-	-	-	-	-	-	-
*Vinyl Chloride	78	88	10	8	9	14	14	20
Trichlorofluoromethane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-
TOTAL	3049.83	1423.18	4091	840	5536	1828	5054	2287
	97.0%	97.0%	98.9%	97.6%	99.3%	98.6%	99.2%	98.4%
	2236.5 average		2465.5 average		3682 average		3670.5 average	

(1) Priority Pollutant Analysis

(2) South well down 2:30 pm-7:30 pm, 3/24/81; North well down 4:30 pm-8:15 pm and 9:00 pm-10:45 pm on 3/25/81.

(3) Procedure used will not detect methanol.

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/cjb
5/12/81

TABLE XV
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	4/1/81 WELL (2pumps) VOA N	S	4/9/81 WELL (2pumps) VOA N	S	4/15/81 WELL (2pumps) VOA N	S	4/22/81 WELL (2pumps) VOA N	S	4/29/81 WELL (2pumps) VOA N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*	*	*
Carbon Tetrachloride	79	92	70	51	86	160	76	160	32	190
Chloroform	1000	450	590	180	1200	70	1200	460	730	480
Dibutylphthalate	*	*	*	*	*	*	*	*	*	*
Dichloroethenes	≤10	≤10	≤21	≤10	77	45	87	29	≤31	≤34
Dioctyladipate	*	*	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*	*	*
Methylene Chloride	9	15	-	≤5	-	-	-	-	28	14
Monochlorobenzene	-	-	-	-	≤5	-	≤5	-	-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*	*	*
Phenoanthrene/Anthracene	*	*	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	360	160	260	60	440	380	360	320	260	370
Tetrachloroethene	1400	750	1400	790	1500	1200	1400	1100	1200	1300
Toluene	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	16	-	18	-	27	19	24	15	12	16
1,1,2-Trichloroethane	≤10	-	≤10	-	11	11	21	≤10	≤10	11
1,1,2-Trichloroethene	1800	830	2700	990	3200	2300	3200	2100	2300	2500
Benzene	-	-	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*	*	*
2,4,6-Trichlorophenol	*	*	*	*	*	*	*	*	*	*
Methonol	*	*	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*	*	*
Ethylbenzene	-	-	-	-	-	-	-	-	-	-
Dichlorobenzene	*	*	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*	*	*
Naphthalene	*	*	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	8	17	≤5	≤5	8	25	9	11	≤5	12
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-
TOTAL	4692	2324	5074	2091	6554	4210	6382	4205	4608	4927
	98.9%	98.2%	98.9%	99.0%	98.0%	97.6%	97.9%	98.4%	98.1%	98.2%
	3508	average	3582.5	average	5382	average	5293.5	average	4767.5	average

- Not Detected
* Procedure Used Will Not Detect

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/vrp
10/20/81

TABLE XVI
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	5/6/81 WELL (2pumps) VOA		5/13/81 WELL (2pumps) VOA		5/20/81[1] WELL (2pumps) VOA		5/28/81[2] WELL (2pumps) VOA	
	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	28	36	43	130	34	100	80	84
*Chloroform	480	340	560	320	500	260	380	170
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	≤10	≤10	12	≤10	≤10	≤10	≤10	≤10
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	-	38	-	-	≤5	≤5	≤5	≤5
*Monochlorobenzene	-	≤5	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenoanthrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	220	300	420	360	240	220	220	200
*Tetrachloroethene	1100	1000	660	670	630	580	620	420
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	12	6	18	16	13	11	12	6
*1,1,2-Trichloroethane	6	≤5	12	8	10	≤5	6	≤5
*1,1,2-Trichloroethene	1500	1500	770	760	740	630	680	420
*Benzene	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methonol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
*Ethylbenzene	-	-	-	-	-	-	-	-
*Dichlorobenzene	-	-	-	-	-	-	-	-
*Fluorene	-	-	-	-	-	-	-	-
*Naphthalene	-	-	-	-	-	-	-	-
*Dichloroethane	-	-	-	-	-	-	-	-
*Chloroethane	-	-	-	-	-	-	-	-
*Vinyl Chloride	≤5	25	17	17	13	22	25	25
Trichlorofluoromethane	-	-	-	-	-	-	-	-
TOTAL	3356	3265	2512	2291	1695	1843	2038	1345
	99.0%	97.3%	97.6%	97.8%	97.0%	97.1%	97.2%	96.2%
	3310.5	average	2401.5	average	1769	average	1691.5	average

(1) North well down for a time on 5/27/81

(2) North well sampled 7:00 A.M. on 5/28/81, south well down; south well on a 10:00 P.M. and sampled in evening.

(3) Procedure used will not detect methanol

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/vrp
10/21/81

TABLE XVII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	6/3/81 WELL (2pumps) VOA		6/12/81 WELL (2pumps) VOA		6/19/81 WELL (2pumps) VOA		6/25/81 WELL (2pumps) VOA	
	N	S	N	S	N	S	N	S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	29	53	41	69	54	78	43	160
*Chloroform	390	190	710	240	730	280	730	480
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	≤10	≤10	≤10	-	≤10	≤10	≤10	≤10
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	18	18	-	-	15	16	42	29
*Monochlorobenzene	≤5	≤5	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenoanthrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	260	150	160	110	160	110	180	350
*Tetrachloroethene	490	400	4000	1500	2100	1300	2300	2100
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	9	≤5	-	-	17	-	12	19
*1,1,2-Trichloroethane	≤10	≤10	-	-	≤10	-	≤10	≤10
*1,1,2-Trichloroethene	520	400	2900	1300	2400	1200	2700	3000
*Benzene	≤10	≤10	-	19	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methonol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
*Ethylbenzene	-	-	-	-	-	-	-	-
*Dichlorobenzene	-	-	-	-	-	-	-	-
*Fluorene	-	-	-	-	-	-	-	-
*Naphthalene	-	-	-	-	-	-	-	-
*Dichloroethane	-	-	10	-	-	-	-	-
*Chloroethane	-	-	-	-	-	-	-	-
*Vinyl Chloride	15	17	13	33	56	94	61	89
Trichlorofluoromethane	-	-	-	-	-	-	-	-
TOTAL	1766	1268	7844	3271	5552.5	3088	6088	6247
Top 5 compounds	95.6%	94.1%	99.6%	98.4%	98.1%	96.6%	98.1%	97.5%
	1517	average	5557.5	average	4320	average	6167.5	average

(3) Procedure used will not detect methanol

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/vrp
10/22/81

TABLE XVIII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	7/1/81 WELL (2pumps) VOA N	7/1/81 WELL (2pumps) VOA S	7/10/81 WELL (2pumps) VOA N	7/10/81 WELL (2pumps) VOA S	7/15/81 WELL (2pumps) VOA N	7/15/81 WELL (2pumps) VOA S	7/22/81 WELL (2pumps) VOA N	7/22/81 WELL (2pumps) VOA S	7/29/81 WELL (2pumps) VOA N	7/29/81 WELL (2pumps) VOA S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	34	78	81	170	29	270	34	320	26	210
*Chloroform	570	280	740	370	770	490	860	480	640	420
*Dibutylphthalate	-	-	-	-	-	-	-	-	-	-
*Dichloroethenes	-	-	-	-	≤5	-	≤5	≤5	-	-
Dioctyladipate	-	-	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-	-	-
*Methylene Chloride	-	-	-	-	-	-	-	-	-	-
*Monochlorobenzene	-	-	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-	-	-
*Phenoanthrene/Anthracene	-	-	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	100	170	280	510	540	1400	290	1700	230	560
*Tetrachloroethene	1800	2700	2800	3000	2800	5900	2700	7100	2400	3200
*Toluene	-	-	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	≤5	8	12	22	15	38	17	37	10	26
*1,1,2-Trichloroethane	≤10	-	-	≤10	≤10	12	10	12	-	≤10
*1,1,2-Trichloroethene	2600	3100	3800	4800	4300	6900	4400	7100	3400	5300
*Benzene	-	-	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-	-	-
Methonol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
*Ethylbenzene	-	-	-	-	-	-	-	-	-	-
*Dichlorobenzene	-	-	-	-	-	-	-	-	-	-
*Fluorene	-	-	-	-	-	-	-	-	-	-
*Naphthalene	-	-	-	-	-	-	-	-	-	-
*Dichloroethane	-	-	-	-	-	-	-	-	-	-
*Chloroethane	-	-	-	-	-	-	-	-	-	-
*Vinyl Chloride	10	12	10	11	16	23	21	23	15	24
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-
TOTAL	5134	6348	7228	8838	8485	15033	8377	16777	6721	9750
Top 5 compounds	99.5%	99.7%	99.7%	99.5%	99.5%	99.8%	99.4%	99.5%	99.6%	99.4%
	5741	average	8310.5	average	11759	average	12557	average	8235.5	average

(3) Procedure used will not detect methanol

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/vrp
10/22/81

TABLE XIX
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	8/5/81 WELL (2pumps) VOA N	8/5/81 WELL (2pumps) VOA S	8/13/81 WELL (2pumps) VOA N	8/13/81 WELL (2pumps) VOA S	8/19/81 WELL (2pumps) VOA N	8/19/81 WELL (2pumps) VOA S	8/26/81 WELL (2pumps) VOA N	8/26/81 WELL (2pumps) VOA S
*BHC (Hexachlorocyclohexane)	-	-	-	-	-	-	-	-
*Carbon Tetrachloride	9	130	10	110	26	100	29	170
*Chloroform	350	260	390	250	600	290	640	360
*Dibutylphthalate	-	-	-	-	-	-	-	-
*Dichloroethenes	≤5	-	-	-	-	-	≤5	-
Dioctyladipate	-	-	-	-	-	-	-	-
*Dioctylphthalate	-	-	-	-	-	-	-	-
*Fluoranthene	-	-	-	-	-	-	-	-
*Hexachloro-1,3-butadiene	-	-	-	-	-	-	-	-
*Hexachloroethane	-	-	-	-	-	-	-	-
*Methylene Chloride	-	-	-	-	12	8	90	25
*Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	-	-	-	-	-	-	-	-
Pentachloroethane	-	-	-	-	-	-	-	-
*Phenoanthrene/Anthracene	-	-	-	-	-	-	-	-
*Pyrene	-	-	-	-	-	-	-	-
Tetrachlorobutadiene	-	-	-	-	-	-	-	-
*1,1,2,2-Tetrachloroethane	110	310	100	340	180	390	180	440
*Tetrachloroethene	1000	2000	1100	1900	1800	1800	1800	2500
*Toluene	-	-	-	-	-	-	-	-
*Trichlorobenzene	-	-	-	-	-	-	-	-
*1,1,1-Trichloroethane	-	18	-	18	-	14	-	20
*1,1,2-Trichloroethane	-	≤5	-	≤5	-	-	-	-
*1,1,2-Trichloroethene	1300	2100	1400	2100	2100	2400	2100	2600
*Benzene	-	-	-	-	-	-	-	-
*Diisoctylphthalate	-	-	-	-	-	-	-	-
*Phenol	-	-	-	-	-	-	-	-
*2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
Methonol	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
*Ethylbenzene	-	-	-	-	-	-	-	-
*Dichlorobenzene	-	-	-	-	-	-	-	-
*Fluorene	-	-	-	-	-	-	-	-
*Naphthalene	-	-	-	-	-	-	-	-
*Dichloroethane	-	-	-	-	-	-	-	-
*Chloroethane	-	-	-	-	-	-	-	-
*Vinyl Chloride	8	18	6	11	15	19	18	27
Trichlorofluoromethane	-	-	-	-	-	-	-	-
TOTAL	2782	4841	3006	4734	4738	5026	4862	6147
Top 5 compounds	99.5%	99.5%	99.5%	99.3%	99.3%	99.2%	98.9%	98.8%
	3811.5	average	3870	average	4882	average	5504	average

(3) Procedure used will not detect methanol

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/vrp
10/22/81

TABLE [illegible]

SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES

(ppb)

COMPOUND	9/9/81 WELL (2pumps) VOA N	9/9/81 WELL (2pumps) VOA S	9/10/81 WELL (2pumps) VOA N	9/10/81 WELL (2pumps) VOA S	9/17/81 WELL (2pumps) VOA N	9/17/81 WELL (2pumps) VOA S	9/24/81 WELL (2pumps) VOA N	9/24/81 WELL (2pumps) VOA S
BHC (Hexachlorocyclohexane)	≤10*	130*	≤10*	69*	≤10*	59*	≤10*	67*
Carbon Tetrachloride / Chloroform	600	270	490	200	470	240	630	240
Dibutylphthalate	*	*	*	*	*	*	*	*
Dichloroethenes	≤170	98	≤180	74	≤140	120	≤230	110
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	-
Monochlorobenzene	≤10	-	-	-	-	-	-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	190	240	160	250	160	590	400	530
Tetrachloroethene	1400	1500	1100	1400	1100	1700	1400	1300
Toluene	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	≤10	≤10	-	≤10	-	≤10	≤10	≤10
1,1,2-Trichloroethane	≤10	≤10	≤10	≤10	≤10	≤10	≤10	≤10
1,1,2-Trichloroethene	1800	1800	1400	1400	1500	1700	1900	1700
Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*
2,4,6-Trichlorophenol	*	*	*	*	*	*	*	*
Methonol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Ethylbenzene	-	-	-	-	-	-	-	-
Dichlorobenzene	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*
Naphthalene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	11	16	12	11	≤10	15	19	14
Trichlorofluoromethane	-	-	-	-	-	-	-	-
TOTAL	4211	4074	3362	3424	3410	4454	4619	3991
Top 5 compounds	98.8%	96.7%	99.0%	97.1%	99.1%	97.9%	98.9%	97.5%
	4142.5	average	3393	average	3932	average	4305	average

- Not detected

* Procedure will not detect

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/vrp

11/3/81

TABLE XXII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	10/23/81 WELL (2pumps) VOA		10/29/81 WELL (1pump) VOA		11/ 4/81 WELL (1pump) VOA		11/11/81 WELL (1pump) VOA	
COMPOUND	N	S	N(1)	S	N	S(2)	N	S(2)
BHC (Hexachlorocyclohexane)	*	*		*	*		*	
Carbon Tetrachloride	34	36		36	*		17	
Chloroform	400	150		220	210		370	
Dibutylphthalate	*	*		*	*		*	
Dichloroethenes	120	77		94	81		140	
Dioctyladipate	*	*		*	*		*	
Dioctylphthalate	*	*		*	*		*	
Fluoranthene	*	*		*	*		*	
Hexachloro-1,3-butadiene	*	*		*	*		*	
Hexachloroethane	*	*		*	*		*	
Methylene Chloride	-	-		-	-		-	
Monochlorobenzene	-	-		-	-		-	
Pentachlorobutadiene	*	*		*	*		*	
Pentachloroethane	*	*		*	*		*	
Phenanthrene/Anthracene	*	*		*	*		*	
Pyrene	*	*		*	*		*	
Tetrachlorobutadiene	*	*		*	*		*	
1,1,2,2-Tetrachloroethane	92	67		69	43		79	
Tetrachloroethene	1100	820		1100	820		1500	
Toluene	-	-		-	-		-	
Trichlorobenzene	*	*		*	*		*	
1,1,1-Trichloroethane	-	-		-	-		-	
1,1,2-Trichloroethane	≤10	-		-	-		-	
1,1,2-Trichloroethene	1600	920		1300	780		1200	
Benzene	-	-		-	-		-	
Diisoctylphthalate	*	*		*	*		*	
Phenol	*	*		*	*		*	
2,4,6-Trichlorophenol	*	*		*	*		*	
Methonol	*	*		*	*		*	
1,1,1,2-Tetrachloroethane	*	*		*	*		*	
Ethylbenzene	-	-		-	-		-	
Dichlorobenzene	*	*		*	*		*	
Fluorene	*	*		*	*		*	
Naphthalene	*	*		*	*		*	
Dichloroethane	-	-		-	-		-	
Chloroethane	-	-		-	-		-	
Vinyl Chloride	≤10	11		12	*		22	
Trichlorofluoromethane								
TOTAL	3366	2081	-	2831	1934	-	3328	-
Top 5 compounds	98.4%	97.7%	N/A%	98.3%	100.0%	N/A%	98.8%	N/A%
	2723.5	average	N/A	average	N/A	average	N/A	average

- Not detected
* Procedure will not detect
(1) Plant shutdown, North well down
(2) South well down

NOTE: Compounds detected on one occasion only and not quatitated have been omitted.

DLC/vrp
12/23/81

TABLE XXIII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	11/19/81 WELL (2pumps) VOA		11/25/81 WELL (1pump) VOA		12/2/81 WELL (1pump) VOA		12/9/81 WELL (1pump) VOA	
COMPOUND	N	S	N	S[1]	N	S[1]	N	S[1]
BHC (Hexachlorocyclohexane)	*	*	*		*		*	
Carbon Tetrachloride	16	29	20		14		64	
Chloroform	560	240	250		240		240	
Dibutylphthalate	*	*	*		*		*	
Dichloroethenes	180	88	83		79		92	
Dioctyladipate	*	*	*		*		*	
Dioctylphthalate	*	*	*		*		*	
Fluoranthene	*	*	*		*		*	
Hexachloro-1,3-butadiene	*	*	*		*		*	
Hexachloroethane	*	*	*		*		*	
Methylene Chloride	-	-	-		-		12	
Monochlorobenzene	-	-	-		-		-	
Pentachlorobutadiene	*	*	*		*		*	
Pentachloroethane	*	*	*		*		*	
Phenanthrene/Anthracene	*	*	*		*		*	
Pyrene	*	*	*		*		*	
Tetrachlorobutadiene	*	*	*		*		*	
1,1,2,2-Tetrachloroethane	120	-	-		55		56	
Tetrachloroethene	1400	1100	800		900		760	
Toluene	-	-	-		-		-	
Trichlorobenzene	*	*	*		*		*	
1,1,1-Trichloroethane	-	-	-		-		-	
1,1,2-Trichloroethane	-	-	-		-		-	
1,1,2-Trichloroethene	1800	1100	800		740		690	
Benzene	-	-	-		-		-	
Diisoctylphthalate	*	*	*		*		*	
Phenol	*	*	*		*		*	
Methonol	*	*	*		*		*	
1,1,1,2-Tetrachloroethane	*	*	*		*		*	
Dichlorobenzene	*	*	*		*		*	
Fluorene	*	*	*		*		*	
Dichloroethane	-	-	-		-		-	
Vinyl Chloride	-	19	-		12		12	
Trichlorofluoromethane					-			
TOTAL	4076	2896	2133	-	2040	-	1926	-
Top 5 compounds	99.6%	98.3%	99.1%	-%	98.7%	-%	95.8%	-%
	3486	average	N/A	average	N/A	average	N/A	average

- Not detected
* Procedure will not detect
(1) South well down

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
1/22/82

TABLE XXIV
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	12/16/81 WELL (2pumps) VOA		12/23/81 WELL (2pumps) VOA		12/30/81 WELL (2pumps) VOA		1/6/82 WELL (2pumps) VOA	
COMPOUND	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride	16	33	≤10	50	≤10	26	23	80
Chloroform	740	370	680	360	310	180	350	280
Dibutylphthalate	*	*	*	*	*	*	*	*
Dichloroethenes	220	150	160	170	87	81	120	120
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	≤10	17	-	-	-	-
Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	260	240	230	400	95	140	110	210
Tetrachloroethene	2200	1200	1700	1300	1000	1600	1300	1800
Toluene	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	-	-	-	-	-	-	≤10	13
1,1,2-Trichloroethane	≤10	-	≤10	≤10	-	-	≤10	≤10
1,1,2-Trichloroethene	3100	1500	2600	2100	1400	1400	1300	1600
Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	10	19	≤10	14	≤10	11	≤10	13
Trichlorofluoromethane	*	*	*	*	-	*	*	*
TOTAL	6556	3512	5410	4421	2922	3438	3233	4126
Top 5 compounds	99.4%	98.5%	99.3%	98.0%	99.3%	98.9%	98.4%	97.2%
	5034	average	4915.5	average	3180	average	3679.5	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
2/12/82

TABLE XXV
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	1/13/82 WELL (1pump) VOA N	1/13/82 WELL (1pump) VOA S	1/20/82 WELL (1pump) VOA N(1)	1/20/82 WELL (1pump) VOA S	1/27/82 WELL (1pump) VOA N(1)	1/27/82 WELL (1pump) VOA S	2/3/82 WELL (1pump) VOA N(1)	2/3/82 WELL (1pump) VOA S
BHC (Hexachlorocyclohexane)	*	*		*		*		*
Carbon Tetrachloride	64	140		70		31		≤10
Chloroform	950	290		270		190		220
Dibutylphthalate	*	*		*		*		*
Dichloroethenes	140	150		170		88		92
Dioctyladipate	*	*		*		*		*
Dioctylphthalate	*	*		*		*		*
Fluoranthene	*	*		*		*		*
Hexachloro-1,3-butadiene	*	*		*		*		*
Hexachloroethane	*	*		*		*		*
Methylene Chloride	-	-		-		-		-
Monochlorobenzene	-	-		-		-		-
Pentachlorobutadiene	*	*		*		*		*
Pentachloroethane	*	*		*		*		*
Phenanthrene/Anthracene	*	*		*		*		*
Pyrene	*	*		*		*		*
Tetrachlorobutadiene	*	*		*		*		*
1,1,2,2-Tetrachloroethane	200	380		310		92		65
Tetrachloroethene	1500	6800		1900		1100		1100
Toluene	-	-		-		-		-
Trichlorobenzene	*	*		*		*		*
1,1,1-Trichloroethane	-	26		18		≤10		-
1,1,2-Trichloroethane	-	-		-		-		-
1,1,2-Trichloroethene	2200	4700		2800		1000		1000
Benzene	-	-		-		-		-
Diisoctylphthalate	*	*		*		*		*
Phenol	*	*		*		*		*
Methanol	*	*		*		*		*
1,1,1,2-Tetrachloroethane	*	*		*		*		*
Dichlorobenzene	*	*		*		*		*
Fluorene	*	*		*		*		*
Dichloroethane	-	-		-		-		-
Vinyl Chloride	≤10	19		19		12		13
Trichlorofluoromethane	*	*		*		*		*
TOTAL	5064	12,505	N/A	5557	N/A	2523	N/A	2500
Top 5 compounds	98.5%	98.5%	%	98.1%	%	97.9%	%	99.1%
	8784.5	average	N/A	average	N/A	average	N/A	average

\- Not detected
* Procedure will not detect
(1) North Well Down

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
3/25/82

TABLE XXVI
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	2/10/82 WELL (1pump) VOA		2/18/82 WELL (1pump) VOA		2/19/82[(2)] WELL (1pump) VOA		2/24/82 WELL (1pump) VOA	
COMPOUND	N (1)	S	N(1)	S	N(1)	S	N(1)	S
BHC (Hexachlorocyclohexane)		*		*		*		*
Carbon Tetrachloride		43		12		≤10		≤10
Chloroform		210		180		160		200
Dibutylphthalate		*		*		*		*
Dichloroethenes		120		92		58		97
Dioctyladipate		*		*		*		*
Dioctylphthalate		*		*		*		*
Fluoranthene		*		*		*		*
Hexachloro-1,3-butadiene		*		*		*		*
Hexachloroethane		*		*		*		*
Methylene Chloride		-		-		-		≤10
Monochlorobenzene		-		-		-		-
Pentachlorobutadiene		*		*		*		*
Pentachloroethane		*		*		*		*
Phenanthrene/Anthracene		*		*		*		*
Pyrene		*		*		*		*
Tetrachlorobutadiene		*		*		*		*
1,1,2,2-Tetrachloroethane		64		57		43		58
Tetrachloroethene		1200		1000		560		1100
Toluene		-		-		-		-
Trichlorobenzene		*		*		*		*
1,1,1-Trichloroethane		-		-		-		-
1,1,2-Trichloroethane		-		-		-		-
1,1,2-Trichloroethene		930		780		540		810
Benzene		-		-		-		-
Diisoctylphthalate		*		*		*		*
Phenol		*		*		*		*
Methanol		*		*		*		*
1,1,1,2-Tetrachloroethane		*		*		*		*
Dichlorobenzene		*		*		*		*
Fluorene		*		*		*		*
Dichloroethane		-		-		-		-
Vinyl Chloride		≤10		≤10		≤10		10
Trichlorofluoromethane		*		*		*		*
TOTAL	N/A	2577	N/A	21[illegible]1	N/A	1381	N/A	2295
Top 5 compounds	%	97.9%	%	99.0%	%	98.6%	%	98.7%
	N/A	average	N/A	average	N/A	average	N/A	average

- Not detected
* Procedure will not detect
(1) North Well Down
(2) Confirmation sample for Calgon carbon study, sampled for THO and did not have zero head space, may have lost some volatiles.

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
3/25/82

TABLE XXVII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	3/4/82 WELL (1pump) VOA		3/9/82 WELL (1pump) VOA		3/18/82 WELL (1pump) VOA		3/24/82 WELL (1pump) VOA		3/31/82 WELL (1pump) VOA	
	N[1]	S	N[1]	S	N[1]	S	N[1]	S	N[1]	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*	*	*
Carbon Tetrachloride		19		-		13		60		60
Chloroform		290		64		260		220		260
Dibutylphthalate	*	*	*	*	*	*	*	*	*	*
Dichloroethenes		160		46		160		150		170
Dioctyladipate	*	*	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*	*	*
Methylene Chloride		-		-		-		-		-
Monochlorobenzene		-		-		-		-		-
Pentachlorobutadiene	*	*	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane		93		150		71		53		84
Tetrachloroethene		820		190		770		960		980
Toluene		-		-		-		-		-
Trichlorobenzene	*	*	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane		-		-		-		-		-
1,1,2-Trichloroethane		-		-		-		-		-
1,1,2-Trichloroethene		650		160		590		740		760
Benzene		-		-		-		-		-
Diisoctylphthalate	*	*	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*	*	*
Dichloroethane		-		-		-		-		-
Vinyl Chloride		-		-		-		13		11
Trichlorofluoromethane		-		-		-		-		-
Ethyl Benzene		-		18		-		-		-
TOTAL	N/A	2032	N/A	628	N/A	1864	N/A	2196	N/A	2325
Top 5 compounds	%	99.1%	%	97.1%	%	99.3%	%	97.0%	%	97.0%
	N/A	average	N/A	average	N/A	average	N/A	average	N/A	average

- Not detected
* Procedure will not detect
(1) North Well Down

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
4/29/82

TABLE XXVIII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	4/7/82 WELL (2 pumps) VOA		4/14/82 WELL (2 pumps) VOA		4/21/82 WELL (2 pumps) VOA		4/28/82 WELL (2 pumps) VOA	
COMPOUND	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride	40	40	22	22	42	42	47	49
Chloroform	430	90	300	61	510	120	570	130
Dibutylphthalate	*	*	*	*	*	*	*	*
Dichloroethenes	140	66	100	44	180	64	210	88
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	-
Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	120	52	88	45	130	82	170	72
Tetrachloroethene	1300	730	750	450	1400	800	1900	920
Toluene	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
1,1,2-Trichloroethene	1800	500	990	300	1800	540	2400	670
Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	≤10	-	-	-	-	-	-	-
Trichlorofluoromethane[1]	≤10	-	-	-	-	-	-	-
TOTAL	3850	1478	2250	922	4062	1648	5297	1929
Top 5 compounds	98.4%	97.3%	99.0%	97.6%	99.0%	97.4%	99.1%	97.5%
	2664	average	1586	average	2855	average	3613	average

- Not detected
* Procedure will not detect
[1] Identified as dichlorodifluoromethane

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
5/24/82

83

TABLE XXIX
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	5/5/82 WELL (1 pump) VOA		5/12/82 WELL (1 pump) VOA		5/19/82 WELL (1 pump) VOA		5/26/82 WELL (1 pump) VOA	
	N[1]	S	N[1]	S	N[1]	S	N[1]	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride		14		21		28		29
Chloroform		200		160		180		210
Dibutylphthalate	*	*	*	*	*	*	*	*
Dichloroethenes		100		94		110		130
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	-
Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane		100		50		51		45
Tetrachloroethene		1000		600		850		640
Toluene	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
1,1,2-Trichloroethene		630		590		650		700
Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride		≤10	-	≤10	-	10	-	10
Trichlorofluoromethane		-	-	-	-	-	-	-
TOTAL		2054		1525		1879		1764
Top 5 compounds	%	98.8%	%	98.0%	%	98.0%	%	97.8%
	NA	average	NA	average	NA	average	NA	average

- Not detected
* Procedure will not detect
[1] North well down

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
6/21/82

TABLE XXIX
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	5/5/82 WELL (1 pump) VOA		5/12/82 WELL (1 pump) VOA		5/19/82 WELL (1 pump) VOA		5/26/82 WELL (1 pump) VOA	
	N[1]	S	N[1]	S	N[1]	S	N[1]	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride		14		21		28		29
Chloroform		200		160		180		210
Dibutylphthalate	*	*	*	*	*	*	*	*
Dichloroethenes		100		94		110		130
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	-
Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane		100		50		51		45
Tetrachloroethene		1000		600		850		640
Toluene	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
1,1,2-Trichloroethene		630		590		650		700
Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride		≤10	-	≤10	-	10	-	10
Trichlorofluoromethane		-	-	-	-	-	-	-
TOTAL		2054		1525		1879		1764
Top 5 compounds	% NA	98.8% average	% NA	98.0% average	% NA	98.0% average	% NA	97.8% average

- Not detected
* Procedure will not detect
[1] North well down

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
6/21/82

TABLE XXX
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	6/2/82 WELL (2 pumps) VOA N	6/2/82 WELL (2 pumps) VOA S	6/9/82 WELL (2 pumps) VOA N	6/9/82 WELL (2 pumps) VOA S	6/16/82 WELL (2 pumps) VOA N	6/16/82 WELL (2 pumps) VOA S	6/23/82 WELL (2 pumps) VOA N	6/23/82 WELL (2 pumps) VOA S	6/29/82 WELL (2 pumps) VOA N	6/29/82 WELL (2 pumps) VOA S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*	*	*
Carbon Tetrachloride	32	30	26	340	28	440	16	240	16	210
Chloroform	620	300	810	720	790	580	390	310	390	270
Dibutylphthalate	*	*	*	*	*	*	*	*	*	*
Dichloroethenes	≤450	120	350	≤290	≤460	≤160	≤210	≤290	≤220	≤260
Dioctyladipate	*	*	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	≤10	≤10	≤10
Monochlorobenzene	-	-	-	-	-	≤10	≤10	≤10	≤10	≤10
Pentachlorobutadiene	*	*	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	240	120	190	560	170	360	142	22	35	190
Tetrachloroethene	1400	1000	1500	1500	1500	2000	760	540	780	1000
Toluene	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	11	-	≤10	-	≤10	20	10	24	10	-
1,1,2-Trichloroethane	10	-	-	-	-	≤10	-	≤10	-	≤10
1,1,2-Trichloroethene	1900	910	1700	2400	1700	2200	960	1300	950	1100
Benzene	-	-	-	≤10	-	≤10	-	≤10	≤10	≤10
Diisoctylphthalate	*	*	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	23	17	20	21	35	16	12	13	11	10
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-
TOTAL	4686	2497	4606	5861	4693	5806	2410	2779	2442	3090
Top 5 compounds	98.4%	93.3%	98.8%	94.5%	98.4%	96.1%	98.0%	96.4%	97.3%	96.1%
	3591.5	average	5233.5	average	5249.5	average	2594.5	average	2766	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted. A sample for priority pollutant scan collected on 6/17/82 is not shown due to improper and incomplete analysis by the outside laboratory.

DLC/vrp
8/27/82

TABLE XXXI
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	7/7/82 WELL (2 pumps) VOA N	7/7/82 WELL (2 pumps) VOA S	7/14/82 WELL (2 pumps) VOA N	7/14/82 WELL (2 pumps) VOA S	7/21/82 WELL (2 pumps) VOA N	7/21/82 WELL (2 pumps) VOA S	7/28/82 WELL (2 pumps) VOA N	7/28/82 WELL (2 pumps) VOA S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride	20	94	36	150	38	77	35	150
Chloroform	310	190	390	310	530	190	580	270
Dibutylphthalate	*	*	*	*	*	*	*	*
Dichloroethenes	≤101	≤140	≤140	≤200	170	≤290	140	280
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	330	-
Monochlorobenzene	-	-	≤10	-	-	-	13	≤10
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	96	140	180	200	130	240	120	180
Tetrachloroethene	500	690	650	1000	1200	1100	1100	1200
Toluene	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	≤10	13	11	24	18	14	18	22
1,1,2-Trichloroethane	≤10	-	≤10	≤10	-	≤10	-	-
1,1,2-Trichloroethene	710	820	820	970	1200	1100	1100	1000
Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Phenol	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Fluorene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	19	21	23	18	19	13	210	16
Trichlorofluoromethane	-	-	-	-	-	-	-	-
TOTAL	1776	2108	2270	2882	3305	3034	3646	3128
Top 5 compounds	96.7%	93.9%	96.0%	93.0%	97.7%	96.2%	91.1%	93.7%
	1942	average	2576	average	3169.5	average	3387	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected on one occasion only and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
8/27/82

TABLE XXXII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	8/4/82 WELL (2 pumps) VOA		8/11/82 WELL (2 pumps) VOA		8/18/82 WELL (2 pumps) VOA		8/19/82 WELL (2 pumps) VOA		8/25/82 WELL (2 pumps) VOA	
COMPOUND	N	S	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*	*	*
Carbon Tetrachloride	≤10	42	23	67	87	220	16	39	13	48
Chloroform	160	120	380	110	680	490	280	100	310	11
Dichloroethenes	46	84	110	26	≤430	520	40	76	54	59
Dioctyladipate	*	*	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Monochlorobenzene	-	-	-	-	14	≤10	≤10	-	10	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	96	200	76	200	160	450	100	120	100	150
Tetrachloroethene	280	620	1200	900	1900	3900	860	670	1100	770
Toluene	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	-	-	-	≤10	12	≤10	≤10	≤10	≤10	≤10
1,1,2-Trichloroethane	-	-	≤10	≤10	11	≤10	≤10	-	≤10	-
1,1,2-Trichloroethene	380	600	1400	1100	2500	4000	1200	690	1400	780
Benzene	-	-	-	-	≤10	≤10	≤10	-	≤10	-
Diisoctylphthalate	*	*	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	≤10	≤10	38	-	≤50	50	18	≤10	24	≤10
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-
TOTAL	982	1676	3237	2423	5854	9620	2554	1715	3041	1937
Top 5 compounds	98.0%	96.9%	97.8%	98.1%	98.3%	99.1%	97.1%	96.6%	97.5%	98.4%
	1329	average	2830	average	7737	average	2134.5	average	2489	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
10/27/82

TABLE XXXIII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	9/1/82 WELL (2 pumps) VOA		9/8/82 WELL (2 pumps) VOA		9/15/82 WELL (2 pumps) VOA		9/22/82 WELL (2 pumps) VOA		9/29/82 WELL (2 pumps) VOA	
COMPOUND	N	S	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*	*	*
Carbon Tetrachloride	14	80	42	120	31	86	23	72	36	88
Chloroform	250	160	400	250	530	200	440	170	410	200
Dichloroethenes	35	100	≤120	≤150	≤160	≤200	≤150	≤180	≤170	≤210
Dioctyladipate	*	*	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*	*	*
Methylene Chloride	41	14	-	-	12	-	-	-	30	-
Monochlorobenzene	14	-	-	-	-	-	10	-	16	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	150	170	99	140	59	75	70	70	120	150
Tetrachloroethene	1200	1200	1400	860	1900	800	1200	730	2100	800
Toluene	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	≤10	≤10	16	≤10	12	≤10	≤10	≤10	17	12
1,1,2-Trichloroethane	≤10	-	≤10	≤10	-	-	-	-	-	≤10
1,1,2-Trichloroethene	1100	1100	1400	880	2200	830	1300	740	2400	800
Benzene	-	-	-	-	-	-	≤10	-	≤10	-
Diisoctylphthalate	*	*	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	17	14	≤50	-	61	-	-	-	-	-
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-
TOTAL	2841	2848	3537	2420	4975	2201	3213	1972	5309	2270
Top 5 compounds	96.5%	95.9%	96.7%	98.8%	98.7%	99.1%	98.8%	99.0%	99.0%	98.6%
	2844.5	average	2978.5	average	3588	average	2592.5	average	3789.5	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
10/27/82

TABLE XXXIV
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	10/8/82 WELL (2 pumps) VOA N	10/8/82 WELL (2 pumps) VOA S	10/13/82 WELL (2 pumps) VOA N	10/13/82 WELL (2 pumps) VOA S	10/21/82 WELL (2 pumps) VOA N	10/21/82 WELL (2 pumps) VOA S	10/26/82 WELL (1 pump) VOA N	10/26/82 WELL (1 pump) VOA S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride	39	69	49	73	18	36	52	
Chloroform	400	170	.400	170	310	120	250	
Dichloroethenes	≤160	≤370	≤160	≤180	≤110	≤130	≤130	
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	140	-	-	-	-	
Monochlorobenzene	17	-	24	-	≤10	-	≤10	
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	160	150	130	130	130	120	120	
Tetrachloroethene	840	770	820	670	680	660	730	
Toluene	-	-	-	-	-	-	-	
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	15	10	21	13	≤10	-	≤10	
1,1,2-Trichloroethane	≤10	≤10	10	≤10	≤10	≤10	≤10	
1,1,2-Trichloroethene	950	800	880	650	740	580	750	
Benzene	≤10	≤10	14	-	-	-		
Diisoctylphthalate	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	
Vinyl Chloride	-	-	-	-	-	-	-	
Trichlorofluoromethane	-	-	-	-	-	-	-	
TOTAL	2601	2359	2648	1896	2018	1656	2062	
Top 5 compounds	96.1%	95.4%	95.2%	94.4%	97.1%	96.6%	95.5%	N/A
	2480	average	2272	average	1837	average	N/A	

\- Not detected
* Procedure will not detect

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
11/30/82

TABLE XXXV
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	11/4/82 WELL (1 pump) VOA		11/10/82 WELL (1 pump) VOA		11/17/82 WELL (1 pump) VOA		11/24/82 WELL (2 pumps) VOA	
	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride	59		38		40		29	54
Chloroform	230		160		200		290	130
Dichloroethenes	130		85		110		≤130	≤91
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-		-		-		-	-
Monochlorobenzene	-		-		-		-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	140		74		56		46	73
Tetrachloroethene	980		720		720		800	650
Toluene	-		-		-		-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	≤10		-		≤10		≤10	≤10
1,1,2-Trichloroethane	-		-		-		-	-
1,1,2-Trichloroethene	1100		690		650		730	580
Benzene	-		-		-		-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Dichloroethane	-		-		-		-	-
Vinyl Chloride	<100		≤100		20		14	26
Trichlorofluoromethane	-		-		-		-	-
TOTAL	≤2748		≤1867		≤1806		≤2049	≤1614
Top 5 compounds	93.4%	%	94.0%	%	96.1%	%	97.4%	94.4
	N/A	average	N/A	average	N/A	average	1831.5	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
1/3/83

TABLE XXXVI
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

COMPOUND	12/2/82 WELL (2 pumps) VOA		12/8/82 WELL (2 pumps) VOA		12/16/82 WELL (2 pumps) VOA		12/23/82 WELL (2 pumps) VOA		12/30/82 WELL (2 pumps) VOA	
	N	S	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*	*	*
Carbon Tetrachloride	34	43	23	13	36	66	44	38	33	21
Chloroform	350	100	250	64	240	44	240	41	340	47
Dichloroethenes	≤150	≤81	41	57	110	≤65	≤90	≤54	≤180	≤59
Dioctyladipate	*	*	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Monochlorobenzene	-	-	-	-	-	-	-	-	≤10	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	100	62	180	48	160	59	60	52	110	27
Tetrachloroethene	810	560	830	450	410	820	840	690	1100	310
Toluene	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	11	≤10	10	-	-	≤10	≤10	≤10	≤10	≤10
1,1,2-Trichloroethane	-	-	≤10	-	-	-	≤10	≤10	≤10	≤10
1,1,2-Trichloroethene	1000	440	740	540	430	710	510	520	1200	210
Benzene	-	-	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	15	20	22	20	≤10	25	14	27	13	25
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-
TOTAL	2470	1316	2106	1192	1396	1799	1818	1442	3006	719
Top 5 compounds	97.6%	94.4%	96.9%	97.2%	96.7%	95.6%	95.7%	94.1	97.5%	90.8%
	1893	average	1649	average	1597.5	average	1630	average	1862.5	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
1/31/83

TABLE XXXVII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	1/5/83 WELL (2 pumps) VOA		1/12/83 WELL (2 pumps) VOA		1/19/83 WELL (2 pumps) VOA		1/27/83 WELL (2 pumps) VOA	
COMPOUND	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride	33	28	22	23	27	34	27	30
Chloroform	300	100	320	94	190	110	280	94
Dichloroethenes	190	93	150	94	130	100	180	120
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride	-	-	-	-	-	-	-	-
Monochlorobenzene	-	-	-	-	-	-	-	-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane	140	46	97	50	100	38	170	54
Tetrachloroethene	920	940	830	320	1100	540	1400	560
Toluene	-	-	-	-	-	-	-	-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane	10	-	11	-	11	9.2	11	5.4
1,1,2-Trichloroethane	5.1	-	6.7	-	5.9	-	6.5	-
1,1,2-Trichloroethene	880	800	1000	270	1200	450	1400	480
Benzene	-	-	-	-	-	-	-	-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Dichloroethane	-	-	-	-	-	-	-	-
Vinyl Chloride	14	22	-	12	-	19	13	22
Trichlorofluoromethane	-	-	-	-	-	-	-	-
TOTAL	2492.1	2029	2436.7	863	2763.9	1300.2	3487.5	1365.4
Top 5 compounds	97.5%	97.5%	98.4%	95.9%	98.4%	95.2%	98.4%	95.8
	2260.6	average	1649.9	average	2032.1	average	2426.45	average

- Not detected
* Procedure will not detect

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
3/15/83

TABLE XXXVIII
SUMMARY OF ORGANIC ANALYSES ON VARIOUS SAMPLES
(ppb)

	2/2/83 WELL (1 pump) VOA		2/9/83 WELL (1 pump) VOA		2/16/83 WELL (1 pump) VOA		2/23/83 WELL (1 pump) VOA	
COMPOUND	N	S	N	S	N	S	N	S
BHC (Hexachlorocyclohexane)	*	*	*	*	*	*	*	*
Carbon Tetrachloride		27		20		27		26
Chloroform		180		140		160		150
Dichloroethenes		130		69		140		100
Dioctyladipate	*	*	*	*	*	*	*	*
Dioctylphthalate	*	*	*	*	*	*	*	*
Fluoranthene	*	*	*	*	*	*	*	*
Hexachloro-1,3-butadiene	*	*	*	*	*	*	*	*
Hexachloroethane	*	*	*	*	*	*	*	*
Methylene Chloride		-		-		-		-
Monochlorobenzene		-		-		-		-
Pentachlorobutadiene	*	*	*	*	*	*	*	*
Pentachloroethane	*	*	*	*	*	*	*	*
Phenanthrene/Anthracene	*	*	*	*	*	*	*	*
Pyrene	*	*	*	*	*	*	*	*
Tetrachlorobutadiene	*	*	*	*	*	*	*	*
1,1,2,2-Tetrachloroethane		81		67		69		68
Tetrachloroethene		870		590		710		640
Toluene		-		-		-		-
Trichlorobenzene	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane		6.3		-		-		-
1,1,2-Trichloroethane		-		-		-		-
1,1,2-Trichloroethene		820		500		580		490
Benzene		-		-		-		-
Diisoctylphthalate	*	*	*	*	*	*	*	*
Methanol	*	*	*	*	*	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*	*	*	*	*	*
Dichlorobenzene	*	*	*	*	*	*	*	*
Dichloroethane		-		-		-		-
Vinyl Chloride		22		15		-		-
Trichlorofluoromethane		-		-		27		17
TOTAL		2136.3		1401		1713		1491
Top 5 compounds	N/A	97.4% average	N/A	97.5% average	N/A	96.8% average	N/A	97.1% average

- Not detected
* Procedure will not detect

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

DLC/vrp
3/15/83

APPENDIX III

New York State Department of Environmental Conservation
600 Delaware Avenue Buffalo, NY 14202

Robert F. Flacke
Commissioner

CERTIFIED MAIL

March 16, 1981

bcc: D. L. Cummings
A. F. Kapteina
M. L. Norsworthy
V. M. Norwood
M. B. Sokolowski
L. B. Tew
Env. File

Mr. C.W. Newton
Olin Chemical Corporation
2400 Buffalo Avenue
Niagara Falls, NY 14302

Re: Olin Corporation
SPDES #NY 0001635
Contaminated Well Water Supply - Report
December 1, 1980

Dear Mr. Newton:

This Department has reviewed Olin's submitted reports on the contaminated well water supply. The following comments are forwarded and additional information requested.

1. *A specific explanation as to the source or cause of this organic contamination in the groundwater supply wells is requested. This was noticeably absent in the report.*

2. *The report references "remedial surficial action" which when supplemented with continued pumping of the wells will result in flushing of the aquifer. Detailed information is requested regarding specifics of such a program and its expected consequences.*

The possibility of extending the well casings from their present 38 ft. level down to a 75-100 ft. depth should be considered as a means to exclude upper bedrock aquifer contamination from entering these wells.

Olin's December 1, 1980 Report entitled "Monitoring Study - Contaminated Well Water Supply" has shown that the groundwater wells as a cooling water source have been shown to contribute organic loadings to the River in the range of 250 lbs/day through the outfalls. The Clean Water Act specifies that BAT requirements must be met for all discharges to navigable waters by July 1, 1984. As such, two well operation can continue with monthly Volatile Organics Analysis monitoring and semi-annual complete organic characterization to assess the effectiveness of this pumping on decontamination of the bedrock aquifer. However, the company should proceed with an alternate design to meet BAT by 1984 if pumping does not exhibit sufficient flushing to decontaminate the cooling water. This contingency plan

RECEIVED
MAR 19 1981
C. W. NEWTON

should be drawn up to allow for review and subsequent completion of necessary construction by early 1984. A compliance schedule will be recommended for inclusion in the renewal permit which would require an Engineering Report by October 1982, Final Plans by February 1983 and Completion of Construction by June 1984.

If you should have any questions concerning the above, please contact Angelo Sarkees at 842-5826. A meeting between this office and Olin representatives would be appropriate subsequent to your review of this letter and submission of the requested information.

Very truly yours,

Robert G. Speed, P.E.
Regional Engineer for Water Quality

AJS:dd

cc: Mr. Nadler, Attn: Mr. Pallante
NCHD
Mr. Adamczyk

APPENDIX IV

CALGON CARBON CORPORATION

PITTSBURGH, PENNSYLVANIA

CARBON APPLICATION REPORT

PILOT COLUMN STUDY

Prepared for Olin Corporation

Niagara Falls, New York

BY: [signature]
R. J. Bourdeau

DATE: March 29, 1983

INTRODUCTION

This report summarizes the pilot column study in which granular activated carbon was evaluated for treating up to five million gallons per day of contaminated well water at Olin Corporation, Niagara Falls Production Facility. The pilot column study was performed by Olin Corporation, as directed by Calgon Carbon Corporation, from October 5, 1982 to termination on January 31, 1983. Daily samples were collected by Olin from each of the four (4) carbon columns connected in series plus the influent well water supply. Selected samples were analyzed for five volatile compounds by gas chromatography. Samples were analyzed by RECRA Environmental Laboratories and these results were interpreted by Calgon in this report.

The primary objectives of this pilot column study was to verify the mini-column test data developed previously by Calgon that a ten minute contact time is sufficient to contain the priority pollutant organics in the well water and project a carbon usage rate.

CONCLUSION

The pilot column study verified that a ten (10) minute contact time was sufficient to contain the mass of priority pollutant organics below a total discharge limit of ten (10) pounds per day at a well water flow rate of 5 mgd. With six (6) adsorbers operating in parallel and a seven (7) day staggerred start-up of each adsorber, 52 truckloads (1,040,000 pounds of activated carbon) would be required to treat 5 mgd per year. A proportionally lower carbon usage rate is required at lower flow rates.

RECOMMENDATION

It is recommended that six (6) adsorbers be connected in parallel to process this water at a flow rate of 5 mgd. These adsorbers should be staggered at a seven day interval in start-up so that only one vessel is replaced at a time.

It is recommended that chloroform be utilized as the operational control parameter to provide indications when to change the lead bed.

Also, since there was a solids build up on the first pilot column that resulted in increased pressure drops, it is recommended that this concern be further addressed prior to installing the full scale system.

DISCUSSION

Mini-Column Study

From February 22 to March 2, 1982 "Mini-Column Feasibility Testing" was performed to evaluate granular activated carbon for the treatment of five million gallons per day of contaminated well water at Olin Corporation, Niagara Falls Production Facility. The mini-column test, is presently called "Accelerated Column Test" (ACT), can predict carbon requirement in a few days of laboratory analysis where normally months of field work are required. An ACT was performed on samples of well water at a flow rate of 279 gpm and a twenty (20) minute contact time. Results of this test yielded the run time at which various organic compounds in the well water broke through the carbon. Of the total organic loading, five (5) volatile organic compounds broke through the column in a simulated 125-day period. The twenty (20) minute contact time was shown to be conservative and a shorter time needed to be evaluated. Using these results, a pilot column study was designed which evaluated four different contact times at a flow rate of 579 gpm.

PILOT COLUMN OPERATION

The pilot column study was designed to determine the optimum contact time which would contain the wavefront. Four (4) five-inch (5") diameter columns, used in this study were connected in series. Ninteen (19) pounds of activated carbon was placed in each column to simulate a five (5) minute contact time per column at a flow rate of one (1) gallon per minute. Therefore, the effluent emitted from Column II would have a ten (10) minute contact time and Column IV a twenty (20) minute contact time.

Olin operated the pilot column system and adjusted the flow rate to maintain approximately 1 gpm through the columns. Samples of the influent (see Table 2) and the effluent (see Table 3 through 5) streams were collected by Olin personnel. These samples were then submitted to RECRA Environmental Laboratories for analysis and the data is tabulated in the attached tables. This data was then used to calculate the carbon requirement for the system.

ANALYTICAL RESULT

Table 1 presents a list of the organic priority pollutants present in the well water during the pilot column study. Over the duration of the study, seventeen (17) weekly samples of the well water were collected and analyzed for the volatile organic compound list in Table 1. The high, low, and average result of these analyses are presented in the table.

The pilot carbon study verified, as previously demonstrated by the ACT, that five volatile compounds were the only organics to break through the columns, these being methylene chloride (CH_2Cl_2), chloroform ($CHCl_3$), (1,1-and 1,2-) Dichloroethylene ($C_2H_2Cl_2$), and carbon tetrachloride (CCl_4). Table 2 presents the concentrations of these compounds in the influent to the first carbon column over the duration of the study while Tables 3 through 5 present the columns effluent concentrations. As can be seen, the influent is highly variable which in turn is reflectd in the column effluents. Previously collected data has shown there are day-to-day and well-to-well fluctuations in the concentrations of total volatiles and the specific chemical species. Some of the data fluctuation may be attributed to sampling and analytical error due to the volatile nature of these compounds and the capability of the analytical methods.

A summation of the total effluent concentration from each column is presented in Tables 6 and 7. These results are translated into pounds of organics discharged versus actual operating time (or total gallons treated) in Figure 1.

TREATMENT SYSTEM

The proposed carbon treatment system to remove organics from Olin's contaminated well water is six (6) adsorbers with 20,000 pounds of granular activated carbon per adsorber that are connected in parallel. An influent header would distribute the untreated water to each adsorber. Each adsorber would begin treatment on a prearranged staggerred start-up so that only one carbon bed would require replacement at a time. The effluent from each adsorber would then be connected to a discharge header to feed the plant operation.

Effluent Total Volatile Organics (TVO), for a normal ten (10) minute contact time, are summarized in Table 6 (plotted in Figure 2) for the treatment of 833,333 gpd. With six (6) adsorbers connected in parallel, the system would treat 5 mgd.

Olin final SPDES permit limitations (effective July 1, 1984) will allow them to discharge up to ten (10) pounds/day total organic priority pollutants. However, because of the fluctuations in the data, Olin requested the system be designed with a 20% safety factor or to achieve a maximum eight (8) pound/day organic limit in the effluent stream.

Based on a seven (7) day staggered start of the adsorbers and 5 mgd for 365 days, Olin would require 52 carbon changes per normally operating year or 1,040,000 pounds of granular activated carbon. The sum of the projected effluent quality from each adsorber based on Figure 2 for a ten (10) minute contact time is 7.4 pounds of TVO per day.

Figure 3 shows a comparison of TVO and chloroform versus cumulative operating time. For the first 42 days of operation, chloroform approximately matches TVO; after 43 days, the increase in 1,2 dichloroethylene increases the slope of the TVO curve. Chloroform is a good indicator of carbon exhaustion and is recommended as the control parameter.

PRECIPITATE CONCERN

During the pilot column study a precipitate accumulated on the carbon in Column I which resulted in the column having to be backwashed. In a large scale system this solid buildup could increase the pressure drop to the point that frequent backwashing would be required to maintain a reasonable pressure drop through the system.

In view of this concern, it is recommended that the pilot system be put back on line at a 1 GPM flow rate to observe the precipitate buildup over a two week period. Water samples should be collected and analyzed to determine what is causing the precipitate, i.e., suspended solids or chemical precipitation. Also, flow and pressure readings should be carefully monitored at least daily. When sufficient precipitate has accumulated on the bed, a sample of the precipitate should be analyzed. This data in addition to flow and pressure readings taken during the initial pilot study will be evaluated by Calgon.

The normal analytical test for determining the precipitates characteristics are:

1. Alkalinity ($CaCO_3$)

   A. Phenolphthalein
   B. Total
   C. Bicarbonate
   D. Carbonate

2. Hardness ($CaCO_3$) (ETDA)

   A. Ca
   B. Mg

3. pH

4. Solids

   A. Filterable, Dissolived-TDS
   B. Non-filterable, Suspended-TSS
   C. Total-TS
   D. Settleable Volumetric

5. Sulfate (SO_4)

6. Chloride (Cl^-)

TABLE 1

OLIN-NIAGARA FALLS PLANT
PRIORITY POLLUTANTS PRESENT IN CARBON COLUMN INFLUENT
(Samples only analyzed for volatile organics)
10/8/82 to 1/27/83

COMPOUND	Concentration (μg/l) HIGH	LOW	AVERAGE
BHC (Hexachlorocyclohexane)	*	*	*
Carbon Tetrachloride	58	18	35.4
Chloroform	400	160	279.4
Dichloroethenes	190	≤ 41	≤ 131.5
Dioctyladipate	*	*	*
Dioctylphthalate	*	*	*
Fluoranthene	*	*	*
Hexachloro-1,3-butadiene	*	*	*
Hexachloroethane	*	*	*
Methylene Chloride	140	N.D.	8.2
Monochlorobenzene	24	N.D.	≤ 4.2
Pentachlorobutadiene	*	*	*
Pentachloroethane	*	*	*
Phenanthrene/Anthracene	*	*	*
Pyrene	*	*	*
Tetrachlorobutadiene	*	*	*
1,1,2,2-Tetrachloroethane	170	46	116.1
Tetrachloroethene	1400	410	854.7
Toluene	N.D.	N.D.	N.D.
Trichlorobenzene	*	*	*
1,1,1-Trichloroethane	21	N.D.	≤ 10
1,1,2-Trichloroethane	≤ 10	N.D.	≤ 6.0
1,1,2-Trichloroethene	1400	430	873.5
Benzene	14	N.D.	≤ 1.4
Diisoctylphthalate	*	*	*
Methanol	*	*	*
1,1,1,2-Tetrachloroethane	*	*	*
Dichlorobenzene	*	*	*
Dichloroethane	N.D.	N.D.	N.D.
Vinyl Chloride	22	N.D.	≤ 13.8
Trichlorofluoromethane	N.D.	N.D.	N.D.

N.D. Not detected
* Volatile organic analysis will not detect this compound

NOTE: Compounds detected and not quantitated or quantitated at <1 ppb have been omitted.

NOTE: Average values represent 17 sample results.

VDL/vrp
3/18/83

TABLE 2

Olin - Niagara Falls Plant Pilot Carbon Study

INFLUENT DATA
(µg/1)

RUN DAYS	DATE	CH_2Cl_2	$CHCl_3$	DICHLOROETHYLENE 1,1	1,2	CCl_4	TOTAL*
0 N	10/6 #1	280	450	<20	<20	<20	730.0
7 N	10/13	220	440	<20	<20	22	682.0
28	11/3	330	170	< 1	140	47	687.0
37	11/12	74	160	< 2	48	< 2	282.0
48	11/23	11	230	< 1	54	11	306.0
57	12/2	13	300	2.7	280	57	652.7
69	12/14	11	330	4.1	200	2.8	547.9
80(72)	12/25	48	350	<.5	110	25	533.0
85(77)	12/30	36	340	<.5	91	18	485.0

* Total of indicated volatile organics

() Run days corrected for column down time

TABLE 3

Olin - Niagara Falls Plant Pilot Carbon Study

METHYLENE CHLORIDE IN CARBON COLUMN EFFLUENTS

(μg/l)

RUN DAYS	DATE		COLUMN NUMBER I	II	III	IV
0	10/6		<0.5			
1	10/7		2.2			
3	10/9		3.5			
4	10/10			<0.5		
5	10/11		19.0			
6	10/12			<0.5		
7	10/13		2.6	<0.5		
8	10/14		140	570		
10	10/16		290	24		
11	10/17	5 AM	19	18		
		6 PM	25	<0.5		
13	10/19		30	20		
15	10/21		20	3.1		
17	10/23		1.3			
19	10/25		5.5	4.4		
21	10/27		15	4		
22	10/28		≤1			
23	10/29		≤1			
25	10/31		91	140		
27	11/2		160	130		
29	11/4		150	130		
30	11/5			≤0.5		
32	11/7		3.7	.59		
33	11/8				0.57	
34	11/9			1.2		
37	11/12		1.8	.89	1.7	
40	11/15			3.0		
42	11/17		3.5	1.6		
43	11/18				1.9	
45	11/20			9.5	1.9	
47	11/22		1.5			
48	11/23			13	18	
51	11/26				6.7	
53	11/28		3.1		6.6	
56	12/1			1.2	.75	
57	12/2			≤.5	12	
58	12/3					39
60	12/5				11	
63	12/8					5.0
64	12/9				4.5	
69	12/14		4.6	11	6.9	6.5
80(72)	12/25		47	230	59	<.5
85(77)	12/30		99	39	85	<.5
91(83)	1/5				64	39
93(85)	1/7				31	
95(87)	1/9				39	11
98(90)	1/12			≤.5	24	29
103(95)	1/17				42	2.4
107(99)	1/21				31	51
113(105)	1/27				12	≤5

() Run days corrected for down time

TABLE 4

CHLOROFORM IN CARBON COLUMN EFFLUENTS
(μg/1)

RUN DAYS	DATE	COLUMN NUMBER I	II	III	IV
0	10/6	<.5			
1	10/7	<.5			
3	10/9	<.5			
4	10/10		6.6		
5	10/11	6.6			
6	10/12		<.5		
7	10/13	35	3.0		
8	10/14	180	<20		
10	10/16	34	<.5		
11	10/17 5 AM	37	<.5		
	6 PM	46	<.5		
13	10/19	130	<.5		
15	10/21	270	2.9		
17	10/23	370			
19	10/25	<.5	.9		
21	10/27	520	6.6		
22	10/28	220			
23	10/29	420			
25	10/31	380	62		
27	11/2	330	360		
29	11/4	330	130		
30	11/5		250		
32	11/7	390	280		
33	11/8			3:0	
34	11/9		350		
37	11/12	350	370	35	
40	11/15		400		
42	11/17	300	400		
43	11/18			74	
45	11/20		420	110	
47	11/22	330			
48	11/23		400	250	
51	11/26			160	
53	11/28	260		190	
56	12/1		350	230	
57	12/2		300	360	
58	12/3				110
60	12/5			390	
63	12/8				130
64	12/9			450	
69	12/14	390	460	530	240
80(72)	12/25	360	410	390	260
85(77)	12/30	360	730	440	320
91(83)	1/5			340	360
93(85)	1/7			420	
95(87)	1/9			450	340
98(90)	1/12		410	340	400
103(95)	1/17			500	440
107(99)	1/21			490	550
113(105)	1/27			700	660

() Run days corrected for down time

TABLE 5

Olin - Niagara Falls Plant Pilot Carbon Study

EFFLUENT FROM CARBON COLUMNS IN μg/l

RAN DAYS	DATE	1,1 DICHLOROETHYLENE COLUMN NUMBER I	II	III	IV	1,2 DICHLOROETHYLENE COLUMN NUMBER I	II	III	IV	CARBON TETRACHLORIDE COLUMN NUMBER I	II	III	IV
0	10/6	<.5				<.5				<.5			
1	10/7	<.5				<.5				<.5			
3	10/9	<.5				<.5				<.5			
4	10/10		<.5				<.5				<.5		
5	10/11	<.5				<.5				<.5			
6	10/12		<.5				<.5				<.5		
7	10/13	<.5	<.5			<.5	<.5			<.5	<.5		
8	10/14	<10	<20			<10	<20			<10	<20		
10	10/16	<10	<.5			<10	<.5			<10	<.5		
11	10/17 5 AM	<.5	<.5			<.5	<.5			<.5	<.5		
	6 PM	<.5	<.5			<.5	<.5			<.5	<.5		
13	10/19	<.5	<.5			<.5	<.5			<.5	<.5		
15	10/21	<.5	<.5			<.5	<.5			<.5	<.5		
17	10/23	1.1				21				3.6			
19	10/25	<.5	<.5			<.5	<.5			<.5	<.5		
21	10/27	<2	<.5			104	<.5			<2	<.5		
22	10/28	5.5				170				19			
23	10/29	4.9				180				17			
25	10/31	4.2	<.5			190	1.5			2	<.5		
27	11/2	3.2	2.9			170	180			10	7.1		
29	11/4	<2	<1			190	<1			8.6	<1		
30	11/5		<.5				<.5				<.5		
32	11/7	6.6	<.5			160	<.5			24	<.5		
33	11/8												
34	11/9		<.5				2				.5		
37	11/12	5.4	<.5			150	<.5			31	<.5		
40	11/15		<1				24				1.0		
42	11/17	4.7	<1			120	34			45	1.3		
43	11/18			<0.5				<0.5				<0.5	
45	11/20		.5	<0.5			56	<0.5			2.7	<0.5	
47	11/22	1.8				140				39			
48	11/23		.82	<1			75	<0.5			5.2	<0.5	
51	11/26			<0.5				<0.5				<0.5	
53	11/28	5.4		<0.5		240		<0.5		25		<0.5	
56	12/1		2.4	<0.5		290		<3.4		35		<0.5	
57	12/2		2.1	≤0.5		240		≤0.5		26		≤0.5	

TABLE 5 (CONTINUED)

EFFLUENT FROM CARBON COLUMNS IN μg/l

RAN DAYS	DATE	1,1 DICHLOROETHYLENE COLUMN NUMBER I	II	III	IV	1,2 DICHLOROETHYLENE COLUMN NUMBER I	II	III	IV	CARBON TETRACHLORIDE COLUMN NUMBER I	II	III	IV
58	12/3				<.5				<.5				<.5
60	12/5			<0.5				9.3				<0.5	
63	12/8				<.5				<.5				<.5
64	12/9			<0.5				22				<0.5	
69	12/14	6	10	5.3	<.5	190	250	63	<.5	<.5	22	3.2	<.5
80(72)	12/25	<.5	<.5	<0.5	<.5	100	58	0.5	<.5	28	12	<0.5	<.5
85(77)	12/30	<.5	<.5	<0.5	<.5	110	140	0.5	<.5	31	28	<0.5	<.5
91(83)	1/5			<0.5	<.5			39	<.5			1.1	<.5
93(85)	1/7			<0.5				79				<0.5	
95(87)	1/9			<0.5	<.5			100	<.5			<.5	<.5
98(90)	1/12		<.5	<0.5	<.5		93	80	<.5		<.5	<.5	<.5
103(95)	1/17			<.5	<.5			170	33			<.5	<.5
107(99)	1/21			<.5	<.5			170	22			<.5	<.5
113(105)	1/27			<.5	<.5			320	81			42	<.5

() Run days corrected for down time

TABLE 6

Olin - Niagara Falls Plant Pilot Carbon Study

SUMMATION OF TOTAL EFFLUENT FROM EACH COLUMN IN μg/l

RUN DAYS	DATE	COLUMN I	COLUMN III	COLUMN IV
0	10/6	<.5		
1	10/8	2.2		
3	10/9	3.5		
5	10/11	25.6		
7	10/13	37.6		
8	10/14	320.0		
10	10/16	324.0		
11	10/17	56.0		
		71.0		
13	10/19	160		
15	10/21	290.0		
17	10/23	397.0		
19	10/25	5.5		
21	10/27	639		
22	10/28	429.5		
23	10/29	621.9		
25	10/31	667.2		
27	11/2	673.2		
29	11/4	678.6		
32	11/7	584.3		
37	11/12	538.2	36.7	
42	11/17	473.2	-	
43	11/18	-	75.9	
45	11/20	-	111.9	
47	11/22	512.3	-	
48	11/23	-	268.0	
51	11/26	-	166.7	
53	11/28	533.5	196.6	
56	12/1	-	234.2	
57	12/2	-	372.0	
58	12/3	-	-	149.0
60	12/5	-	410.3	-
63	12/8	-	-	135.0
64	12/9	-	476.5	-
69	12/14	590.6	608.4	246.5
80(72)	12/25	535.0	449.0	260.0
85(77)	12/30	600.0	525.0	320.0
91(83)	1/5	-	464.1	399.0
93(85)	1/7	-	530.5	-
95(87)	1/9	-	589.0	351.0
98(90)	1/12	-	444.0	429.0
103(95)	1/17	-	712.0	475.4
107(99)	1/21	-	691.0	623.0
113(105)	1/27	-	1074.0	746.0

() Run days corrected for column down time.

TABLE 7

Olin - Niagara Falls Plant Pilot Carbon Study

SUMMATION OF COLUMN 2 EFFLUENT DATA

(10 Minute Contact Time)

RUN DAYS	DATE	METHYLENE CHLORIDE µg/l	CHLOROFORM µg/l	DICHLOROETHYLENE 1,1 µg/l	DICHLOROETHYLENE 1,2 µg/l	CARBON TETRACHLORIDE µg/l	TOTAL µg/l	TOTAL * POUNDS/DAY TVO
0	10/ 6							
1	10/ 7							
3	10/ 9							
4	10/10	<.5	6.6	<.5	<.5	<.5	6.6	0.46
6	10/12	<.5	<.5	<.5	<.5	<.5	<.5	-
7	10/13	<.5	3.0	<.5	<.5	<.5	3.0	0.02
8	10/14	570	<20	<20	<20	<20	570	3.96
10	10/16	24	<.5	<.5	<.5	<.5	24	0.17
11	10/17	18	<.5	<.5	<.5	<.5	18	0.13
		<.5	<.5	<.5	<.5	<.5	<.5	-
13	10/19	20	<.5	<.5	<.5	<.5	20	0.14
15	10/21	3.1	2.9	<.5	<.5	<.5	6	0.04
19	10/25	4.4	.9	<.5	<.5	<.5	13.4	0.09
21	10/27	4	6.6	<.5	<.5	<.5	10.4	0.07
25	10/31	140	62	<.5	1.5	<.5	203.5	1.41
27	11/ 2	130	360	2.9	180	7.1	680	4.72
29	11/ 4	130	130	<1	<1	<1	260	1.81
30	11/ 5	≤.5	250	<.5	<.5	<.5	250	1.74
32	11/ 7	.59	280	<.5	≤.5	.5	280.6	1.95
34	11/ 9	1.2	350	≤.5	2	<.5	353.2	2.45
37	11/12	.89	370	<.5	<.5	<.5	370.9	2.58
40	11/15	3.0	400	<1	24	1.0	428	2.97
42	11/17	1.6	400	<1	34	1.3	436.9	3.04
45	11/20	9.5	420	≤.5	56	2.7	488.2	3.39
48	11/23	13	400	.82	75	5.2	494	3.43
56	12/ 1	1.2	350	2.4	290	35	678.6	4.72
57	12/ 2	≤.5	300	2.1	240	26	568.1	3.95
69	12/14	11	460	1.0	250	22	753	5.23
80(72)	12/25	230	410	<.5	58	12	710	4.93
85(77)	12/30	39	730	<.5	140	28	937	6.51
98(90)	1/12	≤5.5	410	<.5	93	<.5	503	3.49

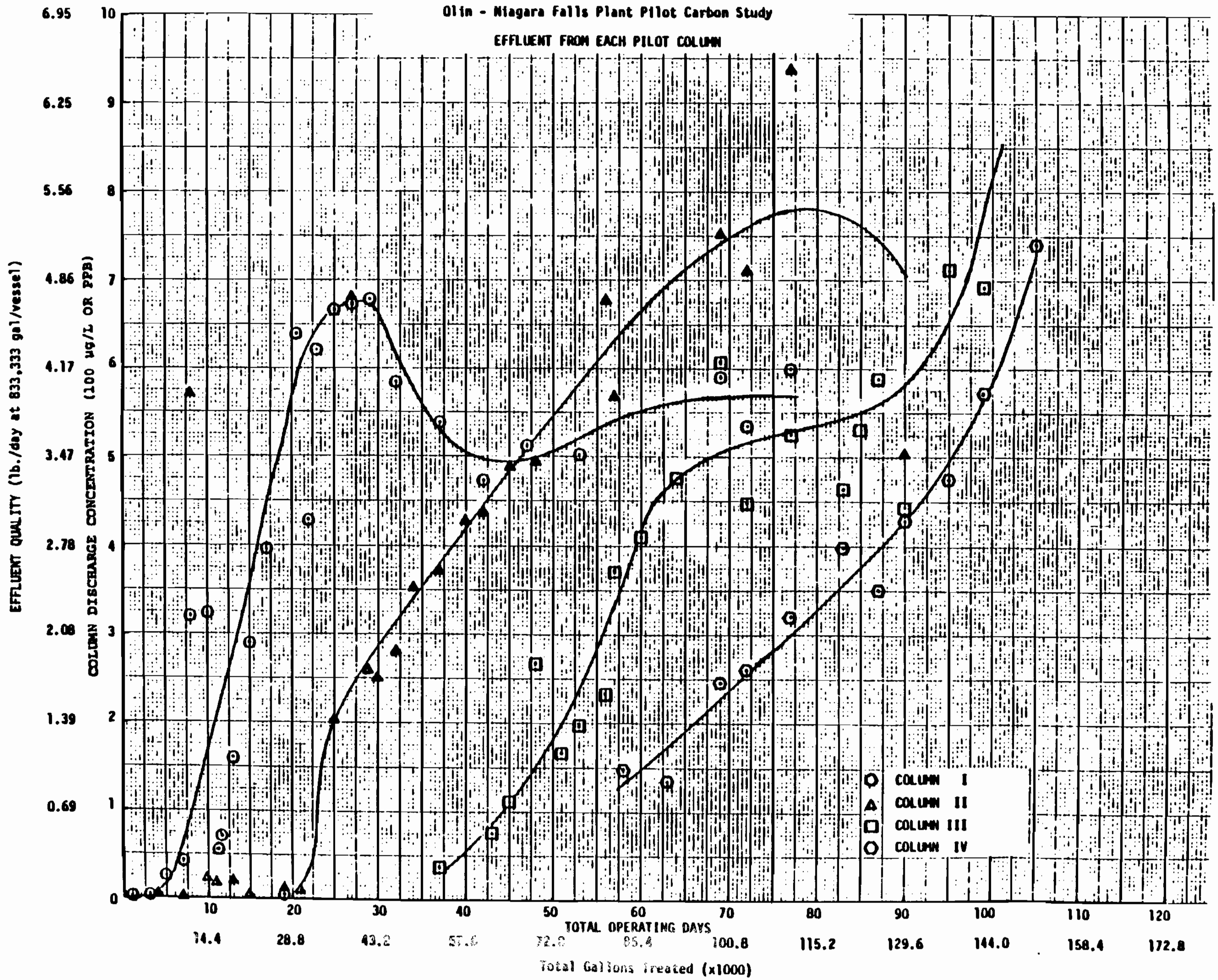
* At 833,333 gal. per adsorber and effluent concentration in µg/l

() Run days corrected for column down time

FIGURE 1

Olin - Niagara Falls Plant Pilot Carbon Study

EFFLUENT FROM EACH PILOT COLUMN



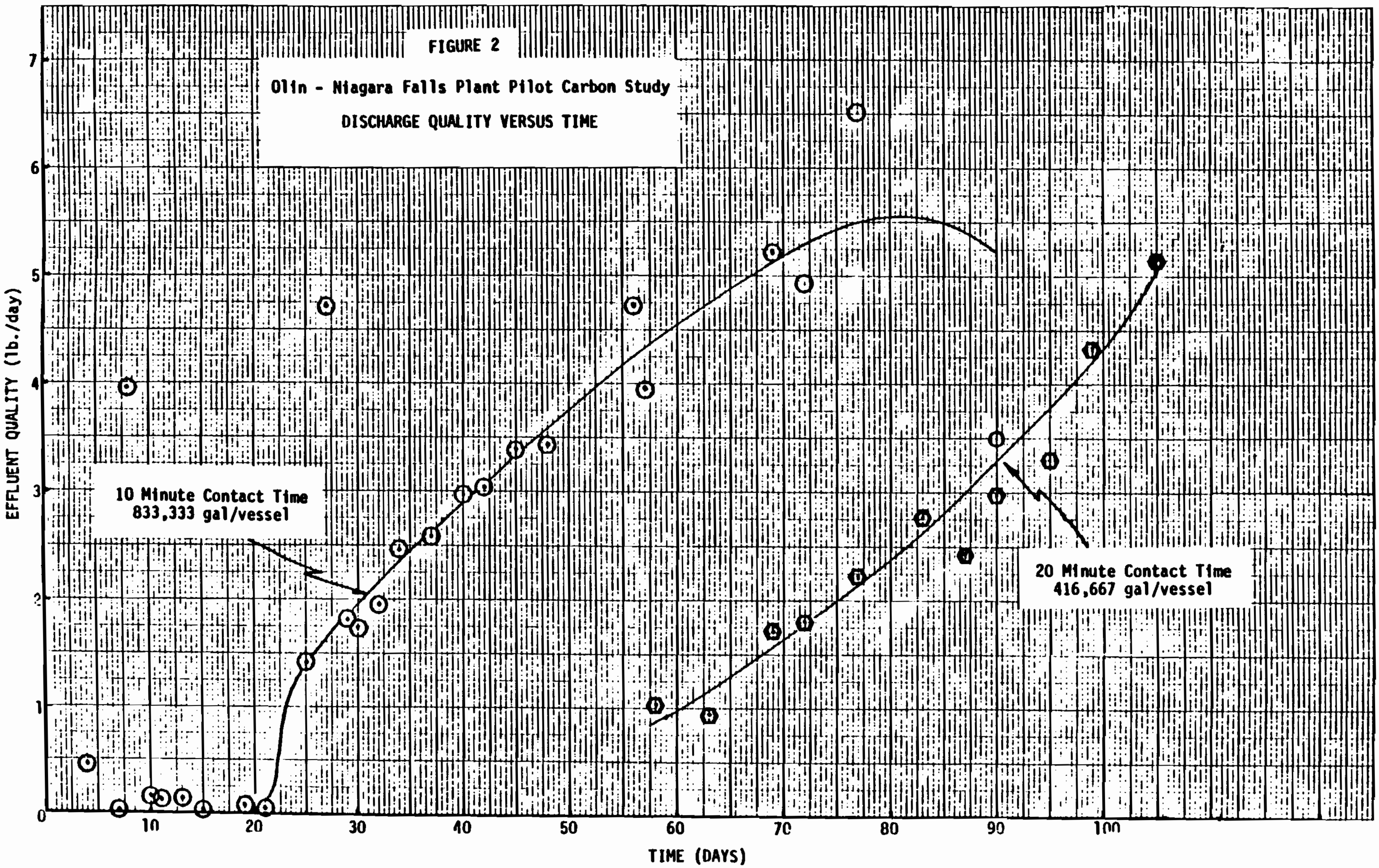
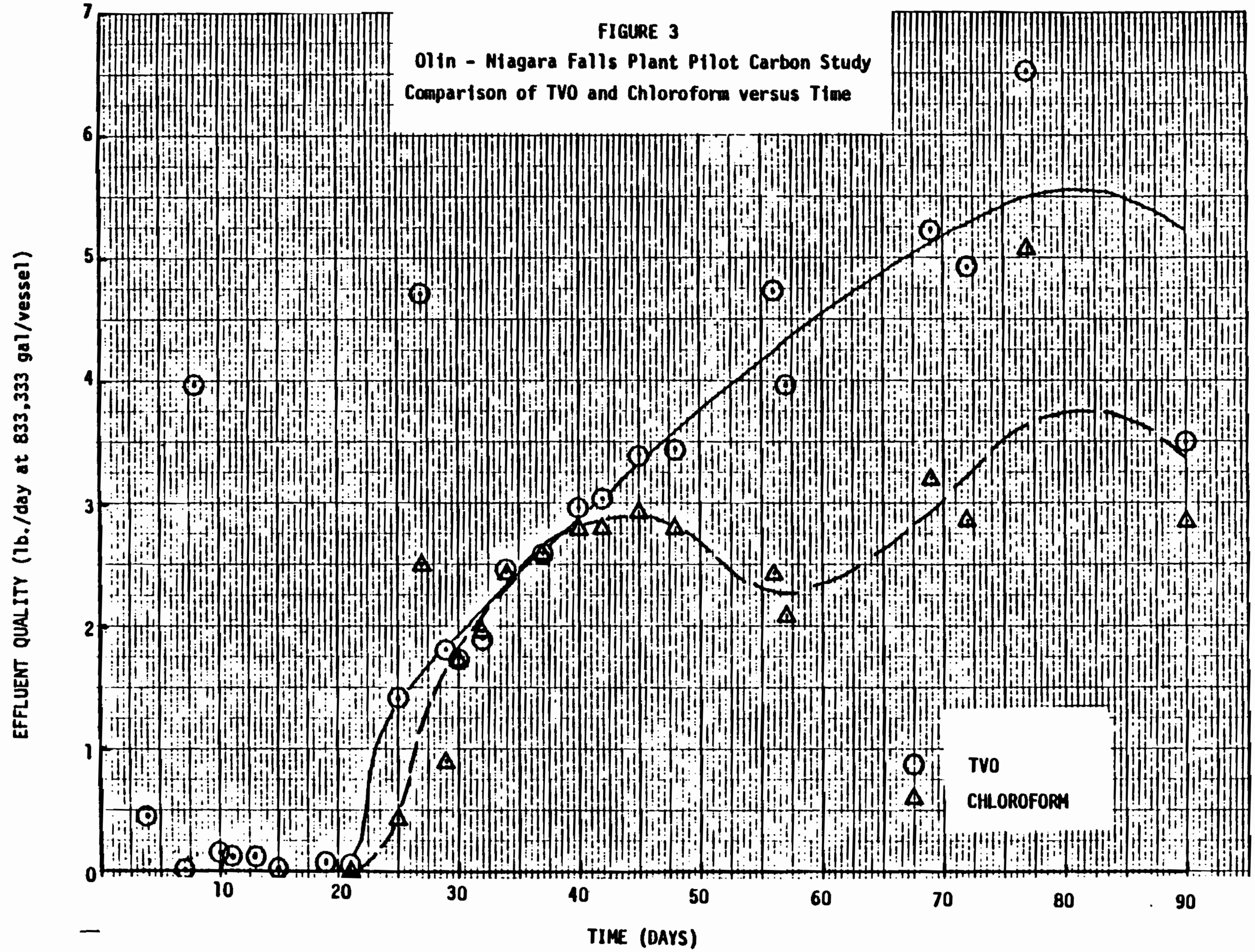


FIGURE 2
Olin - Niagara Falls Plant Pilot Carbon Study
DISCHARGE QUALITY VERSUS TIME
10 Minute Contact Time
833,333 gal/vessel
20 Minute Contact Time
416,667 gal/vessel
EFFLUENT QUALITY (lb./day)
TIME (DAYS)
0
1
2
3
4
5
6
7
10
20
30
40
50
60
70
80
90
100

FIGURE 3

Olin - Niagara Falls Plant Pilot Carbon Study

Comparison of TVO and Chloroform versus Time



OM-10000A

INTER OFFICE MEMO Olin

APPENDIX V

TO D. R. Vaughn AT Charleston DATE October 8, 198[illegible]

FROM J. W. O'Grady AT Charleston

COPY TO D. L. Cummings
P. J. Craney
A. F. Kaptenia
M. L. Norsworthy
V. M. Norwood
M. S. Smithson
A. P. Szustak

SUBJECT New York State DEC
Bioassay, October 5-6, 1981

On October 6, 1981, representatives from the NYSDEC were in the Niagara plant to sample the water sources and clear water outfalls. This was done as part of a larger state/federal project designed to assess the water quality of the Niagara River. While composite samples were being taken of the North and South wells, the river inlet and 1, 3, and 4 CW outfalls, grab samples were taken at all of the preceding, with the exception of the river inlet, for bioassay analysis. A bioassay was not run on the river water as the DEC feels it has ample testing information on this source showing that it is not acutely toxic.

The water for the bioassays was immediately transported to the State laboratory at Avon, New York (just south of Rochester) and a 24-hour static test was conducted. A 2-liter and two, 200 mil aliquots were taken from each sample. Five fathead minnows, Pinephales promelas, were placed in the 2-liter container and 10 Daphnia magna, were placed in the 200 mil aliquots. The type and nature of the bioassay was a 24-hour static test which is an indicator of acute toxicity. At the end of the 24-hour cycle there were no fatalities. The results of this test by the State as well as our own test in August indicate there is no acute toxicity in either our water supplies or our clear water sewers.

The State will continue to test other industrial dischargers over the next 5 to 6 weeks and a report with all the results should be available in early December.

J. W. O'Grady

JWO/wr

WHY FILE THIS COPY? IF YOU MUST RETAIN IT, SPECIFY A DEFINITE RETENTION PERIOD: ONE YEAR ________ OTHER ________

OM-10000A

INTER OFFICE MEMO Olin

TO Distribution AT Various DATE October 14, 1981

FROM J. W. O'Grady AT Charleston

SUBJECT Niagara Falls Bioassay
August 26-27, 1981

COPY TO J. C. Brown
D. L. Cummings
P. J. Craney
A. F. Kapteina
M. L. Norsworthy
V. W. Norwood
M. S. Smithson
A. P. Szustak
D. R. Vaughn

SUMMARY:

On August 26 and 27 two 24-hour static bioassays were conducted on influent and effluent water at the Niagara Falls plant. No mortality was exhibited in either of the tests.

TEST I - The first test was conducted on well water from both the North and South wells. All methods employed followed those discussed in EPA-600/4-78-012 (Methods for Measuring the Acute Toxicity of Effluent to Aquatic Organisms, Peltier 1978). The fathead minnow (Pimephales promelas) was the test species used. The well water was collected in four (4), five (5) gallon grabs. Two (2) each from each well. Each five (5) gallon grab was placed in a separate tank. Of the two (2) grabs from each well one was aerated and one was not. Ten (10) fish were placed in each chamber including two (2), five (5) gallon controls of city water.

TEST II - The second test was a crude screening test to obtain preliminary data from various water sources throughout the plant. Four (4), five (5) gallon grab samples were taken. One (1) each from 1CW, 3CW, 4CW and river influent. As in Test I a five (5) gallon control of city water was also used.

DISCUSSION:

Test organisms were purchased from a fish hatchery in Pennsylvania, treated for parasites and disease, and allowed to acclimate to laboratory conditions for two weeks prior to the tests. Average fish size was 4.5 cm, average weight .78 grams.

TEST I - Two (2), five (5) gallon samples were taken from each well and placed in previously sterilized five (5) gallon aquariums. Temperature of the well water at the well head was 12°C. A heating coil was used to elevate the temperature to the 20-22°C range, as the fish were acclimated at 22°C. Prior to the start of the test each tank was tested for temperature and dissolved oxygen (D.O.).

	Temperature	D.O.
Control A	21.5°C	8.8
Control B	21.1°C	8.8
North Well A*	20.2°C	6.3
North Well B*	20.5°C	5.8
South Well A*	20.2°C	6.0
South Well B*	20.5°C	6.5

*Volatile Priority Pollutant Analyses ran on well water samples of the same date as the test water was taken (8/26/81) show levels of 4862 μg/l in the North Well and 6147 μg/l in the South Well.

To insure that there was enough oxygen and to avoid the possibility of its being a contributing factor to mortality, North Well tank B and South Well tank A were aerated for 10 minutes. Their D.O's were brought up to 7.6 and 7.5.

At the completion of Test I the temperature of all six (6) tanks was 22.0°C and the D.O. of each was:

Control A	7.3	North Well A	5.6	South Well A	6.4
Control B	7.2	North Well B	6.4	South Well B	5.7

All test organisms were alive at the end of 24 hours and Test I was terminated.

TEST II - One (1), five (5) gallon sample each of 1, 3 and 4CW effluent and river water influent as well as a five (5) gallon control were tested. The 1CW sample was heated to bring it up to 22.0°C and 3 and 4CW were cooled to bring them down to that range. The river water was 22.0°C at the sample point (the well house).

At the start of the test the following temperature and D. O. was recorded.

	Temperature	D.O.
Control	22.0°C	8.7
1CW*	20.5°C	8.4
3CW	23.0°C	7.6
4CW	22.0°C	7.4
River	22.0°C	8.3

*Volatile Priority Pollutant Analyses was run on 1CW grab as this outfall is primarily 100% well water. Data shows that the level was 3697 μg/l on 8/27/81.

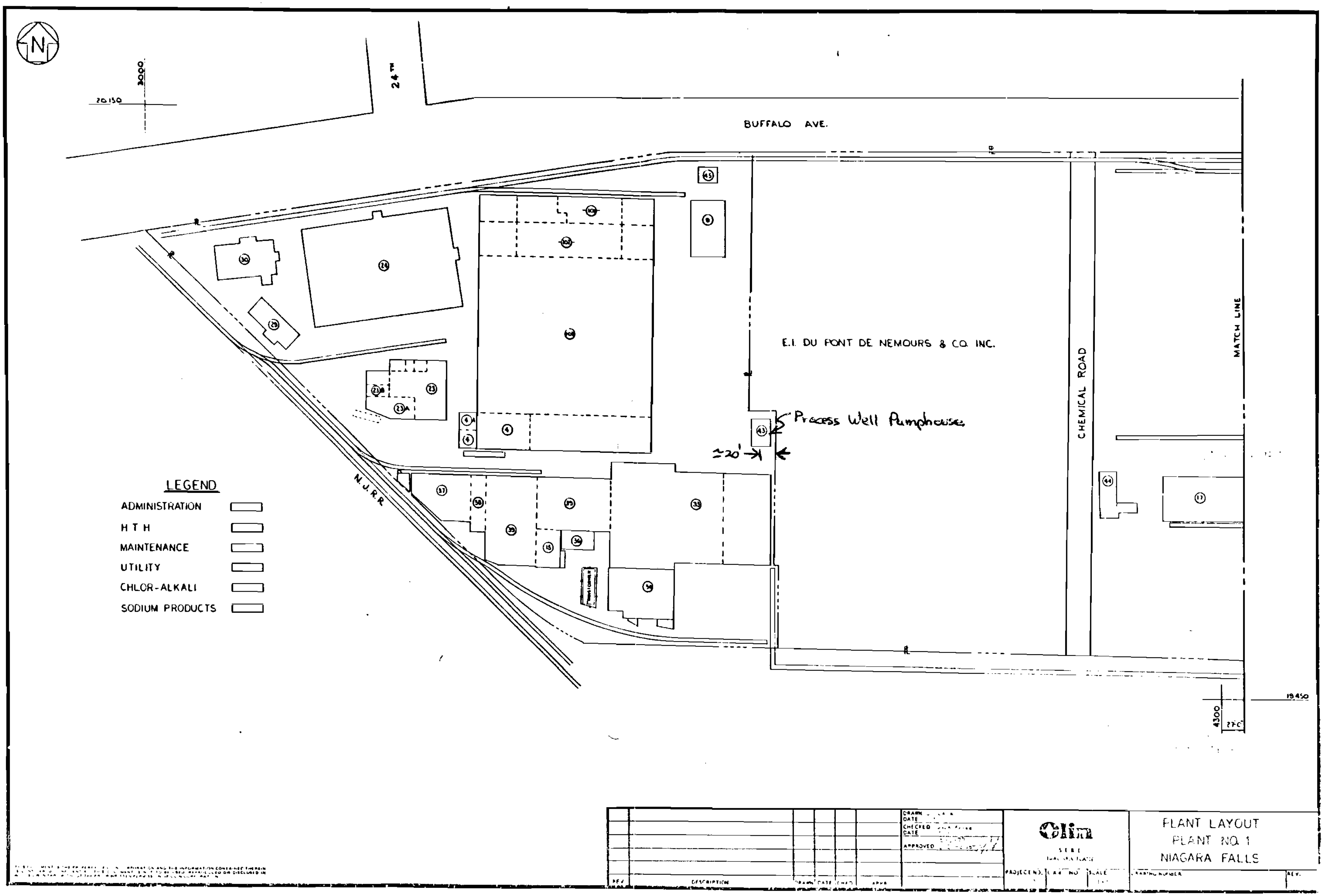
As in Test I, all organisms were alive at the end of the 24-hour testing period.

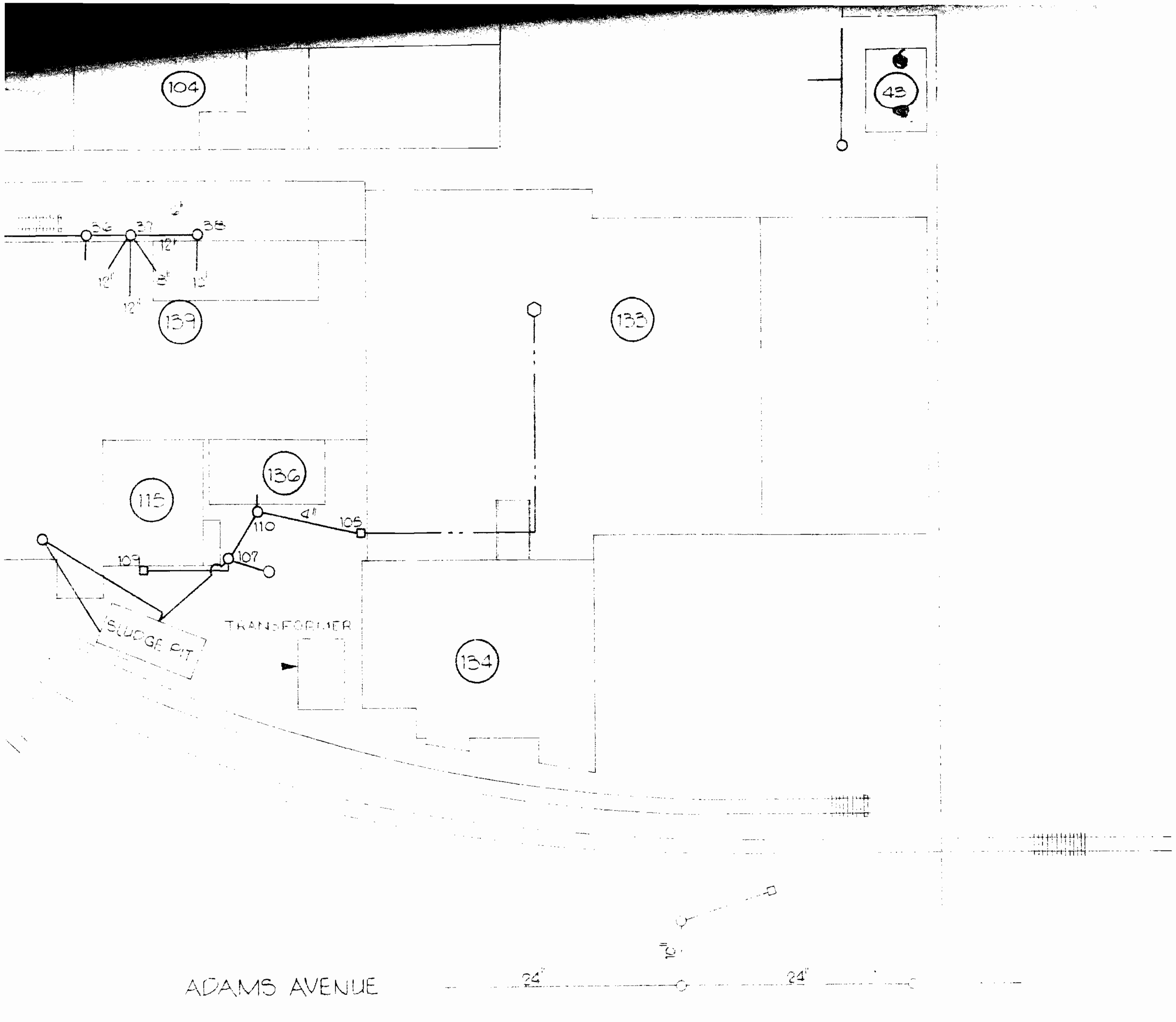
CONCLUSION:

Although the test serves as a preliminary indicator that the water at Niagara Falls is not acutely toxic a more vigorous long-term definitive test conducted over a 96-hour time period would confirm this.

J. W. O'Grady

JWO/vrp


BUFFALO AVE.
24TH
20150
3000
E.I. DU PONT DE NEMOURS & CO. INC.
Process Well Pumphouse
≃20'
CHEMICAL ROAD
MATCH LINE
N.J.R.R.
LEGEND
ADMINISTRATION
H T H
MAINTENANCE
UTILITY
CHLOR-ALKALI
SODIUM PRODUCTS
19450
4300
Olin
PLANT LAYOUT
PLANT NO. 1
NIAGARA FALLS
DRAWN
DATE
CHECKED
DATE
APPROVED
REV.
DESCRIPTION
PROJECT NO.
SCALE



KEY

- ○ □ -- MANHOLES & CATCH BASINS
- ⬡ -- SUMP PUMP
- ▭ -- SEWER MONITOR STATION
- ——— BELOW GRADE SEWER
- —·· — ABOVE GRADE SEWER

NOTES

1. THIS DWG REPLACES DWG D-6036-830-5-1.
2. REFERENCE THIS DWG WITH DWG D-1592-830-5-14

hibbard·engineers
STRUCTURAL • INDUSTRIAL • MECHANICAL • CIVIL • ELECTRICAL
1316 MAIN STREET NIAGARA FALLS NEW YORK 14301 • 716-282-1281

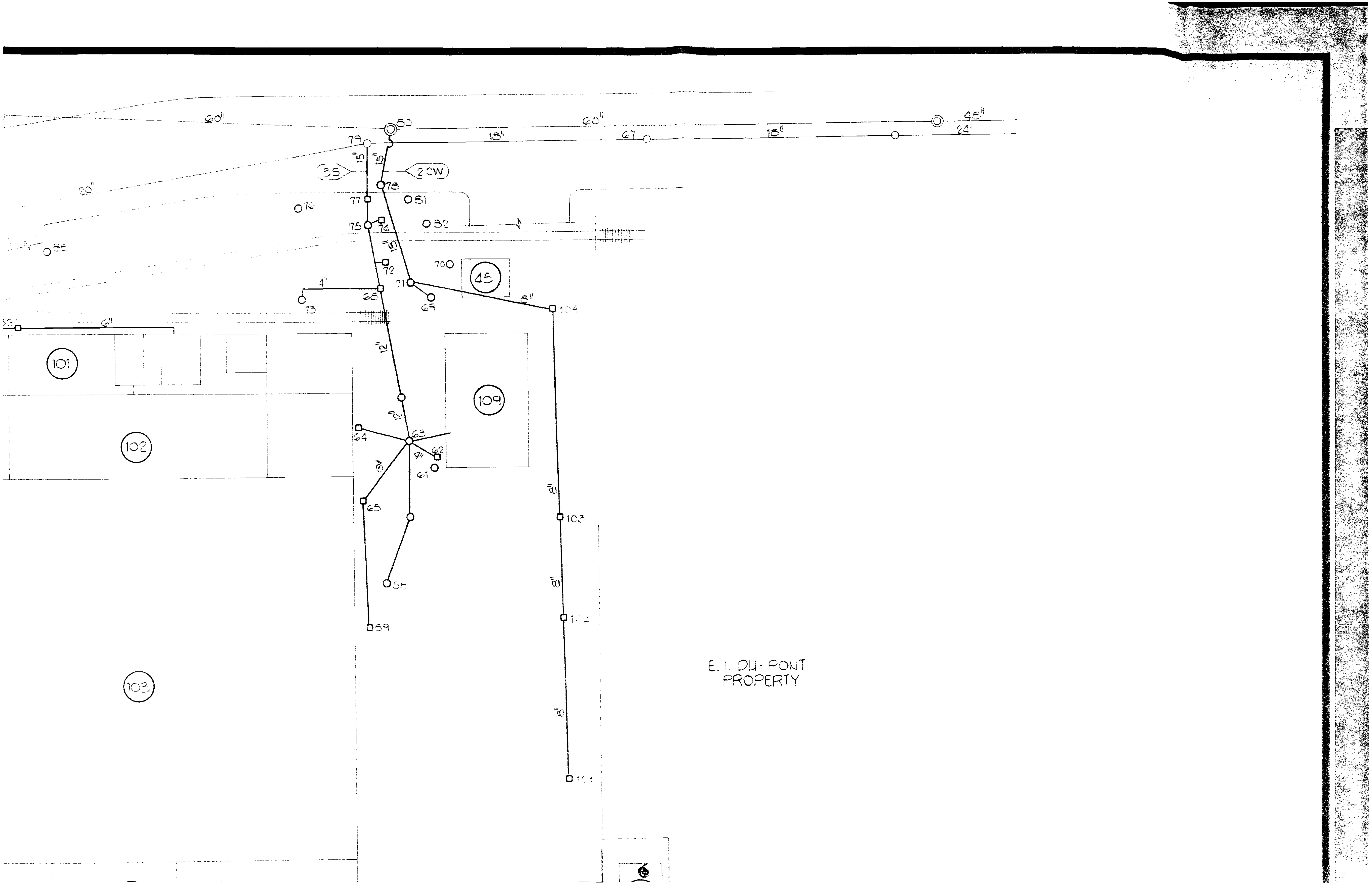
JOB No. 80-151-

...VE LINES UPDATE	FTM	7/82	FM	RFK
...ED MONITOR STATION	BS	1/77	FM	RFK
...UED AS BUILT	B.S.	5/76	FM	RFK
...LIMINARY ISSUE	...	12/...		

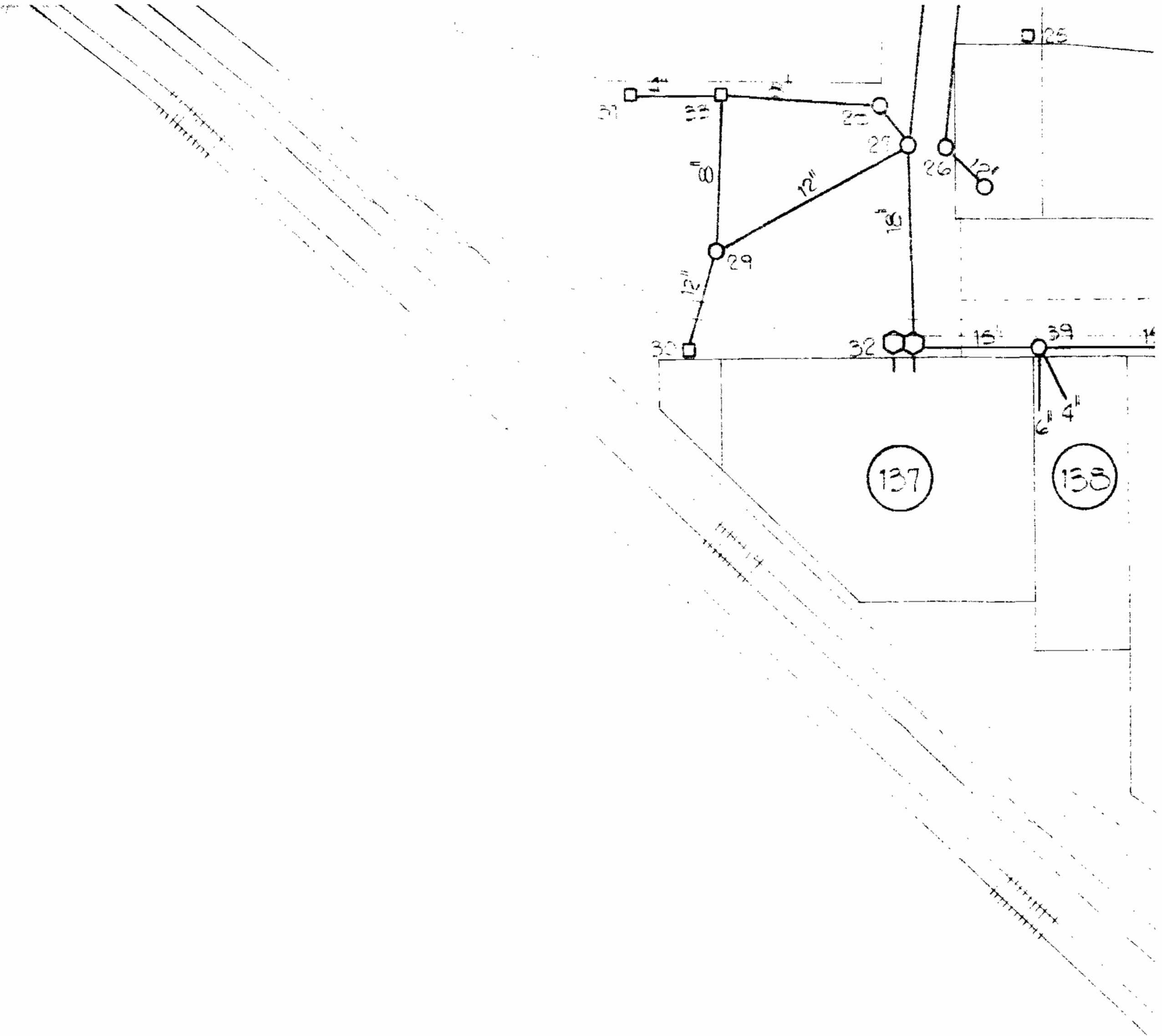
DRAWN DATE T.M. 6·23·80
CHECKED DATE MUNZI
APPROVED A. Kytbeia

Olin
NIAGARA PLANT

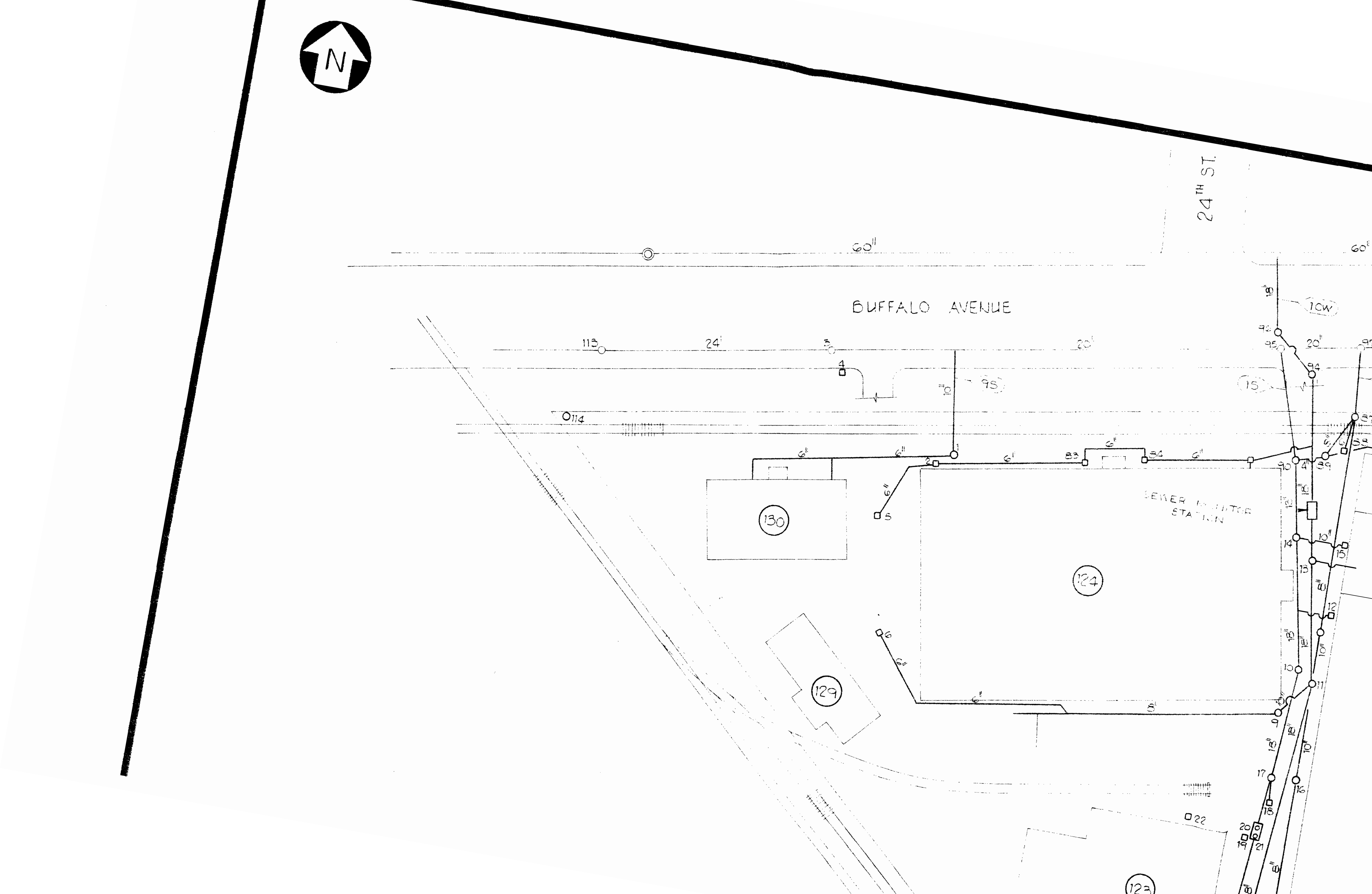
PLANT No. 1
ALL ACTIVE SEWER LINES

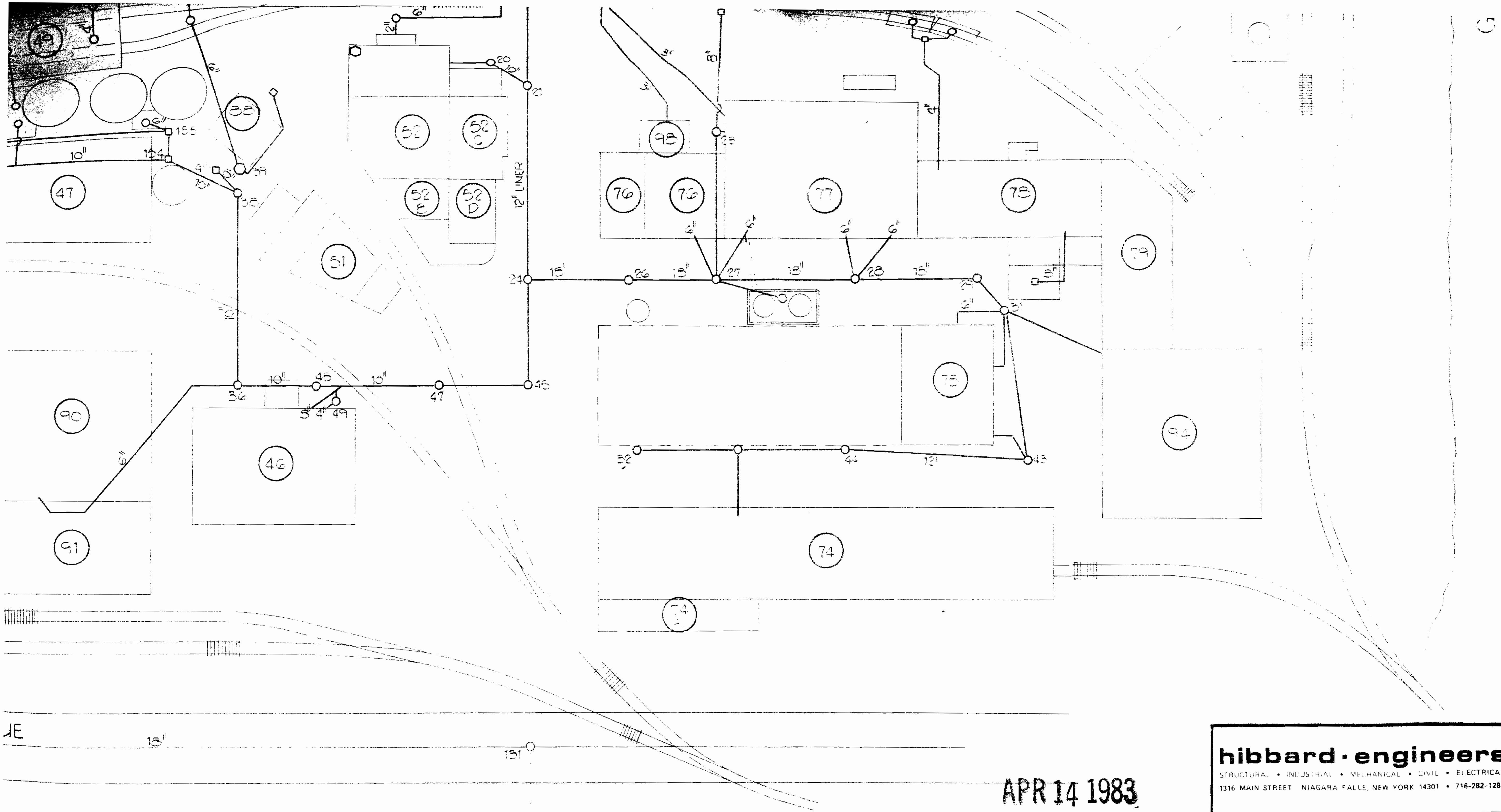


E. I. DU-PONT PROPERTY
101
102
103
109
45
3S
2CW
60"
45"
24"
18"
15"
12"
8"
6"
4"



				2	
				1	
		D-6070-830-5-14	SANITARY & CLEARWATER SEWERS	0	
		7825-A	PLANT 1 ALL SEWER LINES OBSOLETE	A	


N
24TH ST.
BUFFALO AVENUE
60"
24"
20"
10"
18"
6"
8"
130
129
124
123
SEWER MONITOR STATION



APR 14 1983

hibbard · engineers
STRUCTURAL • INDUSTRIAL • MECHANICAL • CIVIL • ELECTRICAL
1316 MAIN STREET NIAGARA FALLS, NEW YORK 14301 • 716-282-1281

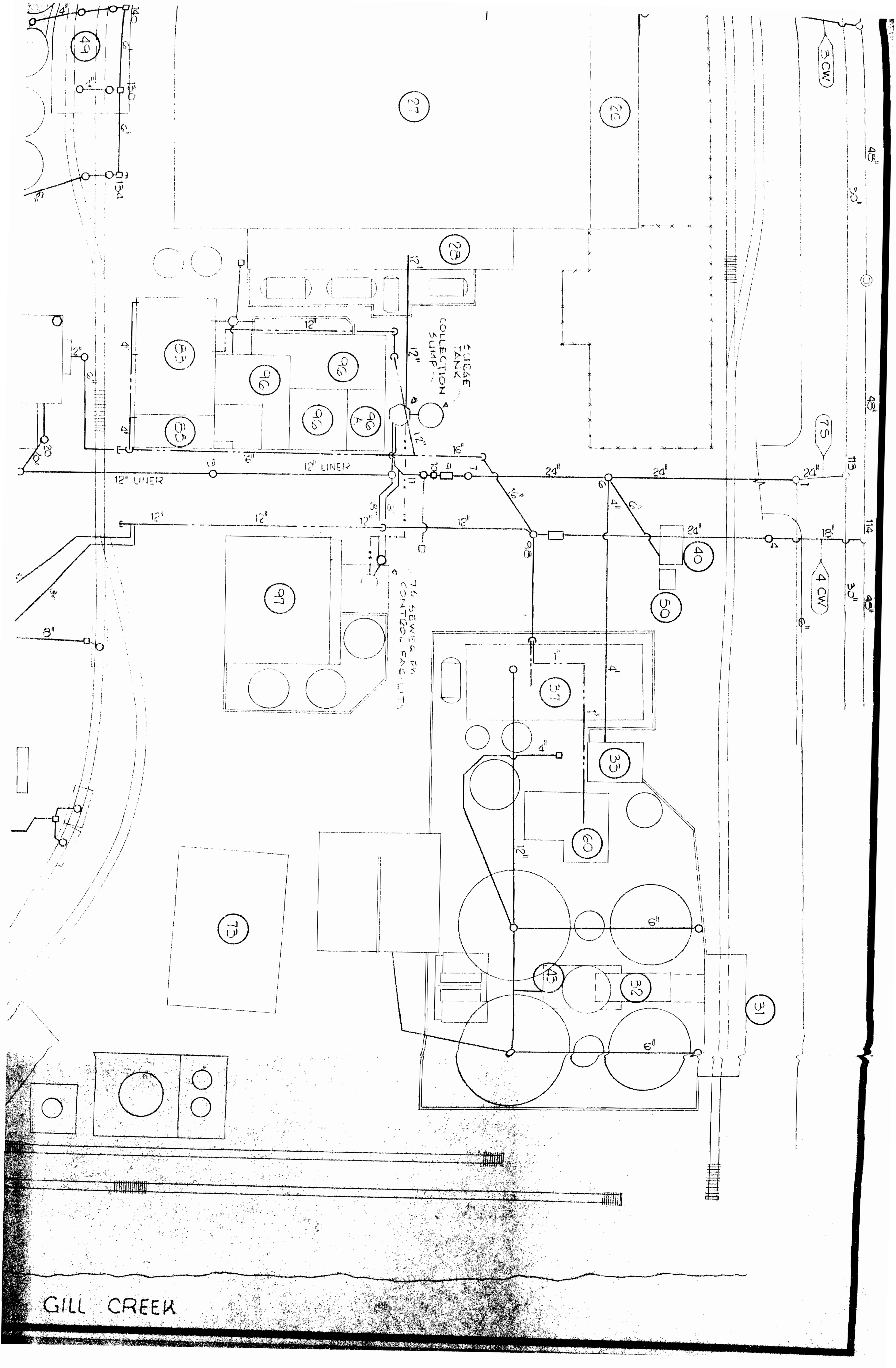
JOB No. 80-151-

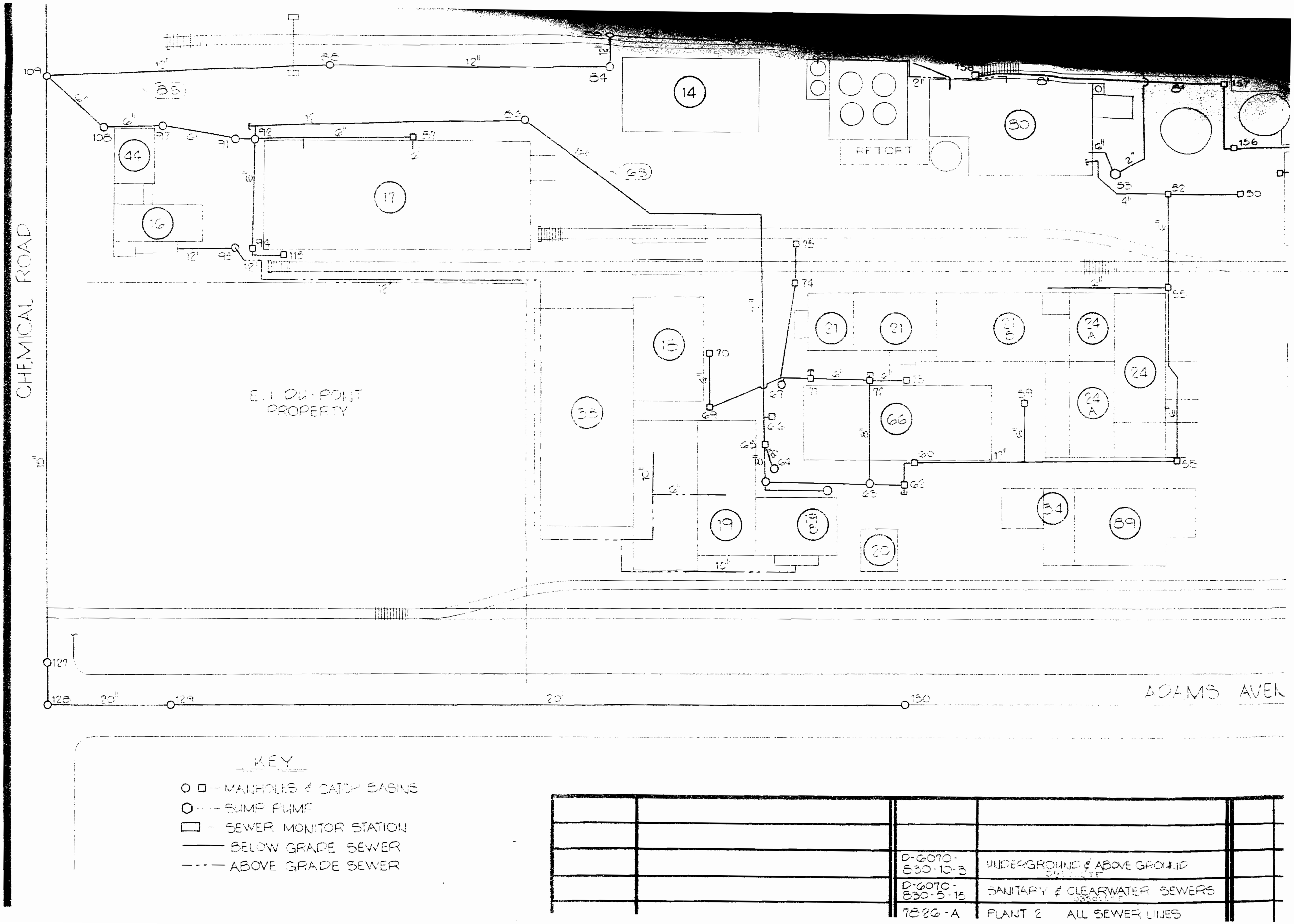
DRAWN DATE	T.M. 6-24-80
CHECKED DATE	F MUNZ. 4-30-82
APPROVED	AFK 4-30-82

Olin
NIAGARA PLANT

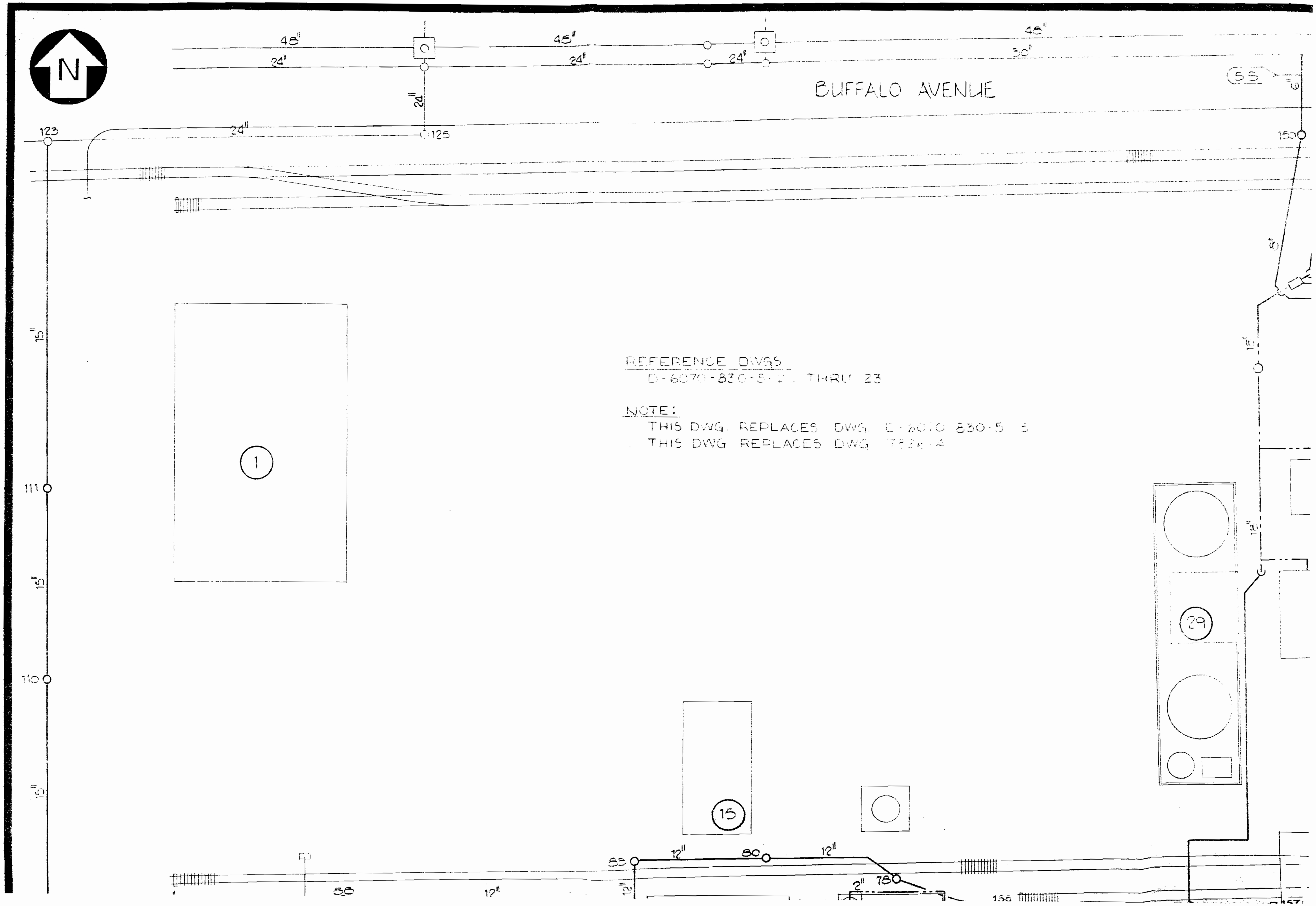
PLANT No. 2
ALL ACTIVE SEWER LINES

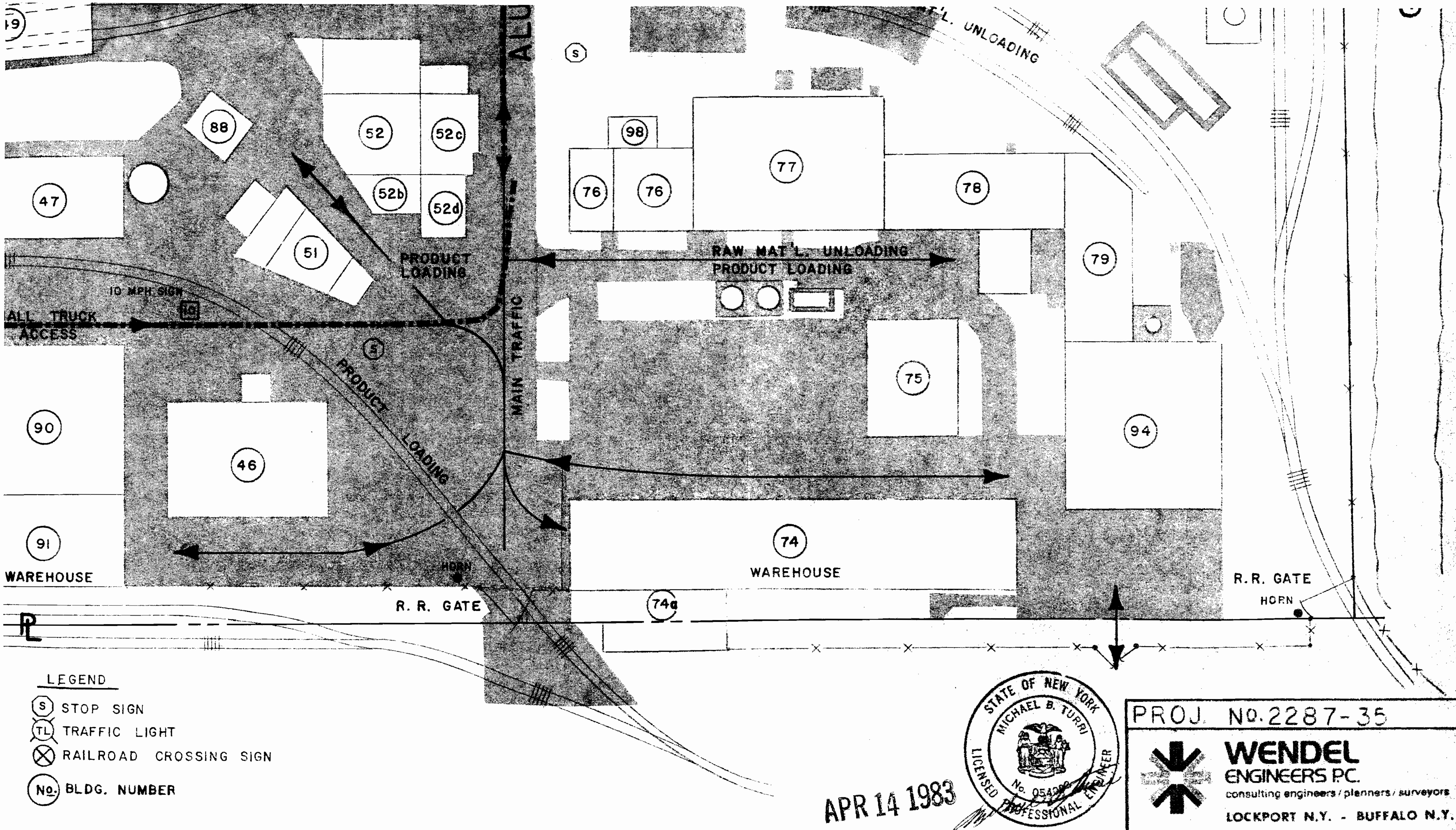
PROJECT NO.	C.A.R. NO.	SCALE	DRAWING NUMBER	REV.
		"	D 1502 030 5-3	


GILL CREEK
SLUDGE TANK
COLLECTION SUMP
TO SEWER PK CONTROL FACILITY
12" LINER
3 CW
4 CW
T5
113
114
27
28
85
96
97
37
33
60
73
43
32
31
40
50
49



CHEMICAL ROAD
ADAMS AVE
E.I. DU PONT PROPERTY
RETORT
KEY
MANHOLES & CATCH BASINS
SUMP PUMP
SEWER MONITOR STATION
BELOW GRADE SEWER
ABOVE GRADE SEWER
D-6070-830-10-3
D-6070-830-5-15
7826-A
UNDERGROUND & ABOVE GROUND
SANITARY & CLEARWATER SEWERS
PLANT 2 ALL SEWER LINES


N
BUFFALO AVENUE
48"
24"
30"
6"
8"
15"
18"
12"
2"
123
125
111
110
150
88
80
78
1
15
29
REFERENCE DWGS
D-6070-830-5-2_ THRU 23
NOTE:
THIS DWG. REPLACES DWG. D-6070-830-5-5
THIS DWG. REPLACES DWG. 7824-4



LEGEND
- (S) STOP SIGN
- (TL) TRAFFIC LIGHT
- (⊗) RAILROAD CROSSING SIGN
- (No.) BLDG. NUMBER

APR 14 1983

STATE OF NEW YORK · MICHAEL B. TURRI · No. 054... · LICENSED PROFESSIONAL ENGINEER

PROJ. No. 2287-35

WENDEL ENGINEERS P.C.
consulting engineers / planners / surveyors
LOCKPORT N.Y. - BUFFALO N.Y.

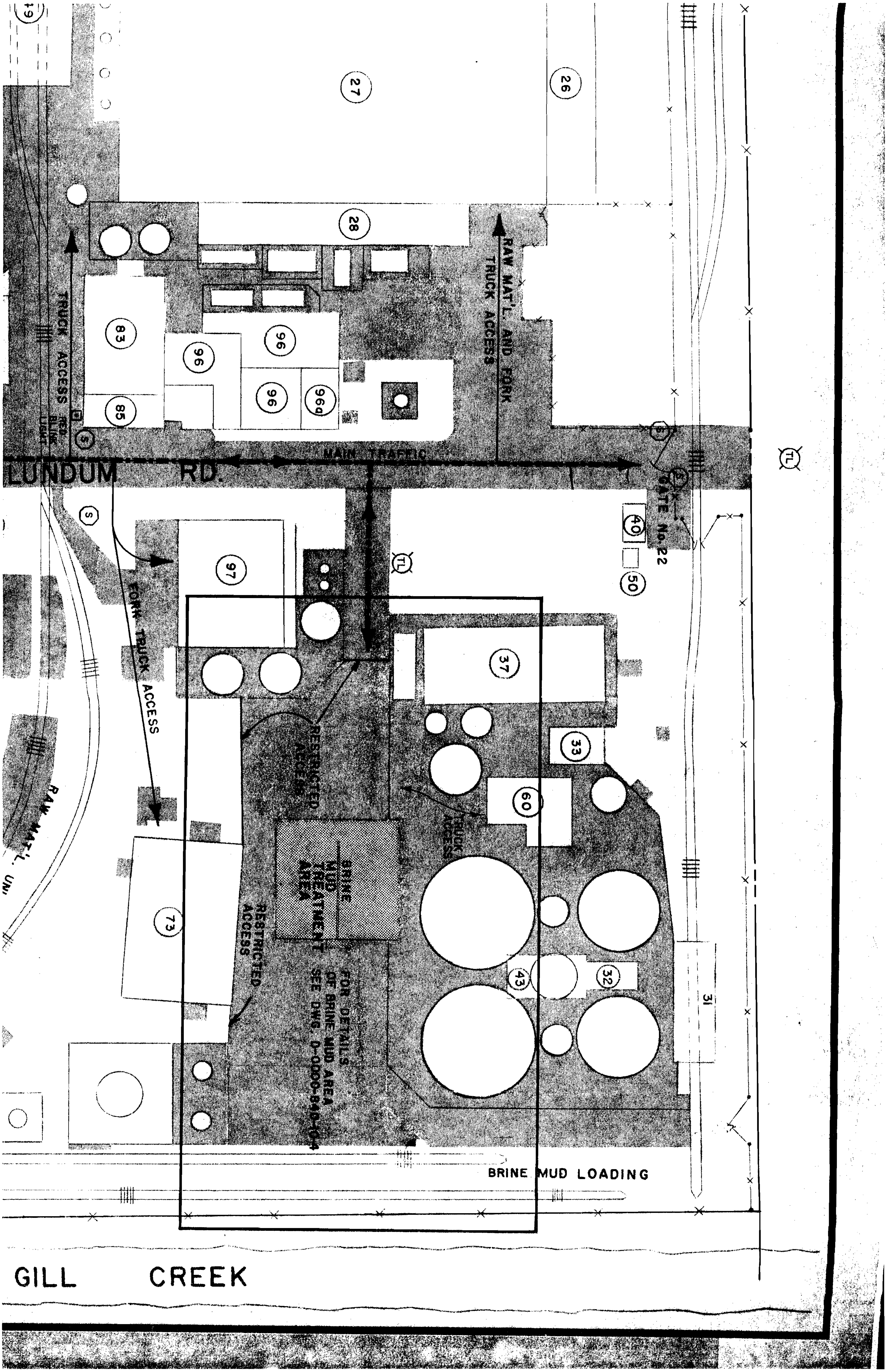
ED 100 YR. FLOOD BDRY. & MAIN TRAFFIC ROAD & EAST OF BRINE AREA	J.E.	1/3/83	

DRAWN P.N.M. DATE 6/24/82
CHECKED DATE 8-A-82
APPROVED

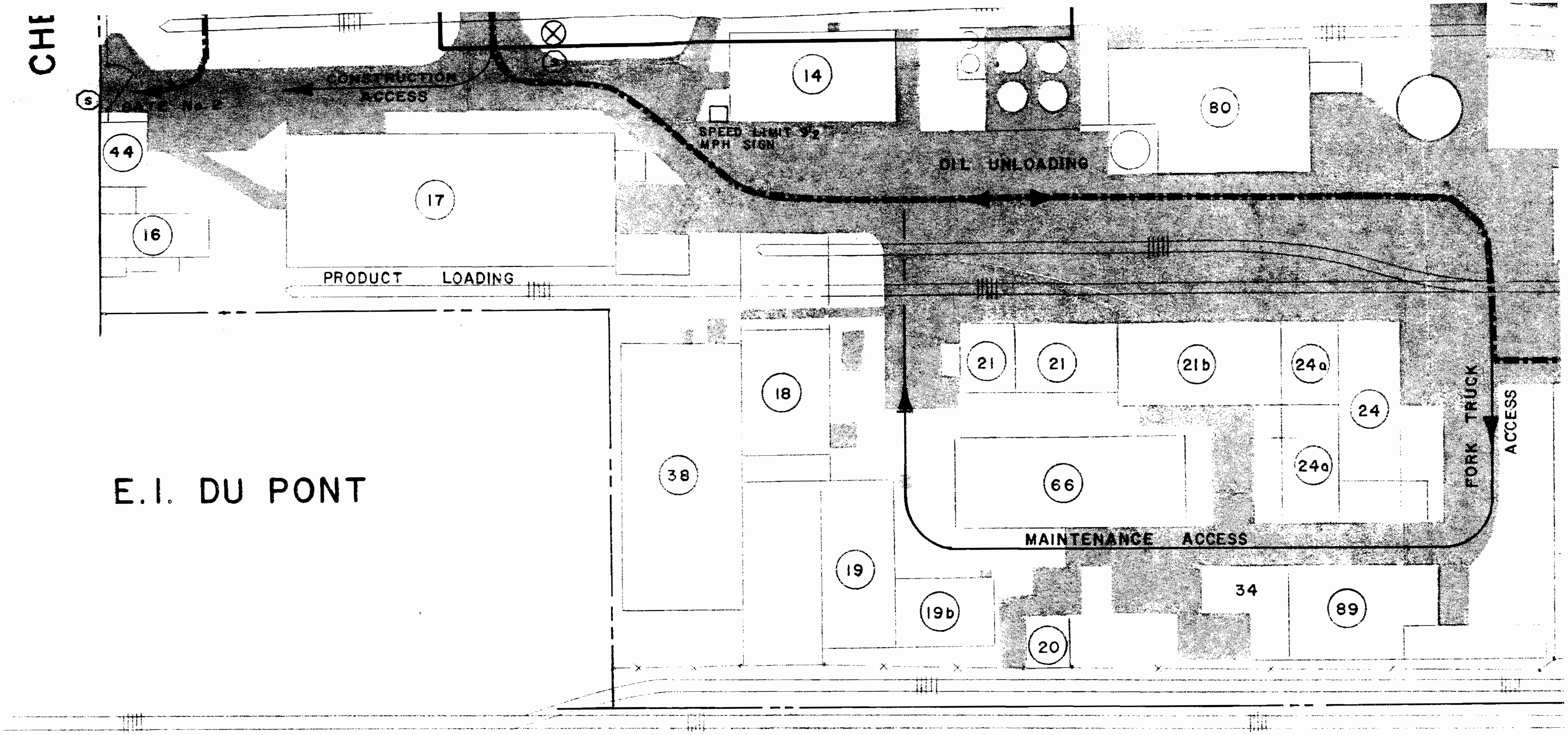
Olin
NIAGARA PLANT

RCRA PART B APPLICATION
PLANT 2, DETAIL

PROJECT NO. | C.A.R. NO. | SCALE | DRAWING NUMBER | REV. 1



27
26
28
TRUCK ACCESS
RAW MAT'L. AND FORK TRUCK ACCESS
83
85
96
96
96
96a
MAIN TRAFFIC
LUNDUM RD.
GATE No. 22
TL
40
50
97
FORK TRUCK ACCESS
37
RESTRICTED ACCESS
33
60
TRUCK ACCESS
BRINE MUD TREATMENT AREA
RESTRICTED ACCESS
FOR DETAILS OF BRINE MUD AREA SEE DWG. D-0000-B40-10-4
73
43
32
31
BRINE MUD LOADING
GILL CREEK



PLANT TRAFFIC PATTERNS

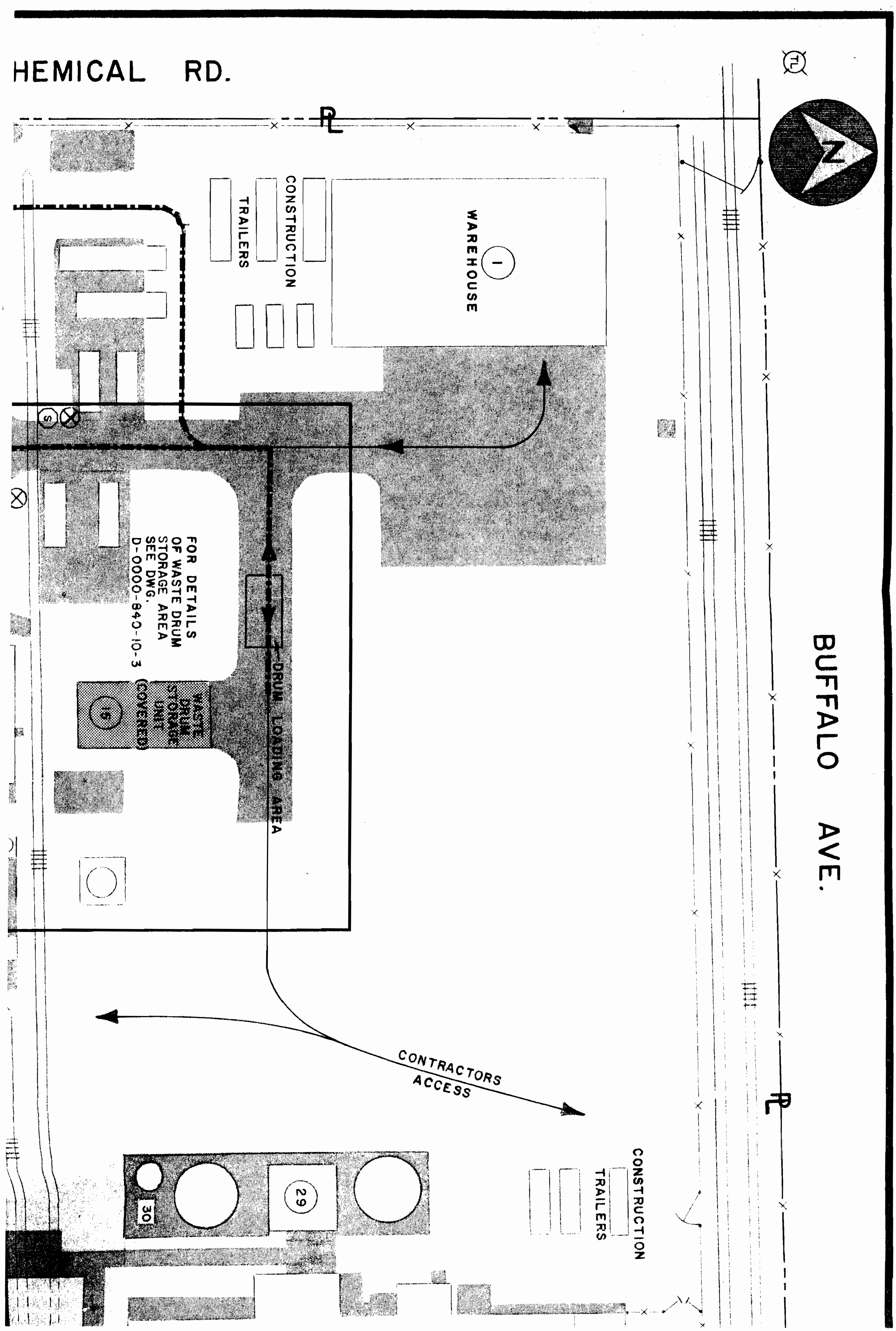
HAZARDOUS AND/OR NON—HAZARDOUS

NORMAL

PAVED AREAS

ADAMS AVE.

D-0000-830-10-20	PLANT 2 ALL EXIST. AND ABANDONED SEWER LINES. (FOR BLDG. LOCATIONS.)			1	REM NOR


HEMICAL RD.
BUFFALO AVE.
N
TL
℄
1
WAREHOUSE
CONSTRUCTION
TRAILERS
FOR DETAILS
OF WASTE DRUM
STORAGE AREA
SEE DWG.
D-0000-840-10-3
WASTE
DRUM
STORAGE
UNIT
(COVERED)
15
DRUM LOADING AREA
CONTRACTORS
ACCESS
CONSTRUCTION
TRAILERS
29
30