HISTORIC AND CURRENT SITE CONDITIONS REPORT

FORMER VACUUM OIL REFINERY SITE
ROCHESTER, NEW YORK

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June 13, 2005

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1.0 INTRODUCTION

AMEC Earth & Environmental, Inc. (AMEC) has prepared this *Historic and Current Site Conditions Report* regarding the Former Vacuum Oil Company – Rochester Works site located in Rochester, New York on behalf of ExxonMobil Refining & Supply - Global Remediation (ExxonMobil). The Vacuum Oil Company site encompasses various parcels of land located on the western shore of a bend in the Genesee River, located in Rochester, Monroe County, New York (see Figure 1-1). Based on the historical research conducted, the Vacuum Oil Company operated a refinery at this location from approximately 1866 to 1935. At its maximum extent, the company operations extended from Violetta Street, south and east to the Genesee River; and east of Exchange Street and Cottage Street to the river. A street map depicting this area is shown as Figure 1-2. As will be discussed at length later in this report, most of the processing, blending and refining operations, as well as all of the administrative and research areas were located between Flint Street and Violetta Street. Areas south of Flint Street contained some processing areas and the majority of the storage tanks. The area between Flint Street and Violetta Street is at present, almost entirely covered by buildings, pavement, and parking lots.

This report focuses on the portion of the historic Vacuum Oil Company Rochester Works property that is currently bounded by Flint Street, Exchange Street/Cottage Street, and the river (see Figure 1-3). For the purposes of this report, the section of property bounded by Flint Street, Exchange Street/Cottage Street and the river, as shown in Figure 1-3, will be identified as "the Site". To present a clearer understanding of the location of areas within the Site boundaries, the Site will be subdivided to correspond to both historic and current circumstances of the property.

The subdivisions of the Site, shown on Figure 1-4, are as follows:

- Former Storage/Operations Area
- Former Barrel Preparation/Storage Area
- Former Canal/Rail Line Area
- Bicycle Path Area

- Undeveloped Area

While the area between Violetta Street and Flint Street that was the location where Vacuum Oil first began operations is not the focus of this report, it will be discussed because of its historical significance and will hereby be identified as the Former Main Plant Area.

The goal of this research was to identify the historic operations and conditions at the Site during the time that it was occupied by Vacuum Oil. The objective of the research activities was to develop an understanding of the process areas, disposal areas, laboratories, storage areas, tankage and contents, pipelines, types of chemicals used, types of products produced, types of wastes produced, and points and methods of shipping and distribution that were associated with Vacuum Oil and its refinery operations.

The Vacuum Oil Company is a predecessor of Mobil Oil Corporation.

The New York State Department of Environmental Conservation (NYSDEC) has raised environmental concerns with ExxonMobil regarding the former Vacuum Oil Site. In 1992, the NYSDEC removed approximately 400 to 500 tons of petroleum sludge that was buried on the southern portion of Site. There were no known operations that were identified in that area.

The Department conducted a Site Assessment in 1999 and 2000. The NYSDEC conducted this investigation as a result of petroleum sludge that was discovered during the construction of the Genesee River bike trail. The Site Assessment was intended to provide information regarding possible environmental contamination on the Vacuum Oil property and determine whether the site should be listed on the New York State Listing of Inactive Hazardous Waste Disposal Sites. While the NYSDEC does not plan to list the Site on the New York State Listing of Inactive Hazardous Waste Disposal Sites as per ECL Section 27-1305 (Finster, 2001), the State reported the presence of surface soil, subsurface soil and groundwater contamination by petroleum products, and, to a lesser extent, by chlorinated volatile organic compounds, metals and pesticides. The Site Assessment concluded that the site contamination is not the result of the

disposal of consequential amounts of hazardous wastes and has been referred to the NYSDEC Bureau of Spill Prevention and Response.

Based on the concerns raised by the NYSDEC, ExxonMobil initiated this review of historic conditions associated with the property, as well as a determination of the current general physical conditions of the area that included the Vacuum Oil property. The NYSDEC focused on the portion of the historic Vacuum Oil Works property that is presently undeveloped and currently owned by either the City of Rochester or First Rochester Associates (bounded by Flint Street, Exchange Street/Cottage Street, and the river). A bicycle path that was built by the City of Rochester, and can be found bordering the Genesee River, traverses that area.

As the former refinery was demolished in the 1930's, the only visual indications of the Site are scattered building foundations, slabs and supports. In order for ExxonMobil to make sound technical decisions regarding future activities, it was necessary to develop, to the extent possible, a thorough understanding of the property and the operations that Vacuum Oil maintained during its tenure onsite. The information summarized in this report is intended to provide ExxonMobil with a technical basis for the possibility of future activities in the area.

This report was developed based on research that was conducted through a variety of informational sources on the area. A partial list of those sources included:

- Aerial Photographs (historic and present-day);
- Sanborn Fire Insurance Maps;
- Personal Interviews;
- Historic Society information;
- Tax maps and historic plats;
- City of Rochester Public Library Historical Department; and
- Regulatory/Municipal Agencies such as NYSDEC, Department of Health, City of Rochester, Monroe County.

Physical surveys were made of the Site on November 3, 2004 and December 6 and 7, 2004. Photographs from those site visits are included as Appendix A. In addition, Environmental Data Resources, Inc. (EDR) was used to develop reports identifying historic topographic maps of the area (Appendix B) and historic aerial photographs by decade (Appendix C).

1.1 SITE LOCATION

The Site is located in the City of Rochester, Monroe County, New York. It is south of downtown Rochester, located along Exchange Street. Flint Street and Violetta Street bound the Former Main Plant Area. The Former Main Plant Area is occupied by several buildings and parking areas. The Site (the land south of Flint Street) is generally wooded and undeveloped. There are several concrete structures resembling former tank and building foundations and several fire hydrants located in this wooded area. The portion of the Site adjacent to the Genesee River is currently utilized for community recreational purposes. A bike path runs along the same course as the former Erie Railroad spur, which serviced the Vacuum Oil Facility. A scrap yard is currently in operation on the western boundary of the Site adjacent to Flint Street. Residential properties bound the Site to the west and south, the Genesee River is present to the east and light commercial/industrial properties are present to the north.

1.2 TOPOGRAPHY AND DRAINAGE

The Site is located along the western bank of the Genesee River. It is separated from the river by a concrete retaining wall that appears to date from the time of plant operations. In general, the Site slopes gently downward to the west, until the line of residential homes was reached, where the elevation rises sharply to about 20 to 30 feet above the plain where the former facility stood. The Site landscape is uneven in nature. Much of the land is covered with historic fill material probably dating from the early days of Vacuum Oil operations. The bike path is elevated and appears to have been built on additional fill that was brought in to support the former rail lines. There is a deep drainage feature that lies between the two branches of the bike path that are found in the eastern portion of the Site (the Bicycle Path Area). Other low spots that appear to

retain water on a permanent or semi-permanent basis can be found in the Former Canal/Rail Line Area.

1.3 SITE GEOLOGY

Based on previous Site investigations, the Vacuum Oil Site consists of both native soils and fills. Fills are present at various points throughout the Site and were encountered from 0-6 feet below grade. Site fills consist of bricks, slag, cinders, gravels, wood and miscellaneous debris. Native soils are generally encountered from 0-16.5 feet below grade. Native soils consisted of sand and silts with varying amounts of clay. Based on the boring logs from previous investigations, the soil types observed are consistent with fluvial and overbank deposits expected in a Site adjacent to the Genesee River. Ground water was encountered at varying depths ranging from 3-8 feet across the Site. Bedrock was never positively identified in any of the previous investigations, but based on the New York State Geologic Map, the Site is likely underlain by the Silurian Lockport Formation. The Lockport Formation is a widespread sedimentary unit, which consists of primarily dolostones with occasional interbedded shales. The Lockport Formation is a widespread unit across the Great Lakes region and is interpreted to have been deposited in shallow seas during the Silurian Period. The Lockport Formation is approximately 180 feet thick in the Rochester area.

1.4 ECOLOGICAL SETTING

The undeveloped portion of the site is primarily early to mid-stage woods characterized by a mix of deciduous species that vary slightly in assemblage between the relatively wetter floodplain to the slightly higher moist woods. There are no clear dominant species in these communities, but some are more abundant than others. Appendix D presents a list of plant species observed on the site. Plant species that are abundant in the wetter portions of the site, including wetland pockets, are eastern cottonwood (*Populus deltoides*), black willow (*Salix nigra*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), pin oak (*Quercus palustris*), sweetgum (*Liquidambar styraciflua*), and American sycamore (*Platanus occidentalis*) in the canopy layer, with an

understory of southern arrowwood (*Viburnum dentatum*), silky dogwood (*Cornus amomum*), witch hazel (*Hamamelis virginiana*), spicebush (*Lindera benzoin*), and saplings of the aforementioned canopy species. The relatively drier, but still moist, woods contain a mix of Norway maple (*Acer platanoides*), red maple, pin oak, red oak (*Quercus rubra*), sweetgum, and American sycamore in the canopy layer, with an understory of witch hazel, southern arrowwood, and bush honeysuckle (*Diervilla lonicera*).

The ground and vine layer in both communities is well dominated by Japanese honeysuckle (*Lonicera japonica*), with red raspberry (*Rubus idaeus*) in the wetter areas and Allegheny blackberry (*Rubus allegheniensis*) in the drier areas. Also abundant in the ground and vine layer is poison ivy (*Toxicodendron radicans*), Asiatic bittersweet (*Celestrus orbiculatus*), goldenrod (*Solidago* spp.), garlic mustard (*Alliaria officinalis*), ground ivy (*Glecoma hederacea*), field garlic (*Allium vineale*), bedstraw (*Galium* spp.), and Virginia creeper (*Parthenocissus quinquefolia*).

In addition to some of the non-native and/or invasive species noted above, there are a few significant monotypic pockets and stands of staghorn sumac (*Rhus typhina*), Japanese knotweed (*Polygonum cuspidatum*), and common reed (*Phragmites australis*) in the pedestrian/bike path portions of the site, and a population of pachysandra (*Pachysandra terminalis*) alongside remnant canal features in the southern portion of the site.

Regarding community age, the largest diameter trees were typically observed in the wettest portions of the site. These trees exhibit a diameter at breast height (dbh) of up to 16 inches. There were several fallen and rotting logs that exhibit diameters that exceed 16 inches. Tree diameters generally tended to decrease northward, toward Flint Street, with the smallest and thinnest trees just south of the three-story building and parking lot. Based on the size and maturity of the trees, it is estimated that the age of the woodland community at the Site is at least 50 years old.

Wildlife species observed on or adjacent to the site, or noted by sign, included gulls (family Laridae), mallard (*Anas platyrhynchos*), rock dove (*Columba livia*), downy woodpecker (*Picoides pubescens*), American crow (*Corvus brachyrhynchos*), eastern gray squirrel (*Sciurus carolinensis*), and white-tailed deer (*Odocoileus virginianus*). A resident claimed that red fox (*Vulpes vulpes*) are commonly seen on the site (Personal Communication Leah Sick, 2004). Although few wildlife species were observed or noted during the site investigations, it is anticipated that a large number of generalist species utilize this Site, as it is a relatively large expanse of undeveloped land in a riverside urban setting. Appendix E presents a list of the above wildlife species and the type of observation used to document its presence (i.e., direct sighting, call heard, etc.).

Although much of the forested floodplain on the site is wetland, four areas of standing water were consistently identified during the site investigations, and one area exhibited standing water occasionally. Three small pockets of standing water were located in the southwest portion of the site (Objects 7, 9 and 10 on Figure 3-1). All three of these standing water pockets were linear in shape and oriented in a northeast/southwest direction. The maximum depth of the standing water was approximately four inches. These pockets were located at the base of the slope that leads to the residential development. Surface water was observed to be seeping down this slope, providing the hydrology to support individual specimens and small populations of lurid sedge (*Carex lurida*), soft rush (*Juncus effusus*), and sensitive fern (*Onoclea sensibilis*).

A relatively larger area of standing water was present to the northwest of the existing three-story building. The northeastern end of this standing water area bears the characteristics of a drainage ditch (i.e., a well-defined linear morphology), whereas this characteristic transitions to a relatively broad and diffuse standing water area to the southwest. The maximum depth of standing water was estimated to be approximately 12 inches at its northeastern end. A biologically derived iron sheen was observed on the water surface.

A fourth area of standing water is occasionally present in the drainage swale between the two bike paths. This area is a linear depression situated between two pipe culverts with drainage to

the northeast. Although no standing water was observed during the November 3, 2004 and December 6 and 7, 2004 physical surveys (see Section 1.0), previous site visits conducted by ExxonMobil have indicated the presence of standing water in this area.

2.0 HISTORY OF VACUUM OIL ROCHESTER WORKS

The following sections summarize the information that was developed regarding the history of the Vacuum Oil Company Rochester Works facility.

2.1 VACUUM OIL COMPANY CHRONOLOGY

The history of Vacuum Oil begins in the very early days of the oil industry with the research on oil refining that was conducted by two men, Mr. Mathew Ewing and Mr. Hiram Everest. Ewing was an early pioneer in the petroleum industry, who conducted experiments in refining crude oil using a kitchen stove and a washboiler, in the backyard of a house on Monroe Street in Rochester, New York, owned by Everest. The successful results of those experiments resulted in development of a process to distill crude oil in a vacuum and as such produce a greater volume of kerosene than other methods that were in use at the time. The vacuum distillation process was outlined in a U.S. patent (Number 56852) that was issued to both men on July 31, 1866 and eventually became the technological base for Vacuum Oil. The features of the patented process included feeding the crude oil continuously through duplicate condensing chambers so as to adapt it to continuous operation and to allow for the preservation of a vacuum. Ewing was the technical resource behind the patent, while Everest provided financial backing for the venture.

While the intent of the initial experimentation was to enhance the refining of crude oil for the production of kerosene, the true interest of Mr. Everest was in the residual oil that was generated by the vacuum distillation process (Vacuum Oil, Undated). The text detailing historical site assessment of the Vacuum Oil Company's facilities and locations is included as Appendix F. Vacuum Oil (Undated) is included as Appendix G. As the result of further experimentation using the vacuum oil process, two additional patents were issued on September 11, 1866. One patent was issued to Mr. Ewing for the residual oil as an improved product for lubrication and other uses, and one to both Ewing and Everest for an improved apparatus for distilling petroleum. The patent notes that the improvement was "introducing jets of superheated steam into and through the mixture of oil in the still and having the arrangement of the heated pipe in

close proximity so as to lessen the amount of oil in the retort" (Vacuum Oil, Undated). Everest was also issued a patent on September 3, 1867 for the combination of two or more vacuum petroleum stills arranged so that the oil was fed from one retort to another.

Mr. Everest and Mr. Ewing founded the Vacuum Oil Company in Rochester, New York on August 28, 1866 and incorporated the company on October 4, 1866. Sometime between 1866 and 1867, the first Vacuum Oil operational still (considered to be of "semi-commercial size") was constructed on Mansion Street (now Exchange Street). The distillate products were sold as kerosene, while the residual oil was sold as machine lubricant and leather refinisher (Vacuum Oil, undated).

The Vacuum Oil Company opened their first office on Andrews Street sometime between 1867 and 1868. For the next few years, the company slowly expanded their product lines and the distribution of their products. In 1873 the offices were moved to Main Street. Historic information also indicates that in 1875, a warehouse for Vacuum Oil was located on Litchfield Street on the New York Central Railroad lines. Litchfield Street is located north of the Site, between what is now Interstate 490 and Route 33, and between King Street and Canal Street. Figure 2-1 shows the approximate locations of these facilities.

In 1874, the original semi-commercial still and the wooden still house in which it was located were both destroyed by fire. Vacuum Still Number 1 was built after the fire in 1875 and housed, along with vacuum pumps, condensers and receivers in a brick building located off of Mansion Street. The next two pieces of production equipment, Vacuum Still Number 2 and Number 3, were erected between 1875 and 1876. Two of these stills had a capacity of 60 barrels each and one had a capacity of 50 barrels. The buildings in which Still Number 1 and Still Numbers 2 and 3 can be seen in Figure 2-2 (courtesy The Center for American History, The University of Texas at Austin), a photograph of the Rochester Works as it was in 1879. Figure 2-3 is the same photograph with the buildings and surface features identified (Baxter, undated). A copy of Baxter (undated), which is an excerpt from the Vacuum Oil News company newsletter, is attached as Appendix H.

Vacuum Stills Numbers 4 and 5 were built between 1876 and 1877 (Vacuum Oil, Undated), each with a capacity of about 200 barrels. The first storage tanks (Numbers 1, 2, 3, and 4), each with about a 500 barrel capacity, were erected in 1877. In 1878, Vacuum Oil built a 20,000 square foot brick warehouse at the works on Mansion Street (now Exchange Street). Vacuum Oil also built a kerosene warehouse in 1878 on Glasgow Street on the Erie Railroad, north of the works. That warehouse was abandoned in 1881 and a new warehouse was built at the works on Mansion Street in 1884.

Information developed on the history of Vacuum Oil indicates that the Rochester Works was approximately eight acres in size in 1881, and contained a number of brick buildings. The information source (Commerce, Manufacturers and Resources, 1881) indicates that at the time, the plant contained 18 steam pipes, four engines, eight stills and nine boilers. The Works produced about 300 barrels of kerosene a day, which could be piped to the Glasgow Street warehouse for storage in a 7,000-barrel onsite storage tank. The 1888 Tax Platt showing the warehouse on Glasgow Street is presented as Figure 2-4.

By 1887, Wagner (1990) notes that the Vacuum Oil Works had 135 tanks and six boilers onsite, though most of these were located in the Former Main Plant Area. Figure 2-5 is an 1892 Sanborn map showing the layout of the Former Main Plant Area. As shown on Figure 2-6, the Site was mostly undeveloped in 1892, containing only eight large oil tanks located in what is identified in this report as the Former Storage/Operations Area of the Site.

The continued development and build up of the Site can be seen in Figure 2-7, a 1910 Tax Platt of the Vacuum Oil Rochester Works. Figure 2-8 is a 1912 Sanborn Map showing the Former Main Plant Area. Figure 2-9 is a Sanborn Map showing the layout of the Vacuum Oil property south of Flint Street in 1912. Table 2-1 summarizes the buildings and aboveground storage tanks that were present onsite, based on the 1912 Sanborn Map, as well as on the 1892 Sanborn Map. In 1916, the Rochester Works occupied fifteen acres and maintained a large number of filters and other equipment for finishing lubricating oil stocks, a large compounding facility, a barrel

factory and a can factory (Rochester Democrat & Chronicle, 1916). Figure 2-10 shows the layout of the Rochester Works in 1918, based on the Tax Platt for that section of Rochester. Figure 2-11 shows the layout of the facility as shown in the 1926 Tax Platt. An undated map of Vacuum Oil that is believed to be, based on a review of other dated maps, contemporary to the 1926 Tax Platt is included as Figure 2-12.

Figure 2-13 (courtesy The Center for American History, The University of Texas at Austin) is an undated photograph of the Rochester Works. Based on the evidence from other maps and drawings developed during the research on the history of Vacuum Oil, it is believed that the picture is from the late 1920's. Figure 2-14 is the same photograph with the buildings and surface features identified, based on the information provided in Figure 2-11 and Figure 2-12.

Historic information reviewed as part of this research notes that it is unclear as to when Vacuum Oil actually stopped operations at its Rochester Works facility. The Rochester Times Union (1955) reported that with the passing of the oil fields in Pennsylvania, it was no longer profitable for the Rochester Works to be kept open and it was closed prior to the depression.

It is known that Vacuum Oil discontinued its facilities on Glasgow Street by 1900 and that by 1935 all of the operations on Mansion Street had ceased. As shown in Figure 2-15, the Sanborn Map for the area in 1938, the area between the line of private residences along Exchange Street, south of Flint Street and west of the old Pennsylvania rail line was still owned by Socony-Vacuum Oil (a successor to Vacuum Oil), but was vacant. The former barrel factory and preparation buildings located between the old Pennsylvania rail line and the Genesee River were present, but were also vacant. Figures 2-16 and 2-17 (Sanborn Maps for the periods 1950 and 1971) further document the vacant nature of the property since the closing of the facility in 1936. Wagner (1990) notes that Standard Oil acquired a controlling interest in Vacuum Oil in 1879, and organized the Standard Oil Trust in 1882. The Trust lasted until 1911, when the U.S. government broke it up. In 1931, SOCONY and Vacuum Oil merged, with the name being changed to Mobil Oil in 1959. An undated brief history of SOCONY Mobil Oil that was prepared by Socony Mobil Oil Company, Inc. is presented as Appendix I.

2.2 RAW MATERIALS AND TYPES OF PRODUCTS

Up until 1890, the primary raw material used at the Vacuum Oil Works was crude oil, which was used in the preparation of finished lubricant products. Vacuum Oil began receiving crude oil in wooden barrels from the Bradford Field located in Pennsylvania in 1869. It was estimated in 1887 that Vacuum Oil used over 4 million gallons of crude oil per year (Wagner, 1990).

With the purchase of the Olean Works in Olean, New York in 1890, the Rochester Works facility no longer needed to accept crude oil. Instead it began accepting raw lubricant stocks from the Olean Works for conversion into salable products. Olean at that time was a delivery point for the main pipelines coming north from the oil fields in Bradford, Pennsylvania. The purchase of the Olean Works from the Eclipse Lubricating Oil Company did away with the necessity to transport crude oil stock to the Rochester Works. Naphtha, refined oil, fuel oil and other products (considered to be by-products of the distillation process used at the Rochester Works) were then handled solely at the Olean Works. Raw lubricating stocks were sent to Rochester by rail car for finishing, barreling, canning, and shipping (Rochester Democrat & Chronicle, 1916).

In the first years of operations, Vacuum Oil made kerosene as the primary distillate. The residual oil was used in finishing leather, and, after the addition of lamp black, was used in refinishing harness boots and other black leather goods (Wagner, 1990). However, the primary interest of Hiram Everest, the co-founder of Vacuum Oil, was in the residual oil produced in the vacuum distillation process. So, in the 1870's, lubricating oils for machinery use began to be generated as the primary product. The production of cylinder lubricating oils followed soon after. Hiram Everest patented the lubricating oils produced through the Vacuum Oil process under the name Gargoyle 600-W (Barnes, 1981). Lubricating oils were sold under the trade name Gargoyle throughout the life of the Rochester Works.

Paraffin was introduced as a product in 1884. In 1888, a line of neutral oils was introduced, and in 1889, spindle oils were introduced for use at cotton spinning mills. In the 1880's, naphtha was sold as a product. It was estimated that over the last half of 1886 and the first half of 1887, that

Vacuum Oil produced over 500,000 gallons of naphtha. Out of that amount, over 300,000 gallons were shipped to the Rochester Municipal Gas Works. Marine engine oils were introduced in 1895.

One of the buildings present in the 1920's was marked as the Transil Oil building. Transil is another name for transformer oils, which are defined as "clay treated napthenic hydrocarbon oils". This oil was in use prior to the advent of polychlorinated biphenyls (PCBs) and was non-carcinogenic.

2.3 KNOWN PROCESSES USED AT THE VACUUM OIL WORKS

The basic process used at the Vacuum Oil Works included the distillation of crude petroleum under pressure to produce lubricating oils, naphtha, and kerosene.

The following information was prepared by the Sunday Morning Herald (February 1, 1880) and is presented in the City of Rochester History regarding the Vacuum Oil Company:

> *"The kerosene works are across the canal, and have been in operation but a few months. The manufacture of illuminating oils from the distillates have been coupled with the original business, and it is hardly necessary to say that the quality made cannot be surpassed, if equaled, anywhere. These works (i.e., the kerosene works) turn out three hundred barrels per day, and the product is piped to the distributing warehouse on Glasgow Street. The strip of land, on which the kerosene works are located, is equivalent to an island, and remote from everything except the river, railroad and canal. A 40-horse power boiler furnishes the power. The fuel used is gasoline instead of coal, and a great saving (estimated at one hundred dollars a week) is thereby engendered. The stills will produce about three hundred and fifty barrels of kerosene every sixteen hours. The distillates, or the portion of crude oil that has not been manufactured into lubricating or leather oil, are pumped from the older works. A new 7,000-barrel tank for holding refined oil has just been constructed.*
>
> *In the manufacture of lubricating oil, the stills contain coils of superheated steam of 800° or 1000°, from which stills the oil passes through pipes in a condensing tank containing cold water.*
>
> *At the end of the condensing tank, in the illuminating oil process, is the tail house, where the oil is graded according to its specific gravity; thence to the receiving tanks, thence to*

the agitator, which holds five hundred barrels, where the oil is purified with acids, after which it receives a treatment of caustic soda. From the agitator the oil goes to bleaching tanks – there are two, of a capacity of three hundred barrels each. Here it settles and cleans itself in a few hours, and is then ready for the market. No particular care is necessary to avoid fire in the bleaching house, which is an ordinary wood structure; for a lighted match thrown in the oil would not ignite it, so thoroughly is it freed from naphtha."

The document goes on to say:

"The only residuum is about twelve barrels of tar to a tankful (350 barrels.) This tar is afterward converted to parafines.

The manufacture of lubricating oils reverses the process of making illuminating oils. The crude oil is run in the stills, containing vacuum (if the bull may be permitted); the superheated steam is turned on, the distillates evaporate and are passed to condensers, while the lubricating oil remains in the still, and is afterward run into coolers, from whence it is pumped into storage tanks. In making the lubricating oil, it is desirable to free the crude from the distillates, and in making the illuminating oils the desideratum is to free the crude from everything but distillates!"

Figure 2-18 shows the original designs for the vacuum process stills.

A review of the 1892 Sanborn maps show the presence of a building containing agitators in the main plant area between Flint and Violetta (see Figure 2-5). Agitators refer to the use of acid washing of the lubricating oil to remove impurities. Sulfuric acid would have been the probable acid used in this washing process. Barnes (1981) indicated that filtering, settling, blending, and compounding were used to produce Gargoyle Mobiloils and Gargoyle Lubricants. Compounding involved the mixing of stocks of oils according to various formulas to make the needed grades of oil.

The 1912 Sanborn maps suggest that by that time period, the facility had changed their filtering process from an acid wash to a filtering process. While buildings and equipment associated with this process were limited to the main plant area between Violetta and Flint, the 1912 Sanborn Map does show the presence of filtering buildings containing storage areas for clay and kilns for recharging the clay after use (see Figure 2-8). The filtering buildings are present just to the north

(to the right) of the building marked "Canning Bldg". A small building marked as an acid house is still located between the line of oil tanks and the Grease Manufacturing Building in the Former Storage/Operations Area of the Site (see Figure 2-9 and Figure 2-14).

2.4 WASTE MATERIALS AND DISPOSAL AREAS

There is little information that can be presented regarding the specifics of waste products produced through the formulation of lubricants at the Vacuum Oil facility, other than the formation of kerosene and naphtha, which while the original goal of Vacuum Oil, was in actuality a by-product of the vacuum distillation process. A summary of the potential waste materials generated at the refinery is as follows:

1. The vacuum distillation process would result in the generation of very heavy residues such as waxes and asphalts for which there was no use at the time;
2. Tank bottoms; very possible that when these materials rose to sufficient levels in storage tanks that the ability to move stored oil through piping was impaired, that the bottoms were cleaned;
3. Solids from settling tanks;
4. Solids from cooling tanks;
5. Wastes from furnaces and the fire boxes from the stills (coke, ash, and cinders);
6. Soaps and additives that might have been used in the manufacturing process of the greases and lubricants;
7. Spills and leaks associated with transfer of oil, gasoline, and product within the plants or off-loaded from rail cars;
8. Residuals from coal pile;
9. Spent filter cake;
10. Laboratory wastes;
11. Machine shop oils and wastes; and
12. Garbage and household debris.

In comparison to other petroleum refining operations the production of oil and grease is not a particularly dirty operation.

There is no information regarding onsite disposal areas and practices. Wagner (1990) notes reports of a burning pit being present somewhere onsite. The pit was closed in 1887 due to complaints about odors and smoke.

2.5 PIPELINES

The following information is taken from Wagner (1990). He notes that there are scattered and vague reports of pipelines that ran from the Vacuum Oil Works to various locations in the City of Rochester. From the information available, he indicates that there were at least three pipelines that did exist at one time. A three-inch line ran from the Vacuum Oil Works location at Mansion Street, along the Erie Railroad, and connected to three tanks located at the Vacuum Oil operations located on Glasgow Street. A second pipeline, two inches in diameter, ran along the same course to Glasgow Street, then ran through Glasgow Street to the old Genesee Valley Canal, and then on to the Central Hudson Railroad near Litchfield Street. A third pipeline ran from the Municipal Gas Works through Frank Street. Figure 2-19 shows the approximate layout of these pipelines.

2.6 SEWERS

The following information is taken from Wagner (1990). Until 1887, Vacuum Oil discharged their wastes to the Rochester city sewers. After that time, Vacuum Oil installed a complete system of drains and sumps of their own to handle surface water and groundwater on their property, and the adjoining Pennsylvania railroad property. Figure 2-20 shows the approximate location of the sewer lines based on the 1892 Sanborn Map.

The Vacuum Oil system included an eight-inch tile drain that was four feet deep and located one hundred feet west of the Pennsylvania Railroad. This drain ran from the south line of the oil

company's property, north to a pump sump near the north part of their property. From the north side of this property was a drain behind a retaining wall that ran south of this pump sump.

Under the west ditch of the Pennsylvania Railroad was a ten-inch drain on rock, which flowed into a large sump between the Pennsylvania Railroad tracks. All of the track drainage was taken to this sump by drainage ditches. All of the buildings between the river and the Pennsylvania Railroad tracks also drained to the sump. From this sump, drainage was pumped to a main sump just to the west. Here most of the oil was recovered by a series of baffle sumps, after which it flowed to a sump east of the railroad and then to the Genesee River.

In addition to these sumps and sewers, there was a 24-inch discharge pipe that ran through a retaining wall on the east side of the property, and an 8-inch iron intake pipe that extended from an intake changer through an opening in the retaining wall about 100 feet south of an old 36-inch city water main. Vacuum Oil drew water from the river and had constructed a valve chamber on the back of the retaining wall at the point where the intake was located.

2.7 SHIPMENT AND MODES OF TRANSPORTATION

Vacuum Oil (Undated) reports that oil was received from regional oil fields in wooden barrels. These barrels were generally about 42 gallons in size. The earliest tank cars used to transport crude oil were simply flat cars with two cisterns located on them. Vacuum Oil eventually built six tank cars for transportation, each of which carried about 80 barrels of oil.

In the 1860's, kerosene was shipped from the Rochester Works in second hand wooden barrels that were obtained from wherever possible and were cleaned and coopered onsite. Lubricating oils were shipped from the works in tin cans. The first tin cans were recycled following use for shipping food to a local restaurant. Subsequently, a local manufacturer made tin cans for Vacuum Oil. Eventually, the company produced its own wooden barrels and tin cans. In the 1870's, kerosene was shipped from the works in tanks cars that had been used to receive crude oil. During that time period, the cars were cleaned with naphtha after the crude oil had been

removed and before kerosene was pumped into them. In 1872, oil-blacking shipments ran from 75 to 125 dozen quarts per day.

In 1878, product was shipped in barrels that were stored in the 20,000 square foot warehouse that was built at the Site. Also in 1878, the Genesee Valley Canal, which paralleled the Genesee River and divided the Works into two parts, was bridged and a trestle was built halfway into the warehouse (see Figure 2-14). Tracks were laid over the trestle to allow cars from the Erie Railroad to be shoved into the building for loading shipments of oil. Information regarding the history of Vacuum Oil indicates that the Canal was, at some point soon after 1879; filled in and served as the base for the tracks of the Pennsylvania Railroad Line (the Erie Railroad was the rail line that was laid down adjacent to the Genesee River.

2.8 HISTORIC INDUSTRIAL ACCIDENTS

Researched literature indicates that a number of industrial accidents occurred on property associated with the Vacuum Oil Company. Information in historical archives states that Fire Department officials indicate at least one tank car was pulled from the river during the life of the facility. Other information indicates that in 1874, fire destroyed a still and wood still house and that in 1878, a naphtha explosion burned down a shed. Another explosion occurred inside a still in 1882 and in 1889, a fire burned down a warehouse on Glasgow Street. In 1900, two retort buildings burned down and in 1901, a fire destroyed large parts of the works, including a number of storage tanks (Appendix G).

However, the largest documented accident at the Rochester Works occurred in 1887, when between 6,000 and 14,000 gallons of naphtha entered the Rochester municipal sewer causing explosions at four locations in the vicinity of the Works. As noted in Barnes (1981), the Rochester Works regularly sent naphtha through a pipeline that ran along the right-of-way of the Genesee Valley Canal to the Municipal Gas Company, which was located south of the Erie Canal and east of Canal Street. On December 21, 1887 Vacuum Oil pumped 14,000 gallons of naphtha to the Municipal Gas Company facility. According to historical documents, a leak in the

pipe allowed the naphtha to escape into a bordering sewer line. The Municipal Gas Company waited for hours before notifying Vacuum Oil. In the meantime, the naphtha collected beneath the streets of the industrial section of Rochester, where it eventually caught fire and exploded. The explosions occurred at the Eureka Steam Heating Company on Platt Street, at the intersection of Mill and Platt Street, in the basement of Congress Hall, and in the Clinton Flouring Mill (Barnes, 1981).

3.0 CURRENT SITE CONDITIONS

As previously mentioned, the field survey of the property on which the former Vacuum Oil Refinery was once located focused on the relatively undeveloped portion of the site which is roughly bound to the north/northeast by Flint Street. Some information is provided here regarding the portion of the site that is found between Flint Street and Violetta Street (see Figure 1-2). Appendix A presents the photographs that are cited in this section of the report.

The undeveloped portion of the site is bound to the east/southeast by the Genesee River (Photo 1), to the south/southwest by a non-distinct property line situated within a wooded area (Photo 2), and to the west/northwest by a moderate to steep slope situated between the site and neighboring residential and commercial property owners. The majority of the undeveloped portion of the site is wooded, but with the following major features: a three-story building and parking lot situated just south of Flint Street (Photo 3), an automobile salvage yard (i.e., junkyard) to the northwest of the building (also south of Flint Street) (Photo 4), paved pedestrian/bike paths with maintained lawn in the eastern side of the site (Photo 5), and a concrete bulkhead bordering the Genesee River (Photo 6). These major features are described below followed by additional descriptions of site features observed during a series of ground surveys conducted from November to December 2004. These surveys were conducted on foot and any feature that was deemed to be significant was photographed and its location logged in with a hand-held geographical positioning system (GPS) unit. These features are depicted on Figure 3-1.

3.1 EXISTING PHYSICAL FEATURES

The three-story building is constructed of concrete block, is roughly trapezoidal in aerial view, and is coincident with the drum storage building depicted on the 1912 and 1938 Sanborns and the 1926 Plat. This building was reportedly last used for commercial purposes as a food warehouse. According to personal interviews, this building is currently used for storage, though some areas of the building are currently used as residences. The rear of the building is

constructed of building materials that differ from the front and sides. These materials are believed to be fireproof brick and block. Typically, such materials would have been used for structures that housed furnaces or conducted some sort of incineration. Based on the review of available Sanborn maps and existing documentation, it is not known whether or not this building, or a portion of this building, was used for such purposes. An asphalt parking lot is located to the rear (southwest) of the building, accessible via a paved driveway along the northwest side (landward) of the building (Photo 7). A large expanse of debris and rubble is present to the south of the parking lot (Photo 8). This rubble and debris extends well into the wooded portion of the site, and contains a mix of tires, metal cables, railroad ties, concrete fragments, and scrap lumber.

A linear drainage swale approximately 5 feet in width-surrounded by a narrow strip of emergent and forested wetland is located to the west of the building and parking lot (Photo 9). This ditch is coincident with the historic location of the canal. This narrow wetland strip transitions to an upland wooded community with a rise in elevation to the northwest (i.e., towards the junkyard). As previously described in Section 1.0, approximately one foot of standing water was observed in the deepest part of the swale during the site investigations.

The section of the drainage situated between Flint Street and Violetta Street (i.e., the developed portion of the site) is relatively narrow and exhibits distinct, but gradually sloping banks (Photo 10). In contrast, the drainage to the south of Flint Street (i.e., the undeveloped portion) broadens into a diffuse forested floodplain. A small dilapidated building, coincident with the unnamed building located just southeast of an old box factory building depicted on the 1926 Platt is present on the east side of the drainage ditch between Flint and Violetta Streets (Photo 11). A large pile of discarded paint balls was noted on the west bank of the ditch, slightly north of the remnant building (Photos 12 and 13).

The junkyard is active and some of the debris (e.g., tires and scrap parts) associated with its operations was observed in piles throughout the site (Photos 14 to 16). Most of these debris piles are situated near the junkyard property line, although numerous tires were also observed much

farther south of the junkyard. A resident claimed that area youths repeatedly set fire to the tire piles about once or twice per year (Anonymous Resident #1, 2004).

A pedestrian/bike path, coincident with the historic path of the Erie Railroad and the W. N. Y. B. P. Railroad lines, bisects the eastern portion of the site. The southern portion of this path is split, with one side extending to the railroad trestle for the river, and the other side continuing along the river (Photo 17). With the exception of two drainage swales situated between the main path and the spur, this area is characterized by maintained lawn (Photos 18 to 20). Two sewer manholes and a short-riser monitoring well are located in line with the end of Flint Street (Photo 21). This well is one of four wells documented to be present on the site. The field investigation discovered three of the four wells (see Objects 29, 44, and 77 in Figure 4-1 and Photos 22 and 23).

A concrete bulkhead borders the Genesee River along the east/southeast site boundary. This bulkhead is developed into a public viewing area at the northern end of the site proper (i.e., by Violetta Street) (Photo 24), whereas the southern end of the bulkhead is somewhat dilapidated and/or obstructed from view by vegetation (Photo 25).

3.2 SITE FEATURES IDENTIFIED DURING GROUND SURVEY

As indicated above, Figure 4-1 presents a graphical depiction of all features observed during the site investigation. Presented below are further details of the site features that are considered to be significant.

Objects 24, 25, 26, and 27 are large concrete retaining walls situated near the bottom portion of the slope between the site and the residential development (Photos 26 to 28). Objects 25, 26, and 27 are semi-circular, whereas Object 24 is more of a distinctly three-sided structure. These retaining walls are coincident with the historic locations of above-ground storage tanks, first apparent on the 1912 Sanborn Map, that were located to the northwest of the grease manufacturing building and southwest of the settling tanks. Objects 78, 79, and 80 are additional

large concrete retaining walls located farther upslope, closer to the salvage yard property. These retaining walls are coincident with the historical location of aboveground storage tanks first appearing on the 1918 Plat. These were located to the west/southwest of the settling tanks. -

Located immediately to the southeast of Object 27 (semi-circular retaining wall) and Object 29 (monitoring well) is a square concrete walled structure (Object 28 and Photo 29) that measures 83 inches on each side. The walls are approximately 26 inches tall and 13 inches wide. This structure is coincident with an unnamed building just southwest of the old grease manufacturing building depicted on the 1926 Plat.

Object 19/20 is a concrete wall coincident with the stave storage buildings depicted on the 1926 Plat (Photos 30 to 32). This wall is approximately 40 inches at its maximum height, is oriented in a northeast/southwest direction, and separates the relatively lower elevation to the northwest from the relatively higher elevation to the southeast.

Three wall sections (Object 11 – Photo 33, Object 13/14 – Photo 34, Object 15/16 – also Photo 34) are situated on three separate terraces along a moderate slope between the site and the residential development. These walls are approximately 12 to 13 inches wide on their upper surface, and are approximately 5 feet in height. The wall sections are longest on the uppermost terrace and decrease in length with lowering elevation.

Aside from the two modern sewer manholes located in line with the end of Flint Street (Photo 21), two older sewer manhole covers (Object 4 – Photo 35 and Object 38 – Photo 36) and two discarded sewerage sections (Object 22 – Photo 37 and Object 49 – Photo 38) are located at various locations throughout the site. Markings were only visible on the sewer manhole cover at the northwest end of the site (Object 38 – Photo 36), which read "Sanitary MC PW". As stated earlier, the field investigation also discovered three of the four wells (see Object 29 – Photo 22, Object 44 – Photo 23, and Object 77 in Figure 3-1). No visible markings were observed on any of these wells. A section of metal piping/tubing that resembles a well casing (Object 42 – Photo 39) is located to the northeast of the Object 44 monitoring well.

Five hydrants were found on the site (Object 21 – Photo 40, Object 23 – Photo 41, and Object 33 – Photo 42) in a line along a topographic break, and Objects 59 (Photo 43) and 74 (Photo 44) in a line along a different topographic break). Most of the hydrants are depicted on the 1892, 1912 and 1938 Sanborn Maps and the 1926 Plat.

A remnant of a concrete structure that resembles a floor pit used in industrial processes (Object 47 – Photo 45) is located near the base of the slope between the floodplain and the main pedestrian/bike path. Long sections of wall or foundation roughly oriented in a northeast to southwest direction are located throughout the approximate center of the site. Objects 58 (Photo 46), 60 (Photo 47), and 61 (Photo 48) form a two-sided structure that is coincident with the stave storage buildings depicted on the 1926 Plat. Objects 63, 64, 65, 70, 71, and 73 (Photos 49 and 50) also form portions of a structure that is coincident with the stave storage buildings depicted on the 1926 Plat.

A few unique machinery parts and industrial debris were also found. A bowl-shaped metal structure that appears to be coated on the inside surface with blue enamel (Object 41 – Photo 51) is located to the southeast of the three-story building. A resident claimed that this particular structure is a component of an industrial oven (Anonymous Resident #2, 2004). Several large mounds of what appears to be slag material (Object 53 – Photos 52 and 53) are located near the center of the site. These mounds are approximately 4 feet in height, 3 feet in width, with a surface that appears to be rusting metal shavings. A piece of machinery containing a placard reading "Reel-O-Matic" (Object 52 – Photo 54) is located just east of these slag mounds. Finally, a large piece of molten plastic (Object 51 – Photo 55) is located to the east of the Reel-O-Matic. Appendix A presents photographs (Photos 56 to 94) of the site in addition to those cited within this section.

4.0 OVERVIEW OF SITE-RELATED ENVIRONMENTAL STUDIES

AMEC acquired historical environmental assessment and investigation reports from regulatory agencies located in Rochester, New York. AMEC personnel reviewed these reports for summary purposes with regards to the general scope of work, sampling and analysis results, resultant areas of concern, and determination of any possible data gaps. The following sections detail the referenced reports.

4.1 1989 Oil and Hazardous Material Site Evaluation

The earliest investigation identified by AMEC was the *Oil & Hazardous Material Site Evaluation, Flint – Exchange Site, Rochester, New York* (dated August 1989), prepared by H & A of New York for Rochester City School District and included as Appendix D to the NYSDEC Site Investigation Report (see Appendix K). As per this report's Executive Summary, this investigation was 'a preliminary evaluation of the potential for oil and hazardous material to exist on the subject property, and potential site construction considerations (foundation types and disposal of site materials) so as to assist the Rochester City School District in evaluating the potential liability associated with ownership, financing and development of a school on the property'. The scope of work for this investigation consisted of reviewing public files, interviews, soil vapor sampling, test borings, soil analysis, and general visual observations of environmental conditions.

The scope of work was reportedly limited to the city-owned, vacant portion of the subject property. Based on figures associated with this report, this area encompassed property from the end of Flint and Violetta Streets (and in between) east toward the Genesee River; as well as right-of-way property along Exchange and Violetta Streets, and limited property south of Flint (widths ranging from 75 feet at the western end to 250 feet at the eastern end of Flint Street). It appears that none of this investigation addressed the area between Flint, Violetta, and Exchange Streets, which is currently improved with commercial and industrial buildings, nor did it address

the majority of the wooded, vacant property south of Flint Street to Cottage Street and Utica Place.

According to this report, soil vapor samples were analyzed and three test-boring explorations (to apparent top of bedrock at 11-13 feet below ground surface) were completed. The three borings were reportedly located within the former Genesee Valley Canal, which is the area between Flint Street and Violetta Street (not included in this investigation) and west of the Genesee River. The soil vapor locations appear to have been completed within the Genesee Valley Canal, along the right-of-way on both sides of Flint Street, Exchange Street and Violetta Street.

Laboratory analysis for volatiles, semi-volatiles, priority pollutant metals, petroleum hydrocarbons and hazardous waste characteristics were conducted on select soil samples. No petroleum hydrocarbon compounds or volatile organic compounds were detected above the laboratory detection limits (0.0003 parts per million (ppm) or less). A composite soil sample from site borings was analyzed for semi-volatile organic compounds. According to the report, ten compounds were possibly present at the detection limit (0.00033 ppm) but could not be quantified. The report concludes that the compounds detected were common by-products of fossil fuel combustion and, where criteria have been established, sample concentrations fell below published USEPA Health Based Criteria for residues in soil.

In addition, a composite of surficial soils was analyzed for priority pollutant metals. Each metal concentration detected was below the reported average for metal compounds naturally present in soils. According to the report, analysis for hazardous waste characteristics (EP toxicity, reactivity, corrosivity, ignitability) was also performed on a shallow soil sample, which was deemed not hazardous based on the results.

4.2 2001 NYSDEC Site Investigation

The next investigation was documented in the *Site Investigation Report, Former Vacuum Oil Company, Site # 828089P, Rochester, Monroe County* (dated March 2001), prepared by New

York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation, Region 8. The text, drawings and pertinent attachments of the report are presented as Appendix L. The NYSDEC investigated a 24-acre portion of the former Vacuum Oil Company facility. The NYSDEC conducted this investigation as a result of petroleum sludge discovered during on-site improvements in 1992 (i.e., construction of the Genesee River bike trail). A newspaper article describing the petroleum sludge discovery from the December 1, 1989 Rochester Democrat and Chronicle is presented as Appendix M. This investigation was designed to provide additional information concerning the nature and extent of contamination on the Vacuum Oil property and determine whether the site should be listed on the New York State Listing of Inactive Hazardous Waste Disposal Sites.

The scope of work for this investigation consisted of a soil gas survey, subsurface soil samples, surface soil samples and groundwater samples (from three monitoring wells). The 24-acre portion investigated was described as being the area located along the western bank of the Genesee River, south of Flint Street (that area identified as the Site in this report). It should be noted that property north of Flint Street and South of Violetta Street (the Former Main Plant Area) was not included in the investigation.

According to this report, the following media samples were collected during their investigation:

1. 53 EMFLUX modules (soil gas survey points) were placed across the site. The modules were analyzed for 25 specific compounds including volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and/or total petroleum hydrocarbons (TPH).

2. Ten test pits and three soil borings were completed at the site as part of the subsurface investigation. A total of eight soil samples were collected from the ten test pits and analyzed for VOCs, SVOCs, metals, cyanide, pesticides and/or polychlorinated biphenyls (PCBs). Four soil samples were collected from borings MW-1 and MW-2 (two from each boring). All of these boring soil samples were analyzed for TPH. In

addition, soil samples were also analyzed for VOCs, SVOCs, and /or metals. No soil samples were collected from test pits TP-6, TP-7, TP-9, and boring MW-3 since there were no indications of impacted soils during the site investigation.

3. Five surface soil samples were collected and analyzed for TAL metals, cyanide, TCL VOCs, TCL SVOCs, TCL pesticides and PCBs.

4. Three groundwater samples were collected from on-site monitoring wells and analyzed for VOCs, SVOCs, metals, and TPH.

Figure 4-1 shows the location of the samples collected by the NYSDEC as part of this investigation.

As stated in the report, results from this investigation indicated petroleum-related contamination with respect primarily to SVOC and BTEX parameters in the surface soil, subsurface soil and groundwater on-site. The most significant petroleum contamination was detected in the northern portion of the site. The report also indicates that to a lesser extent, chlorinated VOCs, metals, and pesticides were also detected above New York State standards.

According to the Passive Soil Gas Survey Results and Contour Map: TPH (shown as Figure 4-2), two areas of concern are located at the northern portion of the Site in that area identified as the Former Barrel Prep and Storage Area and mid-section of the 24-acre Site (east of Riverview Place, centered on the southern end of the Former Canal Rail Line Area). It is noted that the soil gas survey results were difficult to adequately evaluate, as the concentrations were difficult to convert because of issues with units.

TPH concentrations ranged from 250 to 14,800 nanograms and 175 to 53,000 nanograms at these two areas, respectively Although Figure 4-2 illustrates that the TPH isopleths depicting a concentration of 250 nanograms exists across the junkyard, this reported concentration was extrapolated, as the area currently occupied by the junkyard was not included in the soil gas

survey. As noted in Figure 4-3, chlorinated volatiles, as detected by passive soil gas points, were highest at the northern south of the existing on-site building. Total chlorinated volatile concentrations in that area ranged from 100 to 1,096 nanograms.

Subsurface analytical results indicate similar areas of concern as noted from passive soil gas survey results. The sample detecting the most SVOCs, along with reporting the highest concentrations, was collected south of the existing building at the end of Flint Street. It should be noted that the collection of subsurface soil samples appeared to have been concentrated in the northern portion and middle area of the Site (as described above).

Surface soil samples were collected in the northern and southern portions of the site. All five surface soil samples detected concentrations of SVOCs and/or metals exceeding NYS standards. The more commonly distributed SVOCs included the high molecular weight polycylic aromatic hydrocarbons (PAHs): benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-c,d)anthracene; and the medium molecular weight PAH fluoranthene. Metals with positive concentrations included arsenic, copper, lead, magnesium, mercury, selenium, and zinc. The only VOCs that were positively identified were acetone and methylene chloride (two commonly detected laboratory contaminants)

Groundwater samples were collected from three on-site monitoring wells completed in the northern portion of the Site (south of Flint Street) only. The groundwater sample collected from MW-1, the well located closest to Flint Street, had in the highest concentrations of VOCs, as compared to the other two monitoring wells. The groundwater sample from MW-3 was non-detect for VOCs. Metals were detected in the three-groundwater samples in excess of a NYS Standard, Criteria or Guidance Value. While not defined, it appears that the groundwater samples were all analyzed as unfiltered samples.

Appendix N presents the NYSDEC Fact Sheet for the release of the Investigation Report.

5.0 CONCLUSIONS

This Historic and Current Site Conditions Report presents the results of the identification and review of information regarding the historic operations of the Vacuum Oil Rochester Works refinery and an understanding of the existing environmental conditions at the Site. The following conclusions can be drawn based on the completion of this report.

5.1 SUMMARY OF FINDINGS

The former Vacuum Oil Rochester Works extended from Violetta Street, south and east to the Genesee River; and east of Exchange Street and Cottage Street to the river. The bulk of the operations were located between Flint Street and Violetta Street. The presently undeveloped property south of Flint Street, which was the focus of this research, is approximately 37 acres in size and owned by the City of Rochester. At its height of operations in the late 1920's/early 1930's, the facility occupied approximately 10 buildings on the property south of Flint Street and had approximately 65 aboveground storage tanks holding lubricating stock and finished lubricating oil and grease in that area.

The primary wastes that would have been generated were residuals resulting from the operation of the stills; solids generated in the storage tanks, settling tanks, and condensing tanks; spill, leaks and drips from the storage, movement and handling of oil (kerosene, gasoline), as well as general trash and debris. The formulation of lubricates is a fairly clean operation in comparison to other oil refining processes. An examination of the photograph shown as Figure 2-14 (undated, but pictures the Site in approximately the late 1920's), which presents the northern section of the Site when the Rochester Works was in operation, did not identify any significant environmental concerns such as obvious disposal areas.

An environmental investigation conducted by the NYSDEC indicated the presence of a variety of inorganic and organic constituents. The results of the passive gas survey suggest that the concentrations of both total petroleum hydrocarbons (TPH) and volatile organic compounds

(VOCs) were located in an area that centered on production and storage, located in the northern portion of the Site (south of Flint Street). The area encompassed areas that were historically covered by the grease manufacturing building, a still building, condensing tanks, portions of the rail line, the barrel preparation building and the drum storage building. However, this area also covers almost all of the present day junkyard, whose presence may greatly confound the interpretation of any present-day analytical results to historic refinery operations (no NYSDEC samples were collected on the junk yard property). The highest soil gas concentration of TPH was located in the central portion of the Site, in a location where no historic tank or refinery operations occurred.

While the soil gas survey did yield positive detections in the central and southern sections of the Site, the historic information did not indicate the presence of buildings or refinery operations in that part of the Site. While the physical survey of the property conducted as part of this research identified a number of isolated remnants of the refinery, most of those remnants were located in the northern section of the Site. Fewer artifacts were observed the further south on the Site the survey moved. No indications of waste pits, landfills, or open areas of debris were observed as part of that survey.

5.2 CONCLUSIONS

Based on the findings of this report, AMEC has reached the following conclusions regarding the environmental conditions at the Site:

- The bulk of the refinery operations took place north of Flint Street, while refinery operations did occur south of Flint Street, these operations included grease manufacturing, storage tanks and support operations (i.e., barrel/drum preparation and storage);
- The presence of the active junkyard will significantly complicate the ability to interpret environmental data from the northern portion of the Site (south of Flint

Street) as it will be difficult to distinguish between residuals left from the refinery operations and wastes released by the material in the junkyard;

- The NYSDEC soil gas survey results are at their highest concentrations in the center portion of the Site. There were no known tanks or refinery operations in this area;
- A variety of SVOCs (primarily PAHs) and metals were found in surface soil, subsurface soil and in groundwater wells that were completed in that area from the site during the NYSDEC investigations, with concentrations being somewhat higher in the areas where the former operations occurred;
- No visual signs of waste pits, landfills, or obvious areas containing significant amounts of debris were observed (aside from the existing scattered debris that appears to be of more recent origin);
- The NYSDEC investigation characterized constituents of concern that are associated with the Site, though delineation has not been completed; and
- There are issues related to the interpretation of the NYSDEC 2000 Site investigation data that were not considered and should be addressed if additional sampling was conducted. The NYSDEC did not consider the impacts the junkyard may be having on the environmental conditions of the Site and did not research that. The NYSDEC did not produce any background or reference information in order to understand the relative magnitude of the inorganic compounds.

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Vacuum Oil Company. Undated. Tabulated History of Vacuum Oil until 1909.

Wagner, C.M. 1990. Detailed Historical Site Assessment of the Vacuum Oil Company's Facilities and Locations. City of Rochester.

Figures

Figures

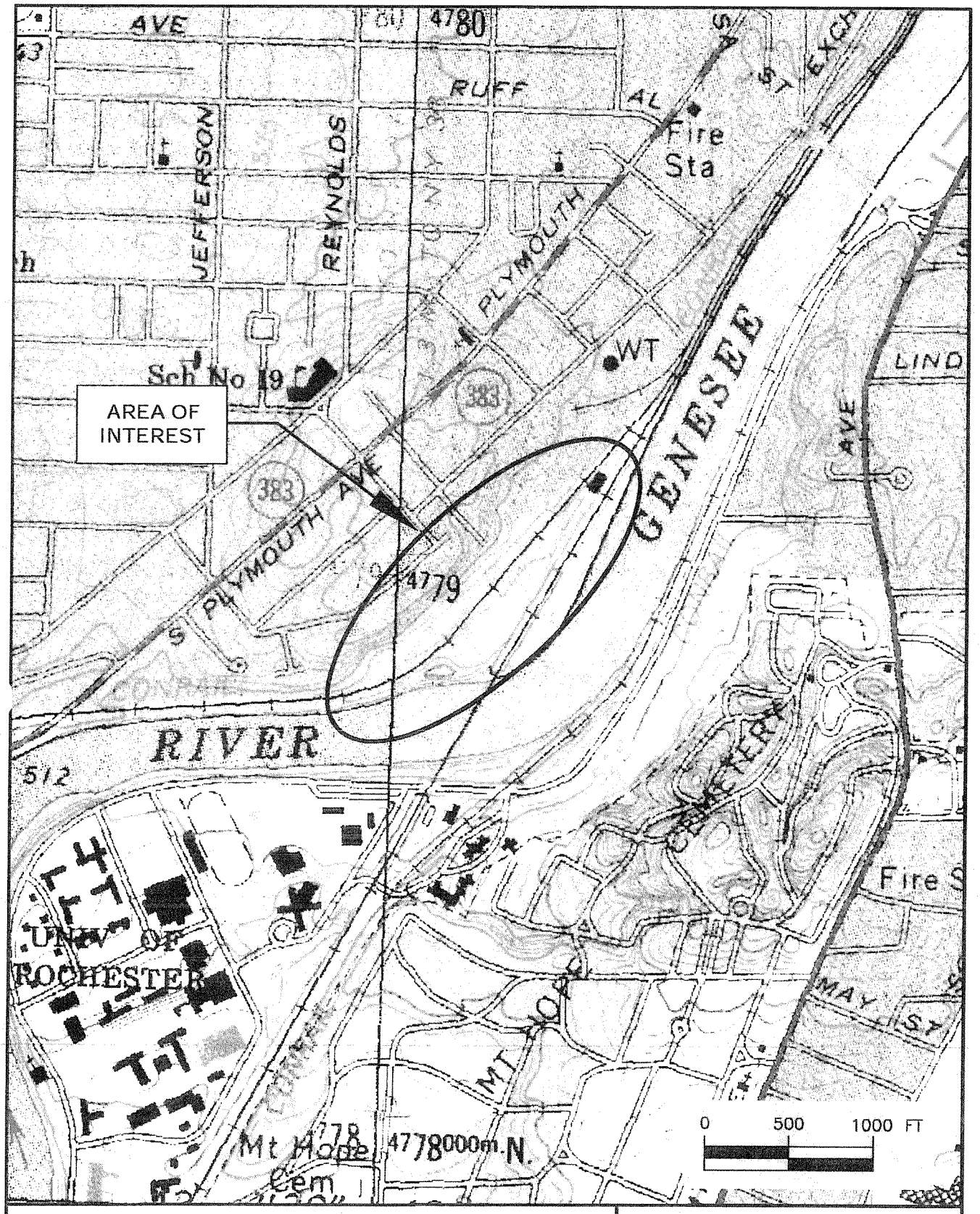


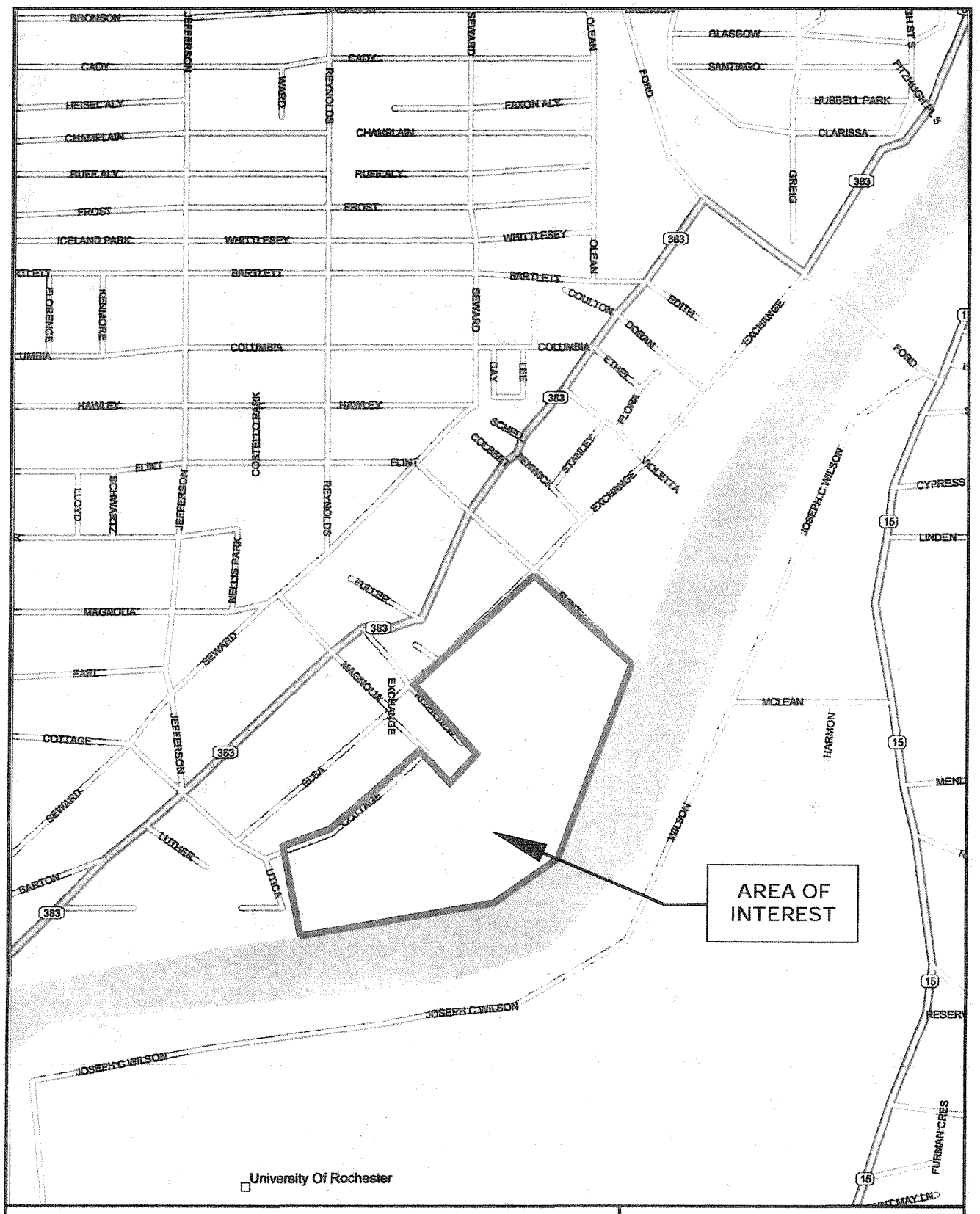
IMAGE SOURCE:

USGS Digital Raster Graphic Quarterquad, Rochester East, 1978
USGS Digital Raster Graphic Quarterquad, Rochester West, 1978

Figure 1 - 1

Site Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500



SOURCE:
DeLorme, Street Atlas USA, 1997

Figure 1 - 2
Site Location and Local Street Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
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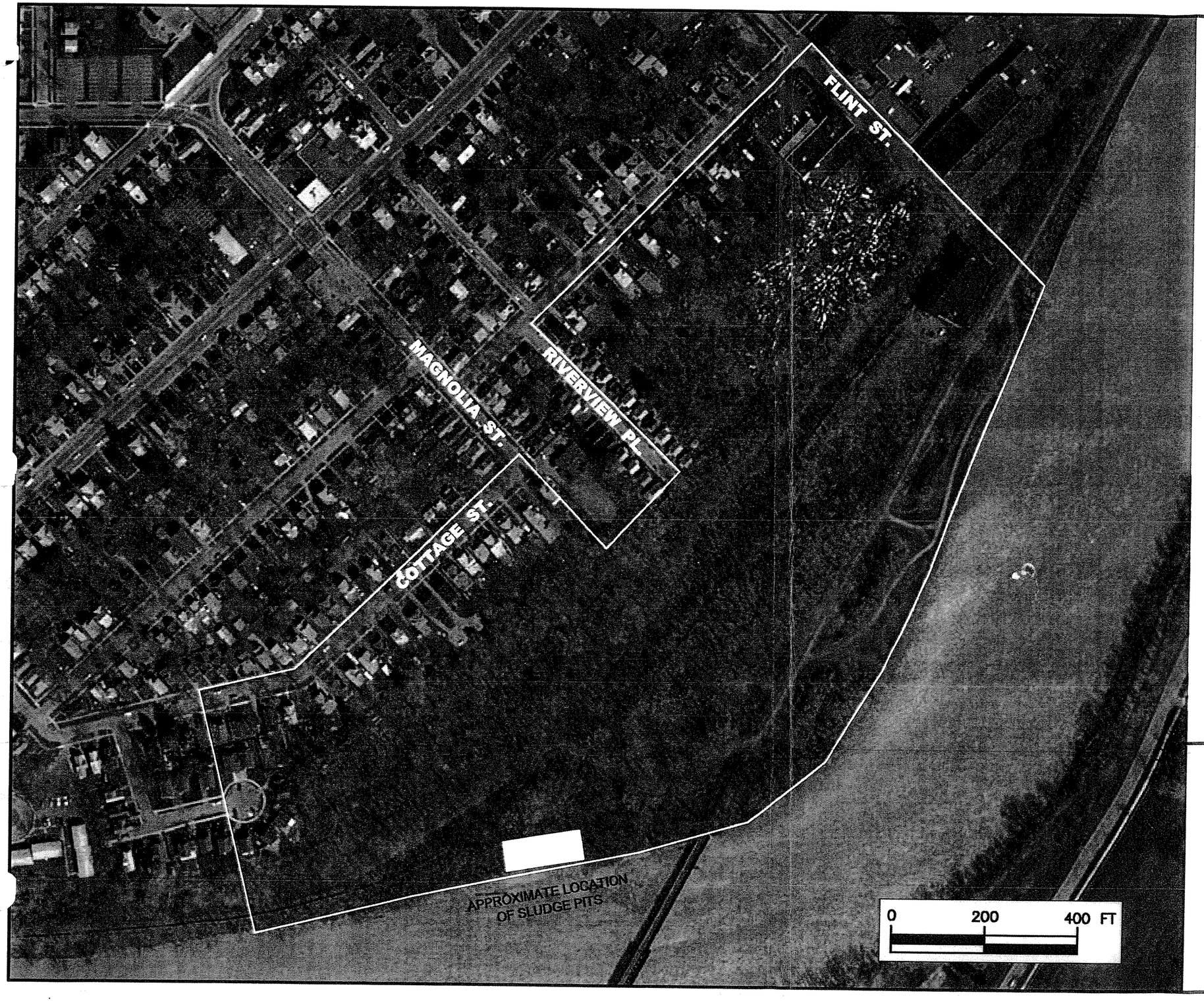
SOMERSET, NJ 08873
(732) 302-9500



N

LEGEND

APPROXIMATE LOCATION OF SLUDGE PITS

AREA OF INTEREST

IMAGE SOURCE:

NYS Digital Orthoimagery Program (NYSDOP)
Monroe County, City Of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

Figure 1 - 3

Site Layout
Vacuum Oil Historic Investigation
Rochester, New York

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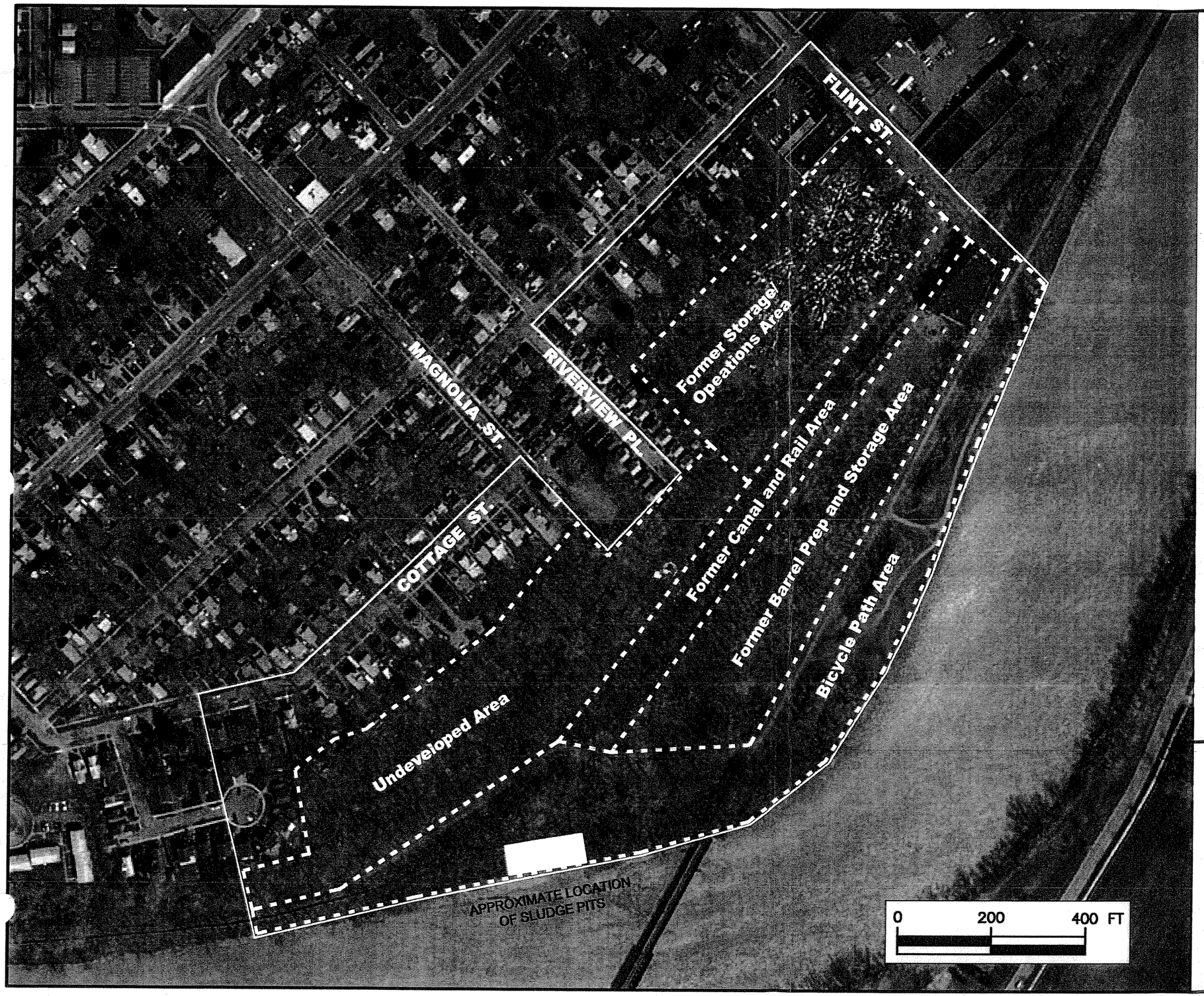
(732) 302-9500



LEGEND

APPROXIMATE LOCATION OF SLUDGE PITS

AREA OF INTEREST

SUBDIVISION AREAS

IMAGE SOURCE:

NYS Digital Orthoimagery Program (NYSDOP)
Monroe County, City Of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

Figure 1 - 4

Site Subdivisions
Vacuum Oil Historic Investigation
Rochester, New York

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(732) 302-9500

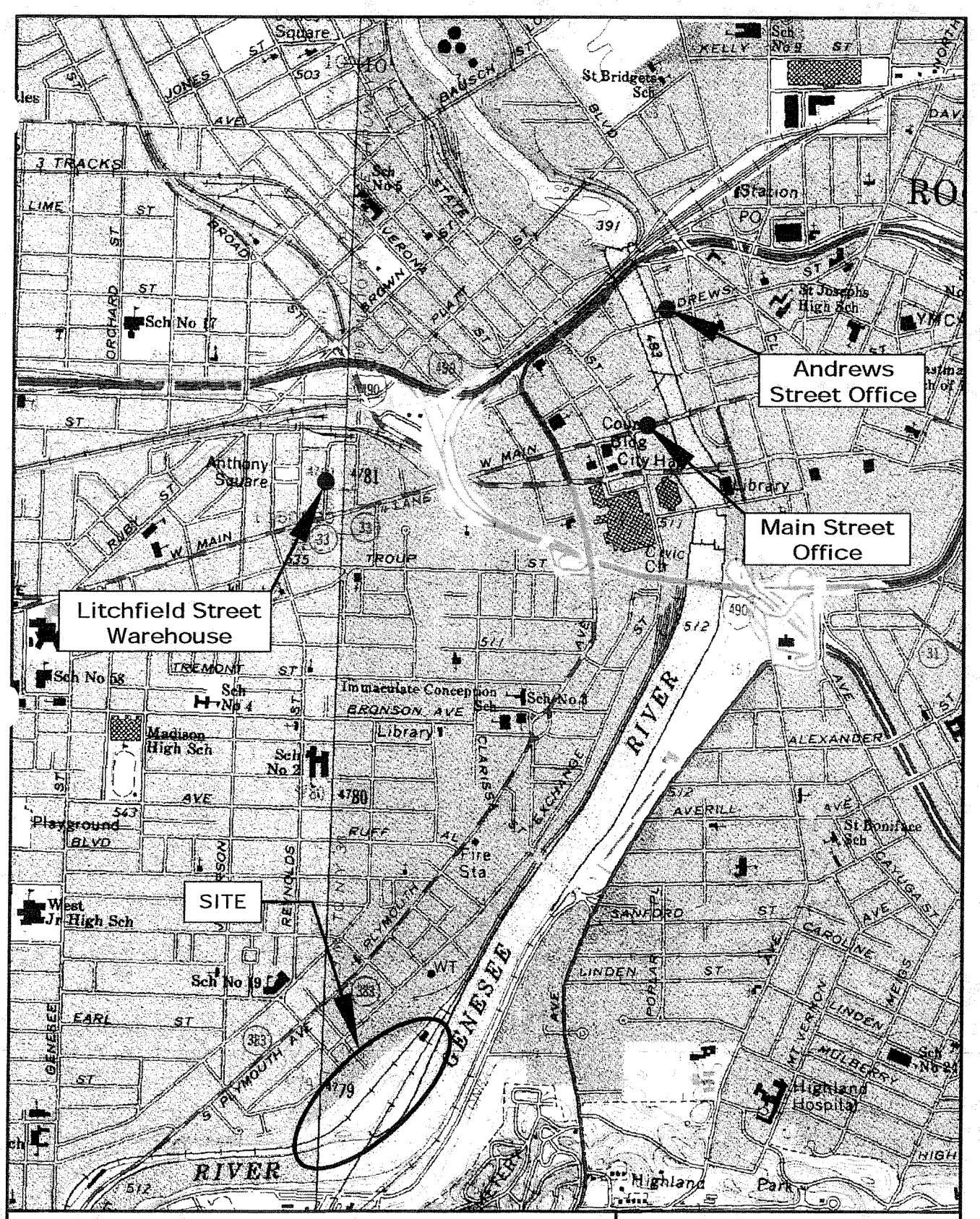


IMAGE SOURCE:

USGS Digital Raster Graphic Quarterquad, Rochester East, 1978
USGS Digital Raster Graphic Quarterquad, Rochester West, 1978

Figure 2 - 1

Historic Office Locations Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

IMAGE SOURCE: The Center for American History
The Univeristy of Texas at Austin

Figure 2 - 2

1879 Photograph of Rochester Works
Vacuum Oil Historic Investigation
Rochester, New York

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302--9500

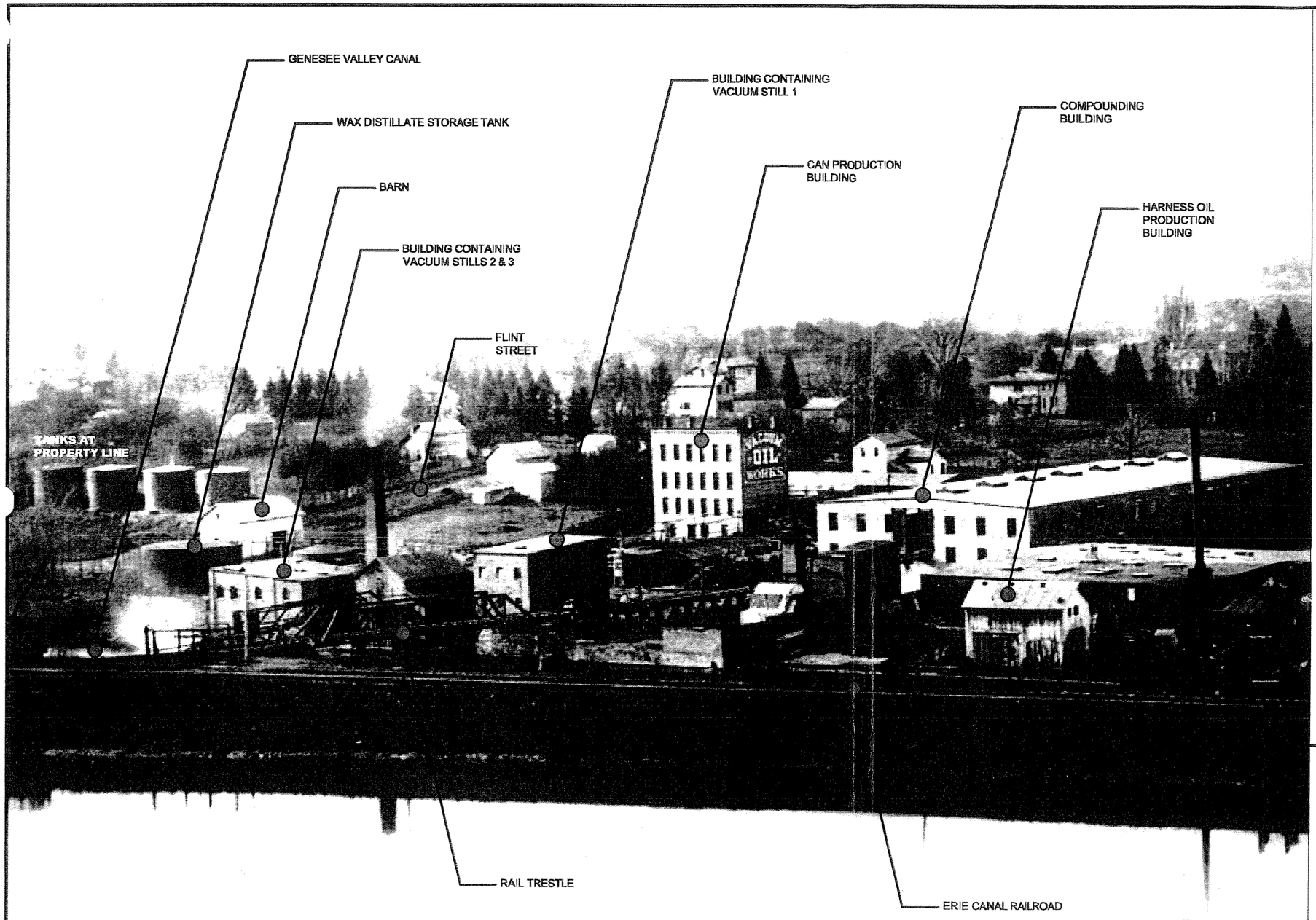
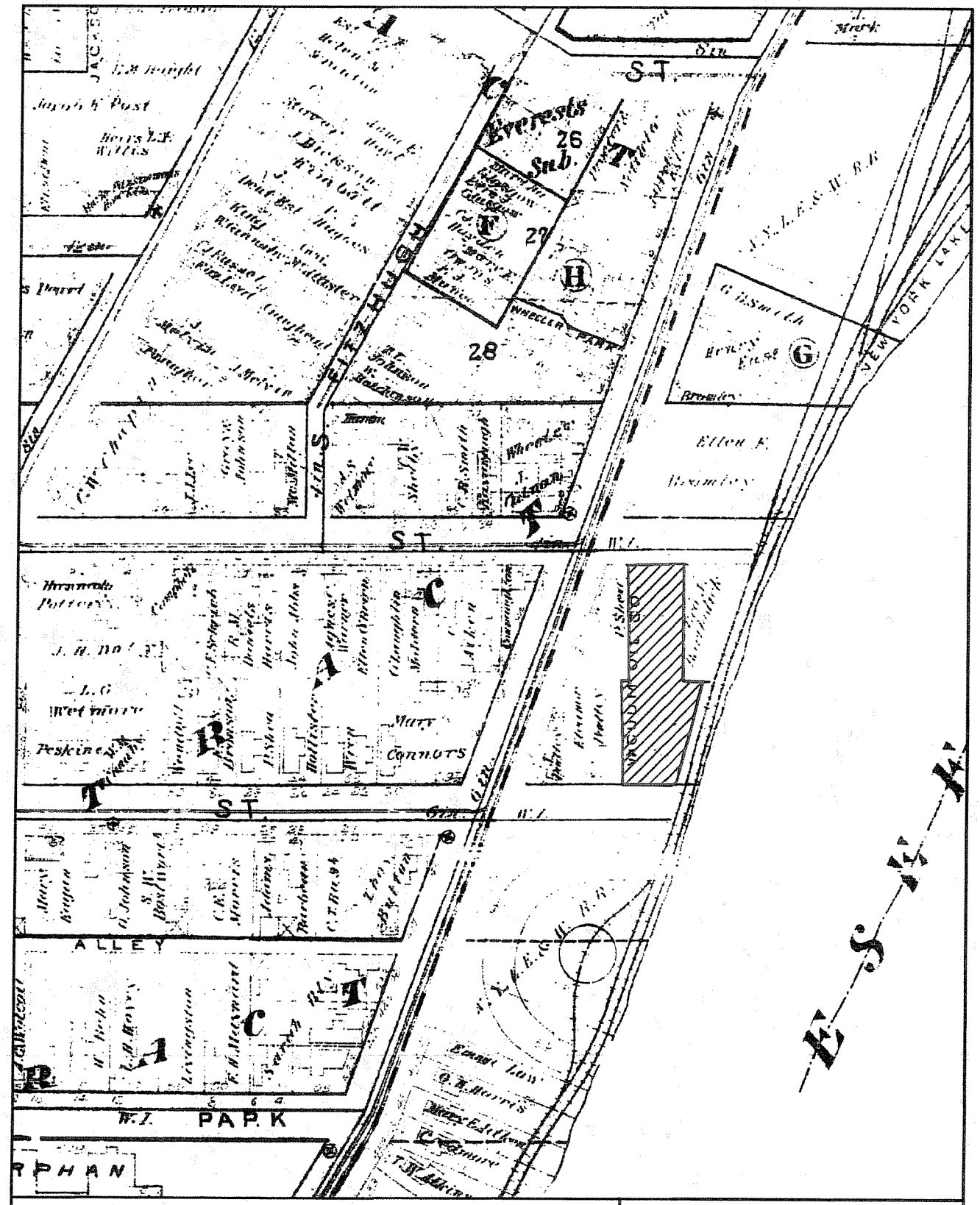


IMAGE SOURCE: The Center for American History
The Univeristy of Texas at Austin

Figure 2 - 3

1879 Photograph of Rochester Works (captioned) Vacuum Oil Historic Investigation Rochester, New York

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500



Source: City of Rochester, 1990

Figure 2 - 4

1888 Glasgow Street Tax Plat
Vacuum Oil Historic Investigation
Rochester, NY

amec
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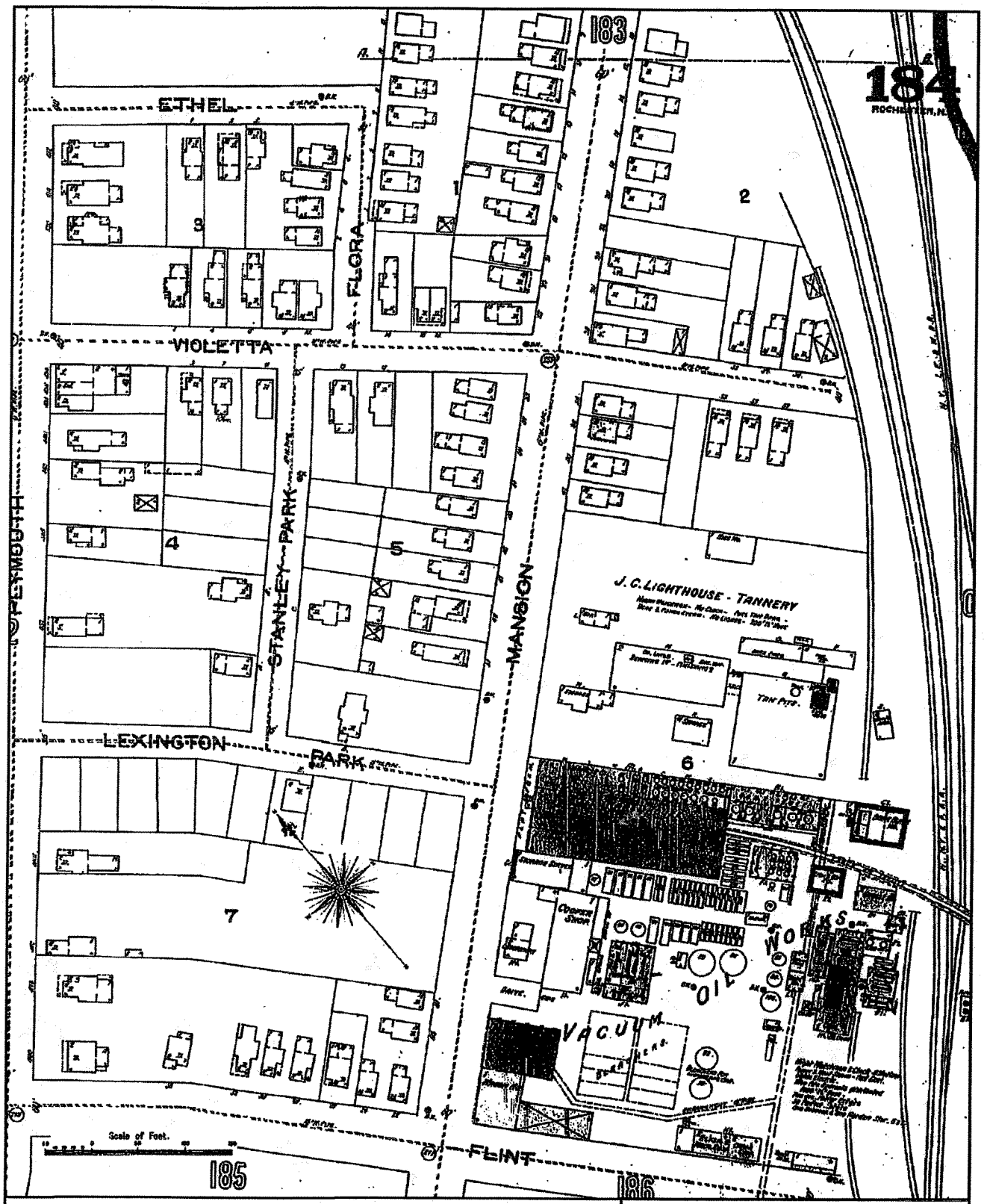
SOMERSET, NJ 08873
(732) 302-9500

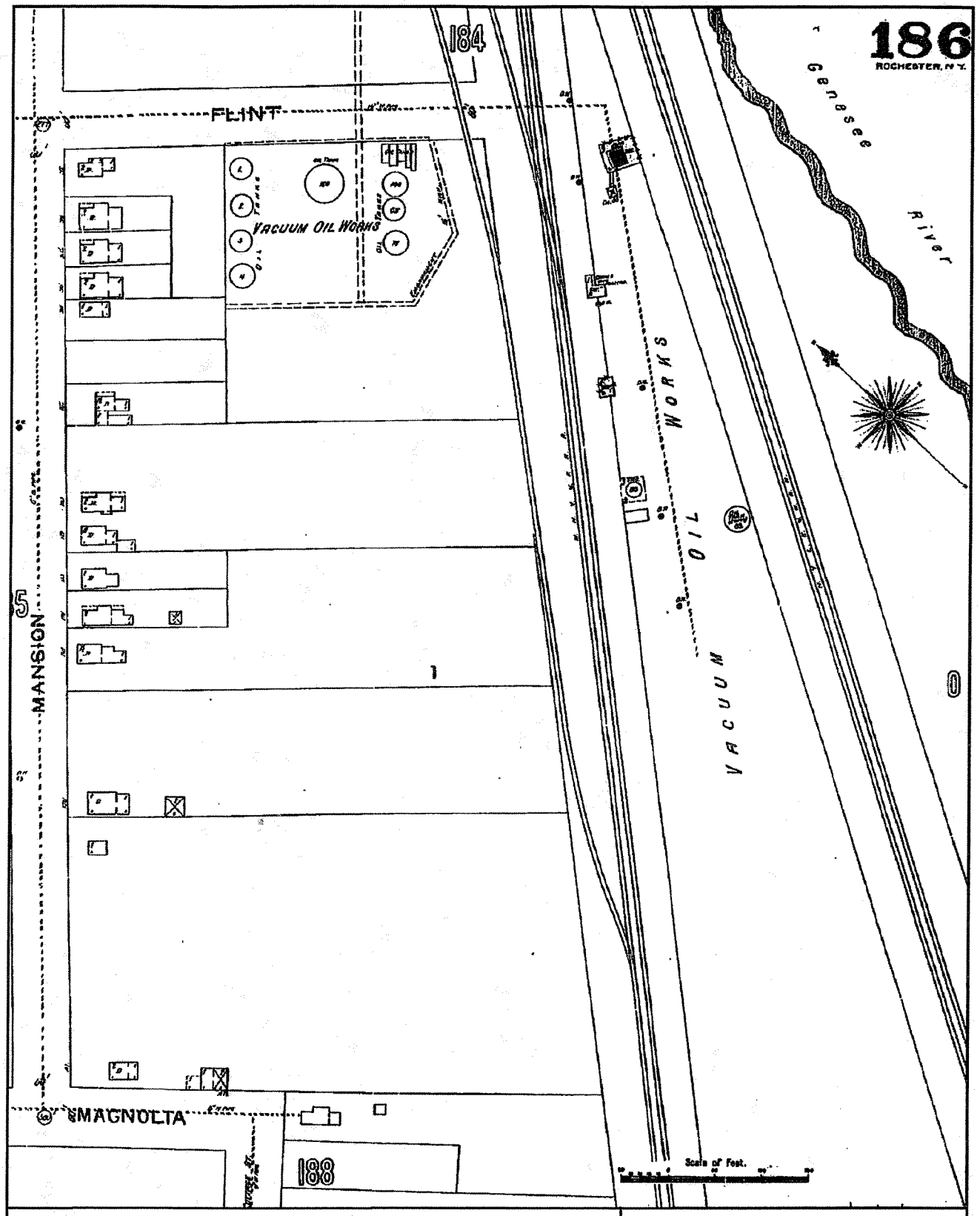


Source: The Sanborn Library, LLC, 1892
Environmental Data Resources, Inc., 2004

Figure 2 - 5

Former Main Plant Area
1892 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

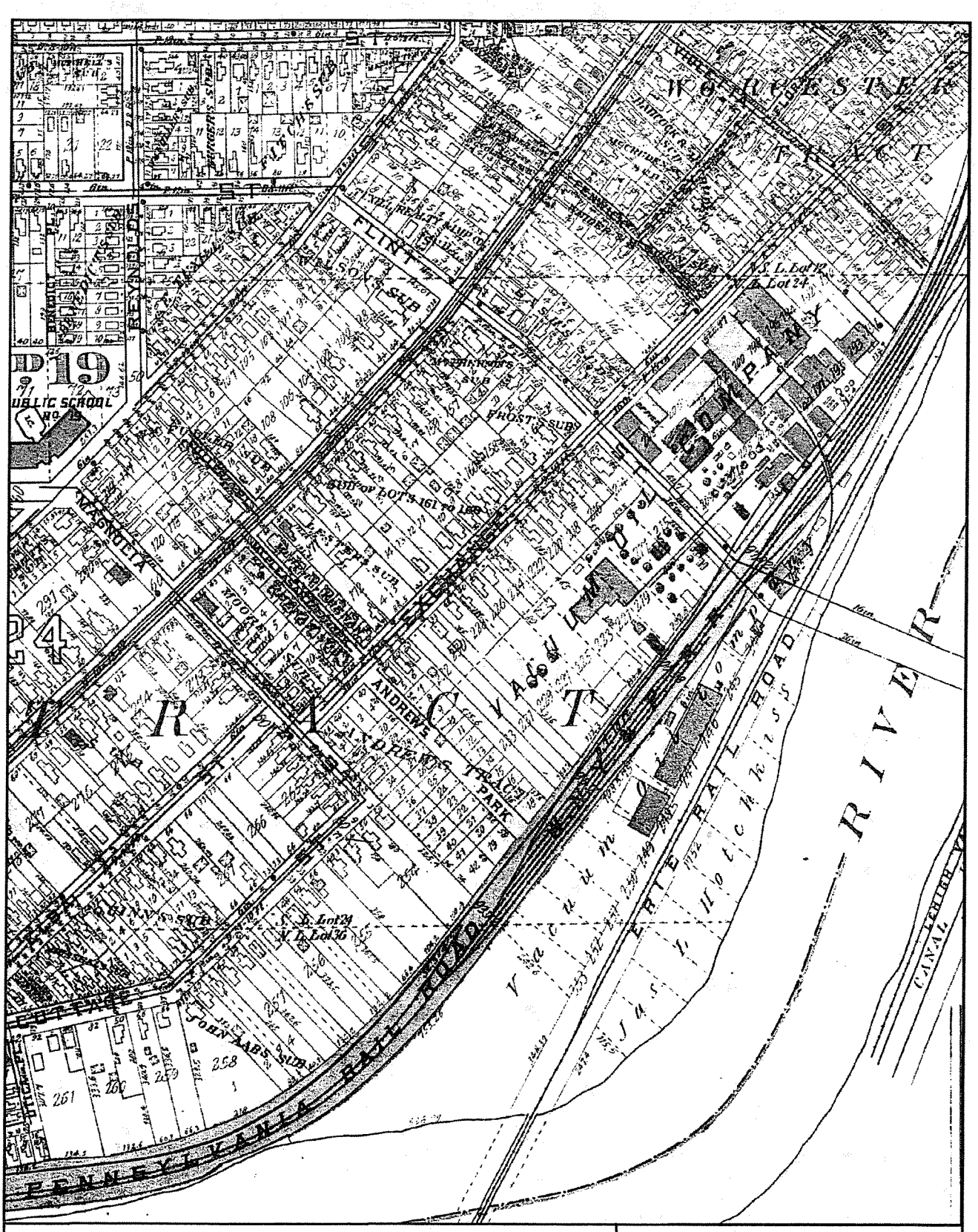


Source: The Sanborn Library, LLC, 1892
Environmental Data Resources, Inc., 2004

Figure 2 - 6

1892 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

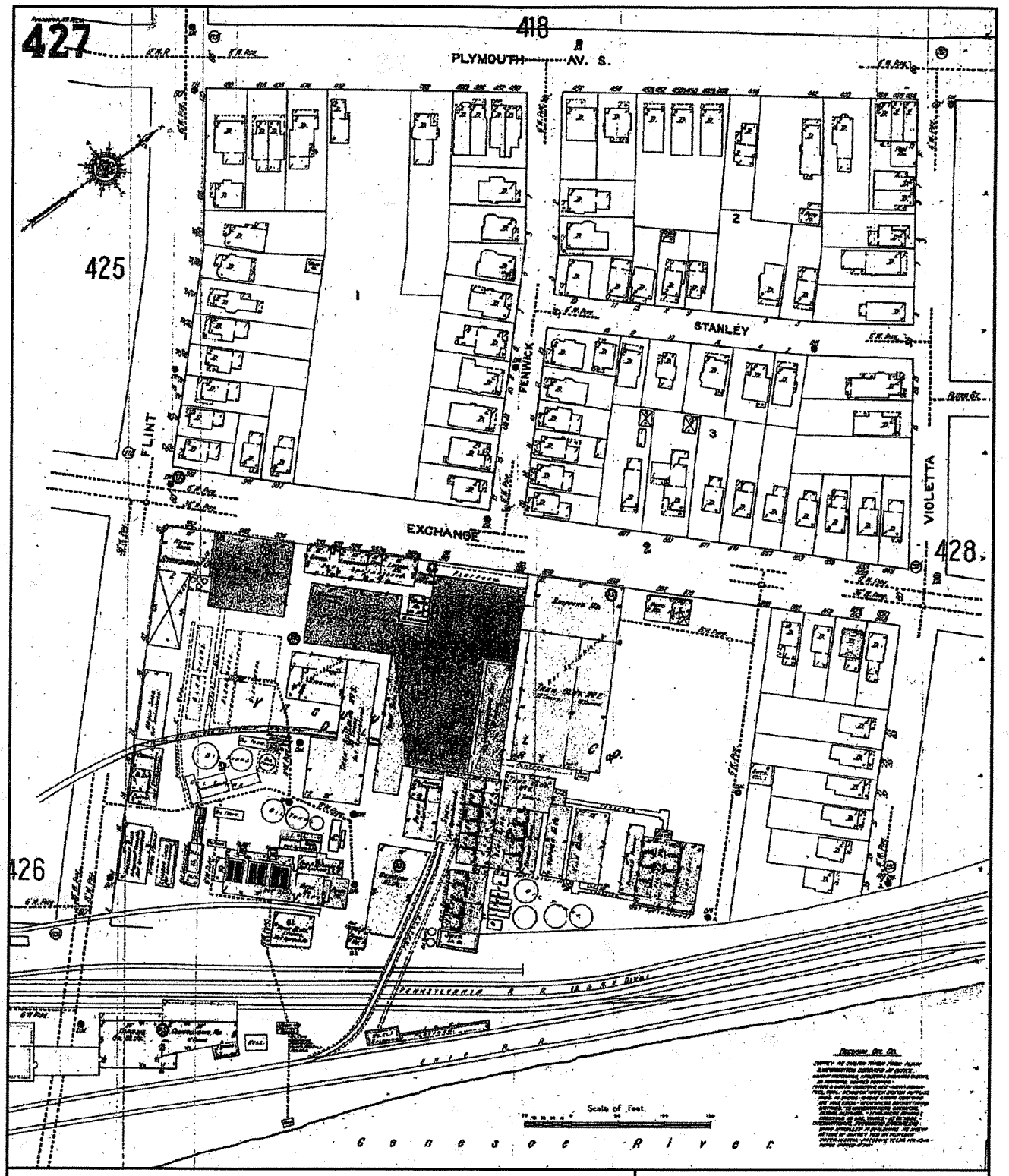


Source: City of Rochester, 1990

Figure 2 - 7

1910 Tax Plat
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

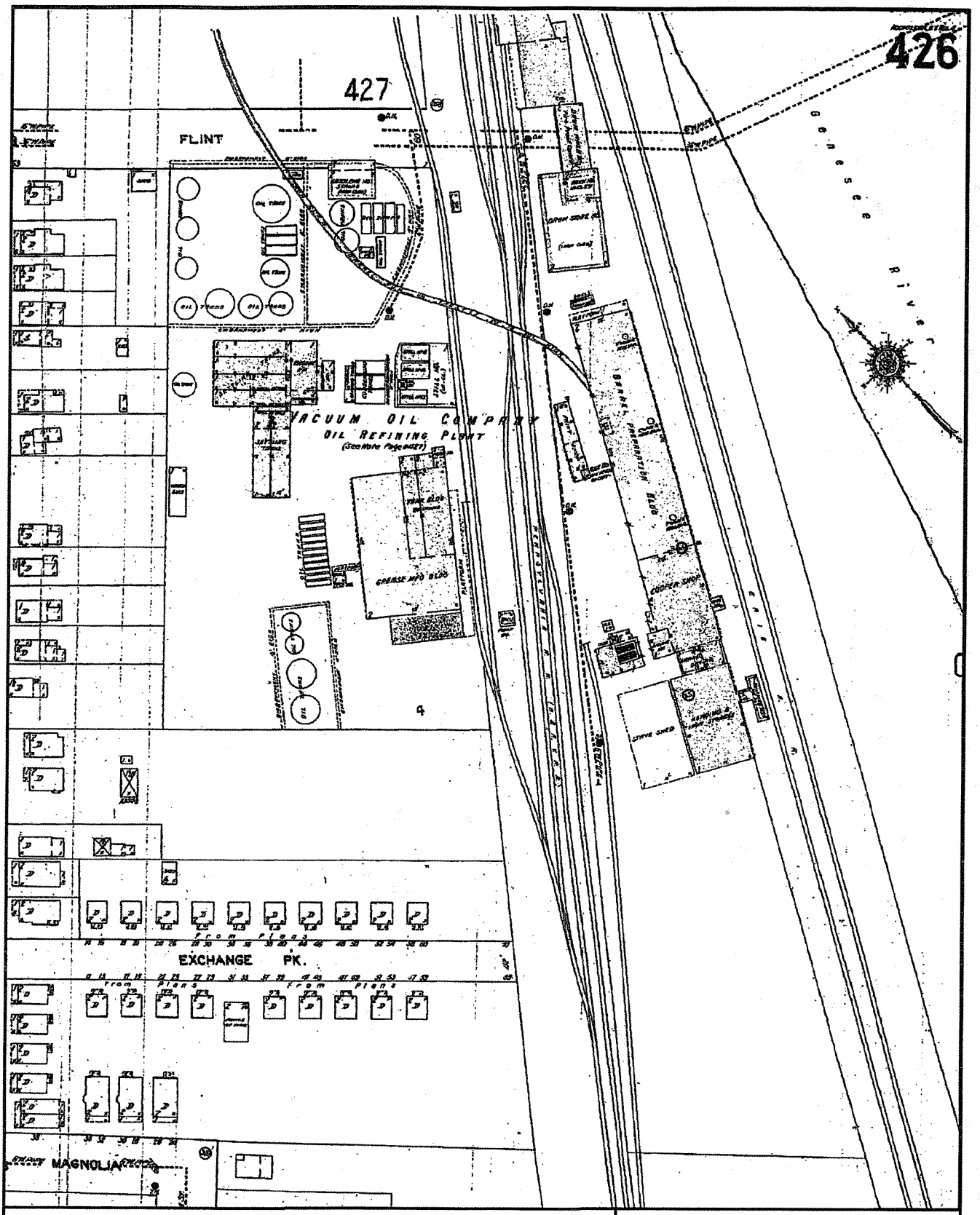


Source: The Sanborn Library, LLC, 1892
Environmental Data Resources, Inc., 2004

Figure 2 - 8

Former Main Plant Area
1912 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

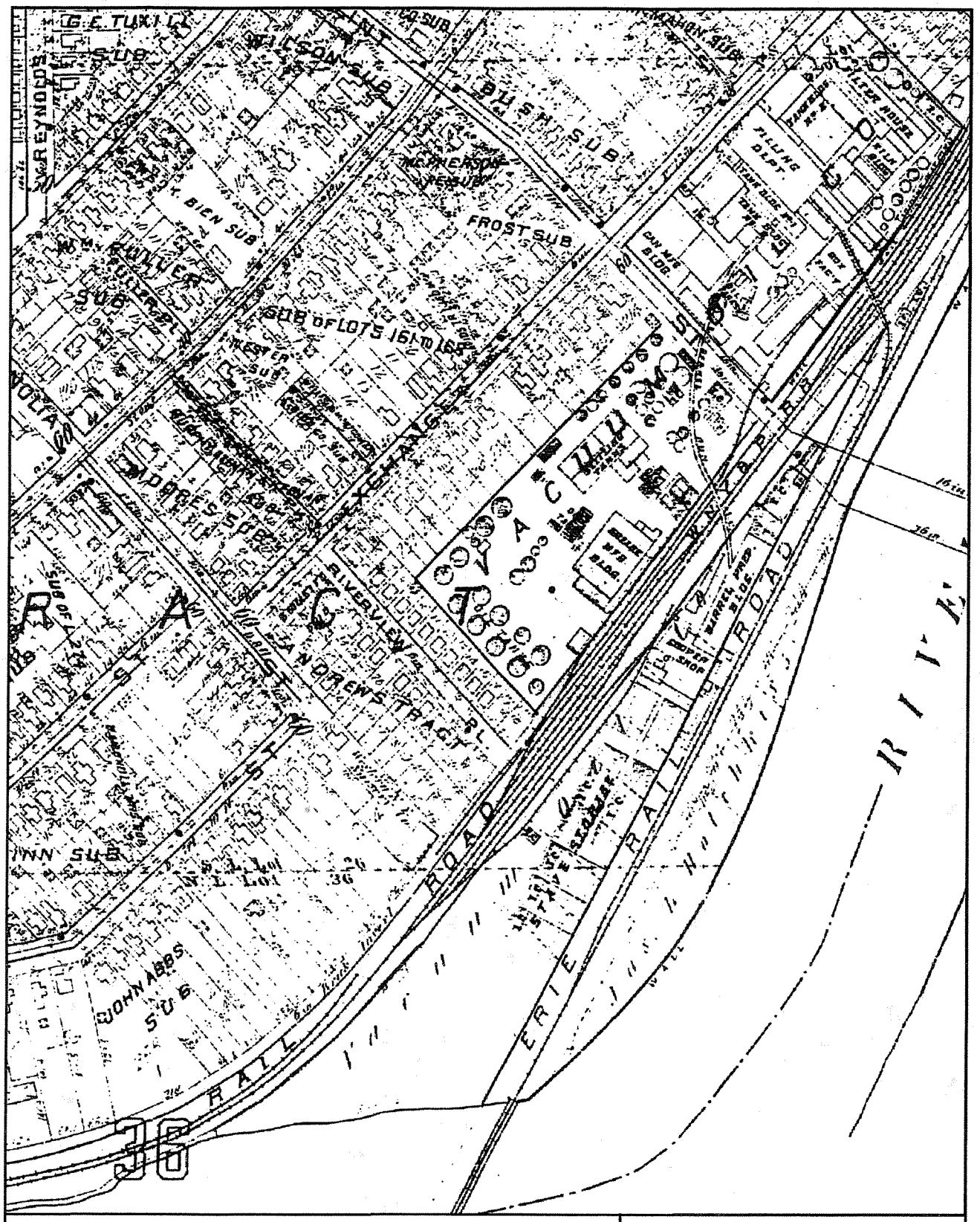


Source: The Sanborn Library, LLC, 1912
Environmental Data Resources, Inc., 2004

Figure 2 - 9

1912 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

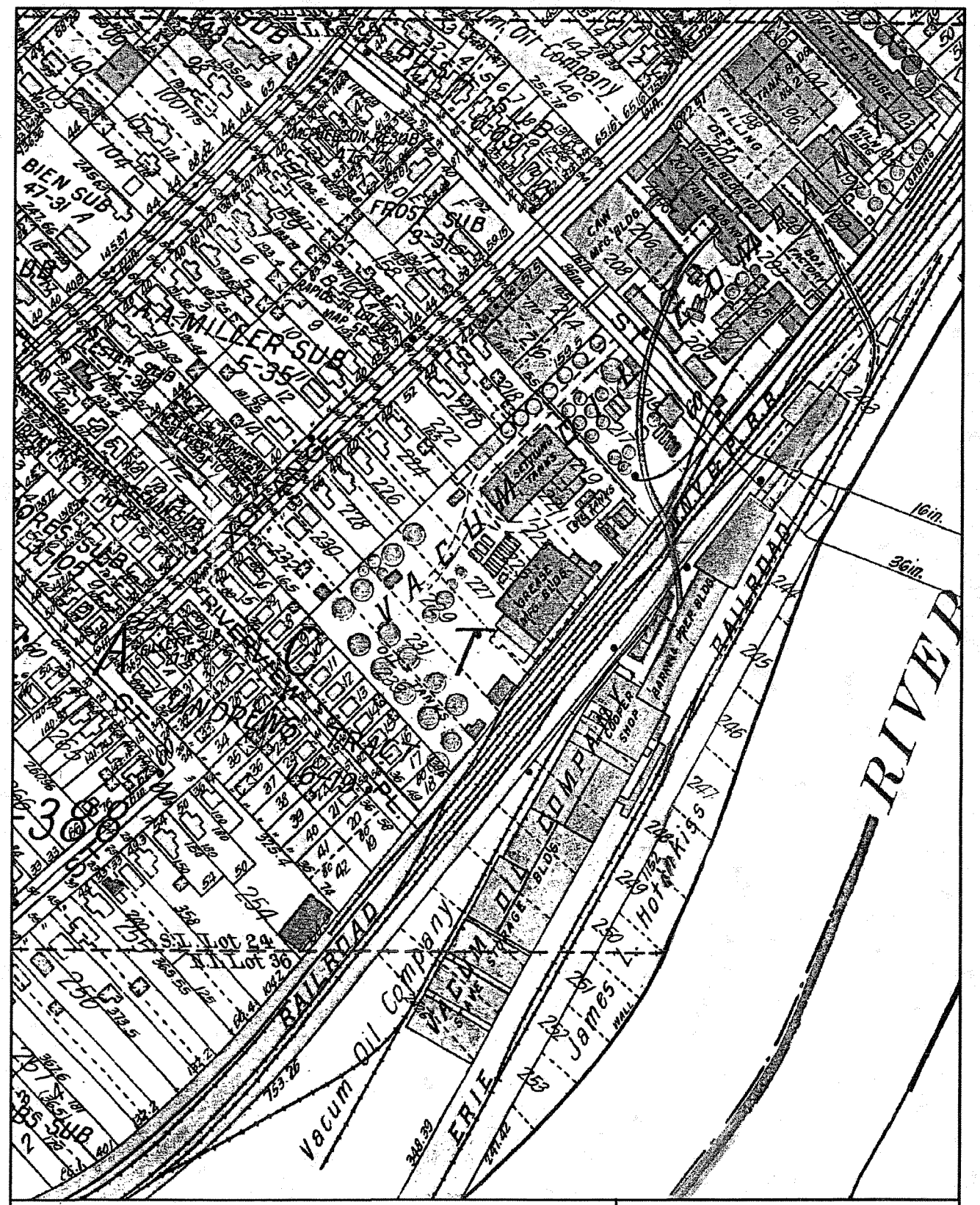


Source: City of Rochester, 1990

Figure 2 - 10

1918 Tax Plat
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

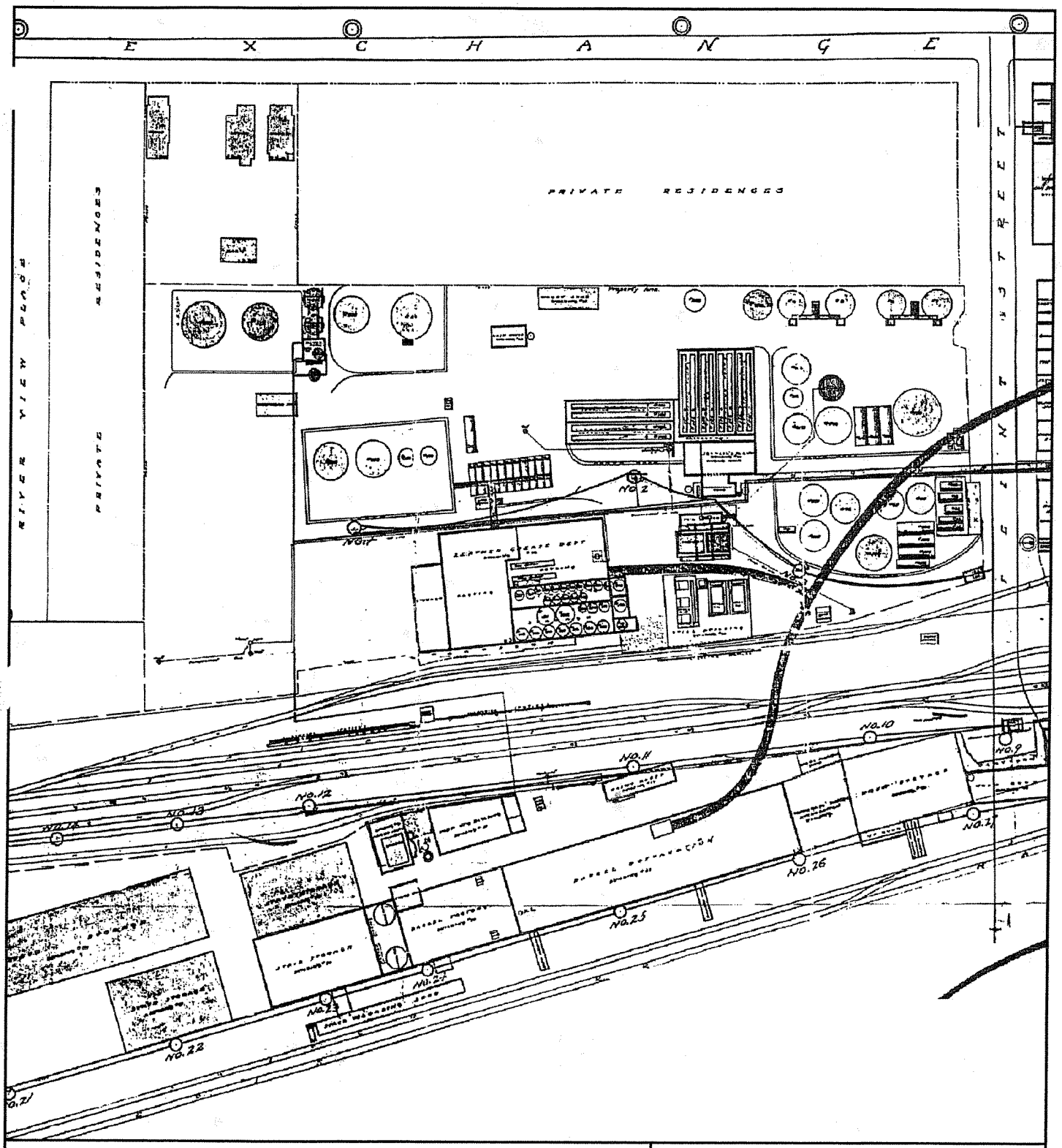


Source: City of Rochester, 1990

Figure 2 - 11

1926 Tax Plat
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500



Source: City of Rochester, 1990

Figure 2 - 12

Undated Map of Vacuum Oil
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

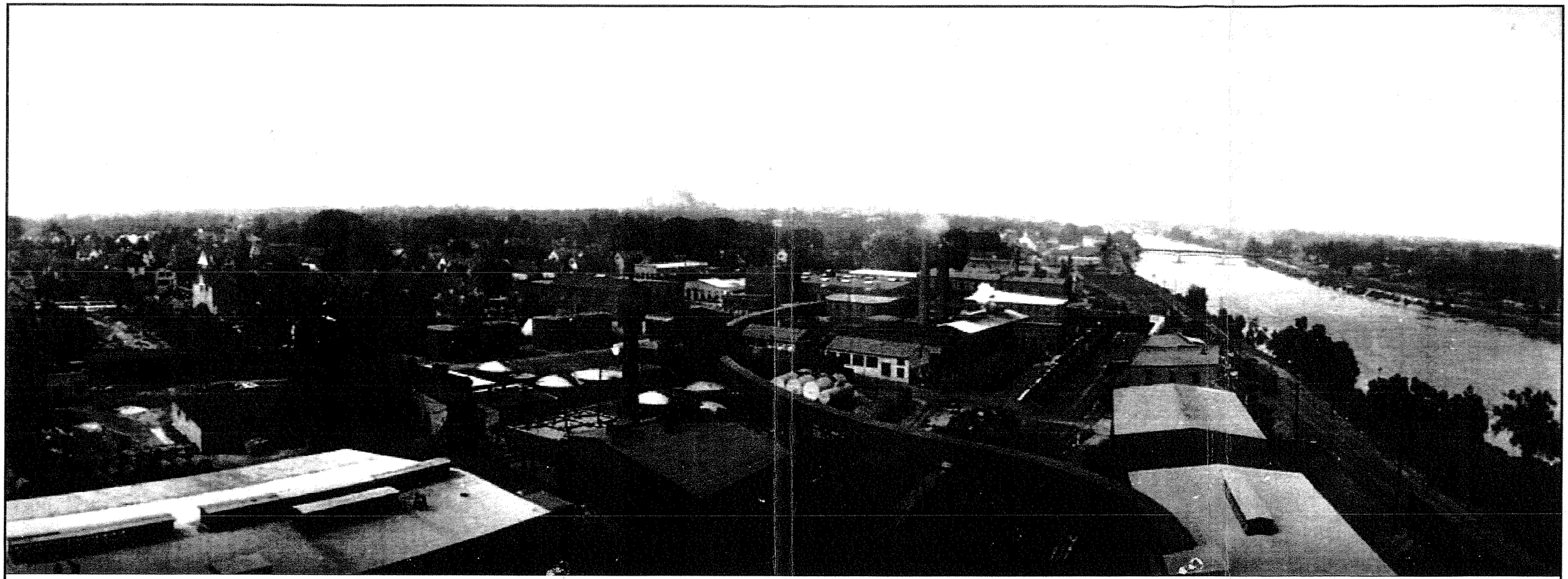


IMAGE SOURCE: The Center for American History
The Univeristy of Texas at Austin

Figure 2 - 13

Undated Photograph of Rochester Works
Vacuum Oil Historic Investigation
Rochester, New York

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

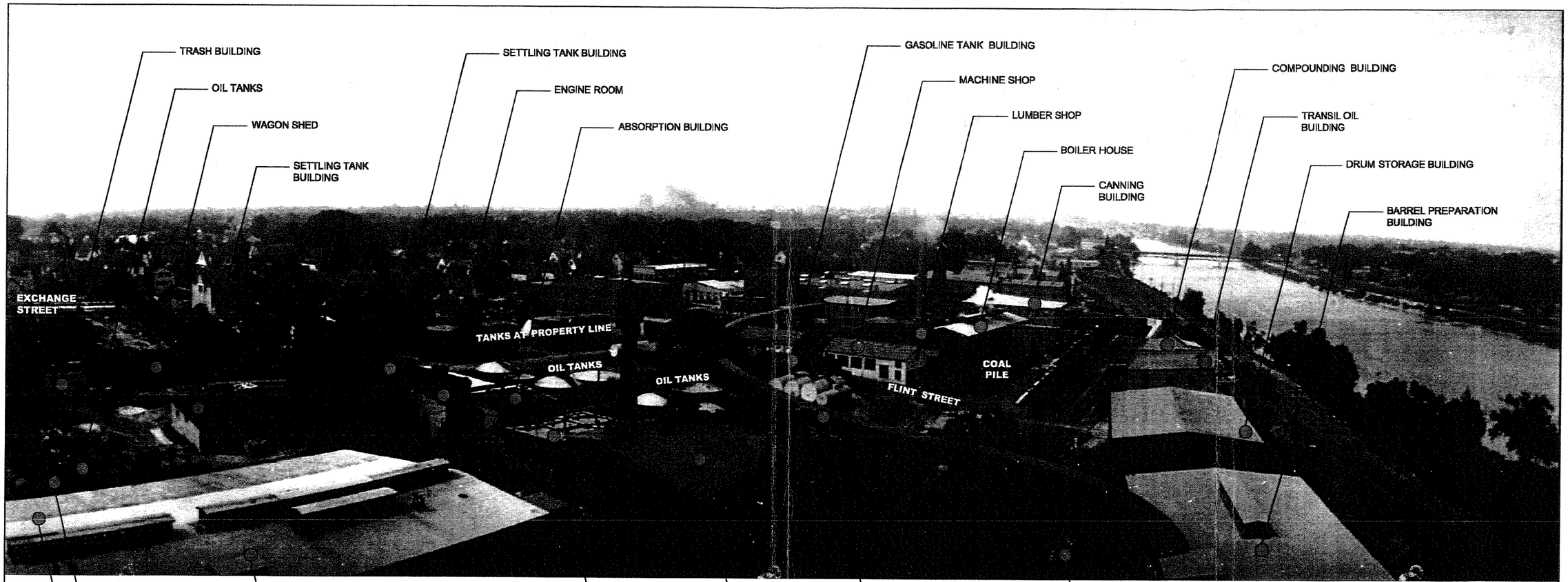
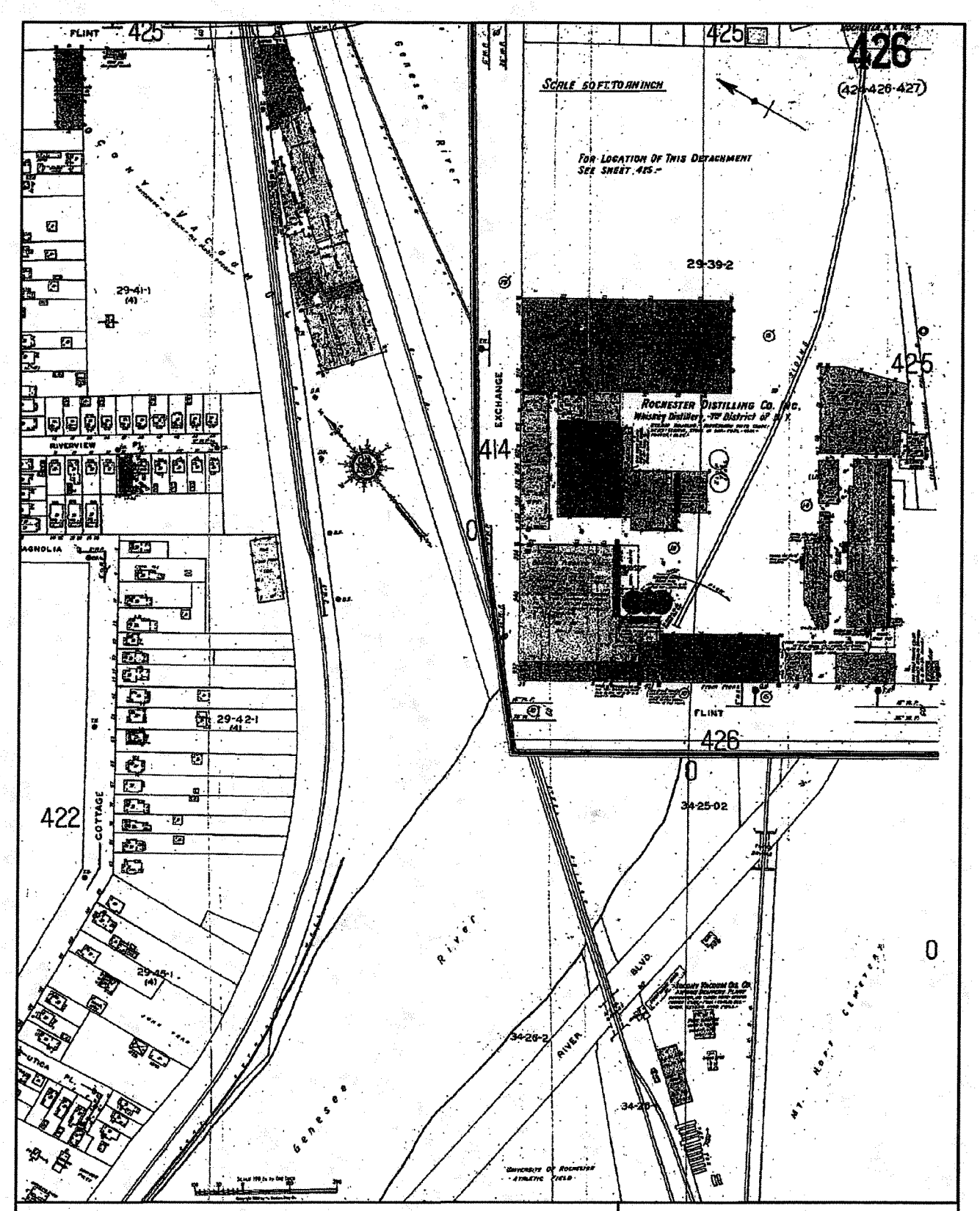


IMAGE SOURCE: The Center for American History
The Univeristy of Texas at Austin

Figure 2 - 14

Undated Photograph of Rochester Works (captioned) Vacuum Oil Historic Investigation Rochester, New York

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500



Source: The Sanborn Library, LLC, 1938
Environmental Data Resources, Inc., 2004

Figure 2 -15

1938 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
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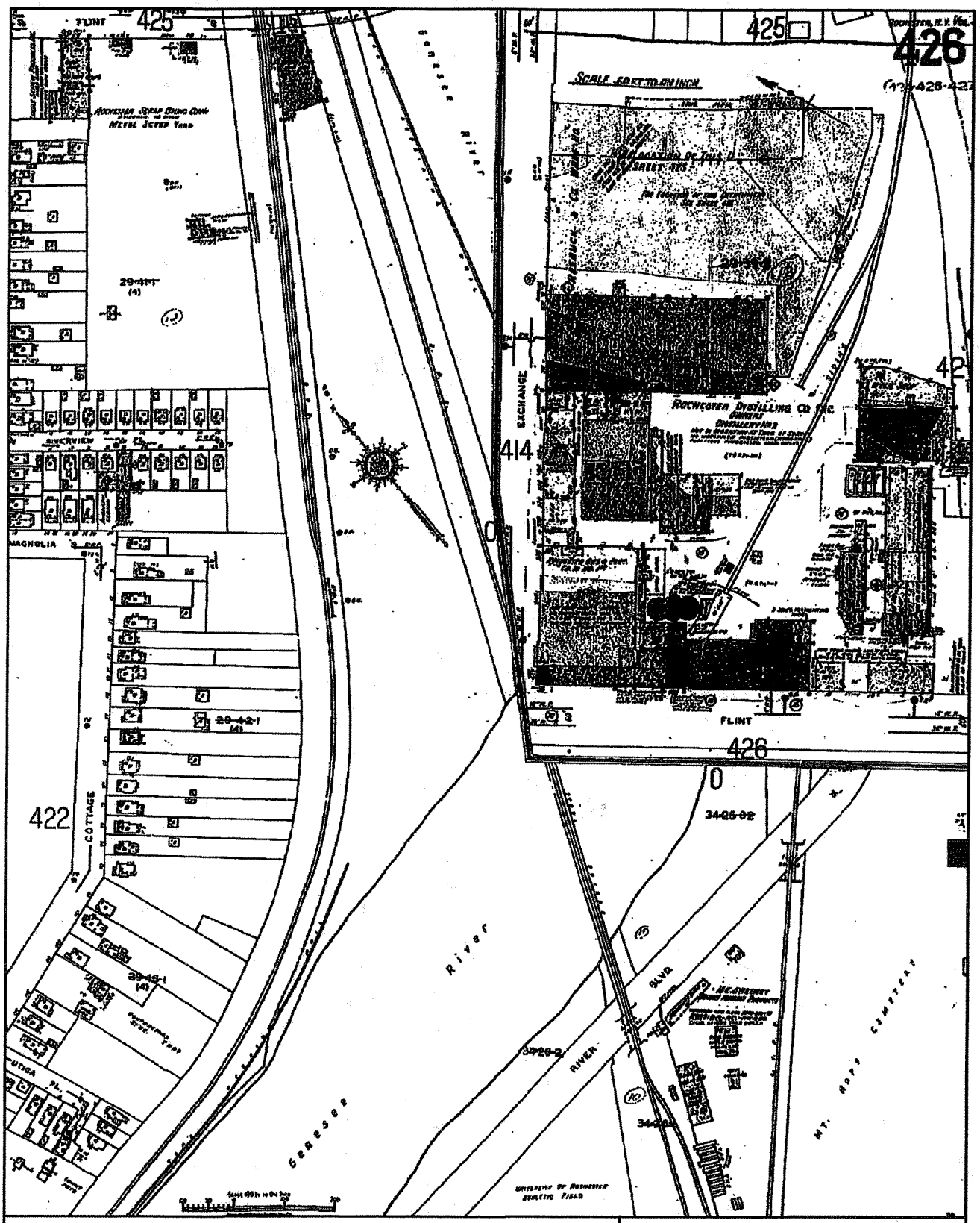
(732) 302-9500



Source: The Sanborn Library, LLC, 1938
Environmental Data Resources, Inc., 2004

Figure 2 - 16

1950 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
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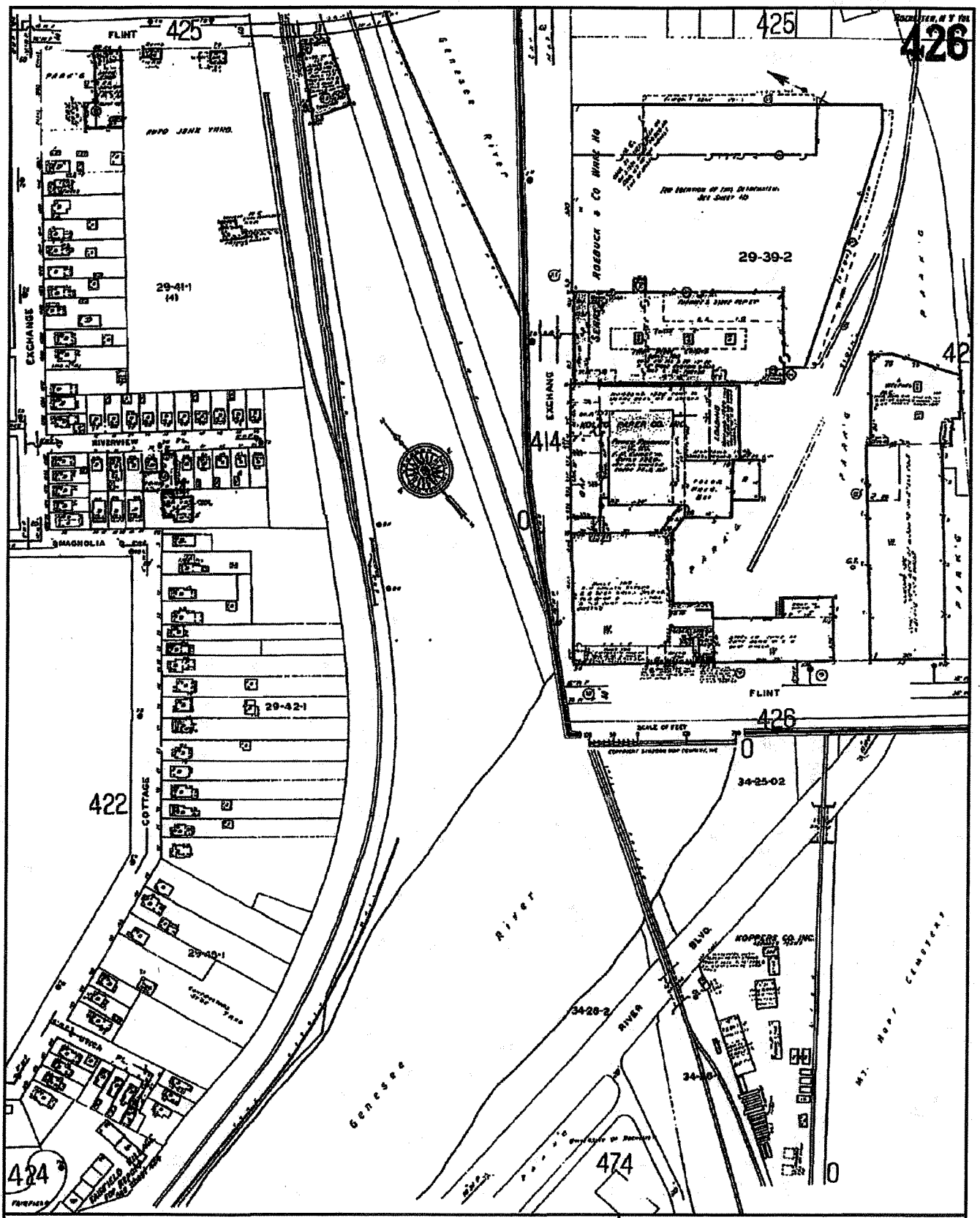
(732) 302-9500

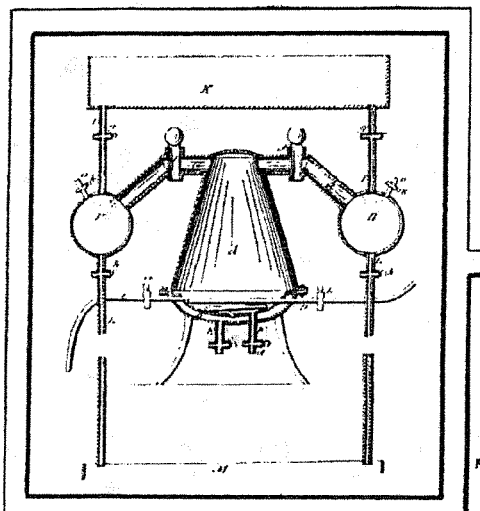


Source: The Sanborn Library, LLC, 1938
Environmental Data Resources, Inc., 2004

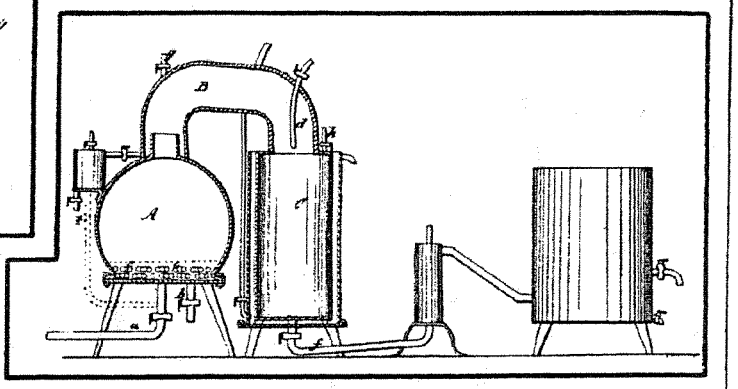
Figure 2 - 17

1971 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

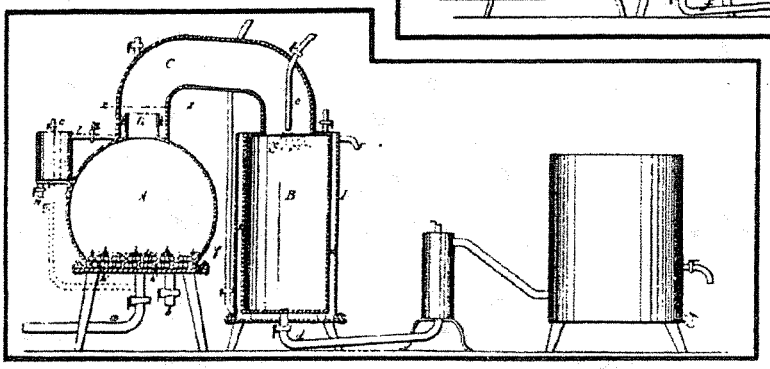
amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500



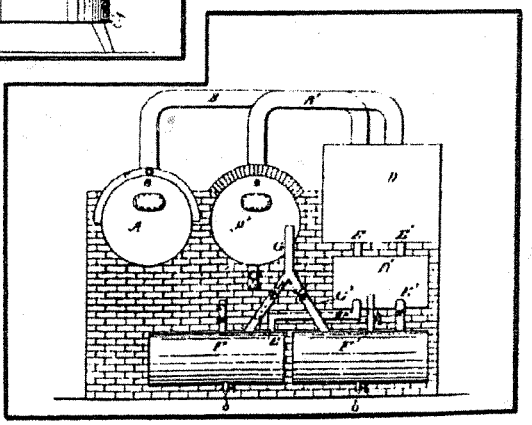
The original design for the Vacuum still. The spheres are condensers. From Ewing's Patent No. 56,852, July 31, 1866



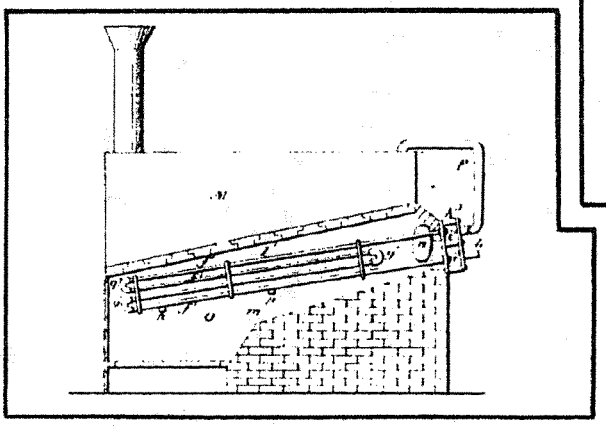
The Vacuum still shown in Ewing's Patent No. 58,020, September 11, 1866



The Vacuum still shown in the Ewing and Everest Patent No. 58,021, September 11, 1866



The Vacuum still shown in Everest's Patent No. 68,426, September 3, 1867



Source: The Center for American History
The University of Texas at Austin

Figure 2 - 18

Historic Vacuum Still Equipment
Vacuum Oil Historic Investigation
Rochester, NY

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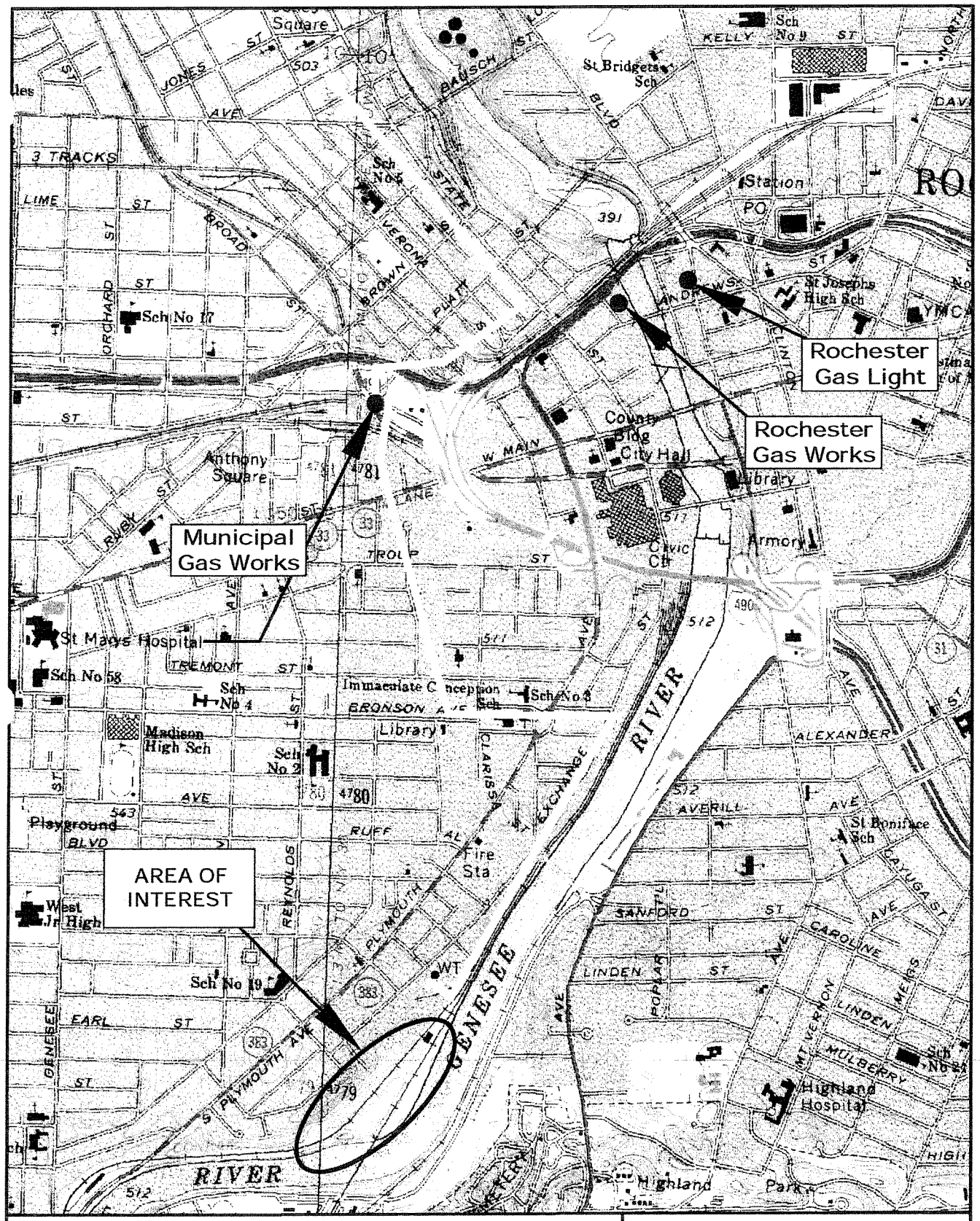

LEGEND:

- Gas Works
- Pipeline

IMAGE SOURCE:

USGS Digital Raster Graphic Quarterquad, Rochester East, 1978
USGS Digital Raster Graphic Quarterquad, Rochester West, 1978

Figure 2 - 19

1888 Pipeline and Gas Works Map
Vacuum Oil Historic Investigation
Rochester, NY

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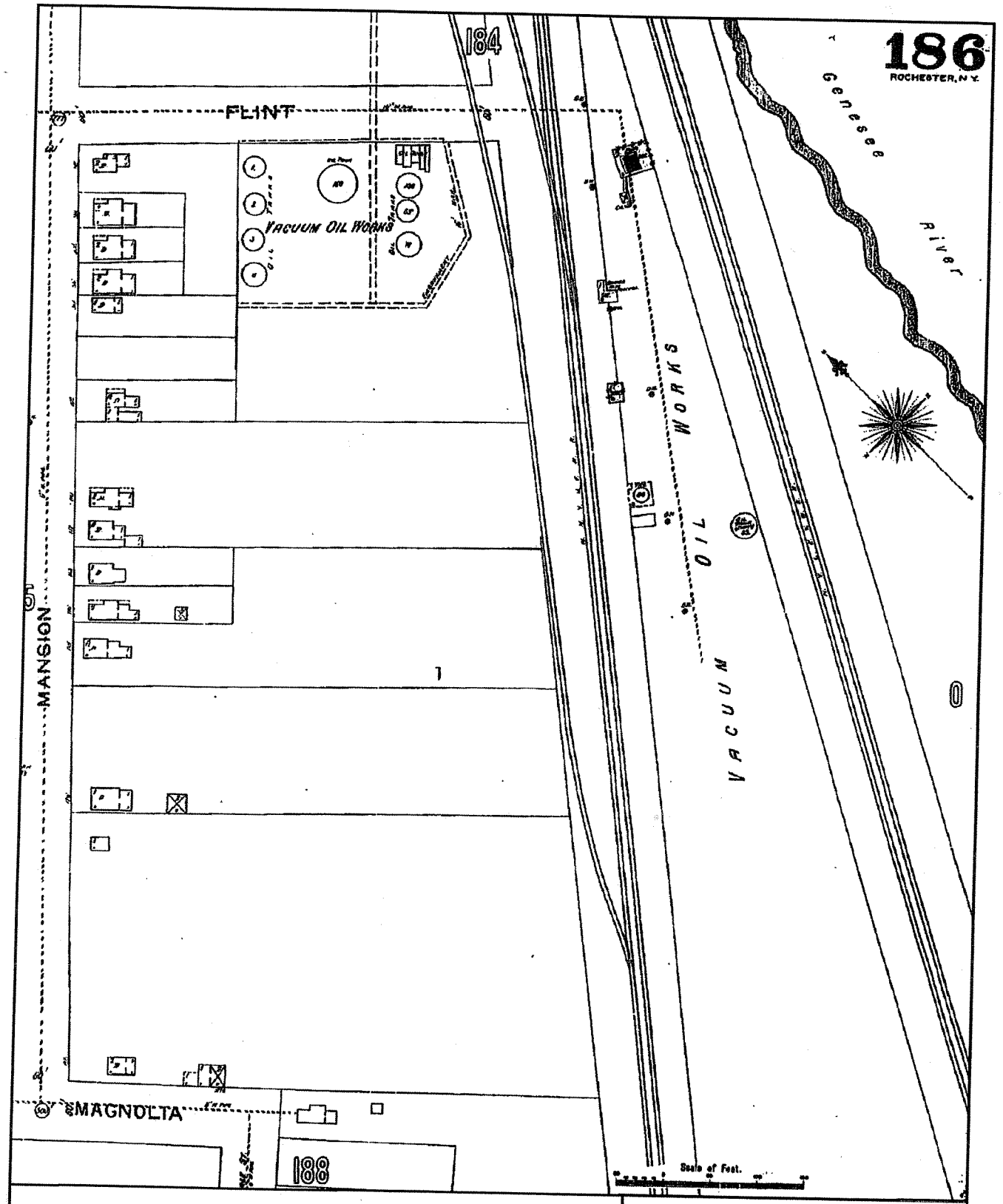

Source: The Sanborn Library, LLC, 1892
Environmental Data Resources, Inc., 2004

Figure 2 - 20

Sewer Lines
1892 Sanborn Map
Vacuum Oil Historic Investigation
Rochester, NY

amec
285 DAVIDSON AVENUE, SUITE 100
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(732) 302-9500

NOTE: The presence of existing physical features was determined through site surveys conducted on 11/03/04, 12/06/04, and 12/07/04. Existing physical feature locations were recorded using a Global Positioning System based on NAD83 map datum.

0 200 400 FT

LEGEND

- APPROXIMATE LOCATION OF SLUDGE PITS
- AREA OF INTEREST
- CIRCLE BLOCK
- CONCRETE PILLARS/FOOTERS
- CONCRETE BLOCKS
- CONCRETE SLAB CORNER
- CULVERT
- DRAINAGE SWALE
- DRUM (55-GALLON)
- FENCE
- FIRE HYDRANT
- FLOOR
- MACHINERY
- MANHOLE COVERS
- MOLTEN PLASTIC
- PIPES
- RAILROAD RAIL
- RETAINING WALL - CIRCULAR
- RETAINING WALL - SQUARE
- RUBBLE AND/OR TIRE PILE
- SEWERAGE PIPES
- SHALLOW FLOOR PIT
- SLAG BALLS, REEL-O-MATIC AND/OR TANK
- WALL
- WALL/FOUNDATION CORNER
- BREAK IN WALL
- POSSIBLE WALL
- MONITORING WELL
- WETLAND

IMAGE SOURCE: NYS Digital Orthoimagery Program (NYSDOP)
Monroe County, City Of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

Figure 3 - 1

Existing Physical Features Layout
Vacuum Oil Historic Investigation
Rochester, New York

amec
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SOMERSET, NJ 08873
(732) 302-9500

NOTE: The presence of existing physical features was determined through site surveys conducted on 11/03/04, 12/06/04, and 12/07/04. Existing physical feature locations were recorded using a Global Positioning System based on NAD83 map datum.

0 200 400 FT

LEGEND

- APPROXIMATE LOCATION OF SLUDGE PITS
- AREA OF INTEREST
- CIRCLE BLOCK
- CONCRETE PILLARS/FOOTERS
- CONCRETE BLOCKS
- CONCRETE SLAB CORNER
- CULVERT
- DRAINAGE SWALE
- DRUM (55-GALLON)
- FENCE
- FIRE HYDRANT
- FLOOR
- MACHINERY
- MANHOLE COVERS
- MOLTEN PLASTIC
- PIPES
- RAILROAD RAIL
- RETAINING WALL - CIRCULAR
- RETAINING WALL - SQUARE
- RUBBLE AND/OR TIRE PILE
- SEWERAGE PIPES
- SHALLOW FLOOR PIT
- SLAG BALLS, REEL-O-MATIC AND/OR TANK
- WALL
- WALL/FOUNDATION CORNER
- BREAK IN WALL
- POSSIBLE WALL
- MONITORING WELL
- WETLAND

IMAGE SOURCE: NYS Digital Orthoimagery Program (NYSDOP)
Monroe County, City Of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

Figure 3 - 2

Photograph Locations
Vacuum Oil Historic Investigation
Rochester, New York

amec
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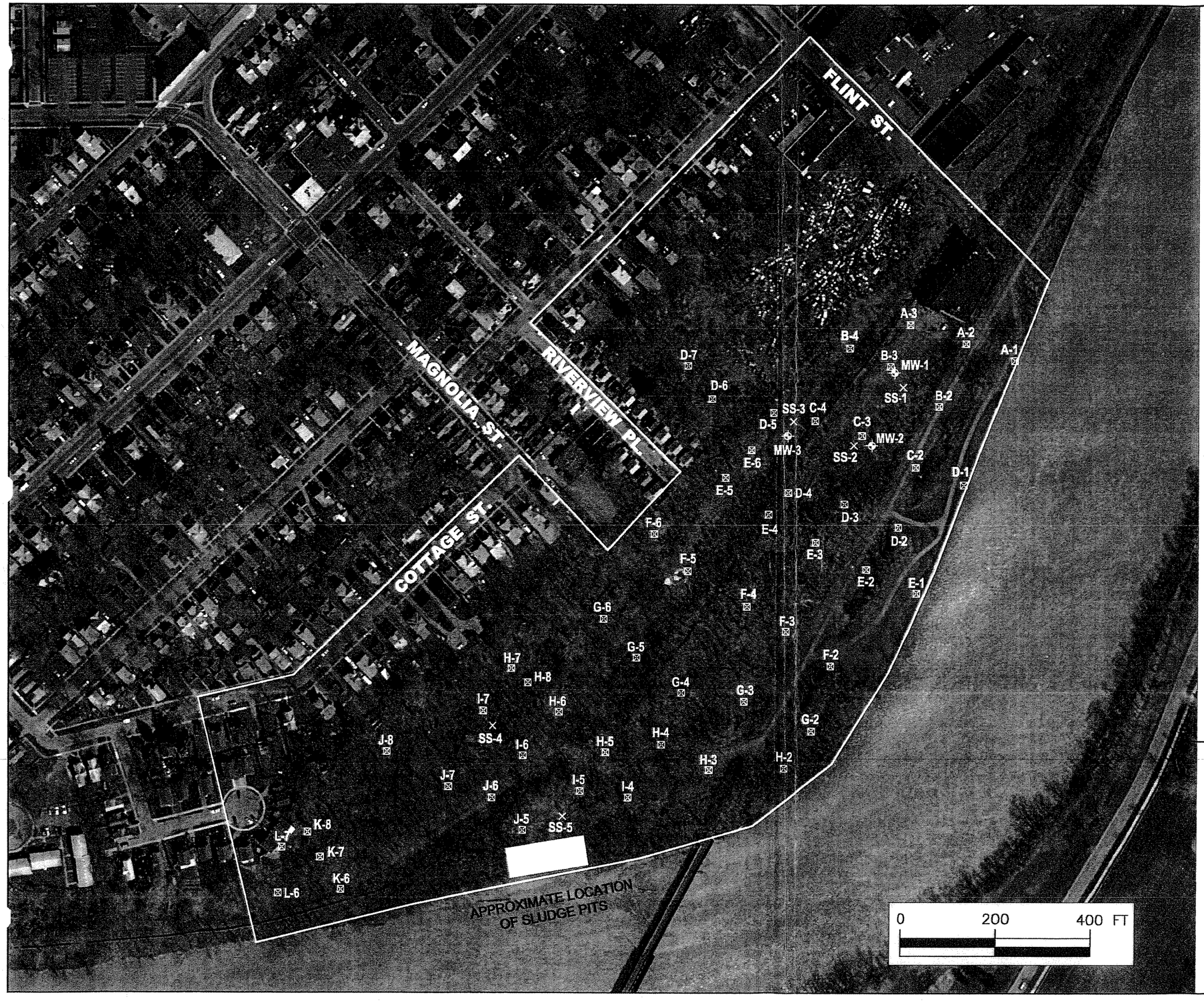
SOMERSET, NJ 08873
(732) 302-9500



LEGEND

- APPROXIMATE LOCATION OF SLUDGE PITS
- AREA OF INTEREST
- SOIL GAS SAMPLE LOCATION NYSDEC, 2000
- SURFACE SOIL SAMPLE LOCATION NYSDEC, 2000
- MONITORING WELL

IMAGE SOURCE: NYS Digital Orthoimagery Program (NYSDOP)
Monroe County, City of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

DATA SOURCE: NYSDEC, Site Investigation Report (2001)

Figure 4 - 1

NYSDEC 2000 Sample Locations
Vacuum Oil Historic Investigation
Rochester, New York

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SOMERSET, NJ 08873
(732) 302-9500

LEGEND

- APPROXIMATE LOCATION OF SLUDGE PITS
- AREA OF INTEREST
- TPH CONCENTRATIONS IN NANOGRAMS
- SOIL GAS SAMPLE LOCATION NYSDEC, 2000

IMAGE SOURCE: NYS Digital Orthoimagery Program (NYSDOP)
Monroe County, City of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

DATA SOURCE: NYSDEC, Site Investigation Report (2001)

Figure 4 - 2

Passive Soil Gas Survey Contours 2000
Total Petroleum Hydrocarbons (TPH)
Vacuum Oil Historic Investigation
Rochester, New York

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

LEGEND

- APPROXIMATE LOCATION OF SLUDGE PITS
- AREA OF INTEREST
- VOC CONCENTRATIONS IN NANOGRAMS
- SOIL GAS SAMPLE LOCATION NYSDEC, 2000

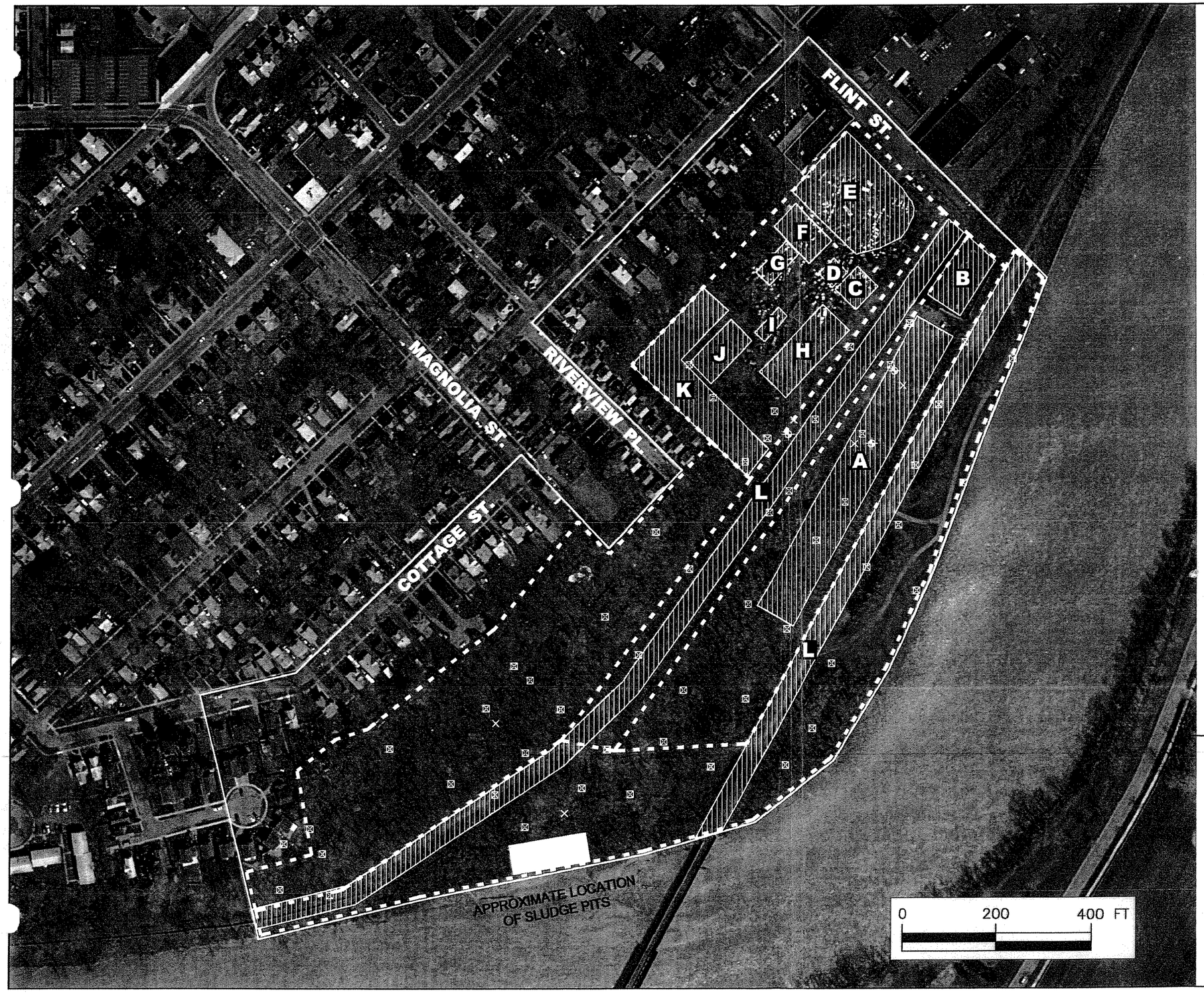
IMAGE SOURCE: NYS Digital Ortholmagery Program (NYSDOP)
Monroe County, City of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

DATA SOURCE: NYSDEC, Site Investigation Report (2001)

Figure 4 - 3

Passive Soil Gas Survey Contours 2000
Total Chlorinated Volatiles (VOC)
Vacuum Oil Historic Investigation
Rochester, New York

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500



LEGEND

- APPROXIMATE LOCATION OF SLUDGE PITS
- AREA OF INTEREST
- SUBDIVISION AREAS
- SOIL GAS SAMPLE LOCATION NYSDEC, 2000
- SURFACE SOIL SAMPLE LOCATION NYSDEC, 2000
- MONITORING WELL

A - BARREL PREPARATION BUILDING
B - DRUM STORAGE BUILDING
C - STILLS
D - CONDENSING TANKS
E - TANK AREA
F - SETTLING TANKS
G - SETTLING TANKS
H - TANK BUILDING/GREASE MANUFACTURING
I - OIL TANKS
J - OIL TANKS
K - OIL TANKS
L - RAILROAD LINES

IMAGE SOURCE: NYS Digital Orthoimagery Program (NYSDOP)
Monroe County, City of Rochester (2002)
NYS Plane , Western Zone , NAD 83, US Survey Feet

DATA SOURCE: NYSDEC, Site Investigation Report (2001)

Figure 5 - 1

Potential Areas of Historic Interest
Vacuum Oil Historic Investigation
Rochester, New York

amec
285 DAVIDSON AVENUE, SUITE 100
SOMERSET, NJ 08873
(732) 302-9500

Appendices

Appendix A

Photographic Log of November and December 2004 Site Visits

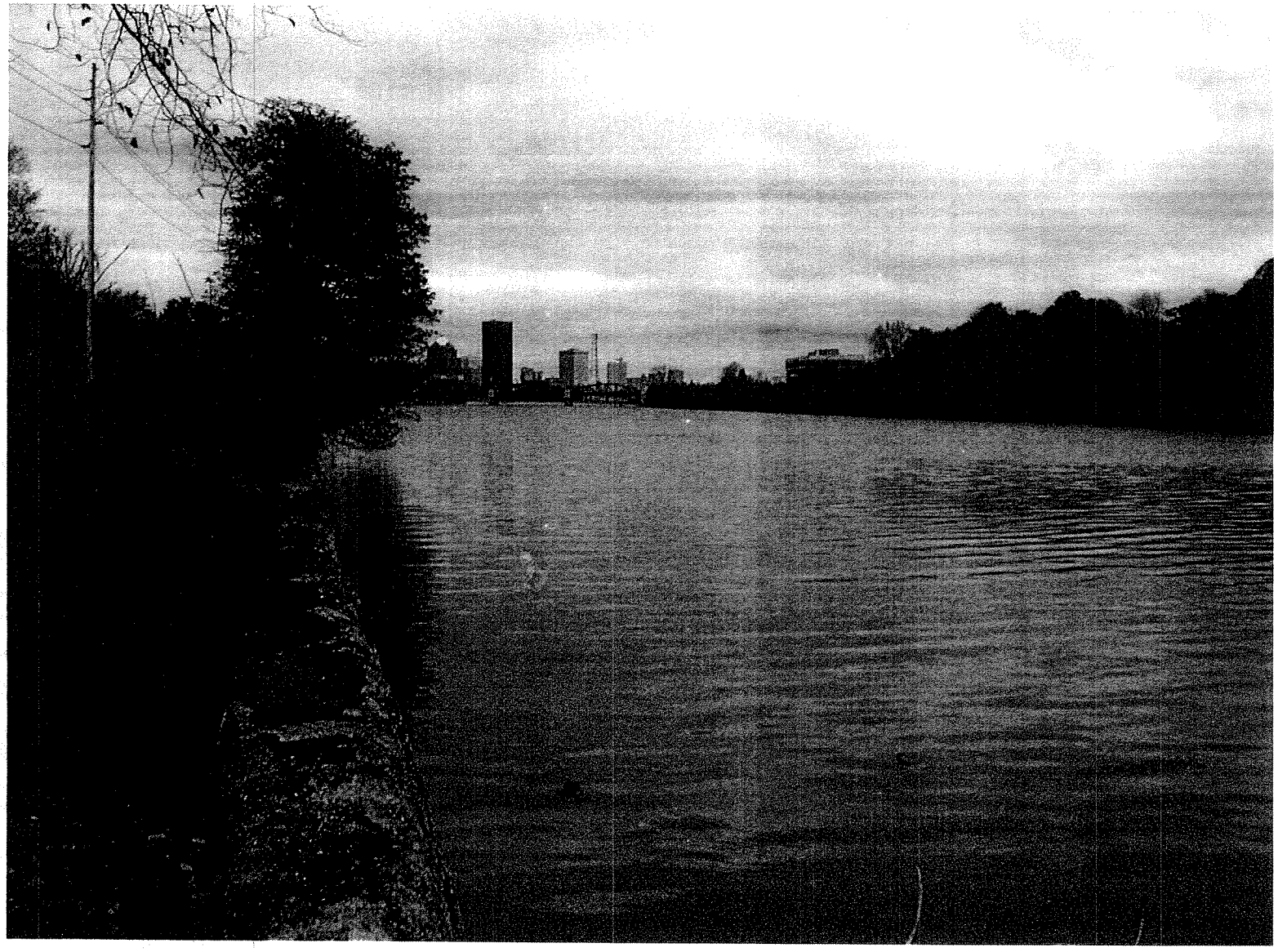


Photo 1: General view of the Genesee River which forms the south/southeast site boundary.

Photo 2: Bike path at the southern end of the site, leading off-site (Genesee River to left).

Photo 3: View of the site from the end of Flint Street, facing east towards the Genesee River (3-story building on right).

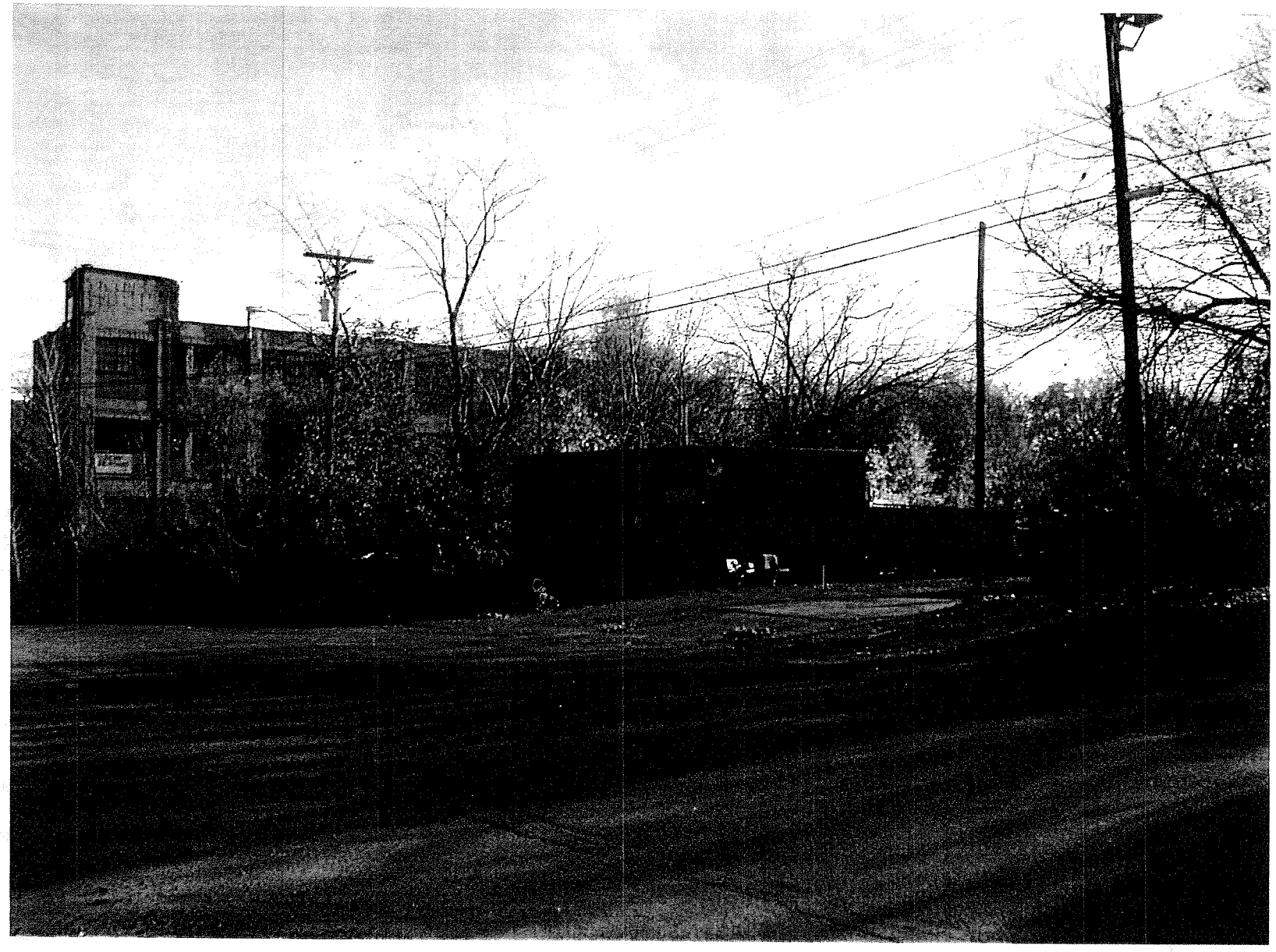


Photo 4: View of the site from Flint Street, facing southeast towards entrance to salvage yard.

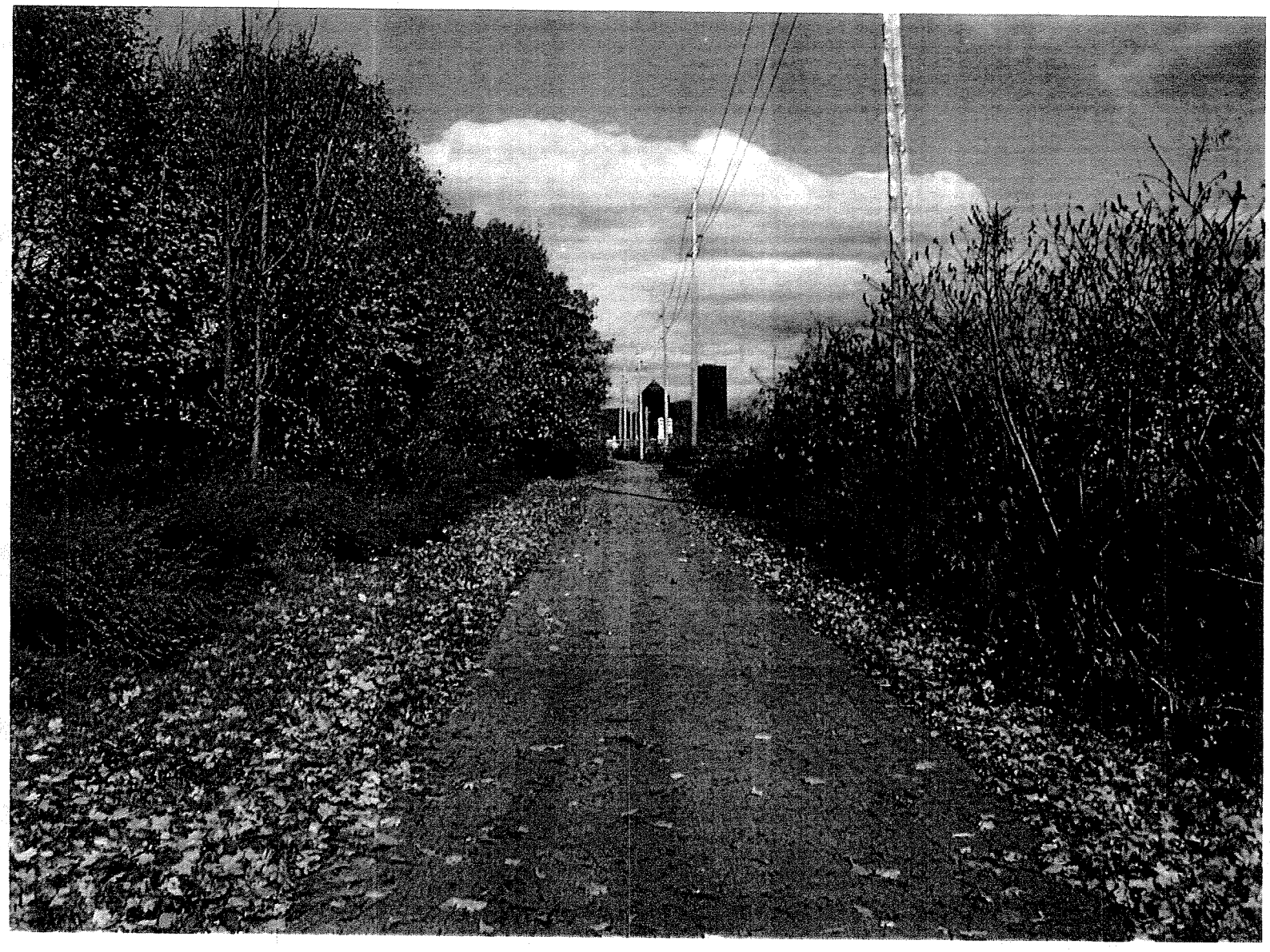


Photo 5: Bike path in the northern portion of the site, viewed from the south facing north.

Photo 6: Bike path spur and bulkhead in southern portion of site, viewed from the north facing south.

Photo 7: Paved driveway located on the northwest wide of the three-story building, viewed from Flint Street, facing south.

Photo 8: Portion of a debris pile located to the southwest of the three-story building.

Photo 9: Ditch wetland community located to the northwest of the three-story building (on right). Viewed from the south, facing north (towards Flint Street).

Photo 10: Drainage ditch immediately upgradient (north) of Flint Street, viewed from the southwest, facing northeast.

Photo 11: Dilapidated unnamed building, located to the southeast of historic box factory building, along drainage ditch between Flint Street and Violetta Street.

Photo 12: Dumped paint balls on banks of ditch, situated between Violetta Street and Flint Street.

Photo 13: Close-up view of paint balls.

Photo 14: Tires located in woods along western portion of the site, south of Flint Street and southeast of salvage yard.

Photo 15: Center of tire and concrete rubble pile located near the southeast corner of the salvage yard property.

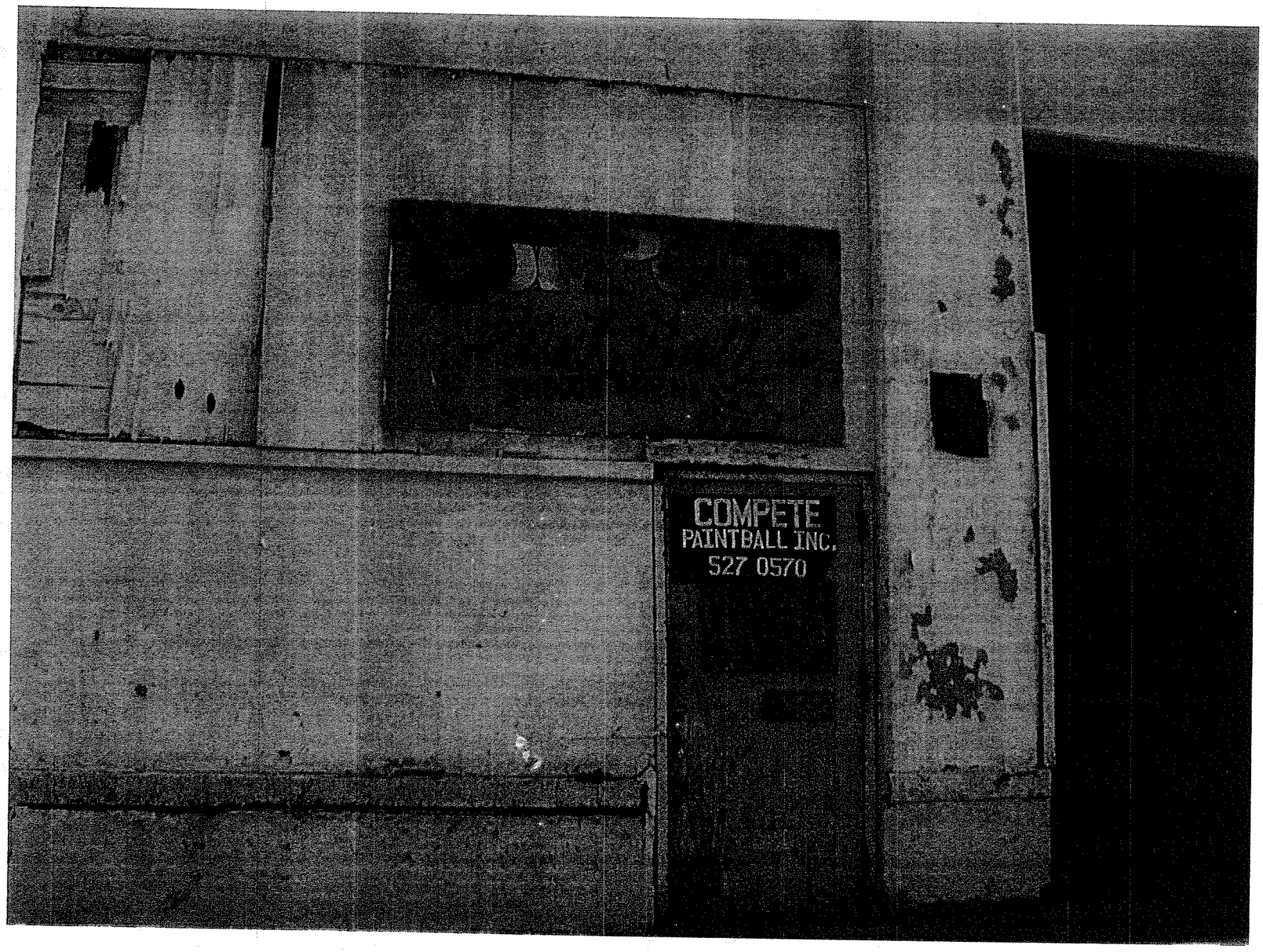


Photo 16: Alleged source of paint balls, located on Exchange Street.

Photo 18: Drainage ditch, situated between main bike path and spur in southern portion of the site.

Photo 19: Flared end section of culvert at upgradient (north) end of ditch (Photo 22).

Photo 20: Flared end section of culvert at downgradient (southern) end of ravine (Photo 22) in December 2004.

Photo 21: Two manhole covers and a well (Object 77) located between the eastern end of Flint Street and the Genesee River, facing northeast.

Photo 22: One of three monitoring wells (Object 29) observed on the site (four wells are located on site).

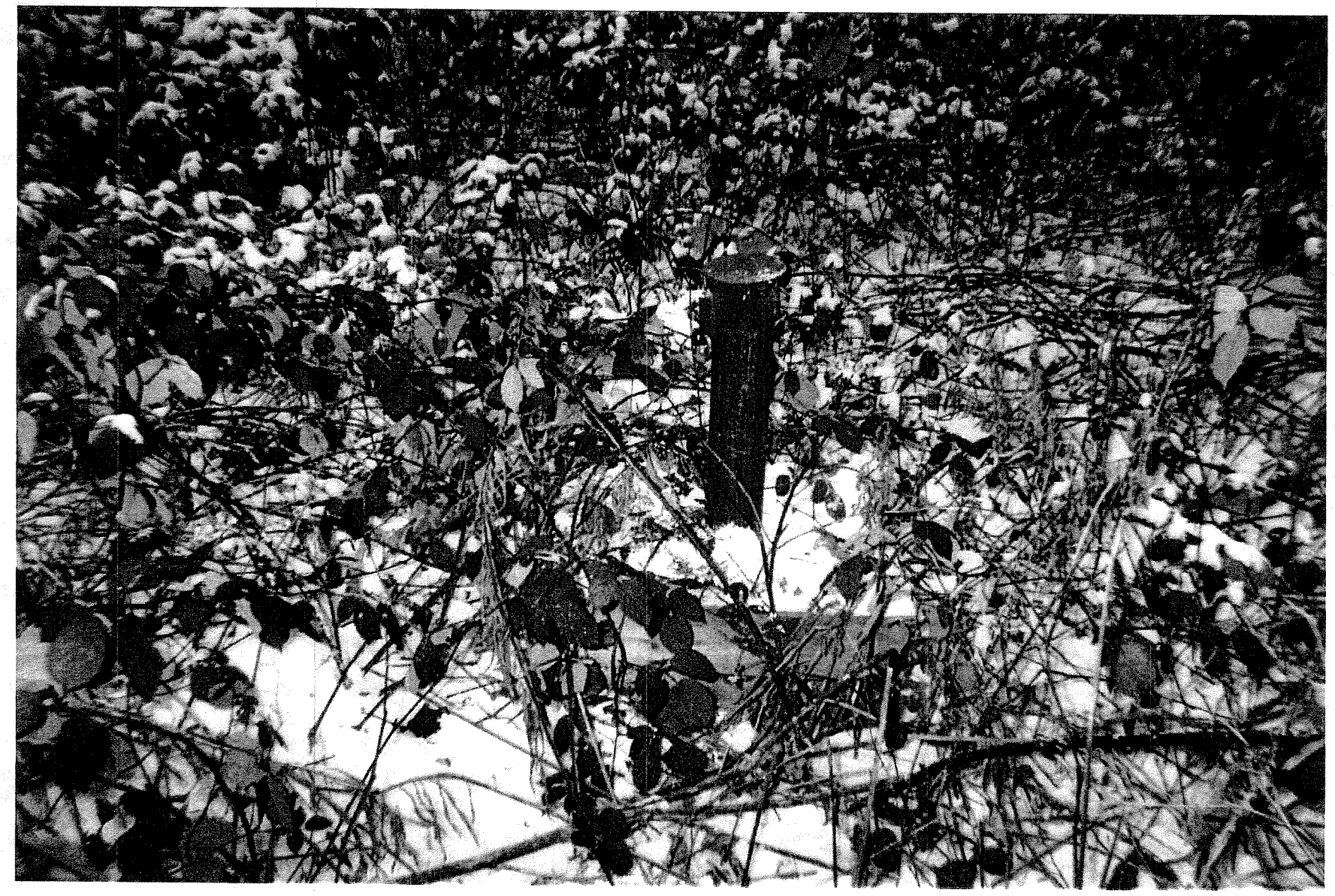


Photo 23: One of three monitoring wells (Object 44) observed on the site (four wells are located on the site).

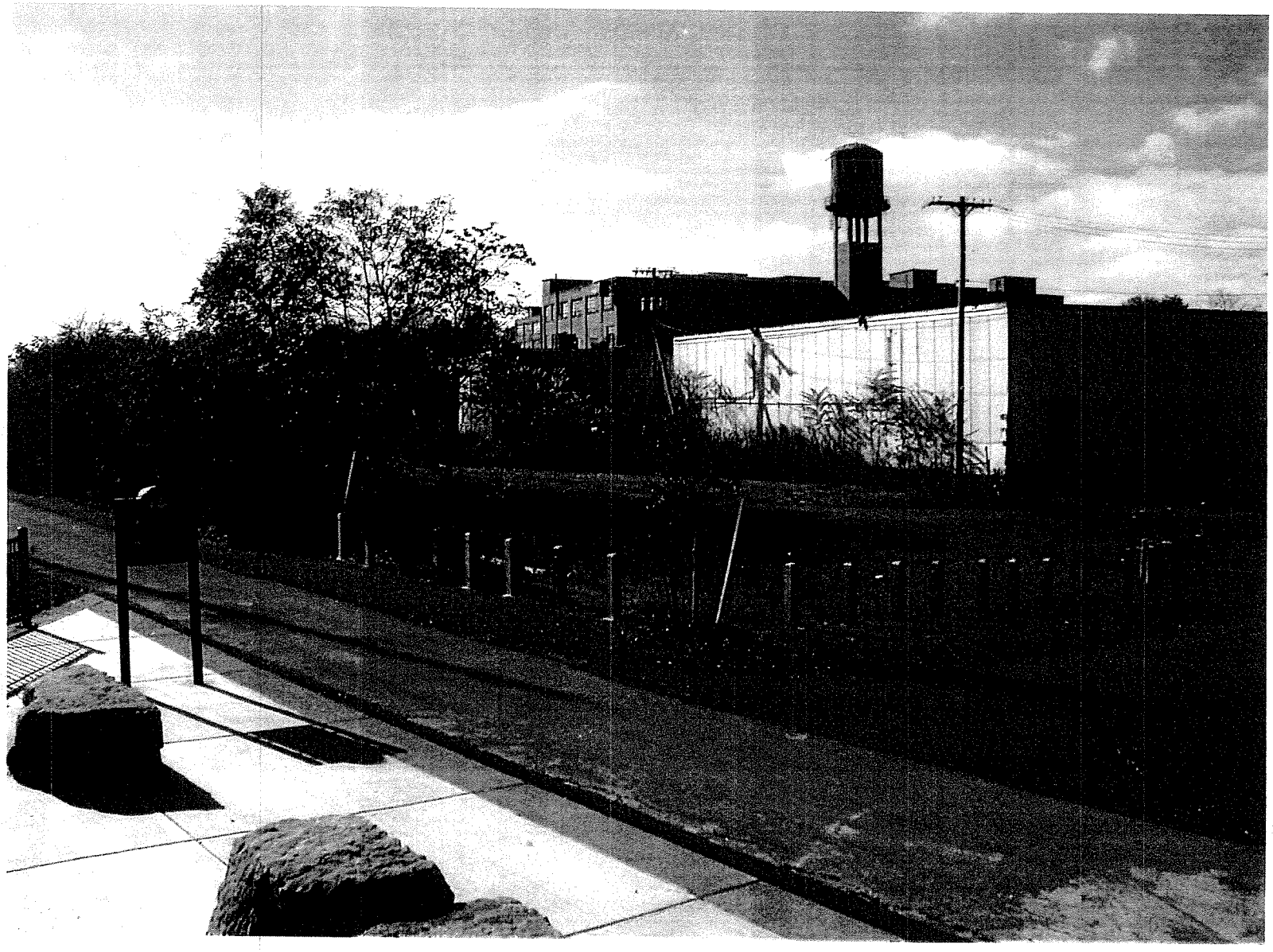


Photo 24: Developed land use in the northern portion of the site, viewed from bulkhead at Violetta Street facing southwest.

Photo 25: Break in the bulkhead near the northern end of railroad trestle.

Photo 26: Concrete retaining wall along the slope in the western section of the site, facing southwest.

Photo 27: Additional concrete retaining walls along the slope in the western section of the site, facing northwest.

Photo 28: A retaining wall filled with scrap tires from the salvage yard along the slope in the western section of the site.

Photo 30: Southwest corner of wall (Object 19), coincident with stave storage buildings depicted on 1926 Plat.

Photo 31: Center of wall (Object 20) coincident with stave storage buildings depicted on 1926 Plat.

Photo 32: Northern end of wall (Object 20) coincident with stave storage buildings depicted on 1926 Plat.

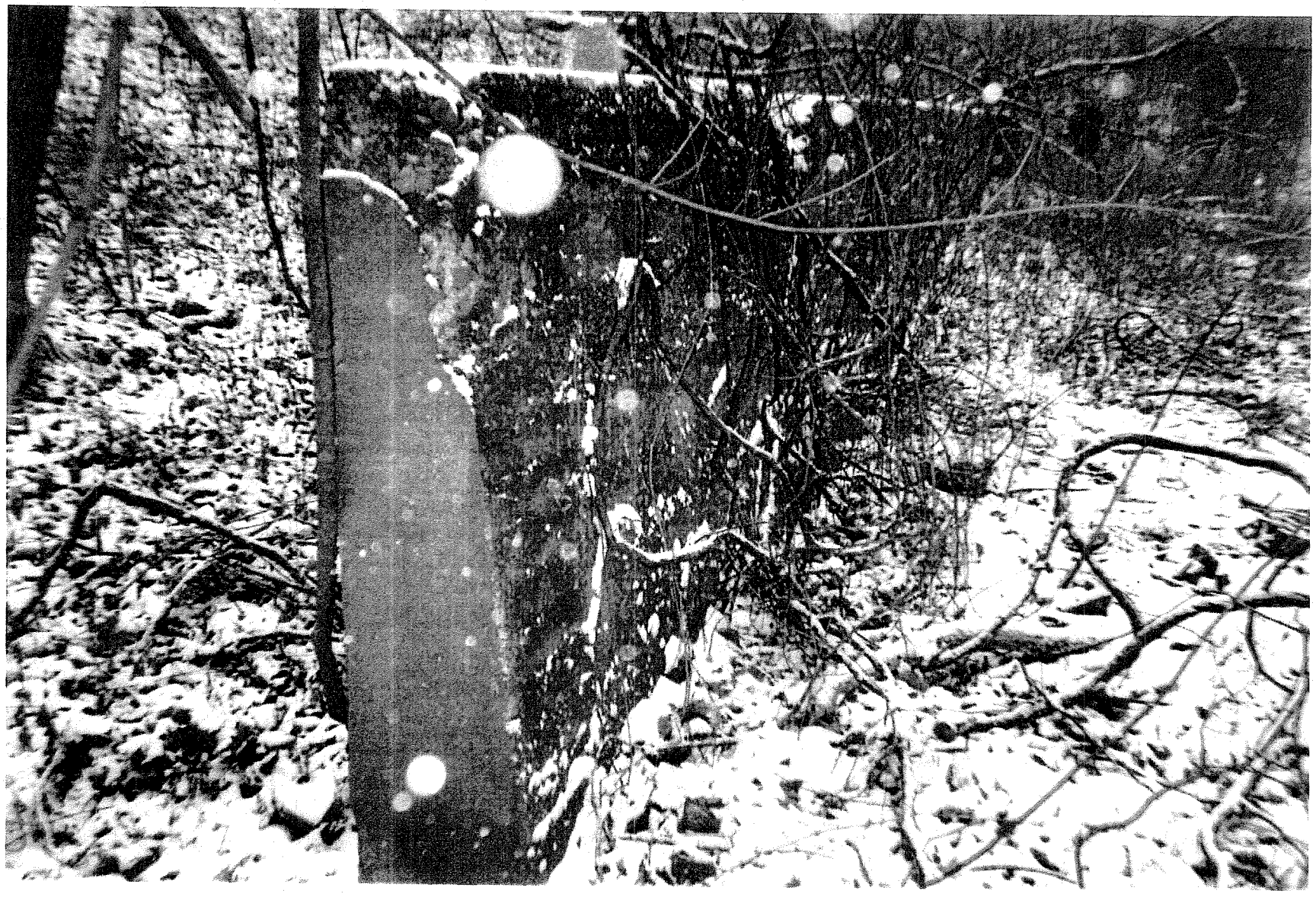


Photo 33: Upper terrace concrete wall (Object 11) running along the toe of slope in the western portion of the site, facing northwest.

Photo 34: Southern ends of mid-terrace wall (Object 13/14) in left foreground and lower terrace wall (Object 15/16) in right background, facing northwest.

Photo 35: A manhole cover (Object 4) and remnants of a wall located just north of the bike path in the southern end of the site.

Photo 36: A manhole cover (Object 38) located near the railroad track rail (Object 37).

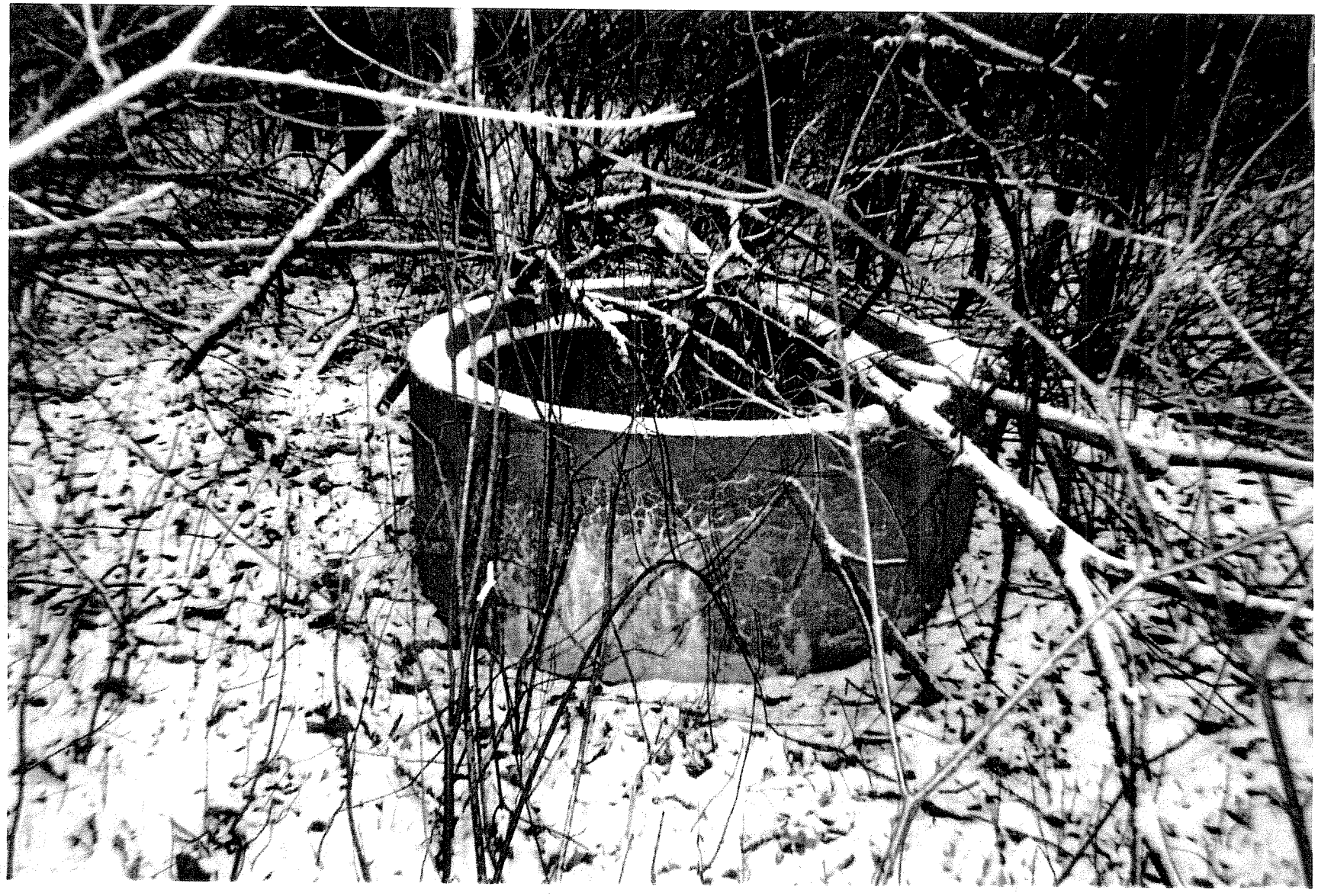


Photo 37: Concrete manhole section (Object 22), located in the center of the site, immediately east of Object 19/20.

Photo 38: A manhole section (Object 49) located in the northern portion of the site, east of the wall that is Object 34/50.

Photo 39: A pipe (possibly an old well) (Object 42) located to the northeast of monitoring well that is Object 44.

Photo 40: Fire hydrant (Object 21) located immediately west of wall that is Object 19/20.

Photo 41: Fire hydrant (Object 23) located at the north end of the wall that is Object 19/20.

Photo 42: Fire hydrant (Object 33) located immediately west of the wall that is Object 34/50.

Photo 43: Fire hydrant (Object 59) located along the western slope from the bike path in the central portion of the site.

Photo 44: Fire hydrant (Object 74) located at the toe of slope of the bike path in the southern portion of the site.

Photo 45: A possible floor pit (Object 47) located just south of the wall that is Object 45.

Photo 46: North end of a remnant wall (Object 58) that is coincident with the stave storage buildings depicted on the 1926 Plat, viewed from the northeast, facing southwest.

Photo 47: The southeastern corner of a remnant wall (Object 60) that is coincident with the stave storage buildings depicted on the 1926 Plat.

Photo 48: Pieces of flooring associated with Objects 58, 60, and 61 that is coincident with the stave storage buildings depicted on the 1926 Plat.

Photo 49: Eastern end of a remnant wall (Object 63/65) that is coincident with the stave storage buildings depicted on the 1926 Plat.

Photo 50: Southern end of a remnant wall (Object 73) that is coincident with the stave storage buildings depicted on the 1926 Plat.

Photo 51: A possible oven part (Object 41) located just west of the slope from the bike path, just south of the 3-story building.

Photo 52: "Slag mounds" (Object 53) and empty tank located in disturbed woods to the southeast of the salvage yard.

Photo 53: Scrap "slag mounds" (Object 53) located within disturbed woods to the southeast of the salvage yard.

Photo 54: Scrap "slag mounds" (Object 53) and Reel-O-Matic (Object 52) located within disturbed woods to the southeast of the salvage yard.

Photo 55: A pile of molten plastic (Object 51) just west of the slope from the bike path in the southern portion of the site.

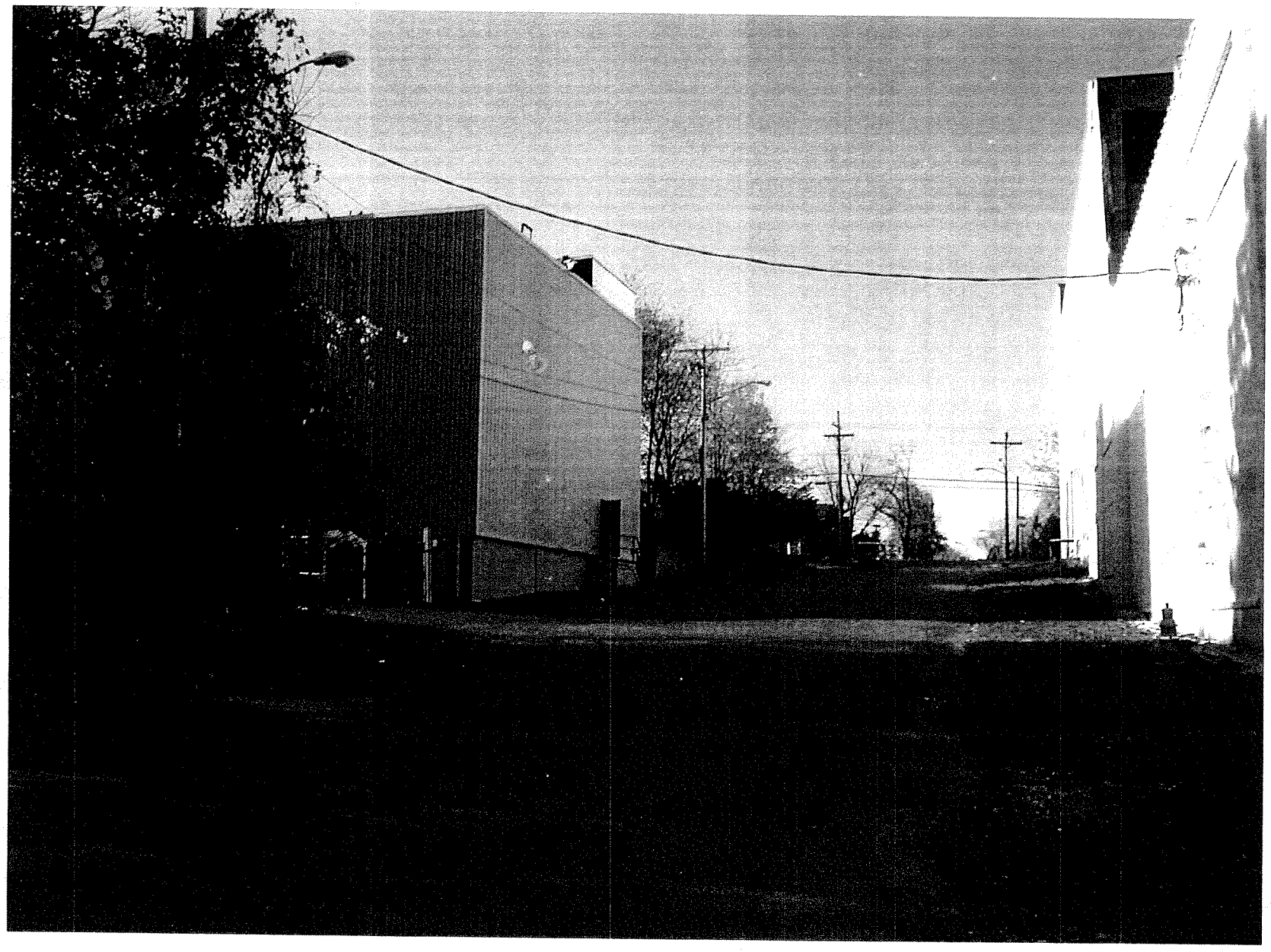


Photo 56: View of the site from the end of Flint Street, facing west towards Exchange Street.

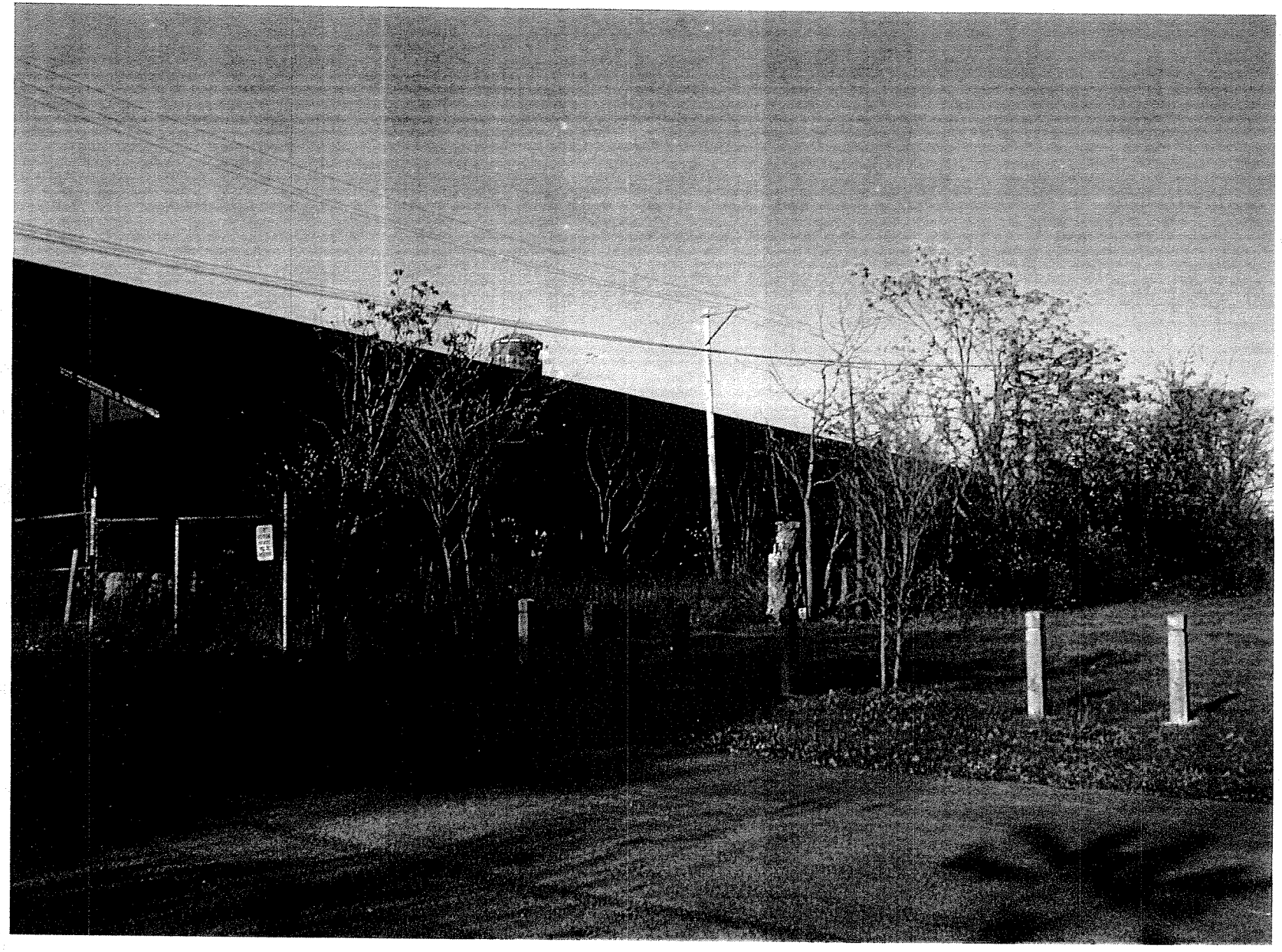


Photo 57: View of the site from Flint Street, facing northwest towards food distribution facility (Food Link).

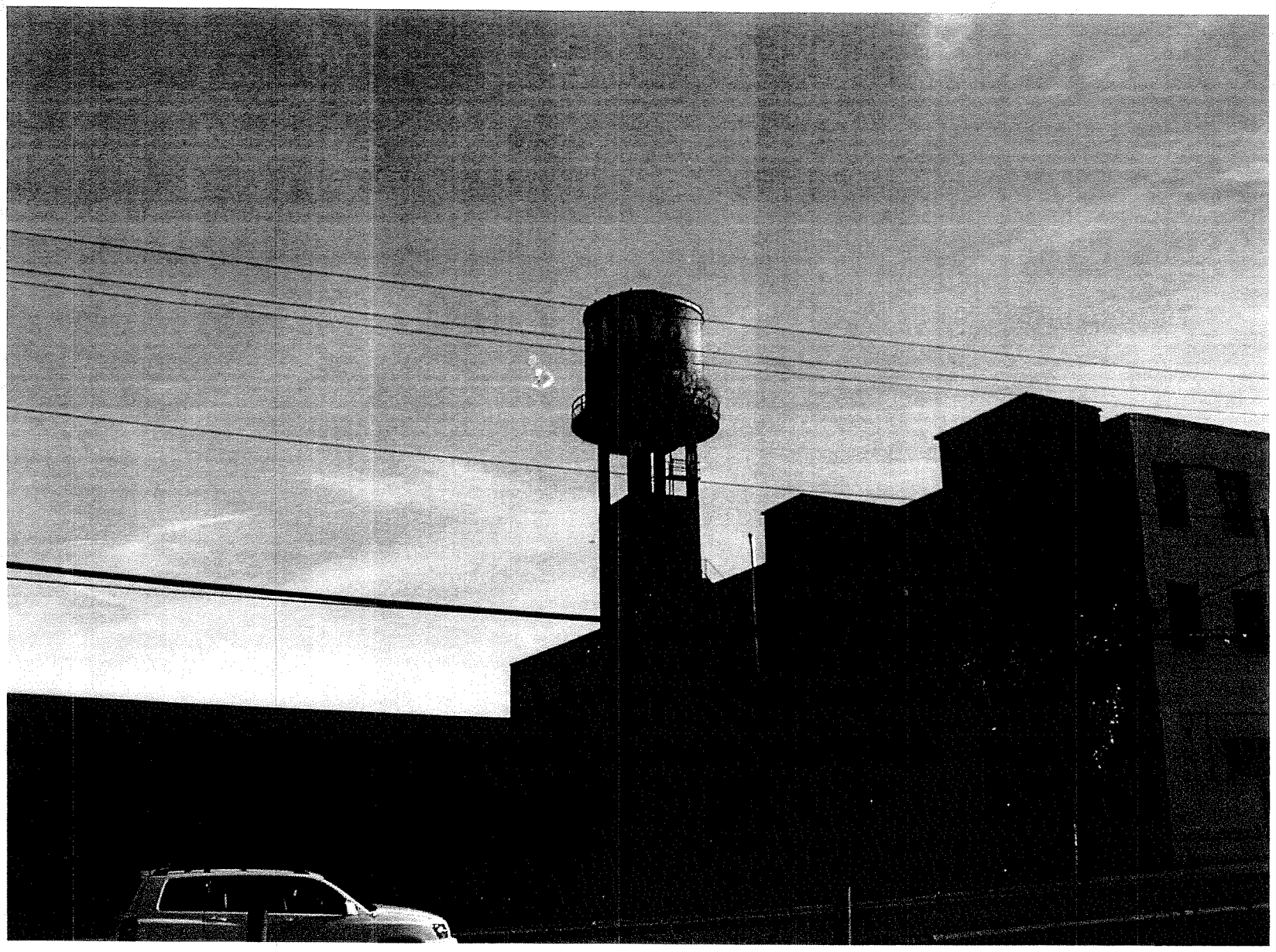


Photo 58: Water tower located atop building in northern developed portion of the site.

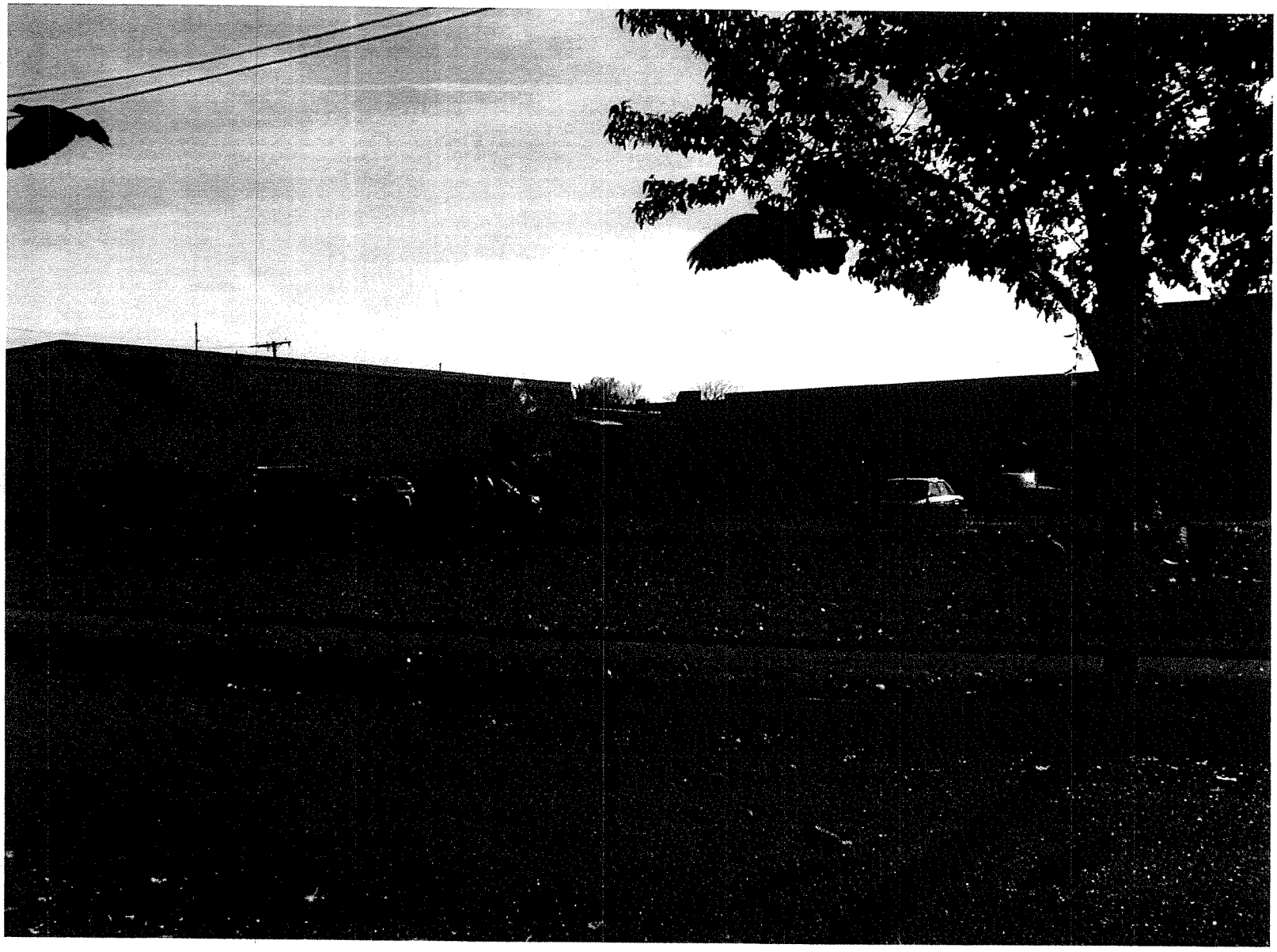


Photo 59: Developed land use in the northern portion of the site, viewed from Violetta Street.

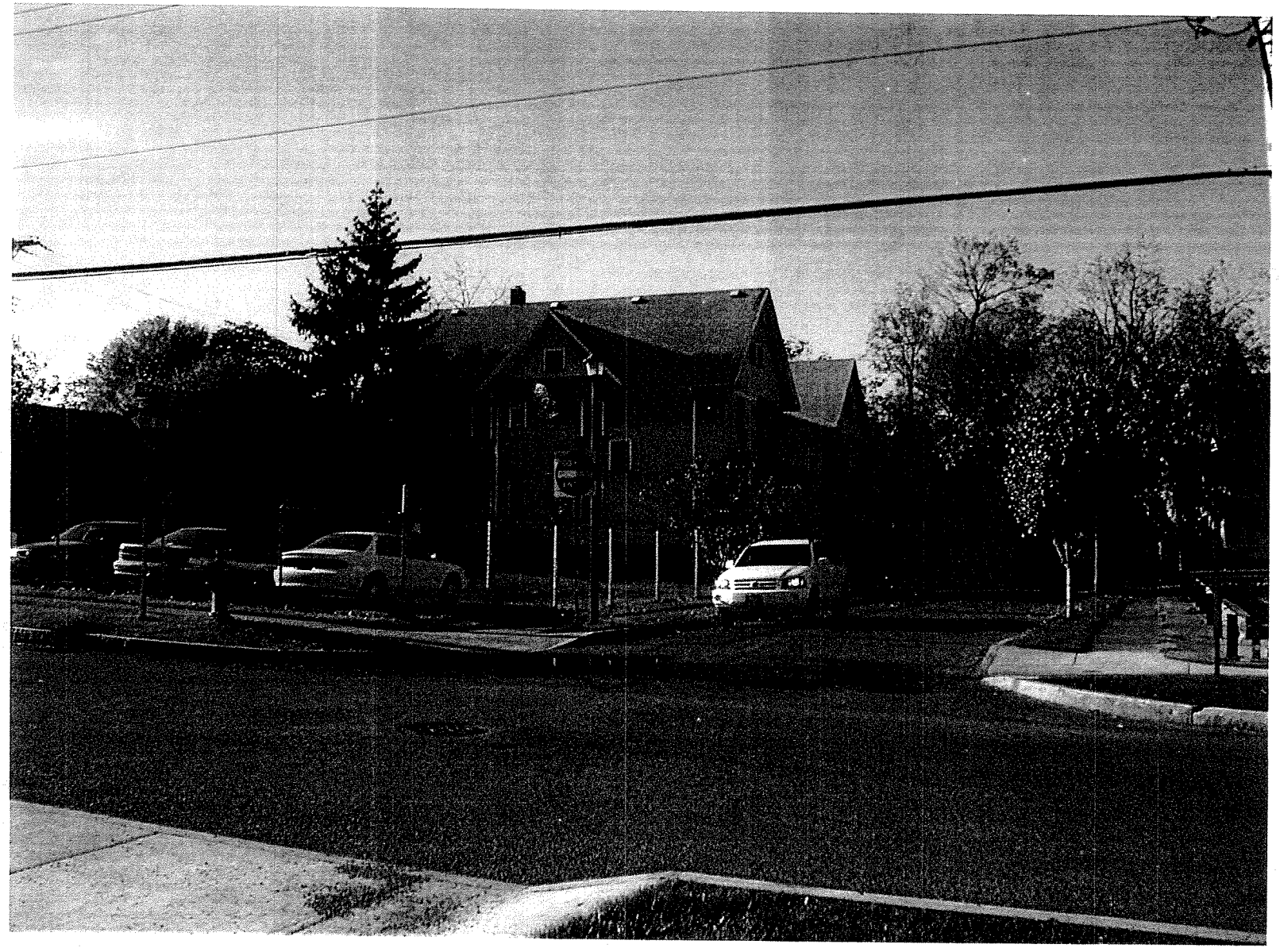


Photo 60: Residential land use in the northern portion of the site, viewed from Exchange and Fenwick Streets facing southwest.

Photo 61: Off-site property located immediately north of Violetta Street.

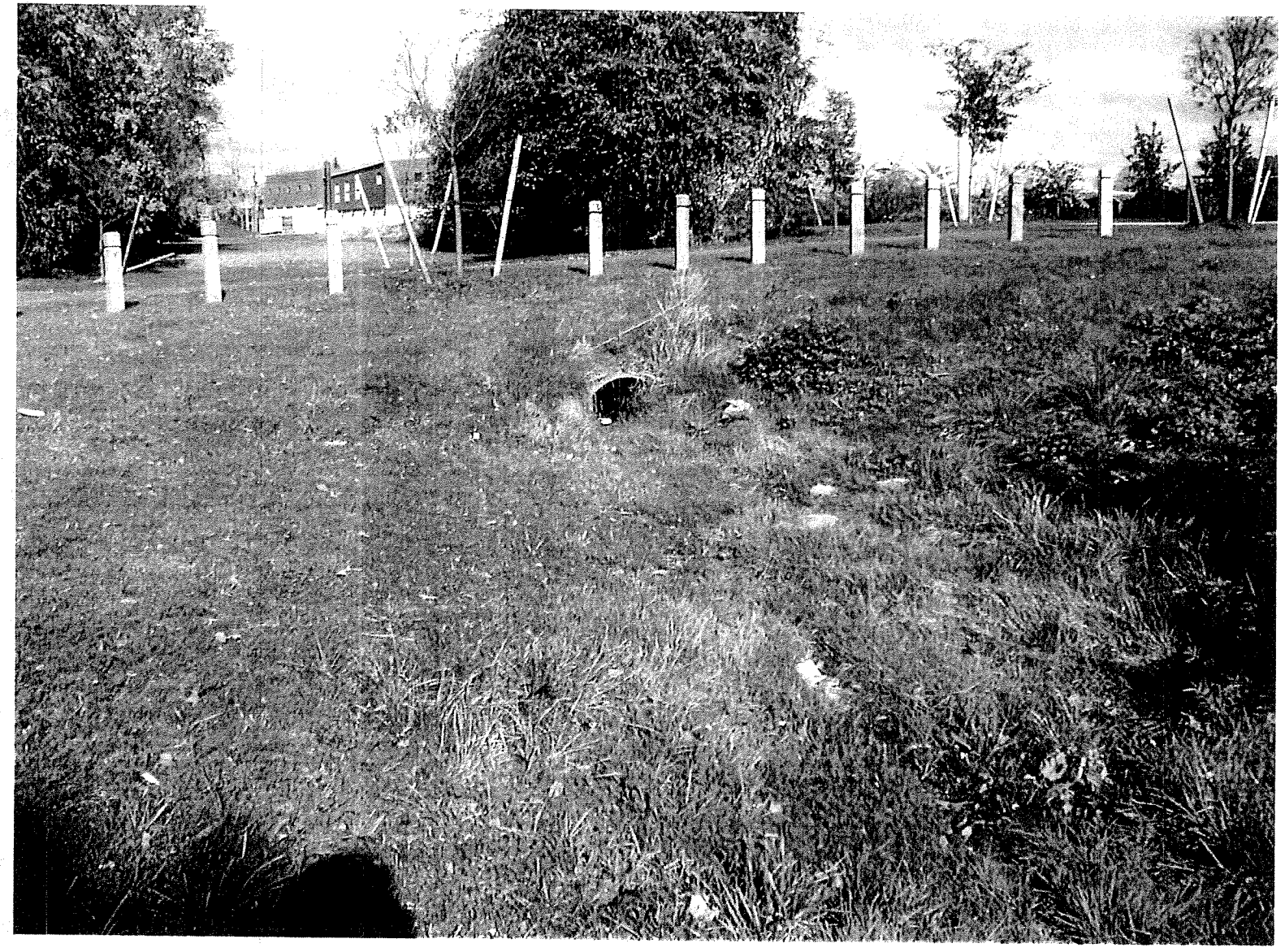


Photo 62: Off-site metal pipe culvert located at northern site boundary (Violetta Street), viewed from the site facing north.

Photo 63: Concrete remnant located along north side of bike path in southern portion of the site, southwest of the railroad trestle.

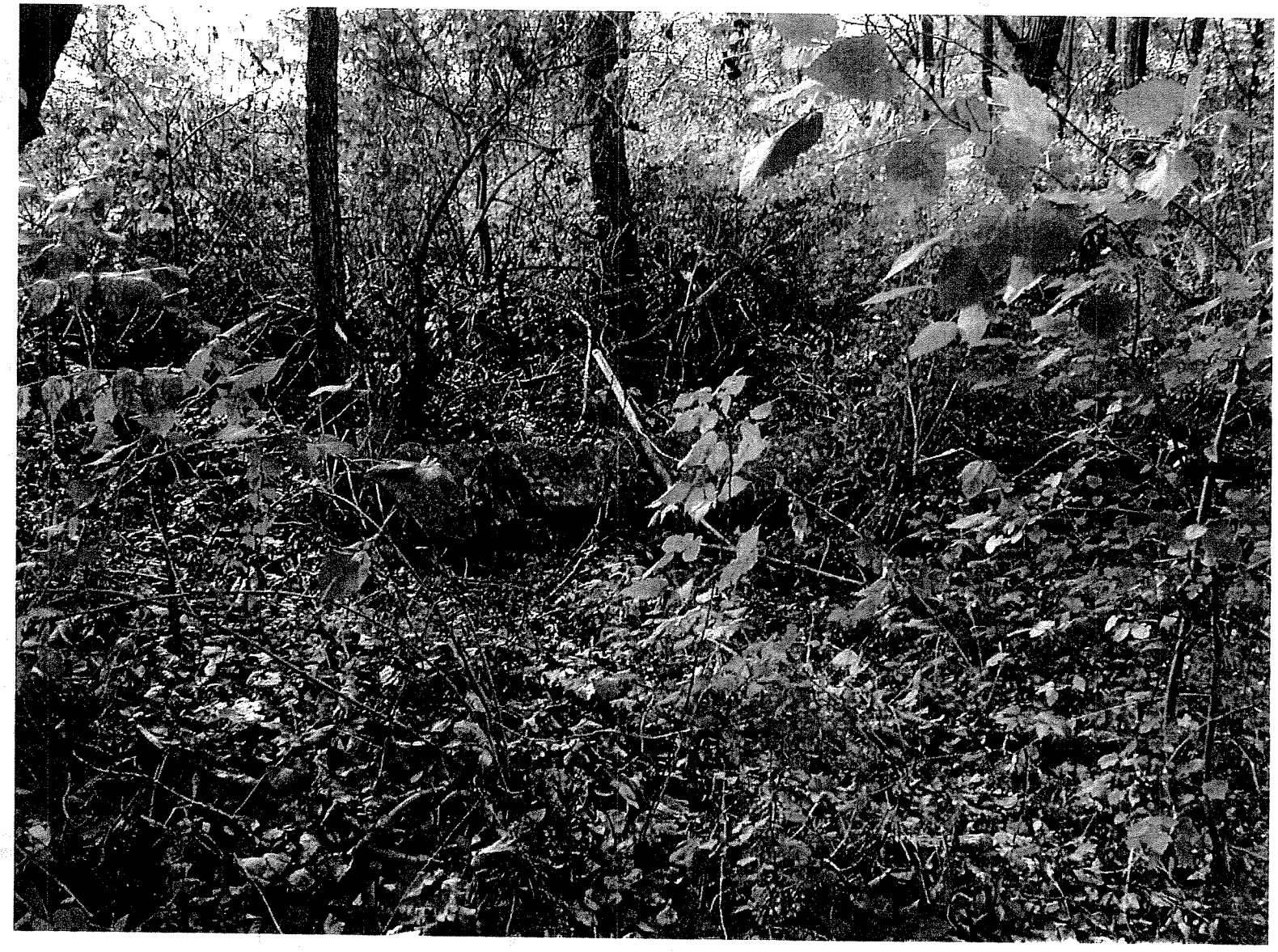


Photo 64: Concrete remnant located along south side of bike path in the southern portion of the site, southwest of the railroad trestle.

Photo 65: Remnant foundation or wall (Object 3) at the southern end of the site.

Photo 66: Rear of structure along western site boundary, believed to be part of a residential property located on Cottage Street.

Photo 67: Remnant circular footing (patio-block sized) (Objects 66 to 69) located within woods in central portion of the site.

Photo 68: Remnant circular footing (Objects 66 to 69) located within woods community in the central portion of the site.

Photo 69: Remnant circular footing (Objects 66 to 69) located within woods community in the central portion of the site.

Photo 70: Approximate mid-point of retaining wall that is Object 34/50, situated parallel to the drainage ditch adjacent to the 3-story building.

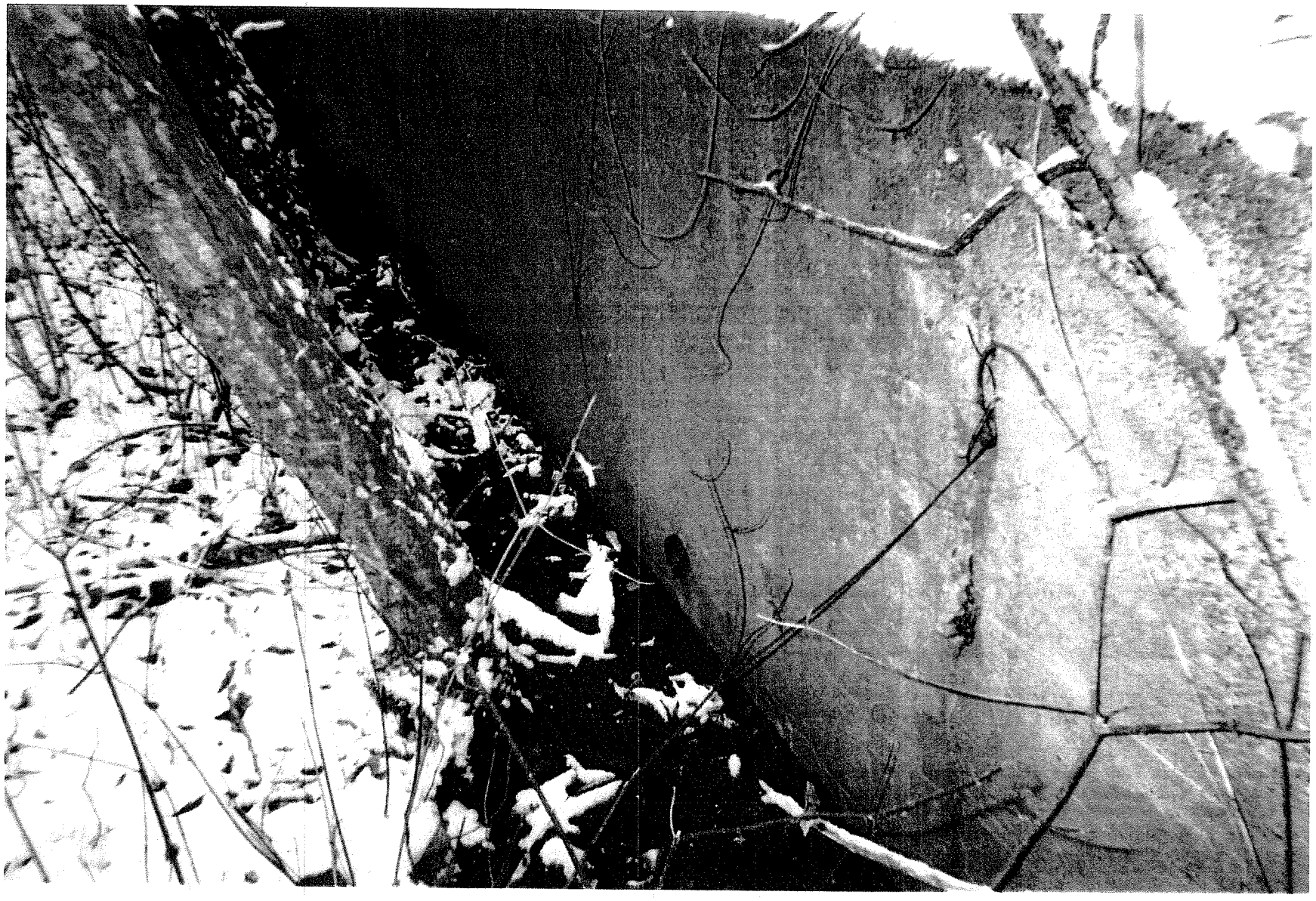


Photo 71: Pipes leading out of the west side of the retaining wall that is Object 34/50.

Photo 72: Southern end of the retaining wall that is Object 34/50.

Photo 73: Remnant circular footing (Object 40) immediately south of the parking lot for the existing 3-story building with iron bracket/fixture located in the center of the footing.

Photo 74: Same remnant circular footing depicted in Photo 73 (Object 40), in December 2004.

Photo 75: Cylindrical concrete pillar (Object 1) lying on its side, located at the southern end of the site.

Photo 76: Fence line (Object 5) and an empty 55-gallon drum (Object 6), located on the slope in the western portion of the site.

Photo 77: View of several vertical pipes that is Object 8.

Photo 78: Empty, rusted 55-gallon drum that is Object 12.

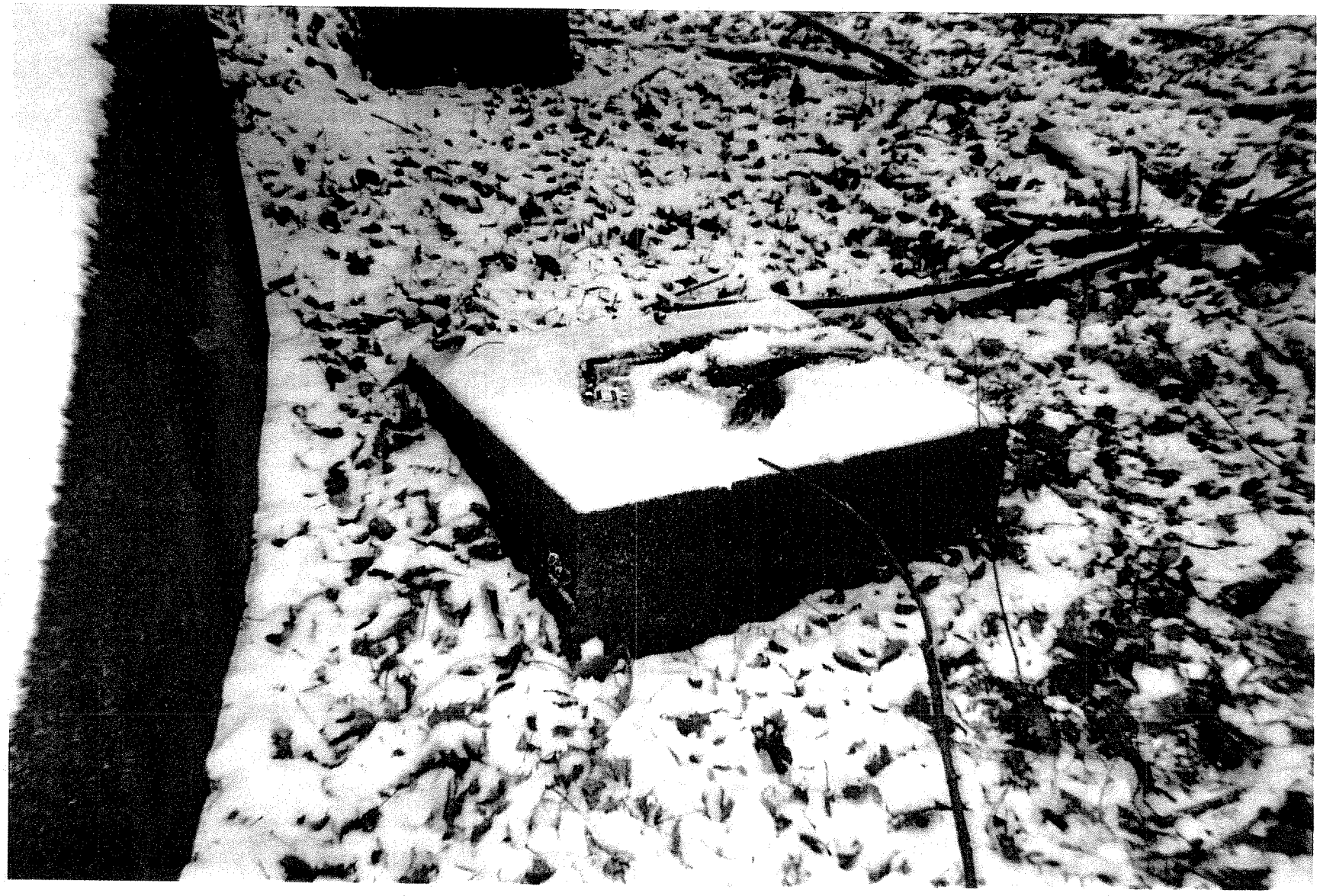


Photo 79: One of several concrete footers located next to the circular retaining walls that are Objects 24 to 27.

Photo 80: Additional concrete footers located near the circular retaining walls that are Objects 24 to 27.

Photo 81: A portion of a concrete footer located near the circular retaining walls that are Objects 24 to 27.

Photo 82: Concrete square structure (Object 28) located immediately to the southeast of the circular retaining walls that are Objects 24 to 27.

Photo 83: Vertical metal pipes (Object 55) located in the central portion of the site.

Photo 84: Railroad track rail (Object 36/37) located to the east of the salvage yard.

Photo 85: Northwest corner of a remnant foundation (Object 39), located just south of the 3-story building and just east of the wall that is Object 34/50.

Photo 86: A fallen tree with a concrete structure buried underneath (Object 54), located immediately to the northwest of the slag piles that are Objects 52 and 53.

Photo 87: Standing water (Object 10) within the forested deciduous wetland community near southern end of the site, facing east.

Photo 88: A second area of standing water (Object 9) within the forested deciduous wetland community near southern end of the site, facing northeast.

Photo 89: A third area of standing water (Object 7) within the forested deciduous wetland community near southern end of the site, facing northeast.

Photo 90: Emergent wetland community (note sensitive fern fruiting bodies) along hillside.

Photo 91: Population of wetland sedges at base on hill below Photo 90.

Photo 92: Concrete blocks (Object 75) just south of the bike path located in the southern portion of the site.

Photo 93: Railroad trestle just outside the southeastern site boundary.

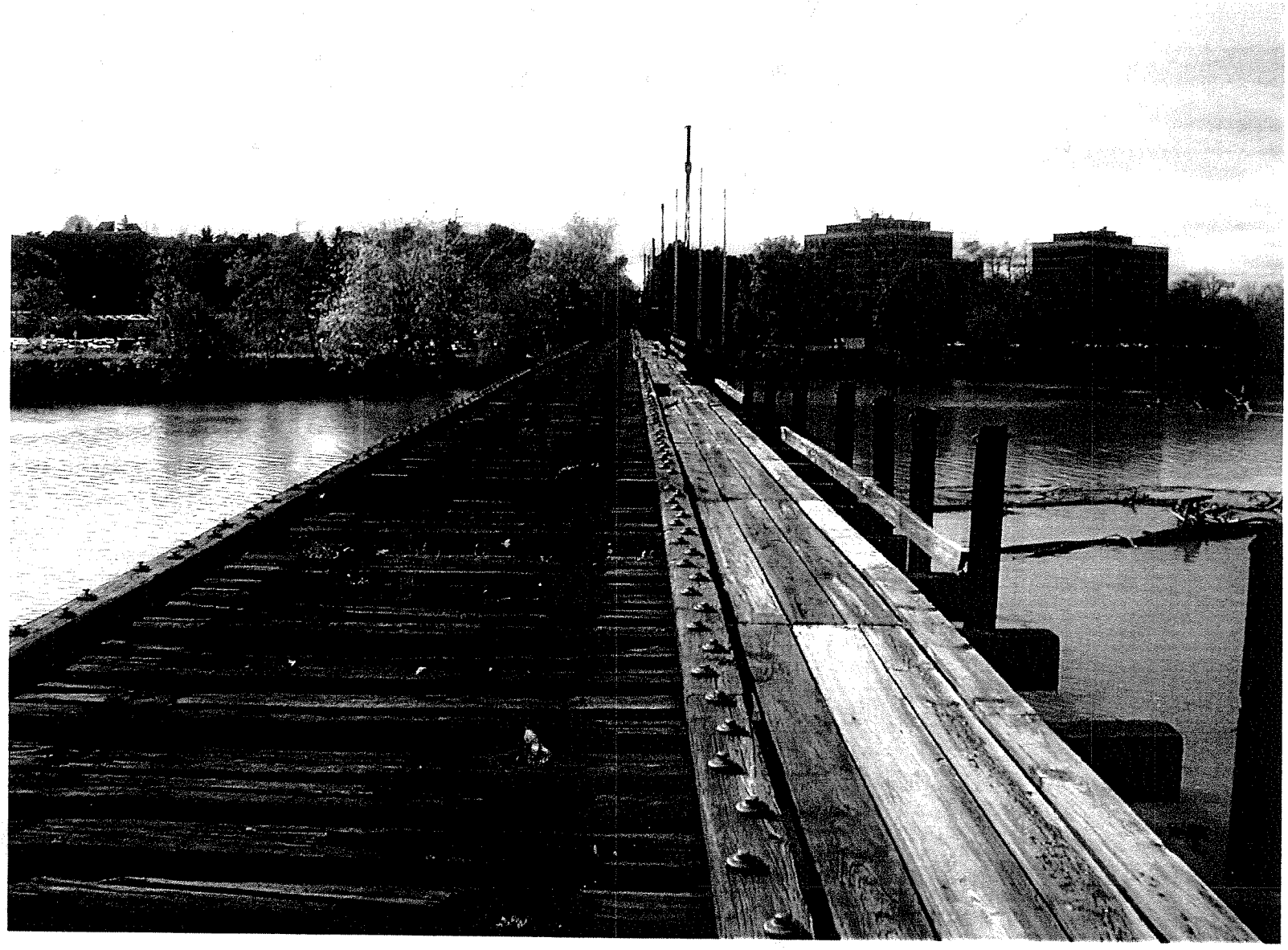


Photo 94: Upper surface of railroad trestle, viewed from the north, facing south.

Appendix B

EDR-Historic Topographic Map Report

EDR™ Environmental
Data Resources Inc

The EDR-Historical Topographic Map Report

Exchange Street/Flint Street
Exchange Street/Flint Street
Rochester, NY 14608

September 29, 2004

Inquiry Number: 1278316-4

The Standard In Environmental Risk Management Information

440 Wheelers Farms Road
Milford, Connecticut 06460

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802

Environmental Data Resources, Inc.
Historical Topographic Map Report

Environmental Data Resources, Inc.'s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property, and its surrounding area, resulting from past activities. ASTM E 1527-00, Section 7.3 on Historical Use Information, identifies the prior use requirements for a Phase I environmental site assessment. The ASTM standard requires a review of *reasonably ascertainable standard historical sources. Reasonably ascertainable is defined as information that is publicly available, obtainable from a source with reasonable time and cost constraints, and practically reviewable.*

To meet the prior use requirements of ASTM E 1527-00, Section 7.3.4, the following *standard historical sources* may be used: aerial photographs, city directories, fire insurance maps, topographic maps, property tax files, land title records (although these cannot be the sole historical source consulted), building department records, or zoning/and use records. ASTM E 1527-00 requires *"All obvious uses of the property shall be identified from the present, back to the property's obvious first developed use, or back to 1940, whichever is earlier. This task requires reviewing only as many of the standard historical sources as are necessary, and that are reasonably ascertainable and likely to be useful."* (ASTM E 1527-00, Section 7.3.2 page 12.)

EDR's Historical Topographic Map Report includes a search of available public and private color historical topographic map collections.

Topographic Maps

A topographic map (topo) is a color coded line-and-symbol representation of natural and selected artificial features plotted to a scale. Topos show the shape, elevation, and development of the terrain in precise detail by using contour lines and color coded symbols. Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination. The colors of the lines usually indicate similar classes of information. For example, topographic contours (brown); lakes, streams, irrigation ditches, etc. (blue); land grids and important roads (red); secondary roads and trails, railroads, boundaries, etc. (black); and features that have been updated using aerial photography, but not field verified, such as disturbed land areas (e.g., gravel pits) and newly developed water bodies (purple).

For more than a century, the USGS has been creating and revising topographic maps for the entire country at a variety of scales. There are about 60,000 U.S. Geological Survey (USGS) produced topo maps covering the United States. Each map covers a specific quadrangle (quad) defined as a four-sided area bounded by latitude and longitude. Historical topographic maps are a valuable historical resource for documenting the prior use of a property and its surrounding area, and due to their frequent availability can be particularly helpful when other standard historical sources (such as city directories, fire insurance maps, or aerial photographs) are not reasonably ascertainable.

Please call EDR Nationwide Customer Service at
1-800-352-0050 (8am-8pm ET)
with questions or comments about your report.
Thank you for your business!

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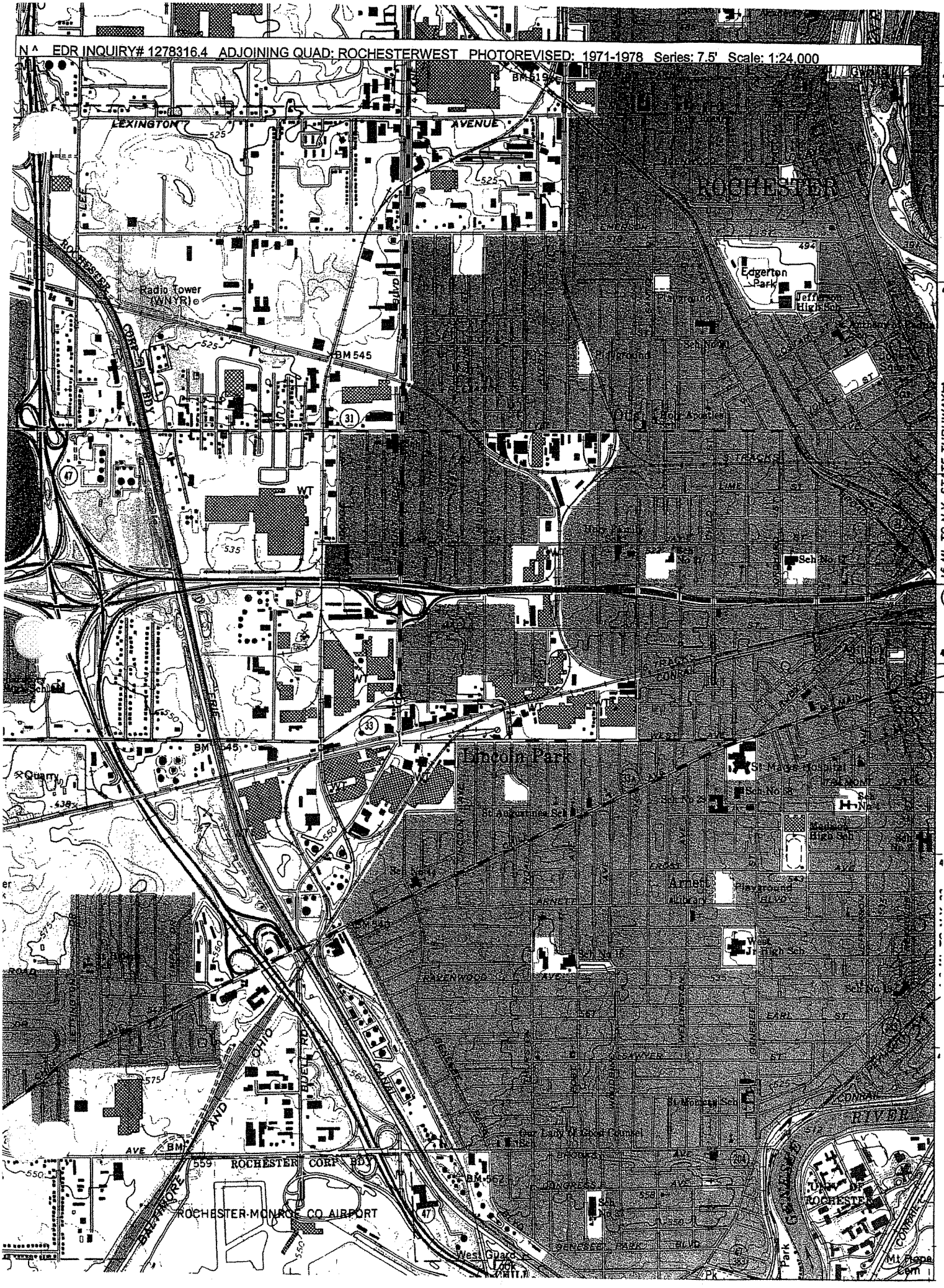
N ^ EDR INQUIRY# 1278316.4 ADJOINING QUAD: ROCHESTERWEST YEAR: 1994 Series: 7.5' Scale: 1:24,000
ROCHESTER
Radio Tower
Edgerton Park
Lincoln Park
Park
ROCHESTER-MONROE CO AIRPORT
RIVER
UNIV OF ROCHESTER

N ^ EDR INQUIRY# 1278316.4 ADJOINING QUAD: ROCHESTERWEST PHOTOREVISED: 1971-1978 Series: 7.5' Scale: 1:24,000



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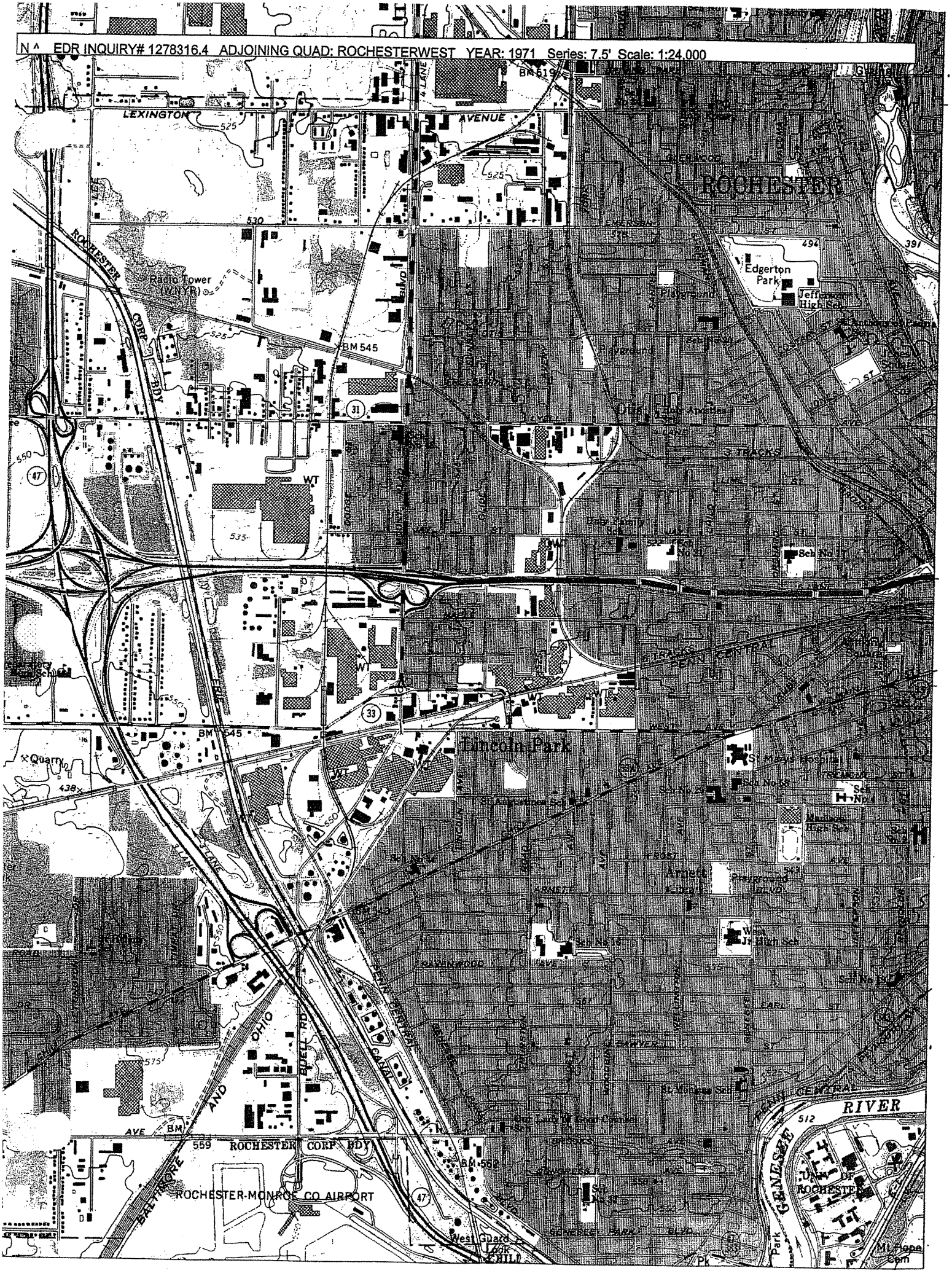
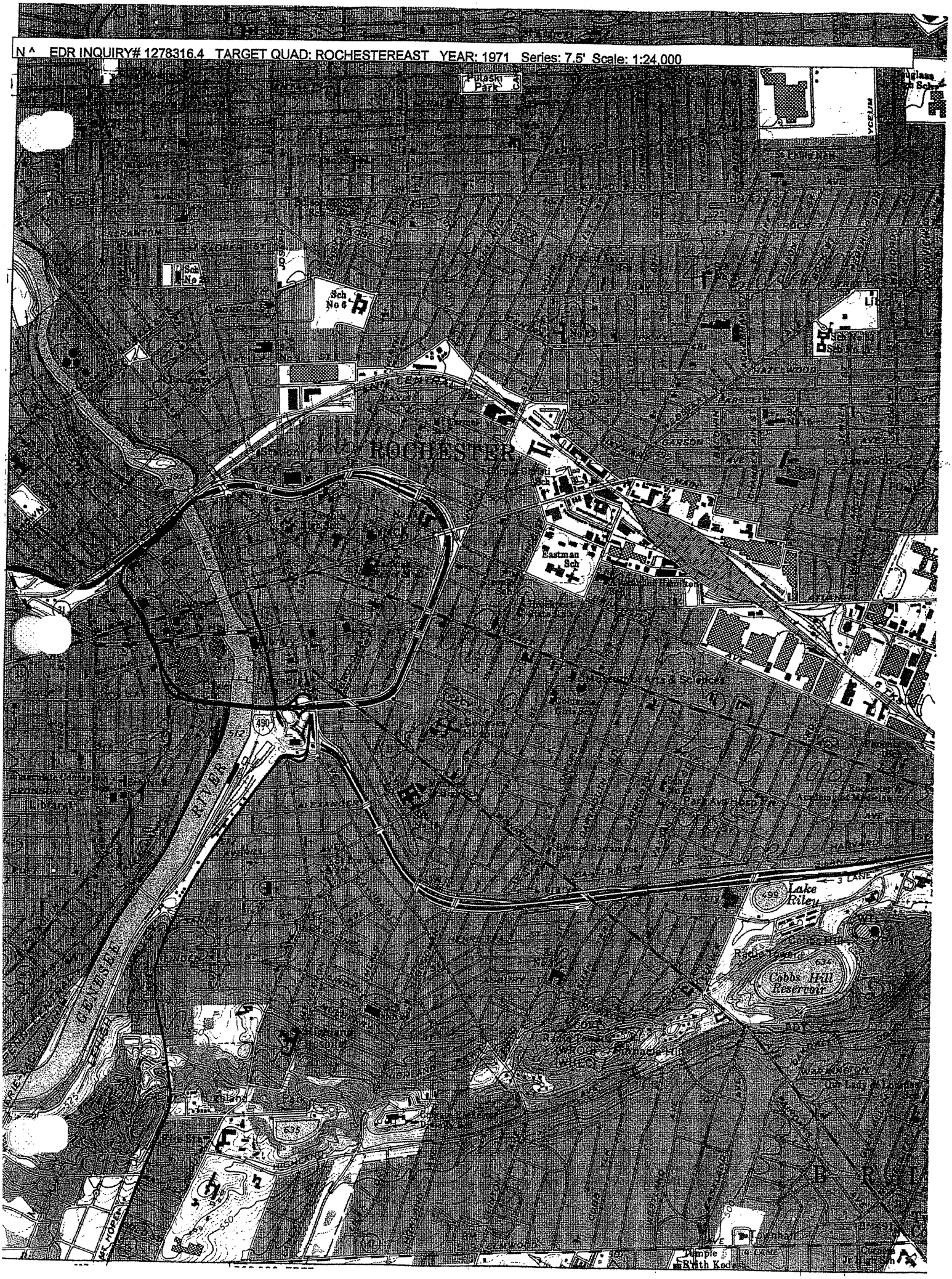
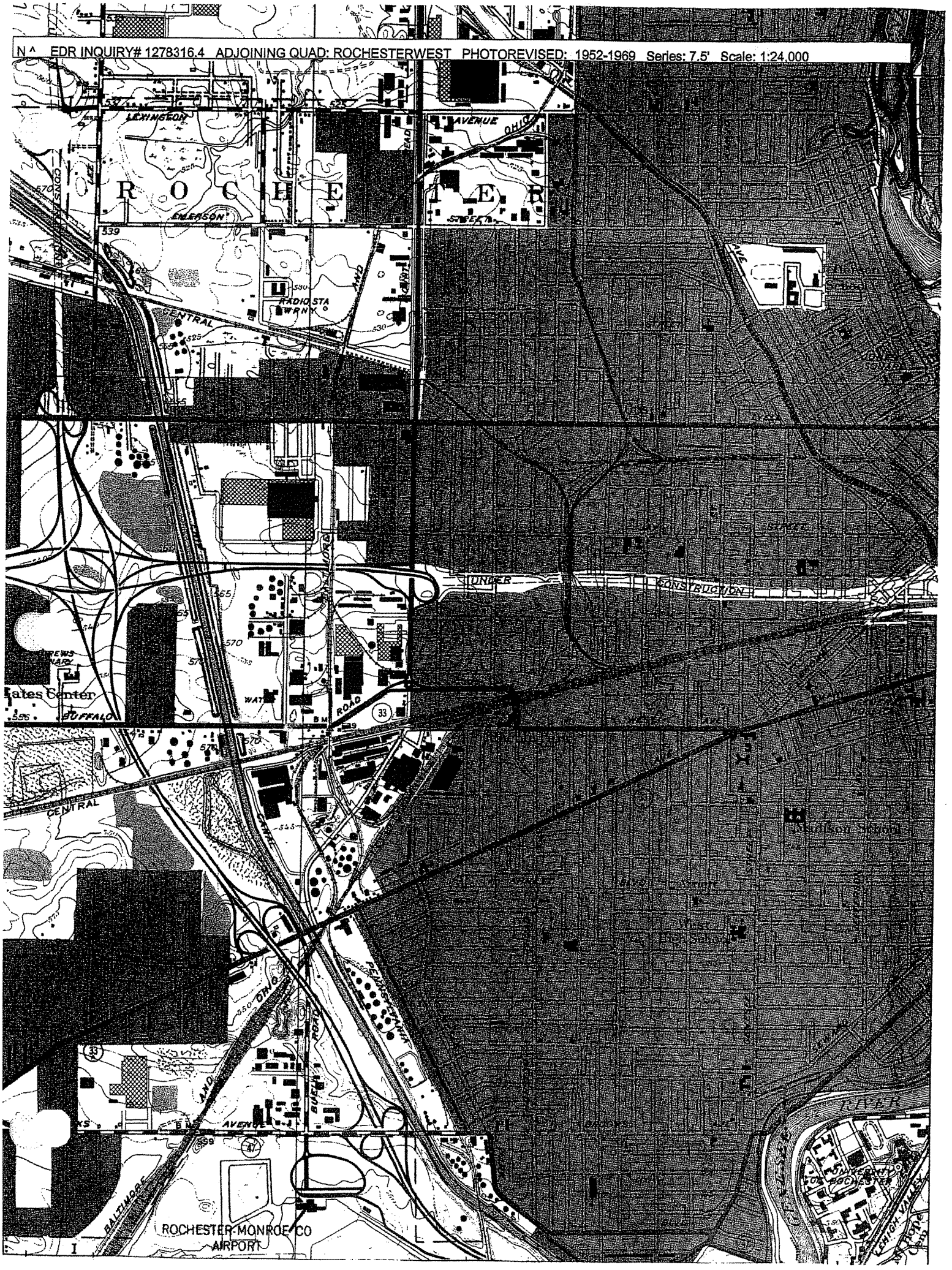



N ^ EDR INQUIRY# 1278316.4 TARGET QUAD: ROCHESTEREAST YEAR: 1971 Series: 7.5' Scale: 1:24,000
ROCHESTER
Eastman Sch
Lake Riley
Cobbs Hill Reservoir
GENESEE RIVER

N ^ EDR INQUIRY# 1278316.4 ADJOINING QUAD: ROCHESTERWEST PHOTOREVISED: 1952-1969 Series: 7.5' Scale: 1:24,000



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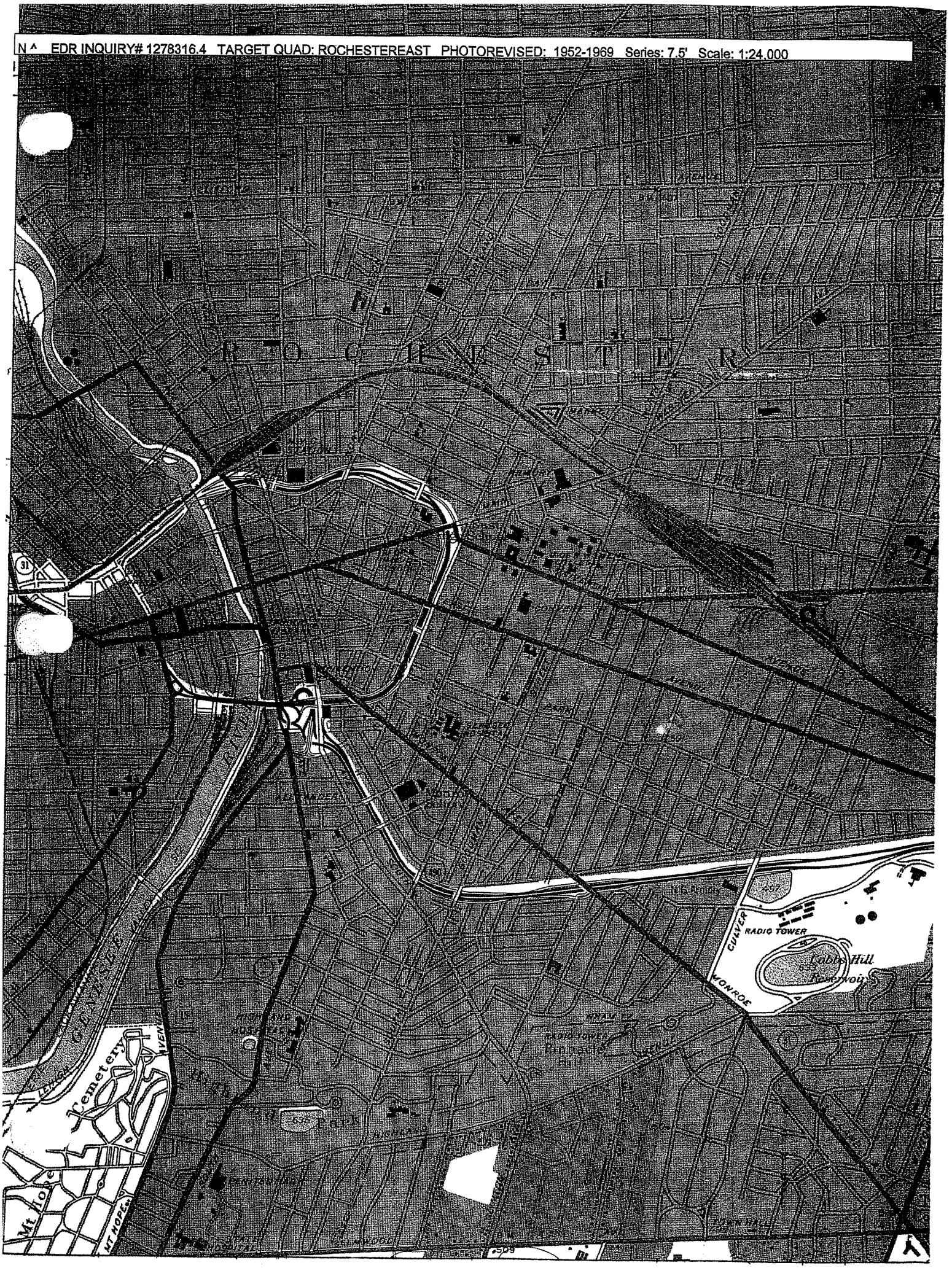

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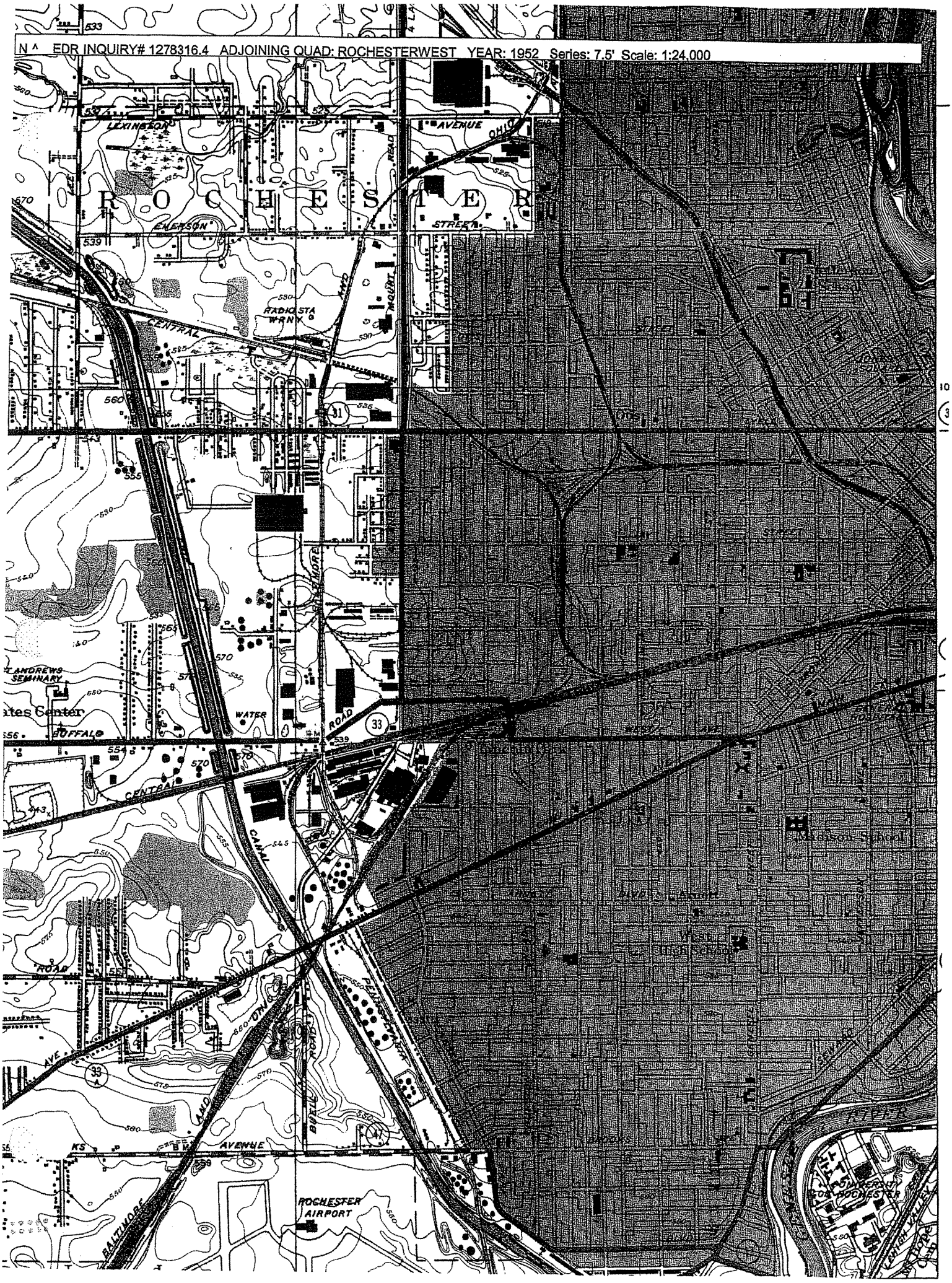

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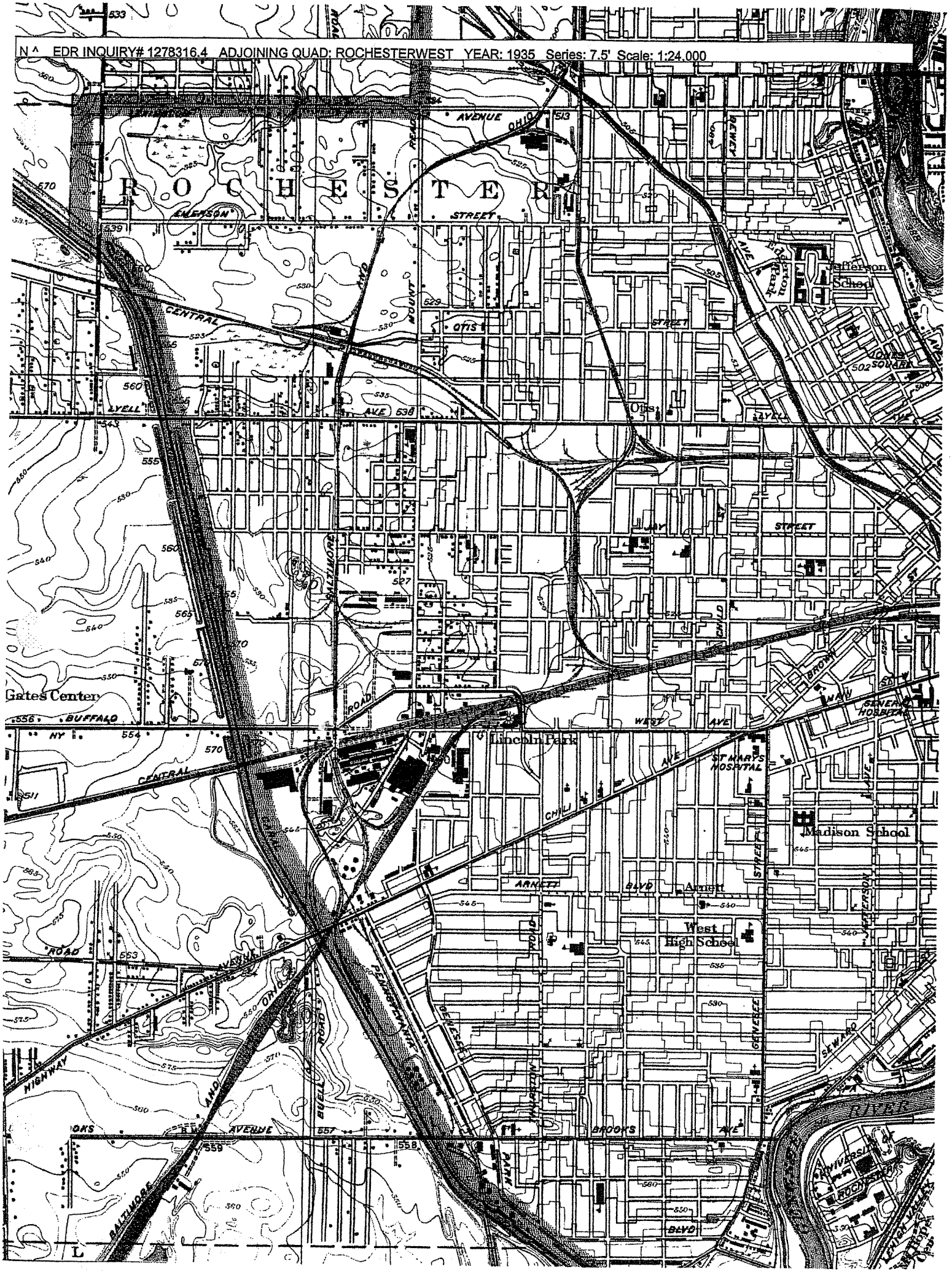

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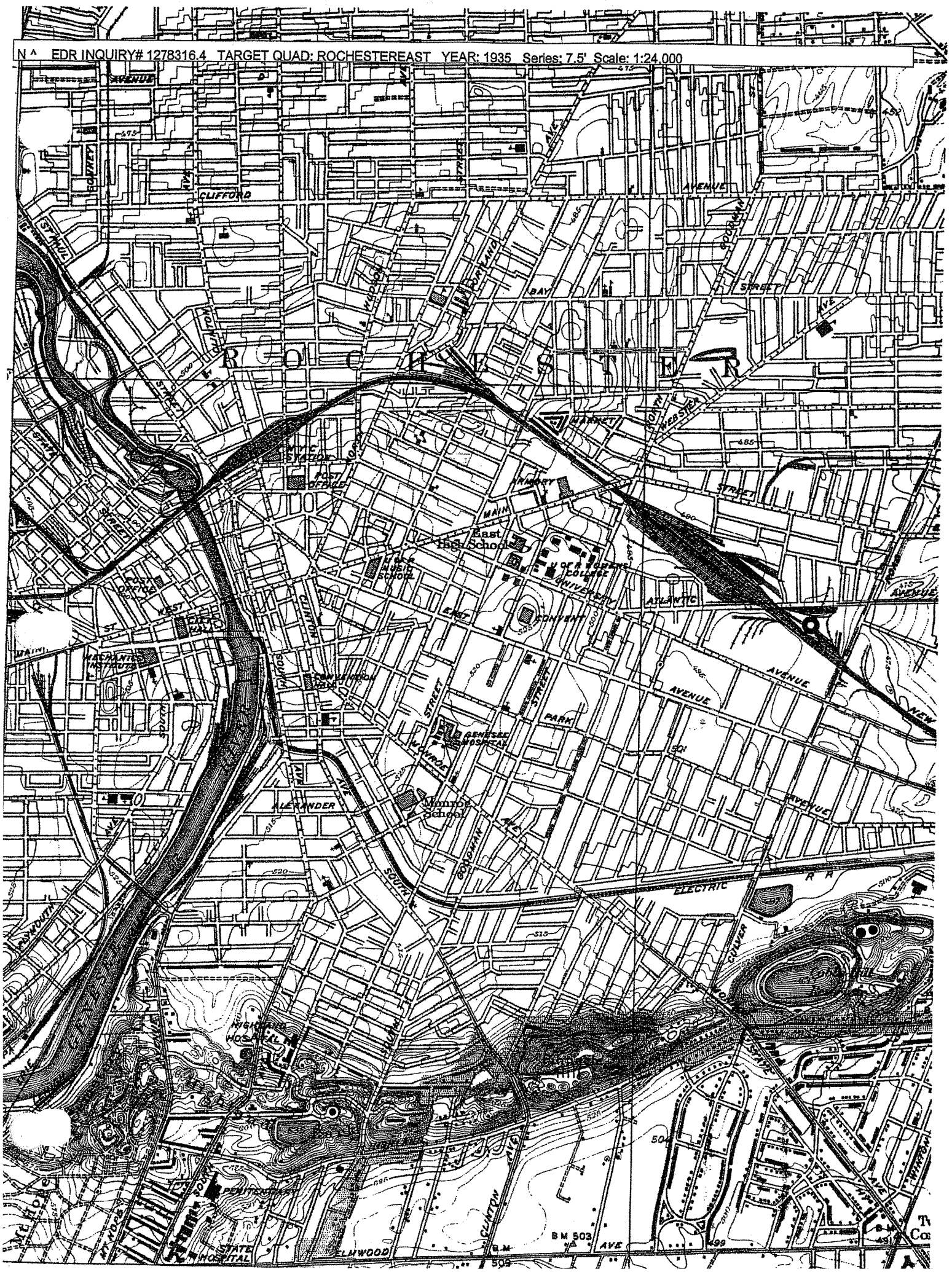

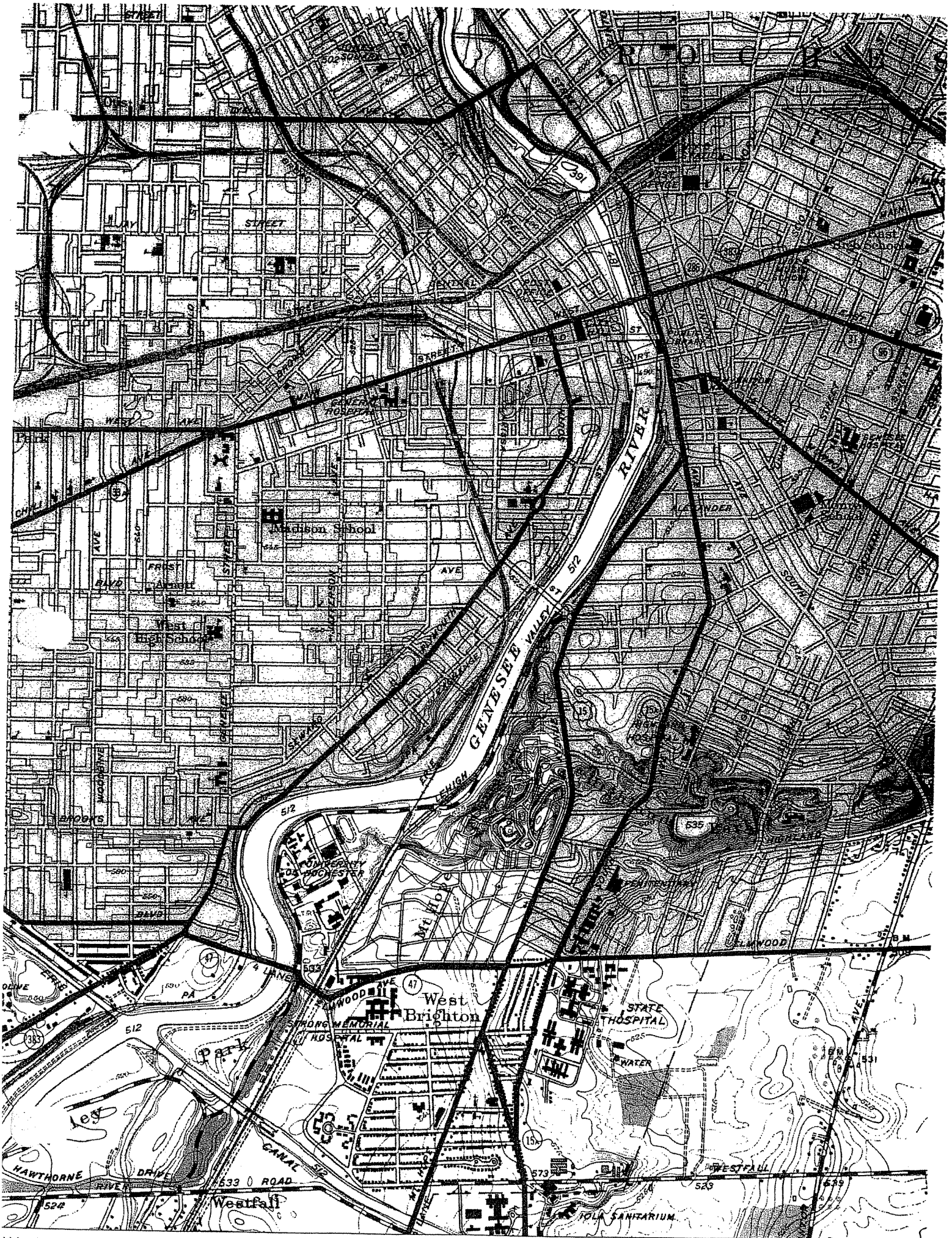

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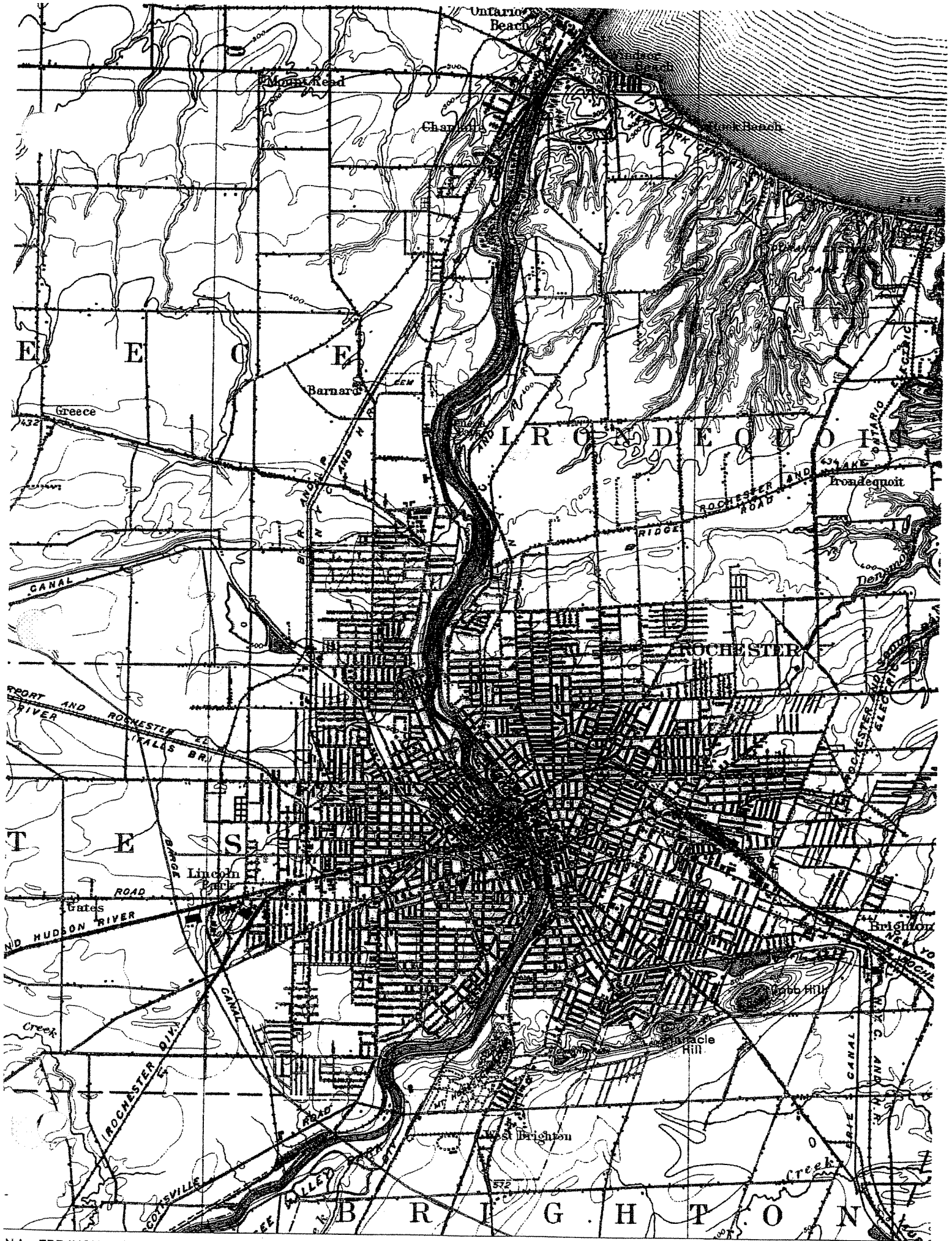
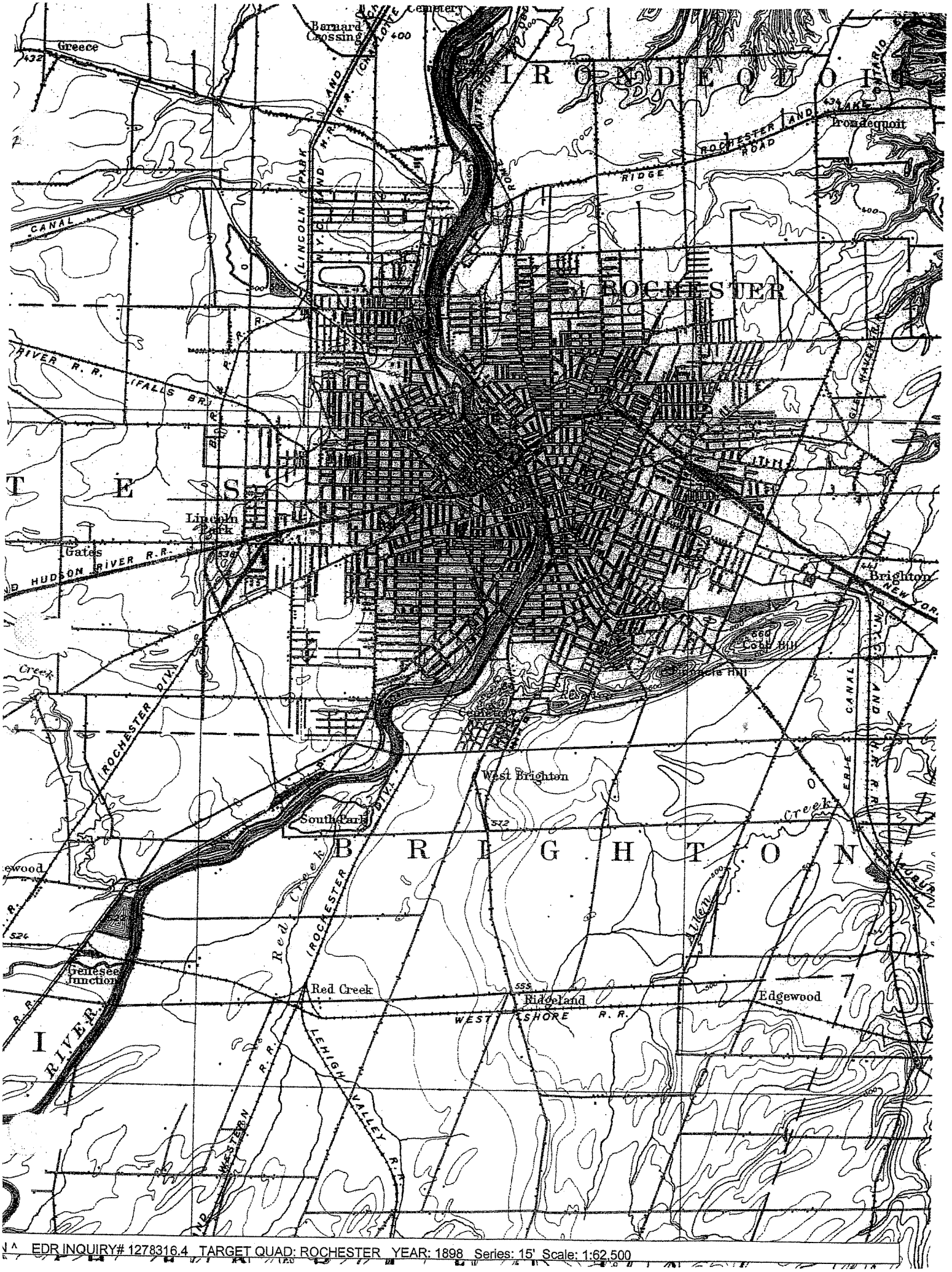

Ontario Beach
Mount Read
Charlotte
Rock Beach
E E C E
Barnard
Greece
I R O N D E Q U O I T
Irondequoit
ROCHESTER AND LAKE ONTARIO ELECTRIC
ROCHESTER AND RIDGE ROAD
CANAL
ROCHESTER
RIVER
(FALLS BR.)
T E S
Lincoln Park
Gates
ROAD
HUDSON RIVER
Brighton
Creek
ROCHESTER DIV.
CANAL
West Brighton
Creek
B R I G H T O N
N ^ EDR INQUIRY# 1278316.4 TARGET QUAD: ROCHESTER YEAR: 1920 Series: 15' Scale: 1:62,500



EDR INQUIRY# 1278316.4 TARGET QUAD: ROCHESTER YEAR: 1898 Series: 15' Scale: 1:62,500

Appendix C

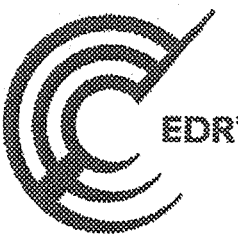
EDR-Aerial Photo Decade Package

The EDR Aerial Photo Decade Package

Exchange Street/Flint Street
Exchange Street/Flint Street
Rochester, NY 14608

September 29, 2004

Inquiry Number: 1278316.5



The Source For Environmental Risk Management Data

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Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

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ASTM E 1527-00, Section 7.3 on Historical Use Information, identifies the prior use requirements for a Phase I environmental site assessment. The ASTM Standard requires a review of *reasonably ascertainable standard historical sources. Reasonably ascertainable means information that is publicly available, obtainable from a source within reasonable time and cost constraints, and practically reviewable.* To meet the prior use requirements of ASTM E 1527-00, Section 7.3.4, the following *standard historical sources* may be used: aerial photographs, fire insurance maps, property tax files, land title records (although these cannot be the sole historical source consulted), topographic maps, city directories, building department records, or zoning/land use records. ASTM E 1527-00 requires *"All obvious uses of the property shall be identified from the present, back to the property's obvious first developed use, or back to 1940, whichever is earlier. This task requires reviewing only as many of the standard historical sources as are necessary, and that are reasonably ascertainable and likely to be useful."* (ASTM E 1527-00, Section 7.3.4, page 12).

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)ate EDR Searched Historical Sources:

Aerial Photography September 29, 2004

Target Property:

Exchange Street/Flint Street
Rochester, NY 14608

PUR ID		*Portion-Findings*	
Year	*Uses*	*(FIM Information Only)*	*Source*
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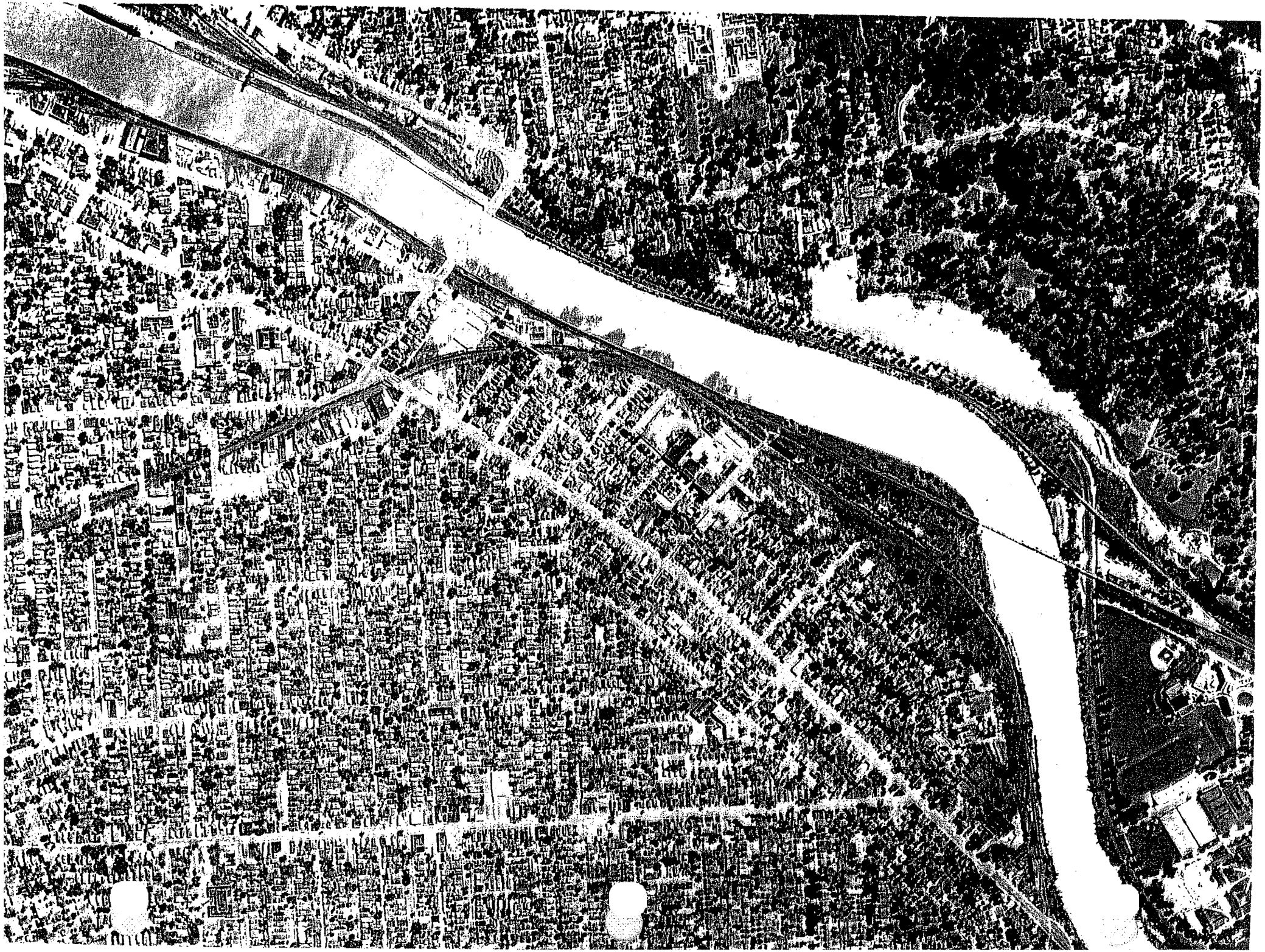
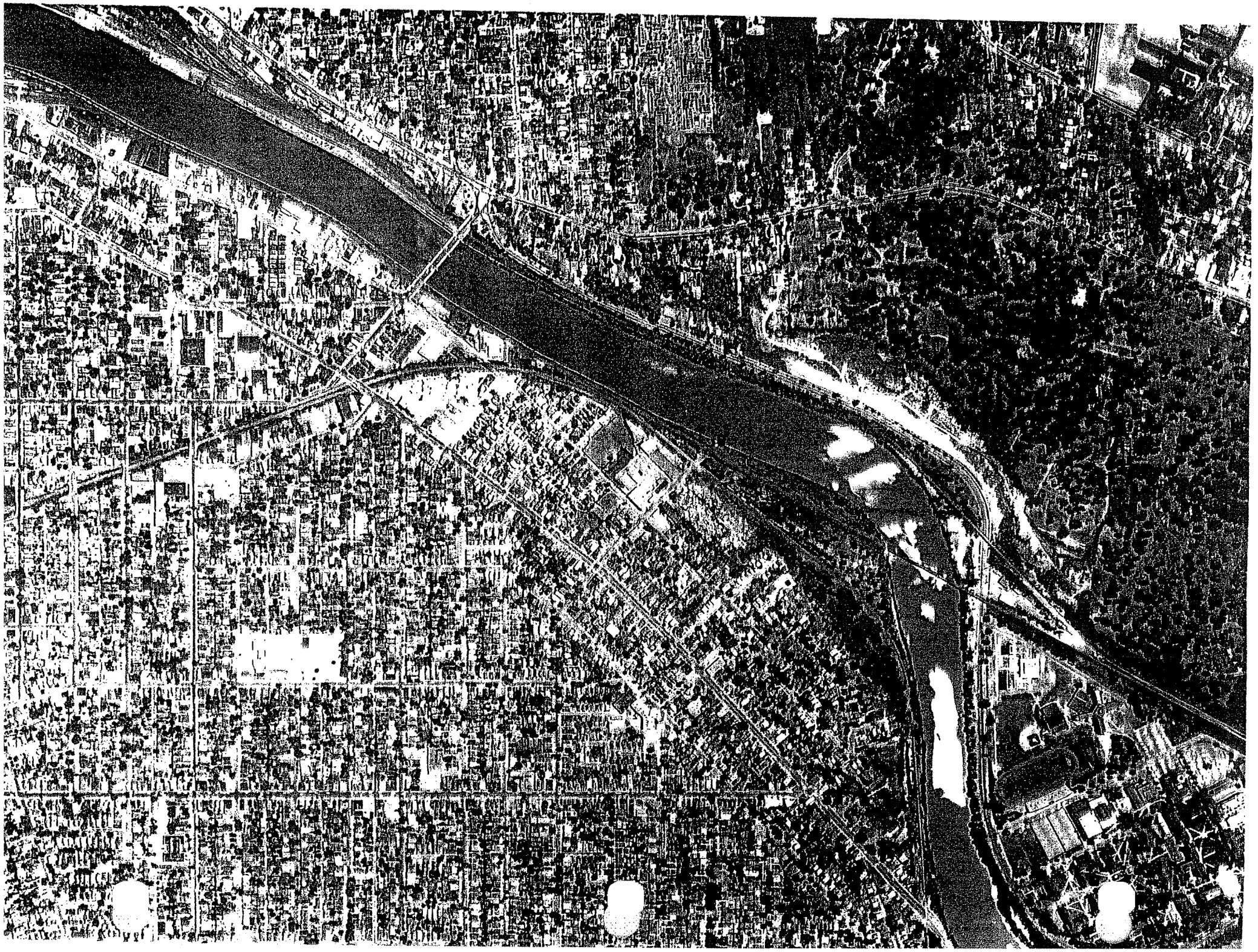
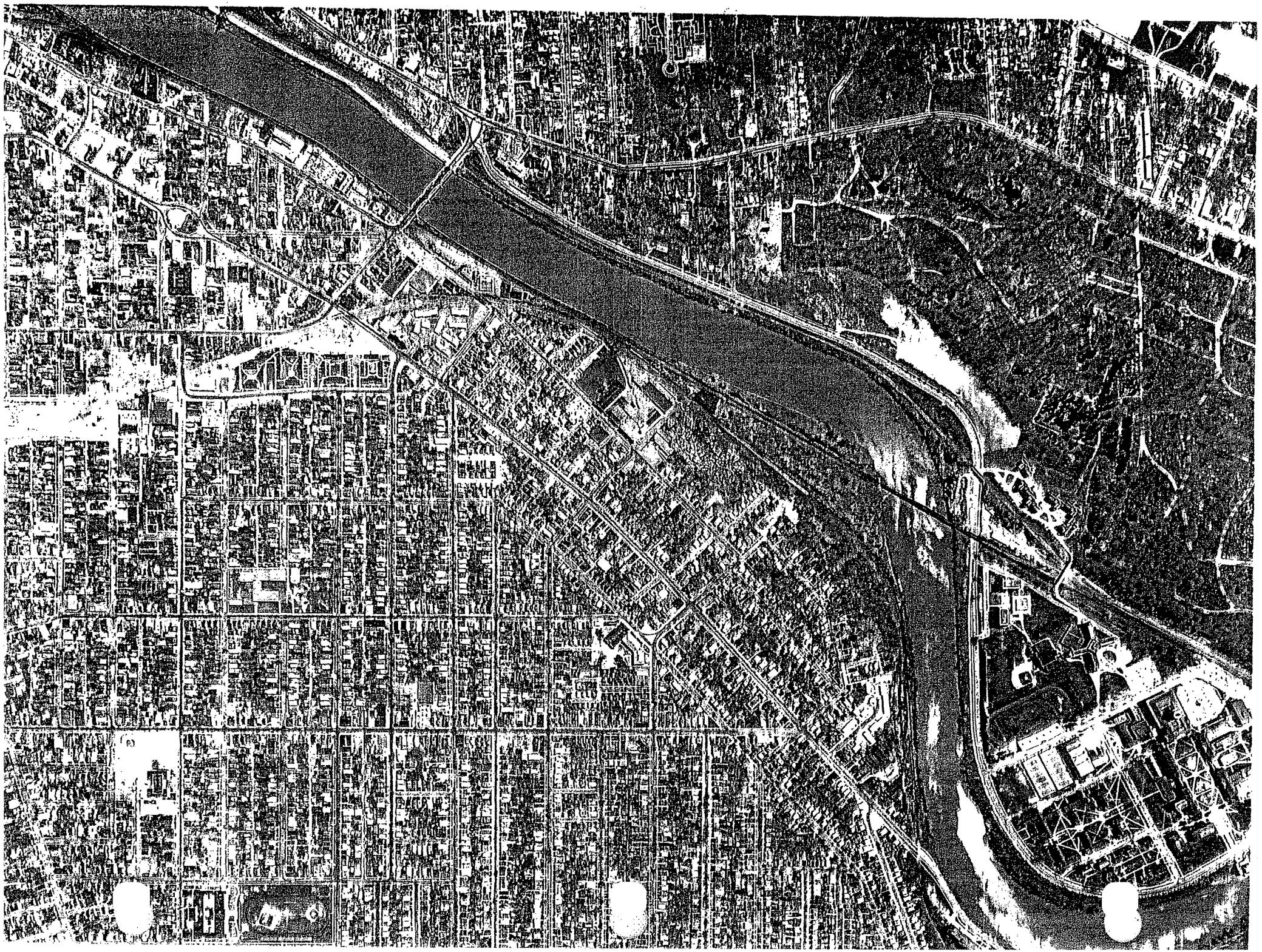
2 1966	Aerial Photograph. Scale: 1"=750'	Panel #: 2443077-B5/FlightDate: July 1, 1966	nar
3 1971	Aerial Photograph. Scale: 1"=750'	Panel #: 2443077-B5/FlightDate: May 7, 1971	nar
4 1980	Aerial Photograph. Scale: 1"=833'	Panel #: 2443077-B5/FlightDate: June 17, 1980	nar
5 1994	Aerial Photograph. Scale: 1"=833'	Panel #: 2443077-B5/FlightDate: April 22, 1994	nar







Appendix D

List of Plant Species Identified Onsite

PLANT SPECIES LIST

The following is a list of plant species identified during site inspections at the Vacuum Oil Site, located in the City of Rochester, Monroe County, New York. Wetland indicator classification nomenclature follows USFWS (1988 & 1996). In addition, NA= Not applicable, NI = No indicator, and NL = Not listed.

Scientific Name	Common Name	Classification
Aceraceae (Maple Family)		
Acer negundo	Box elder	FAC+
Acer platanoides	Norway maple	NL
Acer rubrum	Red maple	FAC
Acer saccharinum	Silver maple	FACW
Anacardiaceae (Cashew Family)		
Toxicodendron radicans	Poison ivy	FAC
Rhus typhina	Staghorn sumac	NL
Betulaceae (Birch Family)		
Betula populifolia	Gray birch	FAC (FACW)
Buxaceae (Boxwood Family)		
Pachysandra terminalis	Pachysandra	NL
Caprifoliaceae (Honeysuckle Family)		
Diervilla lonicera	Bush honeysuckle	NL
Lonicera japonica	Japanese honeysuckle	FAC-
Viburnum acerifolium	Maple-leaf viburnum	NL
Viburnum dentatum	Southern arrowwood	FAC
Celastraceae (Staff-tree Family)		
Celastrus orbiculatus	Asiatic bittersweet	NL
Compositae (Composite Family)		
Artemisia vulgaris	Common mugwort	NL
Cichorium intybus	Chicory	NI
Cirsium arvense	Canada thistle	FACU
Solidago altissima	Tall goldenrod	NL
Solidago rugosa	Rough goldenrod	FAC
Solidago sp.	Goldenrod	NA
Convolvulaceae (Morning-glory Family)		
Ipomoea hederacea	Ivy-leaved morning glory	NI
Cornaceae (Dogwood Family)		
Cornus amomum	Silky dogwood	FACW
Cornus sericea	Red-osier dogwood	FACW+

Scientific Name	Common Name	Classification
Cruciferae (Mustard Family)		
Alliaria officinalis	Garlic mustard	FACU-
Cupressaceae (Cypress Family)		
Juniperus virginiana	Eastern red cedar	FACU
Cyperaceae (Sedge Family)		
Carex lurida	Lurid sedge	OBL
Carex pensylvanica	Sedge	NL
Carex sp.	Sedge	NA
Dipsacaceae (Teasel Family)		
Dipsacus sylvestris	Teasel	FACU-
Equisetaceae (Horsetail Family)		
Equisetum arvense	Field horsetail	FAC
Fabaceae (Bean/Pea Family)		
Melilotus alba	White sweet clover	FACU-
Robinia pseudo-acacia	Black locust	FACU-
Fagaceae (Beech Family)		
Quercus alba	White oak	FACU
Quercus palustris	Pin oak	FACW
Quercus rubra	Red oak	FACU-
Gramineae (Grass Family)		
Dactylis glomerata	Orchard grass	FACU
Digitaria sanguinalis	Crabgrass	FACU-
Festuca arundinacea	Tall fescue (Kentucky fescue)	FACU
Lolium sp.	Rye	NA
Panicum sp.	Grass	NA
Phragmites australis	Common reed	FACW
Poa pratensis	Kentucky bluegrass	FACU
Hamamelidaceae (Witch Hazel Family)		
Hamamelis virginiana	Witch hazel	FAC-
Liquidambar styraciflua	Sweetgum	FAC
Hypericaceae (St. Johnswort Family)		
Hypericum perforatum	Common St. Johnswort	NL
Juglandaceae (Walnut Family)		
Juglans nigra	Black walnut	FACU
Juncaceae (Rush Family)		
Juncus effusus	Soft rush	FACW+

Scientific Name	Common Name	Classification
Labiatae (Mint Family)		
Glecoma hederacea	Ground ivy	FACU
Lauraceae (Laurel Family)		
Lindera benzoin	Spicebush	FACW-
Liliaceae (Lily Family)		
Allium vineale	Field garlic	FACU-
Lythraceae (Loosestrife Family)		
Lythrum salicaria	Purple loosestrife	FACW+
Menispermaceae (Moonseed Family)		
Menispermum canadense	Canada moonseed	NI
Moraceae (Mulberry Family)		
Morus alba	White mulberry	NL
Oleaceae (Olive Family)		
Fraxinus americana	White ash	FACU
Onagraceae (Evening Primrose Family)		
Circaea quadrisulcata	Enchanter's Nightshade	NL
Phytolaccaceae (Pokeweed Family)		
Phytolacca americana	Common pokeweed	FACU+
Pinaceae (Pine Family)		
Picea abies	Norway spruce	NI
Platanaceae (Plane-tree Family)		
Platanus occidentalis	American sycamore	FACW-
Plantaginaceae (Plantain Family)		
Plantago lanceolata	English plantain	NL
Polygonaceae (Smartweed Family)		
Polygonum cuspidatum	Japanese knotweed	FACU-
Rumex crispus	Curly dock	FACU
Polypodiaceae (Polypody Family) – formerly Dennstaedtiaceae		
Onoclea sensibilis	Sensitive fern	FACW
Rosaceae (Rose Family)		
Geum candanse	White avens	FACU
Prunus serotina	Black cherry	FACU
Rubus allegheniensis	Allegheny blackberry	FACU-

Scientific Name	Common Name	Classification
Rubus idaeus	Red raspberry	FAC-
Spiraea latifolia	Meadow-sweet	FAC+
Waldsteinia fragarioides	Barren strawberry	NL
Rubiaceae (Madder Family)		
Galium sp.	Bedstraw	NA
Salicaceae (Willow Family)		
Populus deltoides	Eastern cottonwood	FAC
Salix nigra	Black willow	FACW+
Scrophulariaceae (Figwort Family)		
Verbascum thapsus	Common mullein	NL
Simaroubaceae (Quassia Family)		
Ailanthus altissima	Tree of heaven	FACU-
Sphagnaceae (Sphagnum Family)		
Sphagnum sp.	Sphagnum moss	NL
Typhaceae (Cat-tail Family)		
Typha latifolia	Common cattail	OBL
Umbelliferae (Parsley Family)		
Daucus carota	Wild carrot	NL
Ulmaceae (Elm Family)		
Ulmus americana	American elm	FACW-
Violaceae (Violet Family)		
Viola sp.	Violet	NA
Vitaceae (Grape Family)		
Parthenocissus quinquefolia	Virginia creeper	FACU
Vitis sp.	Grape	NA

Appendix E

List of Wildlife Species Identified Onsite

WILDLIFE SPECIES LIST

The following is a list of wildlife species either observed or noted on the Vacuum Oil Site, located in the City of Rochester, Monroe County, New York.

BIRDS

Scientific Name	Common Name	Observation Type
Wading and Piscivorous Birds		
Laridae	Gull	Visual
Ducks, Geese, and Swans		
Anas platyrhynchos	Mallard	Visual
Doves		
Columba livia	Rock dove	Visual
Woodpeckers		
Picoides pubescens	Downy woodpecker	Call
Passerines		
Corvus brachyrhynchos	American crow	Visual

MAMMALS

Scientific Name	Common Name	
Order Rodentia (Rodents)		
Sciurus carolinensis	Eastern gray squirrel	Visual
Family Cervidae (Deer)		
Odocoileus virginianus	White-tailed deer	Sign (walking trail)
Order Carnivora (Carnivorous Mammals)		
Vulpes vulpes	Red fox	Landowner's account

Appendix F

Detailed Historical Site Assessment of the Vacuum Oil Company's Facilities and Locations by C.M. Wagner dated September 1990

"Water, water everywhere,
And all the boards did shrink.
Water, water everywhere,
Nor any drop to drink."

--Samuel Taylor Coleridge
"The Rime of the Ancient Mariner."

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2. A typical Vacuum Oil still.

3. An undated map of the Vacuum Oil Works at Flint Street.

4. 1888 City Index showing the locations of Vacuum Oil Works, Pipelines, and Gas Works.

5. 1875 Plat showing the proximity of the Rochester Gas Light Company to Water Street, a location of a Vacuum Oil office.

6. Blueprint showing the layout of the Vacuum Oil Works, intake and discharge pipes, sewers, manholes, and oil traps.

7. Plan showing water services to the Vacuum Oil Works.

8. Current Milesquare Sewer Map of the property operated by Vacuum Oil.

9. Current water services to the property operated by Vacuum Oil.

10. 1875 Plat showing Vacuum Oil operations at Exchange (Mansion) Street.

11. 1875 Plat showing Everest warehouse on Glasgow Street.

12. Plat showing Vacuum Oil expansion at Glasgow Street.

13. 1888 Plat showing Vacuum Oil expansion at Exchange (Mansion) Street.

14. 1900 Plat showing Vacuum Oil operations at Exchange Street.

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17. 1926 Plat showing Vacuum Oil operations at Exchange Street.

18. 1935 Plat showing Exchange Street area.

19-22. Sanborn Insurance Maps showing recent building configuration at Exchange Street.

23. 1926 Aerial photo showing Vacuum Oil operations at Exchange Street.

24. 1958 Aerial photo showing the Exchange Street site.

25. 1961 Aerial photo showing the Exchange Street site.

26. 1967 Aerial photo showing the Exchange Street site.

27. 1970 Aerial photo showing the Exchange Street site,

28. 1972 Aerial photo showing the Exchange Street site.

29. 1973 Aerial photo showing the Exchange Street site.

30. Undated aerial photo looking south at the Vacuum Oil Works.

Executive Summary

This is a detailed historical site assessment of the Vacuum Oil Company's Facilities and represents the first step in the City of Rochester's investigation of the Vacuum Oil site.

This report assembles a wide range of information and sources, including: the Rochester Historical Society's file entitled "The Vacuum Oil Company;" 19th and 20th century newspaper accounts of the Vacuum Oil Company, local histories, and city directories at the Local History Department of the Rochester Public Library; the City Historian's records of the company; the New York State Department of Transportation's file on the Vacuum Oil Company; the City of Rochester Water Bureau's records of service to the site; deed histories, platt books, sewer records, and hazardous waste files at the City of Rochester Department of Environmental Services, Office of Maps and Surveys; and the Rochester Fire Department's permit records.

The report describes the property under investigation and traces the history of the Vacuum Oil Corporation. It provides an operations history, explains the company's manufacturing processes, establishes the proximity of it to various gas works, and identifies confirmed and suspected pipeline routes between Vacuum Oil and these companies; it summarizes as well as details histories of deeds, platt books, and permits; it documents sewers and water services for the area, and analyzes and provides aerial photos of the site dating from 1926.

History of the Vacuum Oil Corporation

Hiram Everest and Matthew Ewing founded the Vacuum Oil Company in 1866. In this year two permits were issued, one to Matthew Ewing for "improved material for lubrication and other purposes," and one to Ewing and Everest for "improved apparatus for distilling petroleum." Ewing had discovered a process for the distillation of crude oil that he thought would produce more kerosene than methods already in use. Everest helped to fund Ewing's experiments in this process, interested more in the residual oil than in the kerosene produced. The residual oil was neither burned nor malodorous, characteristics unique to the vacuum process.

After successful experiments with a small still at Ewing's home, Vacuum erected a "semi-commercial size" still on Mansion Street (currently Exchange Street) between 1866 and 1867. The distillates from this still were sold as kerosene while the residual oil was sold as machine lubricant and leather refinisher.

In 1879 Standard Oil acquired a controlling interest in Vacuum Oil and in 1882 organized the Standard Oil Trust, which lasted until 1911. Twenty years after the breakup of the trust SOCONY and Vacuum Oil merged, and in 1959 the name of this company was changed to Mobil Oil.

Operations

In 1866 Vacuum Oil began their operations with a semi-commercial still on Mansion Street (currently Exchange) and continued there until 1936. These operations entailed distilling crude petroleum under pressure to produce lubricating oils, naphtha, and kerosene. Figure 1 shows this area of operations.

The improvements in the distillation process for which Ewing and Everest received a patent consisted of "introducing jets of superheated steam into and through the mixture of oil in the still and having the arrangement of the heated pipe in close proximity so as to lessen the amount of oil in the retort." Figure 2 shows a typical Vacuum Oil still.

During the first years of Vacuum Oil the distillates from this process were sold as kerosene, which was put in second hand barrels for distribution. The residual oil, sweet and unburned, was introduced to tanners for use in finishing leather or, after adding lamp black, was sold for refinishing harness boots and other black leather goods. These leather oils were put in oyster cans. As output increased Vacuum turned temporarily to a local manufacturer for its barrels and cans until it ultimately established its own manufacturing plant to meet its needs.

The first business to make extensive use of Vacuum's leather oils, Alling Brothers Tanners on Andrews Street, became the location of a Vacuum Oil office in 1867.

In 1869 Vacuum Oil began receiving crude oil in wood barrels from the Bradford field. As operations continued the company built and used six tank cars for this purpose, each of which held 80 barrels. In 1878 the company laid tracks on a tressel so that such tank cars from the Erie railroad could be brought into Vacuum Oil's buildings, emptied of crude oil, and filled with Vacuum Oil products.

1872 saw the opening of the German market and an increase in the number of employees to twenty. Vacuum Oil began the practice of cleaning with naphtha the tank cars used to transport crude oil to the works. After these cars were cleaned with naphtha (which had little market value at the time), Vacuum Oil used them to ship kerosene. Vacuum Oil also expanded its range of products, as advertisements in the City Directory list Vacuum Oil as "Manufacturers of Lubricating Oils, Vacuum Oil Blacking for Harnesses, Wholesale dealers in refined petroleum and high test kerosene oils, also sperm whale, elephant, lard, Neats Foot, Straits, Bank, Laborador, Salad, Signal, and other oils." To meet the demand for products, Vacuum Oil constructed double stills 2 and 3 and expanded output and storage capacity further in 1876-77 by constructing stills 4 and 5 (each with 200 barrel storage) and storage tanks 1-4 (each of about 500 barrel capacity).

In 1878 Vacuum Oil built a 200' x 100' stone warehouse at the works on Mansion Street (now Exchange) and expanded operations to include a kerosene warehouse at Glasgow Street on the Erie Railway.

By 1884 the company had built another kerosene warehouse at the Mansion Street site and expanded its number of employees to 90.

In 1884 Vacuum began using a new process for the manufacture of Paraffin Wax from fractionally distilled distillates. Prior to this process, Paraffin Wax had been made by refiners of kerosene from cracked distillates.

In 1885 a branch office was established at Montreal.

Over the last half of 1886 and the first half of 1887 Vacuum Oil produced over 500,000 gallons of naphtha, over 300,000 gallons of which it shipped to the Municipal Gas Works. C. Everest, president of the company, estimated that Vacuum Oil used over 4 million gallons of crude oil per year.

In 1888 a line of neutral oils was established. A publication entitled The Industries of the City of Rochester claimed that the oils made at the Vacuum Oil Works were made to fill orders previously obtained, so that they were shipped out as rapidly as they were manufactured. As a result, little storage space was necessary. However, newspaper reports from December of 1887 contradict this claim. These reports indicate that an on-site investigation discovered that there were 135 tanks and six boilers at the works. This large number of tanks was probably used for storage of enough crude oil to keep the stills running at capacity, a practice which began as early as 1876 but was not consistently maintained until 1890. Figure 3 shows a map of the oil works at Mansion Street (currently Exchange).

This publication also claimed that Vacuum Oil employed 150 travellers who carried goods directly to the customer and listed Vacuum's markets as existing in Europe, Japan, China, Central and South America, and Australia.

In 1890 Vacuum Oil began operations at a refinery in Olean.

While it is unclear as to precisely when Vacuum Oil ceased its operations, Plat books indicate that by 1900 Vacuum Oil had discontinued its facilities at Glasgow Street, and that by 1935 all of the operations on Mansion Street (currently Exchange) had stopped.

Conversations with Fire Department officials indicate that at least one tank car was pulled out of the river opposite the address 700 Exchange Street. Since Vacuum Oil operated in such close proximity to the railroad, the practice of burying railroad tank cars may have also taken place.

Mishaps

Newspaper reports indicate that Vacuum Oil suffered several documented accidents during the course of its operations. Beginning in 1874, an early morning fire at the works on Mansion Street (currently Exchange) destroyed the semi-commercial still and the wood still house. Damage was estimated at $3,500 (UA). In 1878 a similar fire from a naphtha explosion burned down a shed at the works, but the damage in this instance was only $500 (UA 3/11/1878). There was another explosion inside a still in 1882. This caused only $300 damage, since residuum and tar had been removed from the still before the explosion (UA 7/17/1882).

Major damage occurred in 1887 when anywhere from 6,000 to 14,000 gallons of naphtha penetrated the Genesee Valley outlet sewer and caused explosions in the following locations: 1) at the Eureka Steam Heating Company on Platt Street, 2) at the intersection of Mill and Platt Streets, 3) in the basement of Congress Hall, and 4) at the Clinton Flouring Mill. Several people were killed from these explosions, and damage was estimated at well over $100,000. After these explosions Vacuum Oil paid a $100,000 bond to cover the City's liability for damage suits. In addition, the company adopted more stringent fire and accident precautions (UA).

During this year Vacuum Oil abandoned a pit used for burning refuse after receiving several complaints from nearby residents. Though the pit was reported to be "near the works," its exact location is unknown.

In 1889 minimal damage resulted from a fire at the warehouse on Glasgow Street. Four tanks, one containing 600 to 700 barrels and three containing 75 barrels each, did not ignite (UA 8/26/1889).

In 1900 two retort buildings used for burning bone charcoal (through which crude oil is filtered) were destroyed by fire (UA 10/7/1900).

In 1901 a fire destroyed a large part of the Works. Both naphtha and storage tanks burned.

Pipelines

There are several scattered and vague reports of pipelines running from the Vacuum Oil Works to various locations in the city. From the information available it seems that at least three pipelines did at one time exist. A three inch pipeline ran from the Vacuum Oil works at Mansion Street along the Erie Railroad and connected to three tanks at Vacuum's operations on Glasgow Street. A second pipeline, two inches in diameter, ran along the same course to Glasgow Street, and then ran through Glasgow Street to the old Genesee Valley Canal and then to the Central Hudson Railroad near Litchfield Street. A third pipeline ran from the Municipal Gas Works through Frank Street.

Reports of Vacuum Oil offices on Litchfield Street and Water Street suggest the possibility of pipelines in those areas. Both of these locations are in close proximity to gas works.

In addition, there is an unconfirmed report of a pipeline that ran from the Vacuum Oil Works in Olean to the Works on Mansion Street (currently Exchange). If such a pipeline did exist, it probably followed the canal bed. No permit records exist for any of these pipelines.

There are also reports of various pipes that ran within the confines of the Vacuum Oil Works. It is clear from Platt Books that a pipe ran from one portion of the Vacuum Oil works across Flint Street. In addition to this, five pumps connect to various tanks in the Works on Mansion Street. The exact locations of these pumps and pipes can not as yet be determined (UA 12/27/1890). However, an engineer's report dated 1925 references rights given by the state for pipes across parcels 5242 and 5290. Figures 4 and 5 show reported pipeline routes and the proximity of Gas works to the Vacuum Oil Company.

Sewer and Water Services

After the 1887 explosions Vacuum Oil was prohibited from using the city sewer system and so installed a complete system of drains and sumps of their own to care for surface and ground water on their property and on the property of the Pennsylvania RR.

The Vacuum Oil system consisted of the following:
One hundred feet west of the Pennsylvania RR there was an 8" tile drain 4' deep running from the south line of the oil company's property, north to a "pump sump" near the north part of their property. From the north side of this property was a drain behind a retaining wall which runs south of this "pump sump."

Under the west ditch of the Pennsylvania RR was a 10" drain on rock which flowed into a large sump between the Pennsylvania RR tracks. All of the track drainage was taken to this sump by drainage ditches; all of the buildings between the river and the Pennsylvania RR tracks drained to this sump.

From this sump drainage was pumped to a main sump just to the west. Here most of the oil was recovered by a series of baffle sumps, after which it flowed to a sump east of the RR and then to the river (Morse).

In addition to these sumps and sewers there was a 24" discharge pipe which ran through a retaining wall on the east side of the property, and an 8" wrought iron intake pipe which extended from an intake chamber through an opening in the retaining wall about 100' south of the old 36" city water main (Morse). Vacuum Oil drew water from the river and had constructed a valve chamber on the back of the retaining wall to the point where the intake was located (Hulburd).

In addition to these pumps and sewers there are references to two 4" centrifugal pumps and a 6" manganese steel dredge pump, all of which were installed in 1927.

The City sewer system which Vacuum Oil was prohibited from using consisted of the following:
A sewer drained territory above the Vacuum Oil Company's plant for two miles in length and took the sewage north of the barge canal to the Ohio Basin. There were two overflow sewers north of the Vacuum Oil plant. It appears that land west of the Vacuum Oil plant drained into these sewers.

A sewer also ran along Exchange Street. To the Southwest of Vacuum's property a bluff directed most of the surface drainage to the west and to this sewer. The city sewer in the bed of the old Genesee Valley Canal has been sealed throughout this locality (Morse).

Figures 6 and 7 show sewer and water services to the Vacuum Oil Company's property when Vacuum Oil still operated. Figure 8 shows current milesquare sewer maps of the Exchange-Flint Street area. Figure 9 shows current water services to the Exchange-Flint Street area. Appendix A provides a history of water services to the Exchange-Flint Street area.

City Directory References

1867 -- office at Andrews St, corner of Water St
1870 -- office at 12 Stone St.
1872 -- Main St.
1873 -- Powers Block on Main St.
1878 -- Rochester Savings Bank
1895 -- Works at Olean and Rochester

Summary of Newspaper Accounts relating to Vacuum Oil

UA August 28, 1872

This article gives a brief description of the company. The refinery was located on the Erie Railoroad and the Valley Canal. Crude oil came to the company in tanks and was refined into lubricating oil, curriers oil, and Vacuum Oil Blacking. There was an office, salesroom, and storehouse at 2 Buffalo Street, with barrel storage in the basement.

UA 12/14/1874, 3/11/1878, 11/13/1882

All of these articles give accounts of small fires in stills.

UA 12/22/1887

An explosion occurred in the Eureka Steam Heating Company's building on Platt St. at 3:30 PM. A tunnel sewer connecting Platt St. to the Genesee Valley outlet sewer ran underneath the building. A series of explosions followed immediately at the following locations: Mill and Platt Sts., the basement of Congress Hall, and the Clinton flouring mill. These explosions resulted from naphtha penetrating the Genesee Valley outlet sewer. Property damage estimates exceeded $150,000.

This article locates the Platt Street sewer as running from the old Genesee Valley Canal above the Erie Canal at Allen St. and then through Mill St. to its outlet under the demolished mills. The article also says that a pipeline ran from the Vacuum Oil Co. along the Genesee Valley sewer.

Initial investigations indicated that the leak may have been located at the Atkinson St. sewer. Vacuum Oil had been pumping anywhere from 6-14 thousand gallons of naphtha to the Gas works. None of that naphtha reached the Gas Works.

Though company officials claimed that this was the first time that naphtha had ever leaked, a resident of 81 West Ave reported that his house had been filled with a naphtha odor several times before this.

No records could be found for any permits issued to Vacuum Oil for the building of the pipeline, which ran from the Works along the WNY&PRR. It is likely that Vacuum Oil did not have permits for its pipelines.

UA 12/23/1887

This article refers to the Municipal Gas Co., the intended recipient of the naphtha, as an "adjunct of Vacuum Oil," and states that both were owned by Standard Oil.

One witness claimed that he thought the pipeline in question was laid in 1881 and was placed at the bottom of the canal when there was water in it.

There are reports that officials doubted that the Atkinson St. sewer leak was sufficient cause for the explosions. A dig on West Ave where the bridge over the old Genesee Valley Canal was taken away and filled revealed an oily substance floating on water in the eight foot hole, but no pipe was discovered.

Officials investigating the works found that there were 135 tanks and 6 boilers at the works. Company representatives claimed that they were not connected by pipeline to any facility other than the Municipal Gas Works. Furthermore, they said that there was formerly a pipeline on Glasgow St. but that it had been abandoned for years and partially torn up.

This on-site investigation also discovered two sewers which connected with the works and emptied into the river. Company officials claimed that there were traps at the sewer entrances to separate oil from water and that only "non-flammable fluid" entered the sewer.

Another article on the same date reports that the break at the Atkinson St. sewer was determined not to be new. No other leak could be found, and it was sugggested that the pipeline may have had two valves, one which connected it to the Gas Works and another which connected it to the sewer. Vacuum Oil may have been dumping refuse into the sewer on a regular basis and merely left the wrong valve open during the pumping of the naphtha.

The pipeline at Atkinson St. was 3 inches in diameter. Another pipeline of 2 inches in diameter was discovered at the Vacuum Oil Works.

12/28/1887

An article reports that a 2 inch pipe was uncovered 200 feet from where Glasgow St. crosses the WNY&PRR. A piece of the pipe was cut and kerosene poured out. The oil was described as "clear and of good color, remarkably well preserved after having laid in the pipe for several years." Everest claimed that the 2 inch pipe was used to send refined oil to the New York Central and Hudson Railroad and to the Buffalo, Rochester & Pittsburgh Railroad for distribution.

A coroner's inquest on this date mentions 5 pumps which connected to various tanks in Vacuum Oil's Works. It also references pipes connected to these pumps. A three inch pipe ran along the Erie Railroad tracks to three tanks which held refined oil at Glasgow Street. This pipe was said to have been in a leaky condition for 2 years. Another pipe from the Municipal Gas Works ran through Frank Street. The third pipe crossed the canal and had been broken by a passing canal boat. The pipe ran under the Erie tracks to the river.

The article also mentions a pit used to burn refuse. Located near the works, this pit was abandoned when neighbors complained about the smoke. The exact location of this pit is not given.

One witness testified to seeing 30 barrels of naphtha in the canal in 1879.

12/30/1887

The Coroner's Inquest continued with C. Everest's testimony. He states that Vacuum Oil used 4 million gallons of crude oil per year that was shipped to the works via the WNY&PRR. He mentioned two pipes, one from the works on Mansion Street (currently Exchange) to Glasgow Street, and one through Glasgow Street to the old Genesee Valley Canal, and then to the New York Central and Hudson Railroad near Litchfield Street. Vacuum Oil pumped refined oil to the New York Central and Hudson, and to the Buffalo, Rochester & Pittsburgh railroads.

Everest cited the date of construction of the pipe to the Gas Works as 1881 and said that the pipe originated from the pump house on the East side of the Oil Works.

Everest also gave information regarding production. During a period encompassing the last half of 1886 and the first half of 1887, Vacuum Oil produced over 500,000 gallons of naphtha. Over 300,000 gallons of this was pumped to the Gas Works during the same period.

UA 8/28/1901

Article mentions a fire at the Oil works. It also discusses crude oil coming up from Olean, but does not mention how that oil was shipped.

An editorial dated Sept. 2 of an unknown year (post 1887) mentions lightning striking a tank at Olean. It also references a 10,000 barrel storage building on the north side of the works, a large pipe crossing Flint Street, and a "coat of oil" often seen on the river starting on the West side next to the works and extending out, across, and down to the Court St. dam.

Deed History Summary

SBL 121.77-01-07

Vacuum Oil began purchasing lots in this parcel from private citizens in 1866 and had acquired all lots by 1887. In 1931 it became SOCONY-Vacuum property and remained so until 1935 when Rochester Distilling purchased the land. In 1954 the Exchange-Flint Corporation bought the property, and then sold to S. Kolko in 1975. Kolko is the current owner and operates the Kolko Paper Co. on this site.

SBL 121.77-01-08

This has the same history as the previous lot with the exception that Genesee Development Co. purchased the land in 1957 and retained it until selling to S. Kolko in 1975.

SBL 121.77-01-09

This has a similar history to the above two lots and is currently owned by S. Kolko.

SBL 121.77-01-10

Vacuum Oil began purchasing lots here in 1878. In 1941 Rochester Scrap Baling purchased the land, and in 1943 Clancy Carting owned it. R. Kneppar purchased the land in 1980 and sold to One Flint St. Association in 1984.

SBL 121.77-01-11

Vacuum Oil held the property from 1887 to 1940 when they sold to Rochester Scrap Baling. H. Lazerson bought the land in 1956 and sold it to Central Trust in 1960. Sol Atkin, the current owner, purchased the land in 1961.

SBL 121.77-01-54

Vacuum Oil began purchasing land here in 1875. Rochester Scrap Baling Co. purchased it in 1940 and sold it in 1941. A series of owners followed, including the Ontario Machine Co. in 1964, XL Tool and Machine Co. in 1972, the City of Rochester in 1983, and the current owner, G. Schott.

SBL 121.54-03-53.18

Everest owned and operated a warehouse on this land. He sold to Vacuum in 1879. By 1907 Vacuum Oil had sold it. It had a series of individual and commercial owners until it became part of the Rochester Urban Renewal. It is now a part of the Right of Way line on Exchange Street.

SBL 121.69-03-37.2

Vacuum Oil began purchasing lots here in 1875. J.C. Lighthouse owned part of the land before selling to Vacuum Oil in 1899. Rochester Distilling bought the land in 1935. The land is currently owned by Zorba's Palace.

SBL 121.69-04-44

Vacuum Oil purchased the land in 1918 and sold in 1948 to private citizens. Nationwide Tool and Die held the land for a brief period in 1970. Canfield and Tack are the current owners.

SBL 121.69-04-58

Vacuum Oil purchased the land from Everest in 1878 and held it until 1948. The series of owners which followed included the City of Rochester in 1972 and Cannon Air and Heating from 1973-1981. Canfield and Tack are the current owners.

SBL 136.01-03

Vacuum Oil purchased the land from Everest in 1878 and sold it in 1941 to Rochester Scrap Baling. Subsequent owners include Clancy Carting and the University of Rochester. The City of Rochester purchased it in 1970 and is the current owner.

Appendix B provides detailed deed histories of these properties.

Current Site Usage

SBL #	Address	Use
121.77-01-07	932 Exchange St. 936 Exchange St.	S. Kolko (Paper MFG) S. Kolko (Paper MFG)
121.77-01-08	22 Flint St.	Niblack Foods
121.77-01-09	940 Exchange St.	Vacant
121.77-01-10	5 Flint St.	One Flint Street Association (MFG)
121.77-01-11	15 Flint St.	Flint Auto Wreckers
121.77-01-54	950 Exchange St.	XL Tool and Machine Co.
121.69-03-37.2	920 Exchange St.	N. Atlantic Fisheries
121.69-04-44	924 Exchange St. 925 Exchange St.	Vacant Canfield and Tack
121.69-04-58	854 S. Plymouth	Canfield and Tack Printing
121.54-03-53.18	Exchange Street	Right of Way
136.21-01-03		Vacant

Permit Summary

Neither the Building Information System permit list nor the Fire Department permit records show permits for pipelines or underground storage tanks at the time Vacuum Oil owned and/or operated on the property. It is evident from newspaper accounts, however, that such pipelines and tanks did at one time exist.

Fire Department records show underground gasoline tanks for SBL's 121.69-03-37.2, 121.69-04-58, 121.77-01-11, and 121.77-01-08. They also show installation and removal of a 2,000 gallon tank at SBL 121.77-01-07.

BIS permit records show the removal of a 1,000 gallon underground gas tank in 1978 for SBL 121.77-01-07, the installation of a 1,000 gallon tank in 1971 for SBL 121.69-04-44, the installation of a 1,000 gallon tank in 1967 and a 550 gallon tank in 1973 for SBL 121.69-04-58. In addition to these permits, BIS lists a number of demolition permits and construction permits for lands once owned by Vacuum Oil.

Appendix C lists BIS and Fire Department Permits for the area.

Plat Book Summary for Vacuum Oil Holdings

1875

Vacuum Oil operations are visible on lots 202, 203, 204, and 205 of the Rapids Tract. There appear to be five (5) brick buildings and three (3) storage tanks. See Figure 10

A C. Everest warehouse exists to the north in an area east of Exchange Street bordered by Edinburgh Street to the north and Glasgow street to the south. No storage tanks are visible here, but there is a brick building that may have been used for storage. See Figure 11

1888

There is expansion of the Everest holdings in the area between Edinburgh and Glasgow streets. The brick building now spans two lots and is labelled "Vacuum Oil Co." See Figure 12

Vacuum Oil has expanded in the area of the Rapids Tract to include lots 198-207. There appear to be a number of brick buildings in this area but no storage tanks are visible. There is also expansion east of the W.N.Y.&P.R.R. on to lots 244 and 245 of the Rapids Tract. Two brick buildings are visible here. See Figure 13

1900

There are no longer any Vacuum Oil operations in the area between Edinburgh and Glasgow Streets.

Vacuum Oil has expanded south of Flint Street to include lots 215-221 of the Rapids Tract. Eleven (11) storage tanks and four (4) buildings are visible here. There is also expansion east of the rail tracks in lots 243-249 of the Rapids Tract. Four (4) buildings are visible here.

Plat Book Summary (Continued)

Expansion north of Flint Street includes lands previously occupied by JC Lighthouse. In addition, buildings and storage tanks have been erected on lots 206-209. See Figure 14

1910

Vacuum Oil has expanded south of Flint Street through lot 233. A brick building appears on lots 219-223 and three (3) additional storage tanks appear on lots 227-229. See Figure 15

1918

There is considerable expansion to the area south of Flint Street and west of the WNYPR rail tracks. A Grease MFG building and settling tanks are labeled, and 19 new storage tanks appear in this area (lots 227, 229, 231, 233).

East of the WNYPR tracks operations now include 243-253 with buildings labeled "Barrel Prep. Bldg," "Cooper Shop," and "Stave Storage" now visible.

North of Flint Street buildings labeled "Filter House," "Kiln Bldg," "Filling Dept," "Can MFG Bldg," and "Tank Bldg 1,2,3" can be seen. Additional storage tanks are also evident here. See Figure 16

1926

Additional storage tanks appear on lot 233 of the Rapids Tract. All other areas continue operations. While the configuration seems different, there do not seem to be any new additions. See Figure 17

1935

No Vacuum Oil operations are visible. Abstract Title & Mortgage Co., Rochester Distilling, and Rochester Scrap Baling Co. now operate on the lands previously occupied by Vacuum Oil. See Figure 18

Sanborn Insurance Maps

Plate 426

Sears Roebuck & Co. Warehouse, Kolko Paper Co., Whol Liquors are now operating on the premises E. of Exchange, S. of Violetta, N. of Flint. See Figures 19 and 20

Plate 418

Four storage buildings occupy the premises S. of Flint, E. of Exchange, N. of Riverview Pl. See Figures 21 and 22

Aerial Photographs

Year	Number	Description
1926	Plate 18 Figure 23	Some ground disturbance appears on land adjacent to Vacuum Oil holdings (east of RR). Numerous storage tanks and buildings are evident on Vacuum Oil lands but there is no apparent ground disturbance. Holdings west of Exchange Street appear to contain a small park with athletic fields.
1958	ARK-2V-30,31,32 Figure 24	There appears to be heavy ground disturbance south of Flint Street in an area later occupied by the junkyard. Buildings and ground disturbance are evident north of Flint Street.
1961	4-595,596,639,640 Figure 25	There is minor ground disturbance south of Flint Street. This area shows increased vegetation.
1967	Figure 26	This is similar to the 1961 photo.
1970	1983-14-986 Figure 27	An auto junkyard is present south of Flint Street There is minor ground disturbance east of the RR.
1972	2444-14-544,545 Figure 28	Minor ground disturbance appears in junkyard.
1973	14-423-14-593,594 Figure 29	Similar to 1972.
	Figure 30	Evidence of dumping south of Flint Street. What appears to be a still is evident north of Flint St.

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Conversation with Robert deLaura at the Fire Department on 8/9/90 revealed that a tank car was pulled from the river "years ago," and that this may have been common practice. He also added that he had not heard any information regarding the burying of tank cars in the canal bed.

Deed History

SBL 121.77-01-07

Grantee	Lot	Date	Grantor
Vacuum Oil	206-209	10/8/1886	J.Kavanaugh
"	pt 200, 201	12/8/1887	Wm Rice
"	202-205	10/4/1866	N. Everest
"	pt198-201	12/6/1877	J.Rice
"	198-209	10/4/1866	J.Kavanaugh
"	199-201	4/6/1875	H.Lampert
"	200-201	12/10/1877	W.Rice
"	202-205	10/4/1866	H.Everest
"	207-209	1/24/1874	J.Kavanaugh
"	206-209	10/8/1886	J.Kavanaugh
Vacuum Oil Inc	202-205	10/15/1931	Vacuum Oil
"	206-209	10/15/1931	"
Rochstr Dstilling	199-209	12/31/1935	Socony-Vacuum
Xchg Flint Co.	200-208	8/19/1954	Rchstr Distill
S. Kolko	200-209	12/27/1975	Xchg Flint Co

SBL 121.77-01-08

Genesee Develop Corporation	199,201,203,205, 207,209	12/27/1957	Exchange Flint Corporation
S. Kolko	"	1/30/1975	Genesee Development

SBL 121.77-01-09

Rchstr Distilling	pt 243	12/31/1935	SOCONY-Vacuum
City of Rochester	"	1/3/1949	Rchstr Distilling
Exchange Flint Co.	"	10/13/1954	City of Rochester
S. Kolko	"	1/10/1975	Exchange Flint Co

Deed History, Vacuum Oil Holdings

SBL 121.77-1-11

Grantee	Lot	Date	Grantor
R.Riddle	214,216	3/18/1859	H. Loomis
M. Tumility	pt 214,216	9/11/1888	R.Riddle
J. Tumility	216-S	10/11/1887	R. Riddle
Vacuum Oil	pt 214,216	11/3/1919	J.Ryan
"	pt 214,216	11/5/1919	W Kenfield
"	pt 214,216	11/6/1919	M. Tumility
"	223-225	9/30/1889	B. O'Brien
"	219-221	6/1/1887	E. Gallagher
"	215,217	6/13/1921	N. Everest
"	227-229	10/17/1889	C. Healey
"	230-233	11/13/1913	J. Reagan
"	17,18,20,41,42	5/7/1914	Colbert
Socony-Vacuum	230-233	10/15/1931	Vacuum
"	214,216	"	"
"	17-20,41,42	"	"
"	215,217	"	"
"	227,229	"	"
"	219,221	"	"
"	223,225	"	"
"	214-217,219-221,		
"	223-225,227-228,231-233		
"	17-20,41,42	1/24/1878	H.Everest
Rchstr Scrap	215-233(Odd)		
Baling Corp	17-20,41,42	5/16/1940	Socony-Vacuum
Hyman Lazerson	"	4/26/1956	Rchstr Scrap
H.Lazerson&son	"	5/17/1956	H.Lazerson
Central Trust	"	8/8/1960	H.Lazerson&son
Sol Atkin	"	3/30/1961	Central Trust

Deed History, Vacuum Oil Holdings

SBL 121.77-01-54

Grantee	Lot	Date	Grantor
Vacuum Oil	215,217	11/24/1875	D.Riddle
"	219,221	6/1/1887	E.Gallagher
C.Lucas	214-216,W(215,217)	12/19/1941	Rchstr Scrap
Max Lowenthal	216,pt(214,215,217)	3/13/1958	C. Lucas
950 Exchange Inc	"	9/14/1959	M.Lowenthal&son
Ontario Mach Co	"	7/31/1964	950 Exchange Inc
XL Tool & Mach Co	"	7/21/1972	Ontario Mach Co
G.Schott Jr	"	7/26/1972	XL Tool Mach Co
950 Exchange Inc	pt 218	3/23/1983	G.Schott Jr
City of Rochester	"	3/23/1983	950 Exchange Inc
G.Schott	"	3/23/1983	City of Rochester

SBL 121.54-03-53.18

Grantee	Lot	Date	Grantor
Vacuum Oil	pt 88	12/27/1879	H.Everest
"	pt 97	7/24/1879	H.Everest
Howe & Rogers	pt 88, 97	10/10/1907	M.Sheen
C. Gans	"	5/4/1939	Howe & Rogers
L. Gans	"	6/1/1945	C. Gans
E. Endres	"	12/12/1945	L. Gans
Endel Realty	pt 87,88,97	12/26/1950	E. Endres
E. Bianchi	"	7/19/1960	Endel Realty
Rchstr Urban Renewal	"	2/3/1972	E. Bianchi

This area is now a part of the right of way line on Exchange Street.

Deed History, Vacuum Oil Holdings

SBL 121.69-3-37.2

Grantee	Lot	Date	Grantor
C Seymour	190-193	12/1/1852	M.Ure
JC Lighthouse	194-196	11/22/1880	H. Lampert
Vacuum Oil	198-201	12/6/1877	J. Rice
Vacuum Oil	199, 201	4/6/1875	H. Lampert
JC Lighthouse	194-197	11/22/1880	H. Lampert
VAcuum Oil	190-193	4/18/1906	Seymour
Vacuum Oil	194-197	10/31/1899	JC Lighthouse
Vacuum Oil,Inc	190-201	10/15/ 1931	Vacuum OIl
Rchstr Distill	190-199	12/31/1935	Vacuum
Abstract Title and Mortgage	190-199, pt 200, 201	11/19/1940	Rchstr Dist
Sears Roebuck	"	4/24/1941	Abstract
Mutual Life Ins	"	12/12/1946	Sears
Bankers Trust	"	8/15/1955	Mutual Life
Sears	"	10/11/1977	Bankers Trust
703 Atlantic Ave Inc	"	3/21/1978	Sears
D. Hehir	"	9/25/1980	703 Atlantic
703 Atlantic Ave	"	9/26/1980	D. Hehir
Zorba's Palace	"	12/23/1985	703 Atlantic

SBL121.69-04-44

Vacuum Oil	145.146,pt(143,144)	6/8/1918	H.Clapp
Socony-Vacuum	"	10/15/1931	Vacuum
A.Callahan	"	1/13/1948	Socony-Vacuum
925 Exchange Inc	"	2/10/1948	A. Callahan
Woodhill Products	"	3/1/1968	925 Exchange
Nationwide Tool & Die	"	9/4/1970	Woodhill Prod
R.Nuccitelli	"	12/15/1970	Nationwide Tool
Canfield & Tack	"	1/20/1989	R. Nuccitelli

Deed History, Vacuum Oil Holdings

SBL 121.69-04-58

Grantee	Lot	Date	Grantor
M. Kavanaugh	143-146	3/21/1864	A.Miller
Vacuum Oil		1/24/1878	H.Everest
Socony-Vacuum	145,pt143	10/15/1931	Vacuum
A.Callahan	"	1/13/1948	Socony-Vacuum
925 Exchange	"	2/10/1948	A.Callahan
V.Sullivan	"	4/5/1967	925 Exchange
City of Rochester	"	8/28/1972	S.Virley
V.Sullivan Jr	"	8/22/1973	City of Rochester
Cannon Air & Heating	"	9/17/1973	V.Sullivan Jr
R.Nucitelli	"	5/26/1981	Cannon Air
Canfield & Tack	"	1/12/1989	R.Nucitelli

Deed History, Vacuum Oil Holdings

SBL 136.21-01-03

Grantee	Lot	Date	Grantor
Vacuum Oil		1/24/1878	H.Everest
Socony-Vacuum	"	10/15/1931	Vacuum
Rochester Scrap	244-253,pt TL36	2/18/1941	Socony
H.Schwartz	"	2/20/1941	Rochester Scrap
Clancy Carting	"	11/1/1943	H.Schwartz
G.M. Clancy	"	11/1/1943	Clancy Carting
Frank Goodwin	"	11/3/1961	J.Ark,exec Clancy estate
Univ of Rochester	"	12/15/1961	Frank Goodwin
Frank Goodwin	249-253	11/3/1961	J.Ark, exec Clancy estate
Univ of Rochester	"	12/15/1961	Frank Goodwin
City of Rochester	"	9/15/1970	U of Rochester

Permit History, Vacuum Oil Holdings

(from Fire Dept Records)

SBL121.69-3-37.2

Permit Number	Date	Description
920 Exchange Street		
198600	5/30/1979	remove 2,000 gal tank, install 3,000 gal tank
862970	8/28/1986	fill 2 fuel tanks with k-crete
	9/26/1985	remove 100lb propane tank

SBL121.69-4-58

854 S. Plymouth		
	8/25/1978	underground gas tanks filled with sand

SBL121.77-01-07

936 Exchange Street		
20756	1/31/1945	storage 90,000 gal alcohol
37050	11/14/1960	1-2,000 gal tank
851632	7/24/1985	remove 1-2,000 gal tank
12002	4/30/1990	storage combstble, corrosive lqd
950 Exchange Street		
09284	9/14/1989	cmbstbl lqd, compressed gas strge

SBL121.77-01-11

15 Flint Street		
22859	4/22/1946	install 1-1,000 gal tank
00665	5/20/1986	Auto wrkr, JY, waste

Permit History, Vacuum Oil Holdings
(from Fire Dept Records)

SBL 121.77-01-08

Permit Number	Date	Description
22 Flint Street		
214301		maintain 1,000 gallon tank, pump
37044	9/13/1960	1-1,000 gal tank
	2/14/1989	combustible material storage

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0926 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000

PERMIT# SFX	DATE	US CENSUS	EST COST	AUTHZ USE
			0926	EXCHANGE ST
037444	17/03/20		100000	
		ERECT A REINFORCED CONCRETE MFG BLDG		
039435	18/03/13		9000	
		ERECT 3RD STY ON BRICK OFFICE		
040378	18/09/07		75000	
		REINFORCED CONCRETE STORAGE BLDG		
078472	25/12/31		6000	
		NEW STEEL TRUSS ROOF ON WAREHOUSE		

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

```
BSPMTQY                BIS - PERMIT FOR PARCEL            DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0926        EXCHANGE         ST      PERMIT NO.: __________
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000
PERMIT# SFX      DATE     US CENSUS        EST COST     AUTHZ USE
                                              0926      EXCHANGE         ST
083978          27/01/12                        300
                         CHANGE DOOR IN BRICK BLDG


103239          32/12/13
                         DEMO


103262          32/12/31
                         DEMO


103434          33/03/21
                         DEMO

PF14-PROP SUMM  PF15-ADDR LIST  PF16-SBL# LIST
PF18-PMT DETL
```

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0926 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000

PERMIT# SFX	DATE	US CENSUS	EST COST	AUTHZ USE EXCHANGE	ST
			0926		
103930	33/06/12		270		
		BRICK FENCE			
104534	33/09/30				
		DEMO			
104664	33/10/31				
		DEMO			
106394	34/12/31				
		DEMO			

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

```
BSPMTQY                BIS - PERMIT FOR PARCEL              DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0926        EXCHANGE          ST      PERMIT NO.: _________
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000
PERMIT# SFX      DATE     US CENSUS         EST COST     AUTHZ USE
                                              0926      EXCHANGE          ST
111816           37/05/14
                          DEMO


112203           37/06/28
                          DEMO


112350           37/07/15
                          DEMO


127175           43/04/02                        996
                          INSTAL STOKER IN CONCRETE STORAGE BLDG

PF14-PROP SUMM  PF15-ADDR LIST  PF16-SBL# LIST
PF18-PMT DETL
```

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0926 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE	
128021		43/09/24		0926 4890	EXCHANGE	ST
			CON BLK ADD TO STORAGE BLDG			
128216		43/12/01		2500		
			RENEW ROOFING ON BR STEEL BLDG			
174256		60/04/18		0932 11800	EXCHANGE	ST
			MASONRY ADD TO TRUCK STORAGE BLDG			
128345		44/02/04		0936 13900	EXCHANGE	ST
			ALTERATIONS TO BRICK DISTILLERY			

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0926 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000

PERMIT# SFX	DATE	US CENSUS	EST COST	AUTHZ USE	
			0936	EXCHANGE	ST
129350	44/10/13		3500		
		RAISE ROOF ON PART OF STONE DISTILLERY			
163432D	55/11/09				
		DEMO			
163443	55/11/10		1800		
		ALTER INTERIOR OF BR OFFICE BLDG			
173519	59/11/10		4500		
		ALTER MASONRY STORAGE BLDG			

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0926 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE	
				0936	EXCHANGE	ST
174710		60/06/15		6000		
			ALTER INTERIOR OF MASONRY WAREHOUSE			
175325		60/09/21		750		
			INSTAL 1 2000 GAL GAS TANK 1 PUMP			
189652		66/08/30		6900		
			ERECT 1 STY CONC BLOCK ADDITION PASSAGEWAY			
314945		78/06/12		900		
			REMOVE ONE 1,000 GAL UNDERGROUND GAS TANK			

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
END OF DATA

ENTRY ADDRESS: 0926 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 007 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
				0936	EXCHANGE ST
325848		80/11/26			

DEMOLISH 2 BAY ATTACHED MASONRY GARAGE ONLY (REAR)

851632		85/05/14		700

REMOVE ONE 2000 GALLON GAS TANK, 1 PUMP AND CONCRETE ISLAND

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

```
BSPMTQY              BIS - PERMIT FOR PARCEL              DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0022       FLINT            ST     PERMIT NO.: _________
SBL NO.: 121 . 770 - 0001 - 008 . 000 / 0000
PERMIT# SFX     DATE    US CENSUS       EST COST    AUTHZ USE
                                           0022     FLINT          ST
163369          55/10/28                   10800
                        CEM BLK LOADDNG DOCK ON WAREHOUSE


169236          58/03/03                   85000
                        MASONRY ADD TO FACTORY BLDG


169286A         58/03/11
                        DEMO


169710          58/05/01                    1200
                        ERECT OVERHEAD DOOR IN FACTORY BLDG

PF14-PROP SUMM  PF15-ADDR LIST  PF16-SBL# LIST
PF18-PMT DETL
```

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
END OF DATA

ENTRY ADDRESS: 0022 FLINT ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 008 . 000 / 0000

PERMIT# SFX	DATE	US CENSUS	EST COST	AUTHZ USE
			0022	FLINT ST
171152	58/10/24		275	
		ALUM LETTERS ON BLDG		
214301	74/08/07		100	
		MAINTAIN GAS TANK	1 PUMP	
316017	78/08/08			
		PLUMB - INTALL 1ST FLR SINK AND STAND PIPE		

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
END OF DATA

ENTRY ADDRESS: 0000 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 010 . 000 / 0000
PERMIT# SFX DATE US CENSUS EST COST AUTHZ USE
0000 EXCHANGE ST
863639 86/10/30
PLUMB - MISC REPAIRS

872110 87/03/03 437 10000 000
INSTALL METAL STUDS AND DRYWALL 2ND FLOOR SUBDIVISION OF SPACES - PHASE I-VOID
PERMIT PER LETTER DATED 12/5/88

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQV BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
END OF DATA

ENTRY ADDRESS: 0015 FLINT ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 011 . 000 / 0000

PERMIT# SFX	DATE	US CENSUS	EST COST	AUTHZ USE
			0015	FLINT ST
151552	51/10/26		150	
	MOVE ALL STEEL STORAGE BLDG			
188367	66/03/14		100	
	MAINTAIN JUNK YARD AS AT PRESENT			
194175	69/01/24		2500	
	ERECT WIRE MESH FENCE SOLID STEEL SHEETING			

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0950 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 770 - 0001 - 054 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
				0950	EXCHANGE ST
128899		44/06/29		4000	
			ALTER ADD TO FACTORY BLDG		
129428		44/11/03		600	
			FRAME STORAGE BLDG		
190588		67/03/07		2000	
			ERECT RAMP ONMASONRY BLDG		
225954		74/08/15			
			400 F		

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

ENTRY ADDRESS: 0950 EXCHANGE ST
SBL NO.: 121 . 770 - 0001 - 054 . 000 / 0000 PERMIT NO.: _____

PERMIT# SFX	DATE	US CENSUS	EST COST	AUTHZ USE
823219	82/09/15		0950	EXCHANGE ST
			180000	

CONSTRUCT CONCRETE BLOCK ADDITION TO EXISTING STRUCTURE

823297 82/09/22

INSTALL PARKING LOT

823467 82/10/07

PLUMB - INSTALL 8 FIXTURES AND MISC REPAIRS

850516 85/02/20

PLUMB - INSTALL 6 FIXTURES; CONNECT EXISTING DRAIN

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQV BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0924 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 690 - 0004 - 044 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE	
				0924	EXCHANGE	ST
198377		70/12/15		300		
			ERECT INTERIOR PARTITIONS IN MASONRY BLDG			
198600		71/01/12		600		
			INSTALL 1 1000 GAL GAS TANK			
225952		74/09/01				
			4 100 F			
				0925	EXCHANGE	ST
161281		55/03/15		41500		
			CEM BLK TOOL P DIE FACTORY			

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0924 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 690 - 0004 - 044 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
				0925	EXCHANGE ST
210045		73/07/18		12000	
			ERECT STEEL 1 STY WAREHOUSE		
225953		74/01/10			
			1200 P		
307352		76/07/27		12000	
			ERECT ADDITION AND REFACE BUILDING		
310148		77/04/22		10000	
			INSTALL PARKING LOT		

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0924 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 690 - 0004 - 044 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
				0925	EXCHANGE ST
310149		77/04/22		80000	
			ERECT 1 STY MASONRY ADDITION		
310843		77/06/20			
			PLUMBING		
311733		77/09/06		1648	
			INSTALL 6' X 300' CHAIN LINK FENCE WITH 1' BARB WIRE TOP		
312202		77/10/17			
			PLUMBING		

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8 DATE: 07/17/90 *

ENTRY ADDRESS: 0924 EXCHANGE ST
SBL NO.: 121 . 690 - 0004 - 044 . 000 / 0000 PERMIT NO.: _____

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
312610		77/11/16	0925	1800	EXCHANGE ST

ALTER INTERIOR OF EXISTING BLDG

327611		81/06/16		400000

CONSTRUCT 1 STY BLOCK ADDITION

327945		81/07/09

PLUMB - INSTALL 11 FIXTURES AND THREE 4" ROOF DRAINS

328884		81/09/28

PLUMB - INSTALL 8" DUCTILE IRON FIRE MAIN

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQV BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0924 EXCHANGE ST PERMIT NO.: _____
SBL NO.: 121 . 690 - 0004 - 044 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
				0925	EXCHANGE ST
329120		81/10/19		15000	
			INSTALL SPRINKLER SYSTEM		
332840		82/08/16			
			PLUMB - INSTALL 4" C I AND 1 CATCH BASIN		
884007		88/11/28	653		
PLUMBING-7 FLOOR DRAINS					
890064		89/01/09	437	80000	710
INTERIOR ALTERATIONS TO ESTABLISH PRING SHOP					

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQY BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
MORE PERMITS ARE AVAILABLE FOR PARCEL - PRESS PF 8

ENTRY ADDRESS: 0854 S PLYMOUTH AV PERMIT NO.: _____
SBL NO.: 121 . 690 - 0004 - 058 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
				0854	S PLYMOUTH AV
190572		67/03/01		10500	
			ERECT 1 STY EM BLOCK GARDEN SUPPLY PROVIDE OFFSTREET P		
RK STORE					
190935		67/05/05		275	
			INSTALL 1 1000 GAL AGAS TANK		
211084		73/10/17		600	
			INSTALL 1 550 GAL GAS TANK		
211581		73/12/04		20000	
			ERECTADDITION TO MASONRY BLDG FOR STORAGE		

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

BSPMTQV BIS - PERMIT FOR PARCEL DATE: 07/17/90 *
END OF DATA

ENTRY ADDRESS: 0854 S PLYMOUTH AV PERMIT NO.: _____
SBL NO.: 121 . 690 - 0004 - 058 . 000 / 0000

PERMIT#	SFX	DATE	US CENSUS	EST COST	AUTHZ USE
				0854	S PLYMOUTH AV
224638		77/09/19			
			200 CB		
251668		79/06/12			
			1 200 CB		
317619		78/09/26		30000	
			CONSTRUCT 1 STY MASONRY ADDITION TO EXISTING BLDG TO BE USED FOR STORAGE		

PF14-PROP SUMM PF15-ADDR LIST PF16-SBL# LIST
PF18-PMT DETL

Appendix G

Vacuum Oil Company (undated)

VACUUM OIL COMPANY

This company was incorporated August 28, 1866 for a period of twenty years with a capitalization of ten thousand dollars divided into forty shares. The operations "will be carried on in the City of Rochester, County of Monroe, State of New York."

The capital was increased March 11, 1867 to twenty-five thousand dollars (the record of the ballots at this meeting shows that of the forty shares outstanding, Mr. M.P. Ewing, the originator of the particular Vacuum Process, and his son, George P. Ewing, each owned one share or, together 1/20 of the entire capitalization.)

In the records to which we have access, no reference has been made as to the purchase of these shares by the Standard Oil Company, but it had generally been understood here that this occurred in 1879. Mr. W. H. Patterson told me that during this year, while he was yet a still-man, he conceived the idea of blending certain stocks being currently run for the purpose of producing a line of oils of low pour test suitable for use in cold weather. The only oils on the market at that time adapted to the work were the so called Natural West Virginia Oils. These were not entirely satisfactory because the grades having the desired pour points were so low in viscosity as to be unsuitable for heavy work. As they were classified in price lists according to gravity deception as to pour was also easily practiced.

The beginning of the line of Mr. Patterson's "cold test oils" was laid during one evening "trick", was tested in the laboratory the following morning and later completed by the addition of others until it compromised oils of zero, 10° to 15°, 20° to 30°, and 40° cold test (now called "pour point"). In both the best and lower priced grades such oils had not been made before by any oil refiner and Mr. Patterson believed this line, which was demanded by consumers, was one of the reasons why the Vacuum Oil Company was wanted by the Standard Oil Company.

The record of the meeting of November 15, 1884 reports the increase of the capitalization of twenty-five thousand dollars; states this is divided into one hundred shares of two hundred fifty dollars each and announces the term of the existence of the company to be "thirty years from this date" and is signed by Mr. H.B. Everest, President, C.M. Everest, John D. Archbold, A. M. McGregor, and H.H. Rogers.

1866 - July 31, 1866 patent No. 56852 issued for the "Improvement in Apparatus for Distilling Petroleum" to M.P. Ewing of Rochester, New York, assigned to himself and H. B. Everest. Mr. Ewing, with financial assistance from Mr. Everest, erected a small experimental still at his home in Monroe Avenue where Mr. H. B. Everest saw it in operation. That the results of the experiment seemed to have been convincing is indicated by

two patents issued September 11, 1866. One to Mr. Ewing being for "Improved Material for Lubrication and Other Purposes" and the other to Mr. Ewing and Mr. Everest for "Improved Apparatus for Distilling Petroleum." The chief improvements consisted of "introducing jets of superheated steam into and through the mixture of oil in the still and having the arrangement of the heated pipe in close proximity so as to lessen the amount of oil in the retort."

1866-67 The first still of semi-commercial size built on Mansion St. under these patents was started in 1866 and finished in 1867. On completion of the experimental still the distillates were treated and sold as Kerosene. The residual oil was sweet and unburned characterizing this from that left from the distillation of crude in the ordinary stills. It was introduced to tanners for use in finishing leather and after adding lamp black to other portions of the product was put up in tins and sold for refinishing harnesses, boots and other black leather goods.

The result of running this still is reflected in the patent No. 68426 granted to Mr. H. B. Everest under date of September 3, 1867.

1867-68 Opening of office at Andrews Street, corner of Water in the building of Alling Brothers, Tanners. The first record of Vacuum Oil Company in the business Directory under head of "Oil Dealers & Manufacturers." The

entire force at the works consisted of two still men, two firemen, and one general utility man. The still and firemen worked on day and night shifts of twelve hours each. The general utility man cleaned, coopered, and filled the second hand barrels used for the Kerosene and Lubricating oils and also put up the leather oil in tin cans. The barrels were purchased where ever obtainable. The first two thousand tin cans were purchased from a restaurant to which they were originally shipped full of oysters. Later the cans required were made by a local manufacturing concern, but still later the company put up its own plant for manufacturing barrels, as well as cans.

1869- Progress was being made slowly, most of the production being sold locally but with a gradually enlarging field. The first trials were made of using the residual oils for the lubrication of steam cylinders. The first crude petroleum was received from the Bradford field in wood barrels. These were picked up where ever obtainable and because of the smaller size had an average capacity of about forty-two gallons and this became the unit of measurement in the trade that followed. The earlier tank cars consisted of the ordinary flat car on which two wooden cisterns were placed. Later the company built and used in this service six tank cars of the customary type, each holding about eighty barrels.

1870 - The company started its first advertisement in the Rochester City Directory as manufacturers of "Vacuum Oil Blacking for Harnesses, Boots, Shoes, Buggy Tops, etc." Moved its downtown office to a better location in Stone Street and announced Mr. H. B. Everest as secretary and treasurer. Mr. Everest had a telegraph line erected connecting his home in Stone Street near the office with the works, something over two miles distant. One additional man was added to the force.

1871 - Mr. Charles M. Everest joined the company as bookkeeper. The Kerosene and Leather Oils were practically the whole output. Lubricating Oils for Machinery were finding a market. The demand for kerosene was substantial, growing and a trade with German tanners was felt out this year.

1872 - The market with Germany was now fully established. The growth of the business during the proceeding year brought the payroll this year up to twenty. After supplying the growing demand for kerosene, the surplus was shipped out in tank cars in which the crude was received after that had been cleaned with naphtha from the distillation and for which there was practically no market. The sales of lubricating oils, including those for steam engines, was rapidly increasing so that it was frequently necessary to run the still on Sunday. The advertisement this year showed

a dustinct advance in the activities of the company as will be noted in the following taken from the City Directory: "Vacuum Oil Company, Manufacturers of Lubricating Oils, also the celebrated Vacuum Oil Blacking for Harnesses. Wholesale Dealers in Refined Petroleum and High Test Kerosene Oils, also Sperm, Whale, Elephant, Lard, Neats Foot, Straits, Bank, Laborador, Salad, Signal and other Oils." This list is very interesting in that it names the Fatty Oils commonly in use as lubricants and for burning in lanterns at that period and they were gradually replaced by Petroleum products. The office was moved to Main Street in the center of the business section and because of this fact and that of adding the list of Fatty Oils it seems reasonable to believe that an Oil Store was combined with the office. Some of the Fatty Oils were also used in finishing leather.

During this expansion more Vacuum Still capacity was required and "double stills" Nos. 2 and 3 were constructed. These enabled the carrying out of Mr. Everest's patent of September 3, 1867.

Among other things he claimed as his invention is "The Combination of Two or More Vacuum Petroleum-Stills so arranged that the oil is fed from one retort into the other as it increases in Specific Gravity during the Distillation."

Of the twenty men and boys on the payroll about half were employed putting up the oil blacking, the shipments of which ran from seventy-five to one hundred

twenty-five dozen quarts per day.

1873 - Office removed to Powers Block also on Main Street and announcement was made in advertisement that "office and works were connected by telegraph."

1874 - Mr. H. B. Everest is given in the City Directory as secretary of the Vacuum Oil Company and Mr. C. M. Everest as bookkeeper. The directory advertisement is on a full page and is beautifully printed in colors and also includes a reference to the Vacuum Oil Printing Office in State Street. During the later part of this year fire completely destroyed the semi-commercial still and the wood still house. There were twenty-six names on the payroll.

1875 - Mr. C. M. Everest advertised as Wholesale Dealer in Refined Petroleum with office in Powers Block and a Warehouse in Litchfield Street on the New York Central Railroad lines. After the fire the first successful Vacuum Still No. 1 was erected and housed with the Vacuum Pumps, Condensers, and Receivers in a substantial brick building.

1875-76 - The double Vacuum Stills Nos. 2 and 3 were erected for continuous distillation and to take care of the growing trade.

1876 - Mr. August J. Goebel has the honor of having mixed the first sample of 600 W Cylinder Oil.

1876-77 Stills 4 and 5 each of about two hundred barrels capacity were built for running an intermediate grade of oils. Apparently the question arose at that time as it did again in 1890 of always having at hand a sufficient amount of crude oil of conditioned quality to keep the still running to capacity because in 1877 storage tanks 1, 2, 3, and 4 each of about five hundred barrels capacity were erected for that purpose.

1878 - The company moved into still larger offices in the Rochester Savings Bank Building. During this year a stone warehouse 200' x 100' was built at the Works. The basement floor was level with the yard and the other floor was conveniently higher so that filled barrels could be rolled on the same level from the building across the platform directly onto trucks backed up in front. The Genesee Valley Canal, which separated the Works into two parts, was bridged and a trestle was built from the canal half way through the building and on the trestle and bridge tracks were laid over which cars from the Erie Railroad were shoved into the building for loading of shipments of oil.

1879 - Mr. H. B. Everest was still listed as secretary with offices in the Rochester Savings Bank Building, his house at Denver, Colorado and Mr. C. M. Everest as wholesale dealer in Refined Petroleum with warehouse at Glasgow Street on the Erie Railway. Cylinder oils

steam turbines.

1900 - A shipment of Desberon Cylinder Oil for air cooled automobile engines made by the Desberon Company was shipped to France. This year began the manufacture of Bright Stocks, so far as known the first refinery to use mechanical refrigeration for this purpose.

1901 - This year extra Hecla Cylinder Oil was made for use with super-heated steam.

1901-02 - Complete line of products for converting animal hides into finished leather.

1902 - Navajo Engine Oil and No. 2 Gas Engine Oils were tried out for use in automobile engines. The former on a yacht owned by Mr. C. M. Everest.

1903 - A heavy neutral oil made purposely for use in automobile engines was being tried out. There was also being marketed this year under the name of Mobil Oils a full line for engines of different types.

1904 - Nos. 1, 2, 3 and 4 Mobiloils were marketed. Fire in main office destroyed all records.

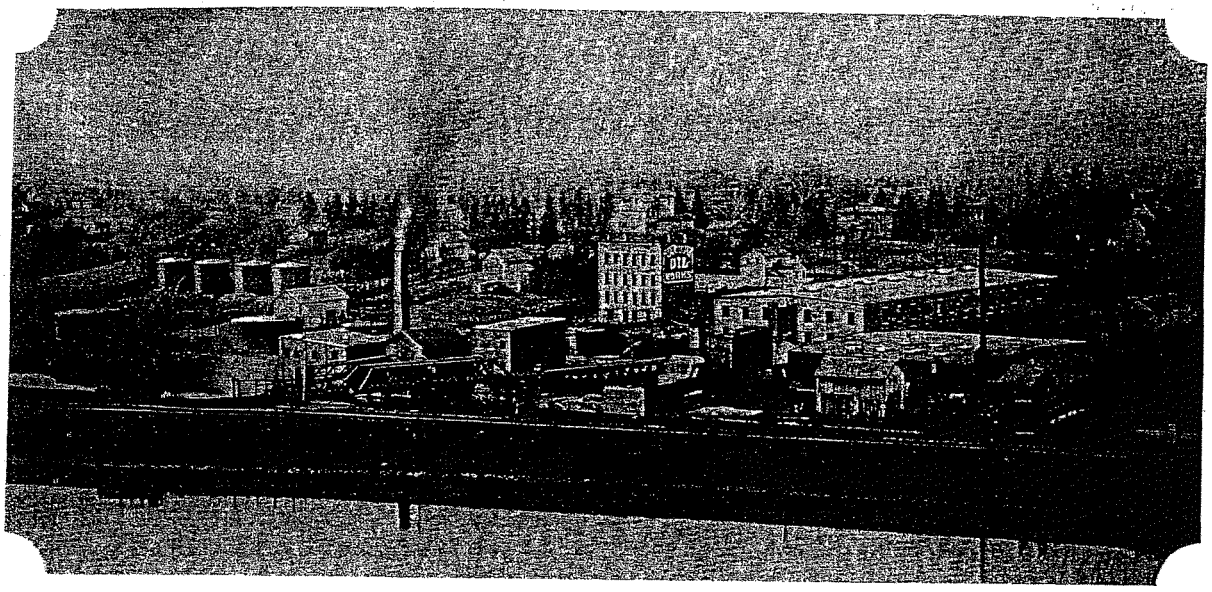
1906 - The first list of Vacuum A, B, C, D, and E Mobiloils.

1908-09 - The problem of oils for the circulating systems of lubricating machinery was at that time solved.

Rochester records do not show the year of the starting of the plants at Bayonne or Paulsboro but this information as well as that of the establishing of the various foreigh offices and companies can be obtained in your office, probably entirely from the Lubricating Committee.

Appendix H

When Vacuum was young – The Company's works in 1879 by Dr. F.R. Baxter from the Vacuum Oil News, undated



The Rochester Works in 1879

When Vacuum was young—

The Company's works in 1879

By Dr. F. R. BAXTER

We are greatly indebted to Dr. Baxter for this careful and very complete description of this old photograph. While the "Old Timers" will find much of interest in the picture and article, they should be especially inspiring to the younger generation as they compare the company of today with the company of yesterday.—Editor.

THE old photograph of the Vacuum Oil Works, reproduced on this page, fairly represents the condition of the works when I was employed in May, 1881. The date of Autumn, 1879, was supplied me by Mr. J. C. Lighthouse who owned the tannery shown in the right-hand foreground. The photograph was taken from a tower on the estate of Mr. Ellwanger of the old nursery firm of Ellwanger & Barry on the opposite side of the river.

The property of the Vacuum Oil Company began at the brick wall about in the middle of the picture immediately below the brick building bearing the sign—"Vacuum Oil Works," and extended along the side of the large stone building to Exchange Street, which was known at that time as Mansion Street. The iron stack on the tannery had been replaced with a brick one when I arrived, which was the feature that fixed the date of the picture.

The railroad in the foreground is a branch of the Erie, and it was over this line that the supplies of crude oil and barrels were received. The rack car* at the left of the picture contained empty barrels. Just to the right is the rack supporting the pipes through which the crude oil received in tank cars was unloaded into the receiving tanks on the other side of the canal, the waters of which show up at the right of the picture. This was the Genessee Valley canal which was afterward abandoned, the property finally coming into the possession of the Pennsylvania Railroad Company. The branch of the Pennsylvania from here meets the main line of the Erie at Olean, and is the line over which our refinery products have been received from Olean since the construction of the first of our refineries at that point.

The brick building with flat roof at the left of the brick smoke-stack contained the Vacuum stills Nos. 2 and 3. Still No. 1 was in the lower building just behind the peaked roof building. Just along the brick wall referred to is the first fire reducing still which is connected to the squatty square brick chimney just beyond it. The flat top building next to it was the tail house where the cuts of naphtha, steam still stock kerosene distillate, etc., were made. The only source of light in those days was from kerosene lamps, which of course could not be brought near such a dangerous place. The illumination of this building was from a locomotive headlight stationed at the left of the barn which is the peaked building at the left of the brick stack.

At the time this picture was taken, the naphtha and kerosene distillates were sold and shipped in tank cars. The wax distillate was stored in the large tank just below the barn because no use had been found for it up to that time.

The residual oils were finished in the compounding department which was in the left-hand side of

* Not very distinct in the photo.

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the large stone building extending from two or three squares of the end facing you to the extreme opposite end of the building. The compounded oils were filled in the basement of this building, and were then raised to the ground floor and either rolled to the front platform for hauling to the New York Central Railroad or loaded directly into cars on the Erie which were drawn in over the bridge and trestle in the foreground.

The harness oil was made in the peaked roof building next to the smoke-stack, and was then pumped to another section of the stone building where it was put into cans. These cans were made on the third and fourth stories of the building bearing the name "Vacuum Oil Works."

The works' office was in the left-hand corner of the large building, and occupied one square. The filtering department was in the right-hand corner of this building facing this way, and extended up the building about half-way.

The filters were sections of cast iron pipe, some 14-in. some 18-in. inside diameter, and 6 ft. and 8 ft. long. They were suspended from the ground floor and were charged by removing the covers and pouring the boneblack from bags directly into the filters.

After the boneblack had been used once, the oil was allowed to drain, the lower head taken off the filter, and the oil-soaked black carted out into the yard, a large pile showing immediately below the sloping roof this side of the brick building bearing the sign. At that time this black was sold to a fertilizer manufacturer who removed some portion of the oil and converted the balance of it into fertilizer with the use of sulfuric acid.

The dwelling just at the right of the brick building was the home, for several years after the plant started, of Mr. Horace Everest, brother of Mr. Hiram B. Everest, and later housed in succession the head cooper, one of our compounders, the carpenter shop, the leather grease experimental shop, under the direction of Mr. S. Y. Alling, and lastly the laboratory.

The low building just this side the dwelling was the cooper shop. The basement of the brick building was the pipe shop, and the ground floor the printing office, in which the advertising matter for selling Vacuum harness oil was printed. Within the past few years the upper stories were dismantled and the lower floor is now used for the hospital.

COPIED FROM THE COLLECTIONS IN THE CENTER FOR AMERICAN HISTORY THE UNIVERSITY OF TEXAS AT AUSTIN

"A grade for each type of service"

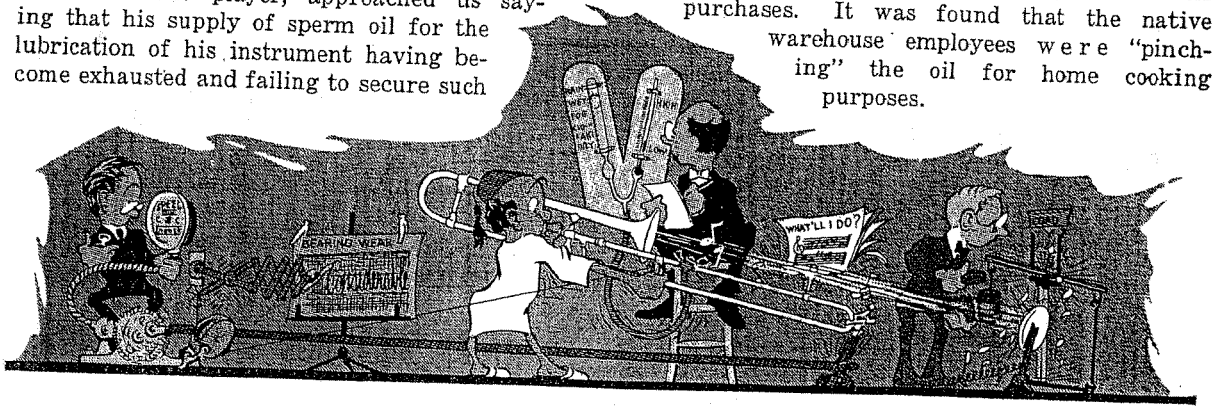
EVERY Gargoyle worker knows that the Vacuum Oil Company stands for "the right oil for the right place," or, in other words "a grade for each type of service." That is the idea which is behind the various Charts of Recommendations, the Engine Builders' book, the Lubrication audits, etc.

In Cairo not long ago, this idea was carried out in providing a means for the proper lubrication of a trombone which functioned in a jazz band.

"The leader of the local jazz band who is also the slide trombone player, approached us saying that his supply of sperm oil for the lubrication of his instrument having become exhausted and failing to secure such supplies in Cairo, he requested advice as to the slide tubes of his instrument," says a letter from Cairo.

"Careful analysis of the bearing conditions show the factors of moderate speed, low temperature, wet steam, variable load and considerable bearing wear. You will be interested to know that Gargoyle D. T. E. Heavy Medium is rendering admirable service under these conditions."

From Cairo also comes the story that a local government department which had been using high grade Gargoyle products consistently, ceased their purchases. It was found that the native warehouse employees were "pinching" the oil for home cooking purposes.



Appendix I

SOCONY Mobil, A Brief History by Socony Mobil Oil Company, Inc.

SOCONY

MOBIL

A Brief History

Socony Mobil Oil Company, Inc.

To all Mobil Oil employees:

This booklet provides a brief look at some of the forward-looking people and history-shaping events that make up the story of Socony Mobil.

I hope you share my pride in the achievements recorded here. We can all be proud of the contribution Mobil has made to the progress of the United States, as well as to the improved standards of living of many people throughout the world.

History never ends. Even as you read this, our company is advancing on many fronts. The Mobil organization was built on a solid foundation of quality, integrity and good citizenship. These characteristics, together with the pioneering spirit that led to such great achievements in the past, are sure to contribute to new standards of progress and individual well-being in the future. We can all be proud of our share in these accomplishments.

President
Mobil Oil Company

Socony Mobil Oil Company, Inc., is one of the world's largest corporations. The Mobil trademark is familiar to millions of people in more than 150 countries and territories throughout the Free World.

Beginning as a specialist in the manufacture and marketing of lubricants, Socony Mobil over the years branched out into all phases of the oil industry — exploration, production, transportation—and the manufacturing and marketing of fuels, lubricants, chemicals, and a wide variety of other petroleum products.

Vacuum Oil Company

Socony Mobil's earliest ancestor, Vacuum Oil Company, grew out of an experiment conducted in Rochester, New York, in 1866, by Hiram Bond Everest, who operated a grocery store, and Matthew P. Ewing, a local carpenter.

The two men had theories about petroleum, a substance discovered in commercial quantities only seven years before.

Their original idea was that distillation of crude oil in a vacuum would produce more kerosine than conventional methods could.

The method was not entirely successful. It did produce some kerosine, but there was also

an unburned residue which was quite unlike kerosine.

Instead of being disappointed, the two men started at once to see what use could be made of the residual product.

Everest, who had been a farmer for several years, thought the new product might be useful for dressing leather. Tested by the leading curriers of Rochester, it proved superior to the animal and fish oils then in use. Everest also discovered it was an excellent lubricant for machinery. He confidently put his resources into the new business venture.

Vacuum Oil Company was formed on August 28, 1866, and incorporated on October 4 of the same year. It was the first company ever formed specifically to manufacture petroleum lubricants.

Sales of the new product increased slowly. Ewing, discouraged, sold his interest in the company. Everest, however, campaigned vigorously for new customers. He made harness oil, demonstrating it to farmers in the Rochester area and personally dressing leather for them. Since the company's output was not great enough to justify buying special containers, he packed his product in small, used oyster cans, put them in a pushcart, and peddled the Vacuum Harness Oil from door to door.

After a few months, laboratory experiments indicated that the petroleum residue from the vacuum process might be used to lubricate steam cylinders. For conclusive proof, he arranged for the lubricant to be tried in steam engines while they were in operation.

This lubricant was the ancestor of one of Mobil's most famous products, 600 W Cylinder

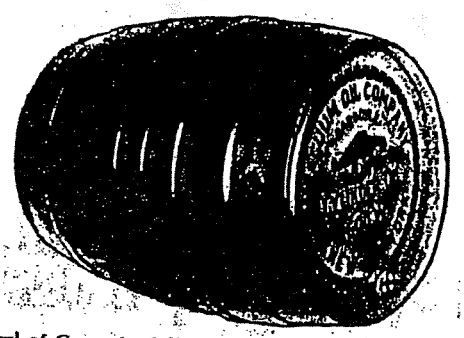
A contemporary photograph of Hiram Bond Everest, founder of Vacuum Oil Company. This picture was taken in 1873, when he was 43 years old.

Oil, which is still manufactured today. The principle of a practical test for every product, which Everest initiated so many years ago, became part of the heritage Vacuum handed on to its successor companies.

But proved performance was not enough. Everest then found he had to convince machinery operators that a mineral oil would be a better lubricant than tallow. Potential customers had to be shown that the new lubricant would not injure machinery and would, instead, be far superior to the animal fats then in use. Once a customer was sold, Everest undertook to teach the most efficient use of the product so the customer could achieve the greatest economy in the use of his machinery.

In this way, Mobil's pace-setting sales-engineering program was begun.

As Everest improved his vacuum process for obtaining lubricants from petroleum, he developed many different products, among them several industrial oils and greases, as well as a line of specialties: hoof dressing, coach oil, axle grease, and tanners' products.



Barrel of Gargoyle Cylinder Oil 600 W, first successful petroleum lubricant for cylinders of steam engines.

He advertised his products almost from the beginning of the business. Early ads extolled Vacuum Oils while commemorating the performances of famous horses of the time. "Small Hopes and Lady Mac," "Smuggler," "Rarus," and others usually were pictured in full and furious motion, all four feet flying.

As Vacuum acquired a reputation for quality and know-how in the field of lubrication, John D. Rockefeller's interest was aroused. Everest became well acquainted with Rockefeller, who made several offers to buy a controlling interest in Vacuum Oil Company. Everest at first turned him down, but in 1879 he sold his interest to Rockefeller, and Vacuum joined the Standard Oil group.

Everest retained the office of president until the turn of the century, visiting the Rochester works and keeping up a lively interest in company activities. Before his death in 1913, Everest saw the company he founded known throughout the world, and once more an independent corporation (following the 1911 break-up of the Standard Oil group).

Charles M. Everest, who joined his father in the company as a boy and grew up working beside him, had the confidence of the Standard Oil group and was allowed considerable initiative in the management of Vacuum.

Charles Everest enlarged the manufacturing capacity of Vacuum and developed one of the first fully equipped laboratories in the oil business. He established a technical department and, with the counsel of leading chemists and engineers, studied every new form of machinery, experimenting until just the right lubricants were evolved for each.

Later, after Vacuum had established branch offices in many parts of the United States, the company turned its attention overseas and established a sales office in Liverpool, England, in 1886.

Vacuum Oil Company, Limited. The Americans took to England wooden barrels filled with lubricants—the steam cylinder oils, spindle oils, and greases for which Vacuum was already famous in the United States. Finished products were shipped from Rochester until 1896, when a blending works was opened at Millwall in London. A British company — Vacuum Oil Company, Limited — was formed to take over Vacuum's United Kingdom business interests

in 1901, and a second blending works was built at Birkenhead that same year.

In addition to its British venture, Vacuum also expanded into other foreign markets.

By 1894, Vacuum had branch offices in Singapore, Yokohama, Bombay, Calcutta, Havana, and Milan. In 1895, Vacuum began doing business in Melbourne, Australia, with branches or agents in all the Australian colonies and in New Zealand. In 1899, Vacuum companies were organized in Hamburg, Germany; in Budapest, Hungary; and in Paris, France. In 1901, affiliates were formed in Italy and Portugal. Through salaried agents or affiliates, Vacuum began selling its products in South Africa in 1909. In 1911, an office was established in Buenos Aires, Argentina, to serve various South American countries.

Trademarks. A universally recognized trademark for Vacuum products was desirable. The word "Vacuum," however, could not be registered as a trademark in all countries where the company did business. The "Gargoyle" trademark was suggested by a London lawyer, Philip N. Justice. It was distinctive, easy to remember, and symbolized the victory of good over evil. Early marketers of products bearing the Gargoyle label described it as a fitting emblem for "the triumph of correct lubrication over friction." It was adopted in 1904, and became the official trademark of the Vacuum Oil Company.

The name "Mobiloil," so popular that its prefix "Mobil" today identifies the company throughout the world, was coined in England in 1899. It was registered as a trademark in the United States in May, 1918.

Vacuum Coach Oil label, printed about 1875, when animal and vegetable oils were normally used as lubricants for machinery. Vacuum pioneered in advertising petroleum products as lubricants.

The words "Gargoyle Mobiloil" appeared on many Vacuum products. The word "Mobil" began to appear by itself in the early 1930's, but the Gargoyle trademark is still used on some of Mobil's industrial products.

The "Flying Red Horse" symbol also began with a Vacuum company. In 1911, Vacuum Oil Company of South Africa registered the trade name "Pegasus" and used a simple line drawing of a flying horse. The red color was credited to a Japanese sales manager who suggested it in a contest some years later. The famous Flying Red Horse emblem is still seen and recognized throughout the Free World.

Vacuum's "Famous Firsts" (1866-1911)

Back in 1866, Vacuum Oil Company had produced the first successful steam-cylinder lubricant made from petroleum. Within 20 years, the company was supplying products to lubricate everything from a sewing machine to a steel mill. It found that new or improved petroleum products often help to make new engines and machinery possible.

The long list of "Famous Firsts" claimed by Socony Mobil today began with the Vacuum Oil Company. Here are a few:

1866. Developed first petroleum lubricant for industrial machines.

1877. Supplied lubricant for first automobile engine, built by George B. Selden. Selden later wrote, "It is beyond doubt that the Vacuum Oil Company was the first to make a suitable mineral oil that would lubricate a gasoline automobile and that I was the first to make use of it." Selden's earlier problem with oil decomposition and annoying exhaust smoke caused by animal or vegetable lubricants discouraged him almost to the point of giving up his "horseless carriage" idea, until he tried Vacuum's new, clear petroleum lubricant.

1882. Lubricated Edison's first central generating system.

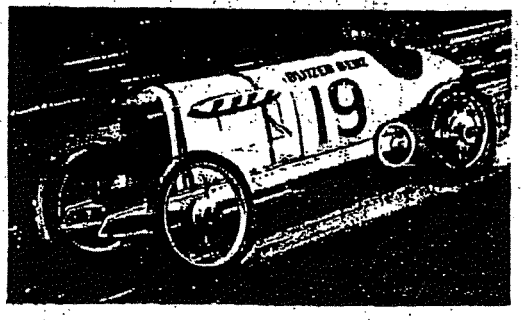
1889. Marketed first high-velocity oil for textile spindles.

1903. Supplied Mobiloil for the Wright brothers' early flights, which launched the age of practical aviation.

1910. The "Dean of American Auto Racers," Barney Oldfield, set a record of 131.72 m.p.h. at Daytona Beach with Mobiloil.

1910. Lubricated the original *SS Mauretania,* which crossed the North Atlantic in the record-breaking time of four days, 10 hours, and 41 minutes, winning the legendary "Blue Riband of the North Atlantic." Mobil lubricants have been used on every ship that has since won this trans-Atlantic speed record.

Vacuum also pioneered in preparing specific lubricants for specific engines. A "Mobiloil Chart of Recommendation," first printed in 1901, helped early drivers select the correct grades of oil.



Barney Oldfield, dean of American auto racers, in his record-winning Blitzen Benz, lubricated by Mobiloil.

Vacuum's Business Principles. The basic business principles of the Vacuum Oil Company were stated as follows on a card printed in 1886:

"We shall always work on the line we have followed for twenty years: inventing and making oils to put friction down as low as it can be put down by oil, with no regard to the cost of making the oil.

"We shall always teach, as we have been teaching for five years, that the proper service of oil so far exceeds its cost that

the best is the cheapest, ten to one, perhaps twenty to one, sometimes perhaps fifty or even a hundred to one.

"The only question is how fast the man most nearly concerned will act on the fact —we mean the consumer.

"We make a few cents a gallon. He makes a few dollars a gallon."

These principles enabled Vacuum to achieve a worldwide reputation for quality and to become the world's leading marketer of lubricants. That reputation is maintained today by Socony Mobil Oil Company.

Standard Oil Company of New York

As Vacuum Oil Company was attaining its place of leadership in lubrication, the second of Socony Mobil's major predecessor companies was being formed.

Standard Oil Company of New York was organized in 1882 by John D. Rockefeller and his associates as part of an extraordinary group of companies and businesses.

Several years earlier, Rockefeller, who had visited the Pennsylvania oil region in its hectic days after the first oil well was drilled, decided the producing end of oil was no place for an orderly businessman. He did, however, see a future in refining, having learned that a gallon of kerosine sold for twice as much as a whole barrel of crude oil. With two partners, he invested in an oil refinery in Cleveland, Ohio.

In 1870, the three men formed the Standard Oil Company.

Convinced that a far-flung combination of small local firms was the most logical pattern for success in the oil business, Rockefeller and his associates proceeded to organize just that.

As needs grew in the oil business, Standard met them. Refining was one of the first bottlenecks, so Standard bought and enlarged existing refineries in Ohio, and built others.

As refinery capacity grew, a new problem arose: transportation. Standard located refineries near railroad lines and built a network of pipelines that linked oil fields with refineries and railways for efficient, economical oil transportation.

Through a series of acquisitions, many firms and executives were added to the group. After 1877, the company bought shares in lubricating oil companies and specialty firms, including, as mentioned previously, the Vacuum Oil Company.

Within a few years, Standard Oil Company had developed into a complex organization of producers, refiners, pipeline companies, and wholesalers, whose activities covered much of the eastern United States.

In January, 1882, the various companies in the Standard group were organized into the Standard Oil Trust, with headquarters in New York. On August 10, 1882, the Standard Oil Company of New York was incorporated.

Standard Oil Company of New York—soon to become known by the form of its cable address, "Socony"—was one of the leading refiners in the Trust and the marketer for New York and New England. It was the major source of administrative and clerical personnel for the Standard Trust, and served as the chief banking unit. One of its special tasks was the development of export business.

In 1884, one of the Standard Oil men who traveled widely in the Far East praised kerosine, saying, "I may claim for petroleum that

it is something of a civilizer, as promoting among the poorest classes of these countries a host of evening occupations, industrial, educational, and recreative, not feasible prior to its introduction; and if it has brought a fair reward to the capital ventured in its development, it has also carried more cheap comfort into more poor homes than almost any discovery of modern times."

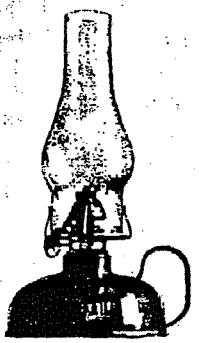
At first, Standard products were sold in the Far East by exporters who purchased from the company. Then, in 1893, Standard established a string of "Asiatic Stations." By early 1894, company managers or agents were active in Shanghai, Calcutta, Bombay, Hong Kong, Yokohama, Kobe, Nagasaki, Singapore, Batavia, and Surabaya.

These offices handled imported kerosine packed in square five-gallon cans, with brand names such as "Astral," "Brilliant," and "Radiant." Standard's Far East trade grew, successfully competing with oil products from Russia and the Dutch East Indies. By the early 1900's, Standard Oil Company sold more than one-third of the total oil products then supplied in Japan.

During the early nineties, Socony men explored the vast potential of the Oriental market. The result was a classic story of the export trade—the story of the Mei Foo lamp and "oil for the lamps of China."

With their vast population and almost total lack of means for adequate illumination, China and other countries of the Orient offered a limitless market for kerosine. The Chinese had been using earthen bowls of vegetable oils in which floating wicks burned. These flickered, smoked, smelled, and gave almost no light.

The only lamps available were too expensive for the average Chinese family. The company solved the problem by manufacturing and distributing a small lamp which burned kerosine efficiently, gave a bright light, and sold for a few cents. Introduced in 1906, these lamps were supplied by the million throughout China —sometimes sold, sometimes given away with the first case of kerosine. They not only created a fine market, but earned the company a lasting friendship. The lamps became known as "Mei Foo" from the Chinese symbols for Socony meaning "beautiful confidence." Even today, in places like Hong Kong, the company is sometimes referred to informally as "Mei Foo," and the name is registered as a trademark.



The famous "Mei Foo" lamp.

In the United States, Standard of New York was supplying kerosine and increasing quantities of gasoline to New York and New England. In 1909, the company had 92 percent of the gasoline market in these states, which came to be known as "Soconyland."

The first record of Socony's marine transportation activities dates from 1884, when the lighterage department scheduled the com-

pany's five tugs and 45 barges on their journeys from Socony's five refineries to the New York harbor area.

The foreign shipping department, organized in 1888, operated an ocean fleet that carried case and bulk oil to markets all over the world. In it were the "kerosine clippers," sailing vessels that delivered kerosine to Bombay, Calcutta, Shanghai, Singapore, Hong Kong, Yokohama, Cape Town, Sydney, and many other ports. The round trip from New York or Philadelphia to these distant ports took a year.

Slow by modern standards, but picturesque and practical, the tall-masted square-riggers filled a specific and important need. Storage tanks were not generally available at Far East ports for handling bulk shipments. Kerosine was shipped in rectangular cans, packed two to a wooden case, which could be easily handled on decks and carried inland by carts or pack animal.

General cargo steamers were in use at the time, but they were coal burners. A ship carrying sufficient coal for the long journey could not also carry enough cases of kerosine to make the trip worthwhile. New York Standard therefore fell back on the mariner's original energy source, the wind, and used sailing vessels equipped with auxiliary steam engines. The kerosine clippers carried on their trade until just after 1910.

Socony had its own list of enviable "firsts," notable not only in the oil industry but in all industry. It built the first all-steel tankship in the United States—the *SS Standard*—in 1888. In 1905, a Socony vessel, the *SS Col. E. L. Drake*, with Barge 95 in tow, made the first trans-Atlantic tow trip, journeying from New York to London in 18 days.

Socony also helped to pioneer company benefit plans for its employees. In 1903, Standard Oil Company of New York was one of the first U. S. corporations to adopt a formal noncontributory pension plan. It provided that male employees be retired at age 65 after 25 years of service, on a pension which was to be 25 percent of the average salary for the last ten years. There were also provisions for optional retirement. Revisions through the years, the first of which occurred in December, 1909, have made these terms more liberal for employees, and have consistently fashioned benefits which were then—and still are—among the best in business.

In the United States, as Standard Oil companies expanded, so did other industrial corporations. The period was one of the most active and enterprising in business history. Numerous corporations were formed, and methods of mass production introduced. There were mergers and combinations of companies in many different industries; the public became increasingly worried about this concentration of industrial power. The public attitude eventually expressed itself in new legislative measures, the most important of which was the Sherman Antitrust Act, passed in 1890.

Earlier that year, the state of Ohio brought suit against Standard Oil Company, charging that only Ohio Standard had been chartered to do business in Ohio, yet through it the entire Standard Oil Trust was operating in the state. The court took notice that Standard had brought lower prices to the consumer of oil

The bark "Brilliant," built in 1901 to carry oil to the Far East. With a capacity of 148,000 cases, it was then one of the largest four-masters in the world.

products, but ruled in favor of the state on March 2, 1892.

Standard Oil top officials decided to dissolve the Trust and to reorganize the business, giving a leading corporate role to Standard Oil Company of New Jersey (chartered in the same year as Standard of New York). The Jersey company's charter was broadened to let it carry on all operations in the oil business, and its name was changed to "Standard Oil Company (New Jersey)." On April 1, 1892, less than a month after the Ohio court ruling, it became the holding company for the entire Standard enterprise.

John D. Rockefeller, ill in 1891, withdrew from active management of Standard Oil. John D. Archbold became the top figure. He and his associates continued to search for new producing areas, refining techniques, and profitable markets—but they operated in an atmosphere of public suspicion and attacks by the press.

In 1902, the first installment of "The History of the Standard Oil Company," by Ida Minerva Tarbell, appeared in *McClure's Magazine*. It ran serially for two years and was then

published as a book in two volumes. Miss Tarbell described Standard in ways that agreed with popular opinion. A reviewer in *The Nation* stated the book seemed to be written "for the purpose of intensifying the popular hate." It was, however, readable and coherent, and the fact that it told the story only as Miss Tarbell saw it seemed but to add to its success.

President Theodore Roosevelt requested a thorough investigation of the petroleum industry by Commissioner James R. Garfield of the Bureau of Corporations, and Standard Oil officials opened their files at the 26 Broadway headquarters office in the hope that an objective inquiry and analysis would result.

Standard officials saw the Bureau's published report and believed it misinterpreted the facts. They protested—publicly and strongly—and a portion of their reply went so far as to say, "The Standard Oil Company furnished the facts and a man with a muck rake dug out such as under his manipulation he felt would prove damaging."

Secrecy, long cherished by Standard, was vanishing. Company officials made vigorous attempts to acquaint the public with Standard's point of view and to answer some of the charges.

This change of policy did little to stem the tide of public opinion. The public was deeply stirred by books, magazine serials, and newspaper stories concerning the practices of meat packers, railroads, manufacturers of food and drugs, and other big businesses—and, most of all, Standard Oil.

Antagonism of the public toward Standard, fanned by many events and people, focused national attention sharply on the alleged mis-

deeds of the "giant of the oil industry." On November 15, 1906, the federal government filed suit under the provisions of the Sherman Antitrust Act against the Standard Oil Company (New Jersey). In their bill, the federal lawyers asked the court to adjudge Standard Oil a monopoly and conspiracy in restraint of trade.

Five years of litigation followed.

On May 15, 1911, in Washington, D. C., the U. S. Supreme Court handed down its long-awaited decision.

The Court found Standard Oil guilty of unreasonable restraint of trade under the Sherman Antitrust Act. The Court said Standard had used unfair practices in an attempt to monopolize the oil industry. Some of the unfair practices: obtaining rebates from the railroads; cutting prices in local areas to drive competitors out of business; excluding competitors' oil from its pipelines.

Standard Oil Company (New Jersey) was enjoined from voting the stocks of, or exerting any control over, 33 separate subsidiaries.

These companies, in turn, were enjoined from paying any dividends to Standard Oil Company (New Jersey) or permitting it to exercise any control over their management.

The decree made it impossible for the company to continue operating as it had, and shortly thereafter it divested itself permanently of all stock it held in the 33 subsidiaries. The transfer was completed by December 1, 1911.

On December 4, John D. Rockefeller, then 72 years old, relinquished the presidency of the company. He had built the greatest integrated oil company the world had ever known. He saw it broken apart by public opinion and court decree, but he lived to see several of its segments grow independently into large oil companies competing against each other in a vastly more complex and diversified oil industry.

The Dissolution. The dissolution of the old "Standard" brought a number of problems to the separate, competing companies which emerged. Each company received an immediate inheritance: the properties that had belonged to it within the "family"; the traditions and methods of operation it had built up as part of the group; and certain complex problems left over from the dissolution itself.

Two of the newly independent companies were Socony (Standard Oil Company of New York), the largest of the new entities except for Jersey Standard itself; and Vacuum, the principal lubricating-oil manufacturer within the old Standard Oil Company.

The 1911 dissolution order left the component companies standing alone and facing the necessity of making their own way in a highly competitive world.

Before the break-up, each of Standard's marketing companies operated in clearly defined areas of the United States. After 1911, there was nothing to stop one company from moving into another's territory.

Today, there is no state in the United States that has fewer than two of the former Standard companies competing against each other in the marketplace. All but Hawaii and Alaska have three or more; some states have six. They also compete in oil exploration and all other phases of the oil business, in addition to competing against "non-Standard" companies.

Both Socony and Vacuum, after the dissolution, had important assets, including their

reputation and the good will which their products and service engendered. But neither was a fully integrated company. As independent companies, Socony and Vacuum were cut off from the producing, pipelining, shipping, and other activities that had been performed by the other Standard companies.

Socony had an established marketing position in New York and New England, and extensive marketing outlets in the Orient, the Middle East, Australia, and South Africa. It had a refinery in Buffalo and several refineries and other plants on the New York waterfront, including the Brooklyn Refinery.

Vacuum emerged from the dissolution with trademarks and a reputation that were among the most valuable in the entire oil business—thanks to the company's emphasis on research, quality, and advertising. It had refineries in Rochester and Olean, which it had operated for many years, and a grease-compounding works. Vacuum continued to market its automotive, industrial and marine lubricants—and its famous lubricating service—throughout the United States and around the world.

Standard Oil Company of New York (Socony) 1911-1931

Socony had a special problem when it came to its new status. It inherited the traditional Standard Oil headquarters building at 26 Broadway. Standard Oil (New Jersey), successor to the old Standard holding company, also headquartered there, as did many smaller companies from the old Standard group.

This, plus the fact that many of the Standard companies still included the name "Standard"

An early advertising card showing tugs and lighters carrying oil products from a refinery—later owned by Socony—to Far-East-bound vessels.

in their titles, did little to clarify the situation in the public mind. To this day, some people do not understand the independent, competitive status of the companies. They believe the 1911 break-up was fictional. Socony officers and directors made sure, however, that it was fact.

First president of the independent Standard Oil Company of New York was Henry C. Folger, who had been a director and the secretary of the holding company. His vice president was H. L. Pratt, a former member of the holding company's Manufacturing Committee.

Socony proceeded immediately on a building program. Refineries were enlarged and a new

refinery was built near Providence, Rhode Island. Bulk storage plants and warehouses were constructed throughout its marketing territory. This form of expansion, however, could not keep pace with the rapid growth of demand for petroleum energy.

In 1911, neither Socony nor Vacuum had under its control the facilities to produce a single barrel of crude oil. Lack of crude was not such a handicap to Vacuum because its products were made from a limited volume of selected crudes. Socony, however, was marketing large volumes of oil in various forms as fuel. It had developed a vast export business in kerosine, and it now faced a swiftly growing demand for gasoline.

Henry Ford had delivered his first Model T automobile to dealers in 1908. By 1911, there were more than 600,000 cars on the road. Oil, instead of being primarily a source of light and heat, took on a more demanding role as a source of mechanical energy. In 1911, the oil industry for the first time manufactured more gasoline than kerosine.

For several years, Socony purchased crude oil from other companies, some of which had now become its competitors. Gradually, it sought the better balance and efficiency of operations which would be possible with its own crude oil source.

In 1918, Socony acquired a crude oil supply with the purchase of a 45-percent interest in Magnolia Petroleum Company, which had helped to pioneer the oil business in Texas.

Magnolia Petroleum Company. Magnolia, so named, some say, because of the great number of magnolia trees in the Beaumont and

Houston areas where the company did business, began as the J. S. Cullinan Company on Christmas Day, 1898, with the lighting of fires to start the Corsicana Refinery – the first refinery in the Southwest.

Four years before, oil had been discovered accidentally in Corsicana, Texas, by men who were drilling for water. The mayor wrote to J. S. Cullinan, known for his success in the development of Pennsylvania oil properties, asking him to come and advise the people of Corsicana what to do about their discovery. Cullinan planned a brief stopover on his way to California.

He saw the field, however, and stayed – to start the work of financing pipeline, refinery, and marketing facilities. It was not easy work; many prospective financiers withdrew their support when they read a report by geologists which asserted that oil would never be found in paying quantities in Texas.

But Cullinan interested Calvin N. Payne of Titusville, Pennsylvania, and Henry C. Folger, and together they formed the J. S. Cullinan Company. They hired 29-year-old E. R. Brown, who had four years' experience with Standard at Olean, New York, to work for them and build a refinery at Corsicana.

The enterprise prospered, and from it other organizations were formed—the Corsicana Petroleum Company in 1899, and the George A. Burt Refining Company in 1901. The Burt Company was organized to build a refinery at Beaumont, Texas, that would absorb much of the crude oil from the great Spindletop Field discovered in the area that same year. The Burt Company became the Security Oil Company.

In 1909, it was purchased (along with the Navarro Refining Company) by John Sealy and Company.

On April 24, 1911, the property was reorganized as the Magnolia Petroleum Company, a joint stock association. John Sealy was its first president. Seven years later, when Socony became interested in it, Magnolia, with the longest ancestry of any oil company in Texas, was a large and integrated company—an important producer, with extensive refining properties and marketing outlets in the Southwest.

Complete ownership of the company by Socony followed on December 15, 1925. By then, an extensive pipeline business had also been organized as a separate corporation known as Magnolia Pipe Line Company.

Among the colorful events in Magnolia's early years are two that made history in the Southwest.

Cullinan believed that oil, instead of coal, could be used as fuel in railway engines. To test his theory, he installed oil-burning equipment in a passenger train running between Corsicana and Hillsboro on the Cotton Belt Railroad. The fuel oil was furnished by the Corsicana refinery and the test probably took place shortly after the refinery went on stream.

The oiling of streets and roads was another Magnolia contribution. Streets in Corsicana were made of loose sand, which blew thickly through the air on windy days. Cullinan noticed that, around the oil storage tanks, oil had spilled or leaked, soaking the sand and packing it tight. "The discovery set me thinking," he recalled years later. "Why not oil the streets and eliminate the discomfort of windblown sand? A Corsicana man let us use a large tract of land on which to experiment with oil as a paving material." The experiment proved so successful that Corsicana streets thereafter were treated with oil, making them dustless.

With achievements like these, it is small wonder that J. S. Cullinan is regarded as "the dean of the oil men of the Southwest, and the founder of the petroleum industry in Texas," and that the company he founded became a leader in the Southwest.

General Petroleum Corporation. Overseas markets, particularly in the Far East, continued to be important for Socony. The supply route through the Panama Canal to the Orient became uneconomical when crude oil was discovered on the West Coast of the United States. For a domestic source of crude, Socony, in May, 1926, purchased an integrated West Coast company — General Petroleum Corporation. Here again, Socony gained not only crude, but also a refinery. The result—a strong marketing position in three West Coast states.

The story of General Petroleum rings with pioneer courage and fortitude. The company was founded in May, 1910, by Captain John Barneson, who entered the oil business when he was past forty, after a brilliant career that included a period as skipper of the *USS Arizona*.

With William Matson, who later founded the Matson Navigation Company, Capt. Barneson achieved a "first." He conducted the first experiments using oil as a marine fuel, successfully converting the *SS Enterprise* from coal to oil, and completing several trial runs in 1898 between the U. S. mainland and Honolulu.

Capt. Barneson foresaw a good business in petroleum and applied his talents to the many

Socony Abroad (1911-1931). While Socony was obtaining crude sources and marketing outlets in the United States, it was not neglecting its overseas ventures.

Marketing operations of the Bulgarian Branch of Socony began in 1913, and were supervised by the main office of the Levant Division of Socony with headquarters in Constantinople (now Istanbul), Turkey.

On April 2, 1914, Socony was formally registered to do business in Greece. Because of a state monopoly for the supply and distribution of kerosine, however, Socony's marketing operations were confined to lubricating oils.

Socony acquired a 50-percent interest in Standard Oil Company, Yugoslavia, Incorporated, on June 13, 1927.

As the business of the company expanded in the three original Socony markets — India, China, and Japan — new territories were also developed. Sale of Socony products spread to Indo-China, the Malay Peninsula, the Philippine Islands, and Sumatra and Java, now part of Indonesia.

After the dissolution in 1911, it was necessary for Socony to re-enter countries like Australia and South Africa, which had been allotted to Jersey Standard and to Vacuum. This it did — in 1922, with Socony Proprietary, Ltd. in Australia; in 1926, with Standard Oil Co. (South Africa), Ltd. in South Africa.

Iraq Petroleum Company, Limited. In addition to these activities, mainly in marketing, Socony sought important crude sources overseas — and for good reason.

During the 1920's, there were fears, as there have been before and since, that the United States was about to run out of oil. In 1922, the Secretary of State asked for volunteers among American companies to join European interests in an oil exploration venture in what had been the Ottoman Empire in the Middle East. Negotiations were begun with the Turkish Petroleum Company.

In 1925, TPC obtained a 75-year concession from the Government of Iraq. In 1927, oil was discovered at Kirkuk in what later proved to be one of the world's largest oil fields.

By 1928, an American concern, the Near East Development Corporation, was able to secure an interest in TPC, now renamed the Iraq Petroleum Company. Of the 14 American companies that had originally sought to participate in Iraq, all but two had either withdrawn or sold their interests. The two — Socony and Jersey Standard — are present owners of Near East Development. Through it, Socony Mobil now holds an 11⅞ percent interest in Iraq Petroleum Company, Limited and associated companies, with oil reserves in Iraq, Qatar, and Abu Dhabi.

Vacuum Oil Company (1911-1931)

Vacuum Oil Company, meantime, had been broken off by court order from the Standard Oil group in 1911, in the same manner as Socony.

During the years immediately following the break-up, Vacuum improved its already excellent skills in lubrication. Its market became the world.

A 1913 meeting in Hamburg, Germany, brought together the managing directors, chief engineers, and many marketers from all of the

Vacuum Oil Companies. Policies and specifications were developed and made uniform. For Vacuum people, the work of providing quality lubricants seemed much more like a profession than a business.

Just before World War I, the export business of Vacuum Oil Company required a refinery on the U. S. East Coast. A location near Paulsboro, New Jersey, seemed most suitable, and Vacuum purchased it in April, 1916. The Paulsboro refinery, which went on stream in 1917, was designed to manufacture lubricating oil. Gasoline and kerosine were considered strictly by-products.

Vacuum continued the emphasis on research that had characterized the company since the beginning. At the Paulsboro location, it built the most modern research laboratory possible. This was in addition to the quality-testing laboratories that were part of the refinery itself.

Some of the great advances in petroleum processing first saw commercial use at the Paulsboro plant. The first continuous two-stage fractionating unit was built in 1928. The first Duo-Sol unit for continuous treating of lubricating oil stock went into service in 1934. In 1936 (after the merger of Socony and Vacuum), Paulsboro put into operation the first commercial catalytic cracking unit, a breakthrough in refining technology.

Vacuum was one of the earliest companies to give salesmen salaries as well as commissions. Adopted in 1912, its plan called for a commission of one percent on low-grade oil, two percent on intermediate, and three percent on high grade, or Mobiloil. The company paid salesmen as soon as the order was shipped, while other companies did not pay until the

customer settled his bill. Vacuum led in helping salesmen buy cars to cover their territories, financing the purchase and then paying seven cents a mile—unique for the time.

The list of Vacuum's "Famous Firsts" grew rapidly:

1915. Ralph De Palma, winner of the Indianapolis "500," was the first of many at this famous race to use Mobil products. His average speed: 89.84 m.p.h.

1926. Admiral Byrd, first to reach the North Pole by air, used Mobiloil on this historic flight and many subsequent ones around the Arctic and Antarctic.

1927. Charles A. Lindbergh used Mobiloil as a lubricant in the "Spirit of St. Louis." During his first solo flight across the Atlantic, he flew 3,600 miles from New York to Paris, non-stop, and cabled back, "In my flight . . . my engine was lubricated with Gargoyle Mobiloil and I am happy to say that it gave me every satisfaction and my engine functioned perfectly."

1928. Amelia Earhart, the first woman to fly the Atlantic, used Mobiloil.

1928. Sir Hubert Wilkins, when he made the first Antarctic flight, named a newly discovered inlet "Mobiloil Bay" in tribute to the engine oil he used.

In 1911, when Vacuum became a separate company, motor oils for automobiles formed only a small part of the lubricating oil business. Vacuum considered its sales of industrial lubricants much more important. It sold motor oil to motorists only indirectly—generally through marketing companies.

As automobiles became more and more important, marketing patterns changed. The livery stable with a curbside gasoline pump evolved into the service station with its own driveway and one-stop service. Motorists wanted to buy their motor oil at the same time and place as their gasoline.

Marketing companies began to manufacture and market their own lubricants.

Vacuum's directors realized that, to maintain the company's position in the automotive lubricants line, they had to expand its gasoline distribution. Vacuum acquired full-line marketing facilities of its own, as well as additional refineries to boost the supply of products. During the years 1929 to 1931, Vacuum's acquisitions included a number of companies in the Middle West.

Lubrite Refining Company. On September 30, 1929, Vacuum acquired the Lubrite Refining Company, headquartered in St. Louis, Missouri. In its 11 years of existence, this company built a remarkably large business.

Lubrite erected its first refinery in 1919, a year after its founding, in an area south of East St. Louis, Illinois, once known as Kohokia. Deciding later to go into retail marketing, Lubrite advertised its products vigorously in various media, including newspapers and poster boards, and was the first oil company in St. Louis to advertise regularly in newspapers. The name "Lubrite" was quickly accepted as synonymous with quality and dependability.

Wadhams Oil Corporation. Just over a year later, on October 31, 1930, Vacuum acquired Wadhams, a Wisconsin company. Wadhams

Charles A. Lindbergh displaying Mobiloil used during his solo flight across the Atlantic.

started in 1879 when its founder, E. A. Wadhams, began a small grease-blending business in Milwaukee. His equipment was simple, even crude; in his early years, the venture was considered crazy by his friends and fellow-citizens. Wadhams tried to persuade manufacturers to use petroleum lubricants instead of the animal and vegetable oils then popular. By 1882, orders increased — largely because the brewing and tanning industries discovered the value of his petroleum products.

Wadhams headed the organization for nearly 40 years, and built the company's prestige until it became Wisconsin's leading petroleum organization. He remained active in the business until his death in 1917.

The Wadhams company is credited with the first service station in Wisconsin. The idea was that of Harger W. Dodge, who later became the company's president.

Dodge, studying the merchandising problems brought to the petroleum industry by the automobile, reasoned that the owner should be able to fuel his car direct from some storage facility without having the expense of building this storage for himself. It should, of course, be convenient for the owner and the automobile. Around 1917 or 1918, Dodge enlisted the help of a Milwaukee architect; together, they planned a "filling station."

The station they constructed was experimental. Since there was no precedent for this type of marketing outlet in the Wisconsin area, their idea seemed a tremendous gamble. They decided not to put up an expensive, permanent building, but to keep their station inexpensive, attractive – and movable. They reasoned it could be taken down, loaded on a truck, and moved if the first location proved unsatisfactory. The first site, however, was an immediate success.

The design, which roughly resembled a Japanese garden house, proved so attractive and distinctive that Wadhams followed the same lines later for some 100 stations in Milwaukee and other parts of Wisconsin.

Another "first" attributed to Wadhams is the concrete drain pit. By driving over one of the pits, the motorist could have his car's oil drained, the crankcase flushed, and a fresh supply of oil put in, all for the cost of the new oil. The labor was free. A drain pit was constructed in 1920 at the Wadhams Clinton Street Filling Station in Milwaukee.

In Wadhams' early days, its principal products were industrial lubricants and, later, motor oils manufactured at the Wadhams Refinery in East Chicago, Indiana. By 1929, the

firm was a leading marketer of gasoline, particularly Wadhams "370," a premium product.

The company acquired a leading competitor, the Bartles-Maguire Oil Company, and by the time Wadhams was acquired by Vacuum in 1930, it had refining and marketing properties in Iowa, Kansas, Minnesota, Michigan, Oklahoma, Wisconsin, and Indiana.

White Star Refining Company. White Star began when a man named Harry Boyd Earhart and one helper blended "cutting compound and factory lubricants" in a tiny Detroit warehouse in 1910. They did all their own work—blending, selling, delivering, and bookkeeping.

In two years, a line of industrial lubricants was added, along with a modest staff. Added impetus was given company sales in 1913 by a statement, authorized for use in advertising from the Ford Motor Company:

> "White Star Extra Quality Motor Oil is used by the Ford Motor Company in all its plants and branches throughout the United States and Canada."

In 1916, Earhart entered the growing gasoline business with four stations. The four stations grew to 1,500 outlets; the little warehouse grew to two refineries and a series of bulk plants; and the small local business grew into a distribution and marketing system covering Michigan, parts of Indiana, and Ohio, with some distribution in Canada.

Most cars of the day were not equipped with starters, and the cold Michigan weather added to the problem of starting cars in the winter. Available gasoline, usually made for use in milder climates, did little to help. White Star, therefore, developed a high-test gasoline to

meet the need. Called "Staroline Gasoline," it became Michigan's first premium gasoline. Staroline became popular, although it cost seven cents a gallon more than ordinary fuel.

White Star also pioneered in Michigan by introducing "free air" and by adopting a uniform color scheme for all its stations.

The company made a notable record during World War I, shipping large quantities of oil to military centers and industrial plants. Its refineries were at Wood River, Illinois, and Trenton, Michigan, with research laboratories located at Trenton. Among its facilities were unique marine terminals and storage plants on the Great Lakes. One storage tank at Muskegon, Michigan, covered a quarter of an acre and held 2,500,000 gallons of gasoline.

In 1923, White Star felt the time ripe for expansion beyond Detroit, and opened 23 marketing divisions in quick succession. Various oil companies made offers to buy White Star. "At last," in the words of a former employee, "came one which Mr. Earhart believed would assure the continuance of the quality and service ideas of this organization...."

That offer came from Vacuum Oil Company, which purchased White Star in 1930.

Vacuum Abroad (1911-1931). Vacuum Oil Company expanded not only with Lubrite, Wadhams, and White Star, but bought other smaller companies which had additional outlets and plants in New York, Pennsylvania, and Ohio. Vacuum also extended its operations in a number of other countries to include distribution of gasoline as well as lubricants.

The worldwide aspects of the company received new importance with the election of

Ernst Michaelsen to the board of directors in 1930. *The Vacuum Oil News* remarked that this was the first time a member of the "Vacuum Oil Family resident abroad" had received this honor.

Michaelsen, with a 35-year service record—most of it in Scandinavia—was at the time of his election the last survivor of the "Four Horsemen," who had been appointed years before by C. M. Everest to plant the Vacuum flag in Europe. Howard B. Case in the British Isles; E. O. Wader in Germany; L. C. Panizzardi in the Mediterranean countries; and Michaelsen in Scandinavia, pioneered the extensive operations of the Vacuum Oil Companies in Europe. Michaelsen added Russia to his field of operations and helped develop a business which prospered until it was confiscated following the 1917 Russian Revolution.

In addition to the companies formed before 1911 in Germany, Hungary, France, and Italy, Vacuum established subsidiaries in several European countries: Norway — 1918; Poland — 1919; Denmark, Estonia, Latvia, Lithuania, the Faroe Islands, Greenland, and Iceland (all through one company) — 1919; Czechoslovakia — 1920; Yugoslavia — 1920; Austria — 1921; Rumania — 1929; Holland — 1930; Belgium and Luxembourg — 1931.

In Portugal, and many other countries and territories, Vacuum products were marketed through local branches.

A Paris meeting of executives from various Vacuum companies and branches was held in 1930. C. E. Arnott, then president of Vacuum Oil Company, noted that Vacuum had become an important element in the world's kerosine and gasoline markets, with operations on three

continents. A traveler in the Africa of 1930 could find Vacuum products in Morocco, Mauretania, Senegal, the Ivory Coast, the Gold Coast (now Ghana), Nigeria, Cameroon, the Belgian Congo, and Angola, as well as in primitive villages in the continent's interior. Vacuum activity appeared also in the busy cities and prosperous agricultural regions of South Africa, in the mining areas to the north, and in Madagascar (now the Malagasy Republic). The company had markets in Ethiopia and the Sudan; and in Egypt, a distributing organization extended Vacuum gasoline and kerosine sales through many parts of what was then the "Near East."

The phrase "Know your Business," adopted at a conference at Hamburg in 1913, had rapidly evolved into a formal program to educate executives, salesmen, and engineers in the science of lubrication. The program spread rapidly to Vacuum installations in other cities and countries. The program was unique not only in the oil business, but in other industries. By the time of the Paris meeting, many oil companies were imitating it, as well as Vacuum's marketing and organization methods.

Since its beginning, Vacuum had constantly explored ways of improving its refining methods and lubricants. In 1930, as the company moved into the manufacture of gasoline, it took another important step.

Its directors decided to finance a long-term investigation into the possibility of using catalysts to transform low-value, high-boiling-point products into high-value, low-boiling-point gasoline. Their decision led to the development of Thermofor Catalytic Cracking (TCC), a new method of producing high-octane gasoline.

The Merger of Socony and Vacuum

By the late 1920's, Socony had extended its marketing activities across the U.S. and through the Far East, but it was looking for still more ways to get greater balance and efficiency.

Vacuum, with its lubricating predominance around the world, needed more of a tie with direct automotive marketing outlets than it could provide with its own capital.

The two companies' activities complemented each other. One company dealt mainly in lubricants; the other in energy sources. About two-thirds of Vacuum's lubricants were sold overseas, about four-fifths of Socony's business was in the United States.

It seemed a logical step for the two companies to merge.

Because of the terms of the 1911 Standard Oil Company dissolution decree, the two companies were required to secure approval of their prospective merger from a Federal court. The court made a thorough study of the operations of the two companies, and in 1931 concluded that the merger would strengthen the already competitive structure of the oil industry by enabling the merged enterprise to be, in the court's words, "an additional competitor in states and localities where neither company is now substantially established."

On July 30, 1931, the two companies formed the Socony-Vacuum Corporation, which later became Socony-Vacuum Oil Company, Inc.

Socony-Vacuum Oil Company, Inc.

The new Socony-Vacuum Oil Company, Inc., joined a small but growing group of "billion dollar companies." The new board was made

up of directors chosen in equal numbers from the two merging companies. Herbert Pratt, Socony's chairman, became chairman for the new concern, with Charles E. Arnott, Vacuum's president, as Socony-Vacuum's first president.

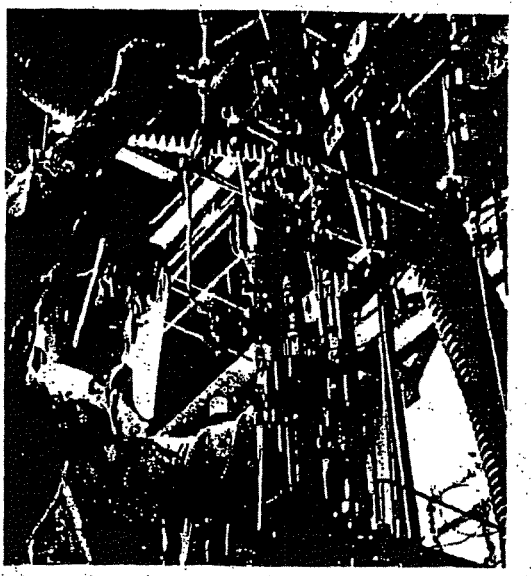
In its early years, the new company found itself with a network of marketing outlets in the Far East, but it owned no crude supplies nearer to that area than California.

Standard Oil Company (New Jersey), also on its own and also an integrated company, had, over the years since the dissolution, developed crude production and refining facilities in Sumatra, but had no marketing facilities in that part of the world. Each company faced intense competition from other integrated companies that operated in both the Far East and Australia.

To meet this competition, the Far East facilities and operations of Socony-Vacuum and Standard of Jersey were merged in 1933 to form Standard-Vacuum Oil Company, with each parent company holding a 50-percent interest.

Stanvac (as Standard-Vacuum was called) soon functioned as an integrated oil company in countries from the east coast of Africa all the way to New Zealand. With broad authority to run its own business, it did just about everything that needed doing in the oil industry — and did it in a huge area extending two-fifths of the way around the world. Its operating area encompassed more than 50 countries and territories containing over 900 million people.

While Stanvac was growing, Socony-Vacuum also was expanding rapidly. By World War II, the new Socony-Vacuum Oil Company, Inc. was competing for business in 43 states in the



Laboratory technician at Mobil Chemical research laboratory in Edison Township, N. J., testing new processes used in making basic petroleum chemicals.

United States, and had become one of the great international, integrated oil companies, with far-flung interests in producing, refining, transportation, and marketing.

World War II. Socony-Vacuum's operations were drastically affected by World War II. Among the worst losses were those of the company's marine personnel and equipment.

Before the United States entered the war, the company's British fleet lost 11 ships and 172 men to the enemy's mines, bombs, shells, and torpedoes.

Socony-Vacuum's *SS Emidio* became the first U. S. tanker definitely known to be lost through enemy action in World War II. It was

shelled, torpedoed, and sunk by a Japanese submarine off the California coast.

Germany's unrestricted submarine campaign against coastwise U. S. shipping began on January 14, 1942. The second ship sunk that night was the company's British-flag tanker *Coimbra* off Long Island, only 10 hours out of New York. During the entire World War II period, from 1939 through 1945, 437 men were lost and 32 ships were sunk in enemy attacks. Another 19 ships were damaged.

World War II wreaked tremendous damage throughout Socony-Vacuum's overseas operations, scattering the organization and damaging its refinery capacity.

Gravenchon Refinery, built in 1933 on the north bank of the River Seine midway between LeHavre and Rouen, France, worked at full capacity in the spring of 1940 to supply fuel for Allied planes, tanks, and ships. France, determined that Hitler would never fight with French oil, laid intricate prevention plans.

Early in June of 1940, the Nazis swept into Normandy and the Gravenchon Refinery staff received a message from the French High Command: *"Gravenchon! Burn all your reserves!"*

In the next two hours, members of the refinery staff carried out their assignment. Families were sent to the opposite bank of the Seine. Then 40 men returned to the refinery to set its stores of fuel afire. The fire blazed for a week.

The invading Germans tried vainly to put the refinery back into operation, but frustrating things happened. Records were lost, fires started frequently, vital machinery was mysteriously missing. Finally, in May, 1943, they gave up, dismantled various units of the plant, and shipped parts to Germany and its satellites.

Early in 1946, Gravenchon Refinery went back on stream. By mid-July, 1948, the refinery had a daily throughput four times higher than it had before the German breakthrough.

The Naples Refinery story was similar. Built in 1935 by an Italian affiliate, the refinery went on stream in the summer of 1937. During World War II, air bombardments destroyed it completely. Not until November of 1946 was the refinery rebuilt and on stream.

During the war, the company undertook an exploration and producing project in eastern Venezuela. It succeeded, and Venezuela became one of the company's important crude-oil-producing areas.

In eastern Colombia, the Barco concession, owned jointly by Socony-Vacuum and the Texas Company through the Colombian Petroleum Company (Colpet), became another source of crude for the company's markets.

Socony Mobil Oil of Canada, Ltd. Socony-Vacuum drilled a wildcat on Prince Edward Island in eastern Canada in 1943. Twenty-five months of Herculean effort resulted in nothing but a dry hole. In western Canada, meantime, the Socony-Vacuum Exploration Company, formed in 1944, sent its men by plane, helicopter, canoe, horseback, truck, jeep, and on foot gathering information to map rock structures that might contain oil.

Seven long years and millions of dollars after the Prince Edward Island attempt, Socony-Vacuum made its first Canadian discovery in what later became the Duhamel Field. Other discoveries followed, including Pembina Field —as of 1963 the largest ever found in Canada, in both area and production.

The Canadian affiliate, now called Socony Mobil Oil of Canada, Ltd., has production fa-

cilities in Saskatchewan, Alberta, and British Columbia. It holds exploration permits in Alberta, British Columbia, Saskatchewan, the Yukon, the Northwest Territories, and the Sable Island region off Canada's east coast.

Expansion in the Middle East. At the end of World War II, Socony-Vacuum sought to regain its position overseas by proceeding with an aggressive refinery construction program and by expanding its crude supplies from the Middle East.

World interest in the Middle East had increased during the war years. Socony-Vacuum's interest, through its predecessor, Standard of New York, dated back to marketing ventures in "the Levant" during the late 19th century. At that time, the company supplied American-made oil products throughout the area. It sold kerosine for lamps to light the black goatskin tents of sheiks who did not dream that under the sands of their deserts lay the world's greatest reservoirs of oil.

Important discoveries were made in Iran (just before World War I), in Iraq (during the 20's), and in Kuwait and Saudi Arabia (before and after World War II). The Middle East became Europe's prime source of oil following World War II.

For Socony-Vacuum, a chance at Middle East oil lay in Saudi Arabia, where the Arabian American Oil Company (Aramco) held the right to search and drill for oil over an area of more than 400,000 square miles. Aramco, at that time owned by Texaco and the Standard Oil Company of California, needed additional capital to expand its facilities. Socony-Vacuum and Standard Oil Company (New Jersey) put up the money in exchange for part ownership of Aramco and of Trans-Arabian Pipeline Company (Tapline). Socony-Vacuum's interest—10 percent—was acquired December 6, 1948. Socony-Vacuum also made long-term purchase contracts with the Anglo-Iranian Oil Company, now called the British Petroleum Company, for crude from Iran and Kuwait.

Crisis in the Middle East came in 1951, with the Iranian Government's nationalization of the oil industry in that country. As a result, producing and refining operations were shut down, and there was a temporary shortage in Free World markets.

To deal effectively with this shortage, and to assure the continuation of adequate supplies of oil to friendly nations, Socony-Vacuum and other American oil companies operating abroad cooperated in supplying needed oil from other sources. Their coordinated action was taken at the request of the United States Government under an agreement approved by the Department of Justice.

The Iranian oil problem was not resolved successfully until 1954, when a long-term agreement was reached between the Government of Iran and a consortium of eight oil companies (later broadened to 16), including Socony-Vacuum. The consortium established two operating companies in Iran. Socony-Vacuum's interest was seven percent.

The Iran crisis was scarcely resolved when another arose in the Middle East. Late in 1956, the Suez Canal, through which most Middle East oil moves, was closed, and the Iraq Petroleum Company pipelines to the Eastern Mediterannean were put out of commission. The resulting tie-up affected many commodities, but

made its greatest impact on oil, choking off two-thirds of Europe's oil supplies.

The company, before the crisis, transported more than half of the oil it drew from the Middle East through Suez and the I. P. C. pipelines. The remainder, not affected by the shutdowns, moved through Tapline (which remained in operation) or was shipped from the Persian Gulf to the Far East.

The day the Suez Canal was closed, Socony-Vacuum and its affiliates began rerouting tankers, swapping petroleum, and shifting refinery patterns all over the Free World. Other oil companies took similar action.

By 1957, the petroleum pendulum had swung from threatened scarcity in Europe to worldwide plenty. When the Suez crisis ended, the industry had gained too much momentum to revert immediately to pre-Suez patterns of supply and demand. Demand for oil did not reach forecast levels. Inventories mounted and product prices weakened. Earnings of most international companies were adversely affected.

Trademark Change. In 1955, the name of the company was changed to Socony Mobil Oil Company, Inc. At the same time, Mobil initiated a new campaign to make it easier for the public to recognize its service stations and products. The first step was to develop a new company emblem.

A bold, attractive trademark was designed and put into use on company bulk plants, refineries, trucks, and other properties. With an estimated seven times greater visibility than the predecessor Mobilgas shield, the new sign gave the company easier, stronger identification and helped attract motorists and other

customers to Mobil service stations, Mobil marinas, and other marketing points.

The next year brought another important change in the company. In late summer of 1956, after 71 years at the famous New York address, 26 Broadway, Socony Mobil moved its headquarters to a new 42-story skyscraper in midtown Manhattan, at 150 East 42nd Street. The move emphasized the company's identity and its independence of the old Standard ties.

Company-wide Reorganization. Further major developments for Socony Mobil took place in 1959, when a company-wide reorganization was undertaken. Magnolia Petroleum Company and General Petroleum Corporation, along with Mobil Producing Company, which had been responsible for producing activities in the Rocky Mountain States, were merged into the parent company. Two major operating divisions were created: Mobil Oil Company, for the U. S. and Canada; and Mobil International Oil Company, for the rest of the Free World outside the Standard-Vacuum area.

Mobil Chemical Company. In June, 1960, a third operating division was created—Mobil Chemical Company.

This division has embarked on a long-range program of expanding its chemical manufacturing facilities and marketing operations in the United States, Europe, and the Far East. It is also expanding the activities of Socony Paint Products Company, which has manufactured industrial maintenance and marine paints since 1872.

At Beaumont, Texas, a major chemical complex is taking shape around Mobil Chemical's new high-purity ethylene plant, which went on

stream in 1961. A high-purity benzene facility began operation in August, 1962.

Mobil Chemical entered the domestic plastics business in 1962, through the purchase of the Kordite Corporation. With a plant and research center at Macedon, N. Y., and other plants at Jacksonville, Ill., and Woodland, Calif., Kordite manufacturers and markets plastic products, including polyethylene and polypropylene film and packaging materials for many consumer and industrial products.

Its merger with Virginia-Carolina Chemical Corporation in 1963 made Mobil a producer of fertilizers and other phosphorus-based chemical products. V-C's operations span 31 states.

Also in 1963, Mobil acquired the worldwide paint and chemical coatings interests of the Martin Marietta Corporation.

Mobil Chemical's overseas operations extend to Italy, the United Kingdom, Taiwan, Australia, and Japan.

Mobil Petroleum Company Inc. In November, 1960, a fourth operating division, Mobil Petroleum Company, was added. This division, which later became Mobil Petroleum Company Inc., had the responsibility for overseeing Socony Mobil's 50-percent investment in the assets of Standard-Vacuum. These assets were split between the owning companies on March 30, 1962, two years after Jersey Standard had agreed to terminate its joint ownership under the terms of a consent decree in a civil antitrust case. Socony Mobil was not a party to the consent decree.

The new Mobil Petroleum Company Inc. currently operates in thousands of localities in more than 50 countries and territories.

Socony Mobil's long history as an international oil company has been characterized by responsible approach to business and its ethical standards. The company has contributed to the sound commercial development of each country where it is active, and to raising the standard of living throughout the free world.

Mobil men and women, appreciative of their heritage of quality and competence from predecessor companies and people, are today's industry pioneers—willing to try new ideas, new methods and new enterprises.

Socony Mobil still subscribes to the view expressed by Vacuum in 1886 in a letter to its customers:

"We want your patronage and your good will. We claim your consideration on the ground that, in consequence of our large facilities and peculiar advantages, we can save you money by giving you better goods at less cost, quality considered, than other makers."

Additional copies
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Appendix J

Rochester and the Automobile Industry by J.W. Barnes dated April and July, 1981 from Rochester History

ROCHESTER HISTORY

Edited by Joseph W. Barnes, *City Historian*

Vol. XLIII April and July, 1981 Nos. 2 and 3

Rochester and the Automobile Industry

By Joseph W. Barnes

Although few are aware of it, Rochester's relationship with the automobile has been a special one. In the first place, owing to the controversial Selden patent, Rochester has a claim to being the birthplace of the automobile. Secondly, Rochester once contained several automobile manufacturers, one in particular that tended to specialize in costly vehicles for the elite market. Thirdly, Rochester is today a major center for the manufacture of parts, materials, and machinery used in the industry. The two divisions of General Motors here constitute the city's third largest industrial employer, while a number of Rochester's specialized manufacturers (notably Gleason Works, Voplex, and several tool and die concerns) are also important automotive support industries.

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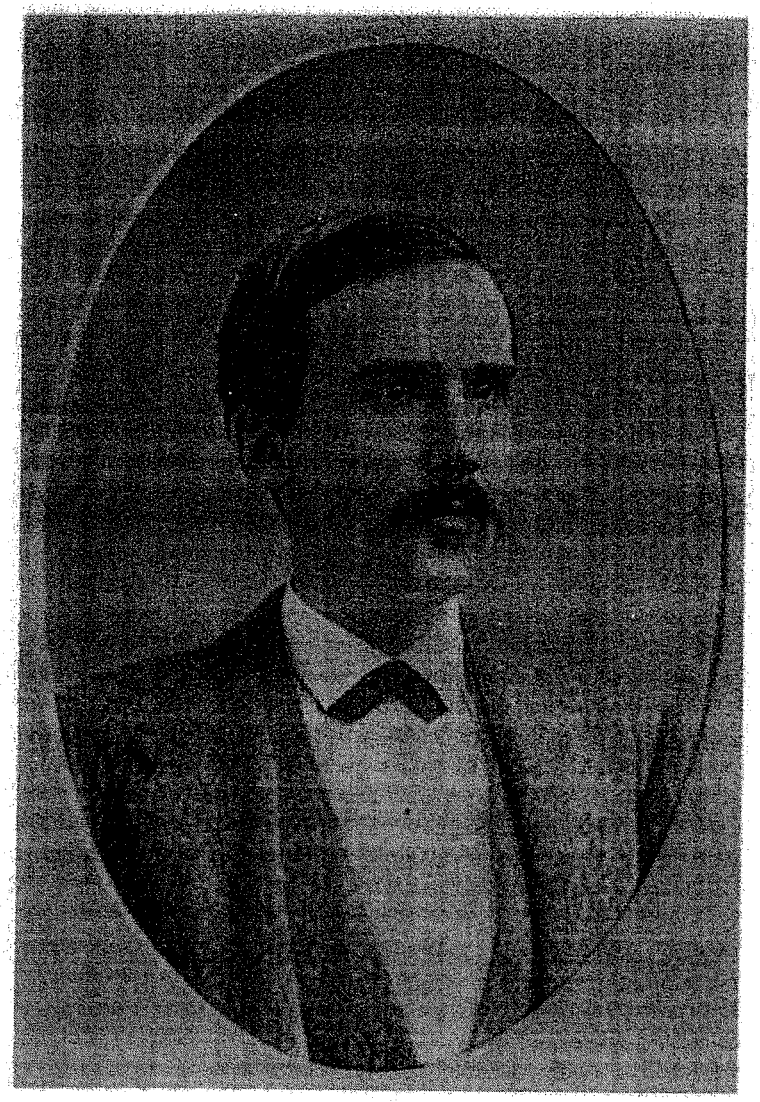
The Selden Patent

The names most often associated with the invention of the automobile are the Germans Daimler and Benz (1880s) and the American Duryea brothers (1893). But many Rochesterians early in this century agreed that priority ought to belong to local attorney George B. Selden, who patented the automobile in 1895. His claim to the exclusive right to the invention was being argued in federal court. The Association of Licensed Automobile Manufacturers (ALAM), powerful upholders of the Selden patent, began lawsuits against the Ford Motor Company and other infringers in 1903. There ensued one the longest, most costly, and bizarre civil suits in American legal history.

To categorize Selden as a patent attorney prejudices the account, although that was his vocation. In fact as a young man he was also an active inventor. George Baldwin Selden was born in nearby Clarkson in 1846. He was the son of the distinguished Judge Henry R. Selden, later a Lieutenant-Governor of New York. The elder Selden was also once spoken of as possible candidate for Vice-President of the United States in place of Hannibal Hamlin. He may be best remembered locally as defender of Susan B. Anthony at her trial in Canandaigua in 1872. Judge Selden disapproved of George's technical inclinations.

In 1859 the Selden family moved to Rochester, and two years later George enrolled in the University of Rochester. He never completed this (or any subsequent) college course, but left to fight in the Civil War, to his father's distress. According to family tradition, two incidents at this stage of his life left George a marked aversion to horse transportation. While once fording the Genesee River at the future site of the River Campus his mount rolled over on him, ruining his best suit of clothes. And during his brief service with the Sixth United States Cavalry Selden drew a horse which missed no opportunity to injure its rider. This steed ended its own career by running into a tree. Selden suffered a narrow escape.

As he would later recall, Selden's interest in replacing the horse for the purpose of motive power had been piqued even earlier when, as a boy, he overheard a conversation between his father and a law client. Discussing the practicability of mechanically propelled vehicles, both men convinced themselves that such a notion was chimerical. They consigned the idea to the rusty dustbin occupied by the steam omnibus, a machine once widely operated in England but legislated out of existence.



George B. Selden in 1871

Such negativity only whetted young Selden's interest. At the war's close, he enrolled briefly in Yale College, but quickly transferred to the Sheffield Scientific School. Here Selden was no doubt happy, but at the end of the decade Judge Selden called him home to read law--that is, to behave responsibly. George dutifully accepted his father's guidance and in 1871 was admitted to the bar.

George's technical bent was to some degree satisfied in the pursuit of his chosen specialty, patent law, and he also dabbled in invention. He patented a barrel-hoop machine of his own devising. He also designed a typewritter, and realized a small income from both inventions.

His preoccupation was of course the automobile, or "road engine" to use his phase, and during the 1870s Selden made gradual progress. Visiting the Philadelphia Centennial Exposition in 1876 to demonstrate the barrel-hoop machine, Selden saw an internal combustion engine invented by George Brayton, an Englishman living in Boston. Despite the Brayton engine's limitation--it was low in power and weighed over half a ton--Selden believed that a modification of this two-cycle behemoth could be used as the power plant for a road engine.

Tinkering late at night in the basement workshop of his father's house on Gibbs Street, Selden planned a number of improvements to the Brayton engine. By enclosing its crankshaft he was able to eliminate the stationary engine's heavy bedplate. He also discarded a number of steam-engine-like parts and reduced the weight of his final design to about 370 pounds. Described by one engineer nearly thirty years later as a "fearful" affair, the Selden engine compressed a gas-air mixture in auxiliary cylinders and introduced it in the working cylinders with open flame ignition.

Selden hired Frank H. Clement to manufacture the protype engine in his machine shop on Mill Street. The Selden engine contained three-cylinders cast *en bloc*. In 1878 the two men bored out only one cylinder. Selden felt that a trial with one piston, if the engine could be made to run, would demonstrate the practicality of his design. The engine did run, but not without considerable difficulty and a great deal of cranking on the part of Selden's machinist assistant, William Gomm. At best the engine operated three to five minutes at a time. Having discarded benzine, kerosene, and exotic mixtures, Selden settled on gasoline for fuel. Despite the one-cylindered engine's feeble performance, Selden was elated at his success.

A year later Selden filed his famous patent application, dated May 8, 1879. One witness to the document was the assistant bookkeeper at Rochester Savings Bank, George Eastman, whose own inventions would soon bear fruit. Selden's patent application described not only the engine, but also a complete automobile incorporating such features as a clutch, compressed air self-starter, and steering system. Selden maintained that the *combination* of such elements, along with his engine, made the road engine patentable.

Selden was not in a hurry to receive his patent, which, once issued by the United States Patent Office, would remain in force for the fixed term of seventeen years. Employing his professional knowledge of the rules and regulations of the Patent Office, Selden was able to delay the issuing of his patent for sixteen and one-half years. During that time he sent repeated amendments of his application to Washington. Existing regulations permitted applicants a two-year period to respond to communications of any kind from the Patent Office. Selden was able to extend his pendency by sending amending material or other communications every two years. A routine matter such as supplying a new oath took Selden 726 days.

That Selden deliberately procrastinated is hardly a matter of question. His motivations are debatable. According to Selden's critics, during and after the great trial, his reason for delay was to allow industry and automotive technology to catch up with his invention. By letting others take on the formidable task of further automotive development, Selden could reap the rewards of his patent without incurring further expense. Selden maintained that during the years his patent was pending he made sincere efforts to enlist manufacturing capital. Be that as it may, during the long pendency from 1879 until 1895, Selden never bothered to produce a prototype or even to finish his three-cylinder engine.

In the late '90s, when automobiles powered by internal combustion has been demonstrated in Europe and in American workshops like that of Henry Ford, the future of the device was still uncertain. Many knowledgeable observers, alarmed at the noise, smell, and danger of gasoline engines, were convinced that automobiles must be powered electrically. One such observer, the millionaire William C. Whitney, organized the Electric Vehicle Company in 1899. The Electric Vehicle Company was an ambitious enterprise devoted to securing a "trust" in the operation of battery powered taxicabs. Facilities for the manufacture of the cabs were secured through a merger with the Pope Manufacturing Company, producers of the Columbia Bicycle. The resulting Columbia

Automobile Company became the Electric Vehicle Company's manufacturing arm. The company was headquartered in Hartford, Connecticut.

How does a company devoted to electric vehicles enter the story of the Selden patent, which described an internal combustion engine? The cautious Whitney and his advisers took pains to search for any patent they thought might be infringed in manufacturing automobiles. The 1895 Selden patent, obscure as it then was, threatened because of its extreme sweeping claim to inventive rights to the automobile. In 1899 the Electric Vehicle Company, also known as the Pope-Whitney combine, entered an agreement with George B. Selden. In exchange for exclusive license, the company agreed to pay Selden $15 per vehicle manufactured or a minimum of $5,000 a year.

It is one of the ironies of automotive history that no sooner had the Whitney group secured control of the Selden patent, that their own future as manufacturers of electric cars fell under a pall. In late 1899 the Electric Vehicle Company suspended dividends on its stock. Limitations in the technology of electric power doomed the company's hopeful projections. Its taxicabs carried a lead-acid battery weighing 1,200 pounds, nearly half the vehicle's entire weight, and cruising range was no more than forty miles. The company's plan was to locate numerous recharging stations in the large cities the cabs were intended to serve. Ingenious techniques reduced the time to change a battery, which required eight hours to recharge, to only thirty seconds. But the accompanying labor costs proved prohibitively high. Electric Vehicle Company stock fell; one by one its subsidiary companies were liquidated. As so often is the case in such circumstances, an odor of financial scandal hung over the company's affairs. The electric vehicle plans of the Electric Vehicle Company came to naught.

The new trade journal of the gasoline car manufacturers derisively called Whitney and his associates "the Lead Cab Trust." But if the Electric Vehicle Company did not enjoy the last laugh over the *Horseless Age* and the gasoline car interests, it would certainly enjoy a great many intermediate ones.

In the midst of its distress, the Electric Vehicle Company turned to what was apparently its sole remaining valuable asset, Selden's "paper" patent. In June 1900 it sent infringement notices to the Winton Motor Carriage Company of Cleveland, the most popular automobile manufacturer of the day, and to the Buffalo Gasolene Motor Company, an engine maker. The action against the latter

served notice against parts and components manufacturers. Infringement notices and subsequent lawsuits were the only means by which the Electric Vehicle Company could enforce its legal monopoly. The notices read in part, "...you are manufacturing and advertising for sale vehicles which embody the invention of the Selden patent.... We notify you of this infringement, and request that you desist from the same and make suitable compensation to the owner of the patent therefor."

Three other businesses were singled out for chastisement before the initial suit was over. These were a New York City importer of European cars; the Ranlet Company of St. Johnsbury, Vermont which consisted of two young men building a single automobile; and the obscure Automobile Forecarriage Company. As expected the weaker adversaries quickly threw in the towel. The Electric Vehicle Company publicized its victory, demoralizing the Winton Company and other automobile manufacturers which had pledged to aid Winton in its defense. Seven independent manufacturers in fact applied for licenses under the Selden patent when the Winton Company, in turn, began secret negotiations with the Electric Motor Vehicle Company to settle out of court. George H. Day, president of Electric Vehicle, demanded a five percent royalty of Winton, a figure held far too steep by the latter.

While negotiations dragged on in late 1902 there was a dramatic new development. Leaders of two Detroit firms, Packard Motor Car Company and Olds Motor Works, organized an association of ten major manufacturers. They told Day that they were willing to pay royalties on the Selden patent of one-half of one per cent, and threatened that if this offer were not accepted, to divert the money to Winton, in a renewed legal contest.

At this point Winton had already been soundly beaten in a preliminary court skirmish. Federal Judge Arthur C. Coxe presided over the infringement case against Winton. In overruling a motion for dismissal he upheld the validity of Selden's patent: "Upon the present record he must be regarded as the first to construct a road-locomotive provided with a liquid hydrocarbon gas-engine of the compression type so arranged as to leave the platform of the carriage unobstructed."

Despite this unfavorable circumstance, the newly associated manufacturers were tough negotiators. At last they persuaded Whitney and Day to accept royalty payments on the Selden patent of one and one-quarter per cent, with important provisos. The Winton suit was to be settled out of court, and Winton was to be granted a

Selden license. The new Association of Licensed Automobile Manufacturers--the group consisting of the original licensees--would henceforth determine admittance to the club. The Electric Vehicle Company, then, would be reduced to the role of receiver of funds. Two-fifths of the royalty receipts were to be returned to the ALAM for organizational purposes. The remaining three-fifths were further divided between the owners of Electric Vehicle and George B. Selden. The Company retained two, and was to give Selden the last fifth. Selden would thus enjoy one-fourth of one per cent of the value of all new licensed car sales.

From the beginning the ALAM committed itself to the promotion of quality standards in automobile manufacture. For its own purposes that meant the encouragement of heavy touring cars costing several thousand dollars--machines of the sort that most of the original ALAM members made.

Nearly simultaneous with the formation of the ALAM in early 1903 was the appearance in Detroit of a new enterprise known as the Ford Motor Company. Like dozens of small automobile manufacturers that sprang up overnight in the early days of the industry only to disappear just as suddenly, Henry Ford's new company possessed a few design innovations, the optimism and energy of its founder, and scant capital. Incapable of much true manufacturing, the Ford factory began as an assembly plant with parts supplied on credit by older manufacturers. Even whole chassis assemblies were taken from the established plant of the Dodge brothers (who for many years wisely specialized in the supply of parts to others). The Ford Motor Company's initial product was the primitive Model A (not to be confused with the "A" of the 1920's), a light two-cylinder gas buggy weighing just over one-half ton and rated at eight horsepower. The little cars were full of flaws but nevertheless were sold as rapidly as Ford's assembly crews could make them. At least one analyst has said that the demand for automobiles in 1903 was so great that practically anything with wheels, that moved, could be sold. But Ford had deliberately aimed his sights at the "low-end" of the market, where pent-up demand was the greatest. The Model A was priced at $850; an improved successor introduced a few years later, the Model N, was only $600. When the famous four-cyclinder Model T was first introduced in 1908, Ford priced its cheapest version at $825, a figure he steadily reduced in succeeding years as the car was steadily improved.

In 1903 the vast success of the Model T and the Ford Motor Company lay some years in the future. The recent settlement of the

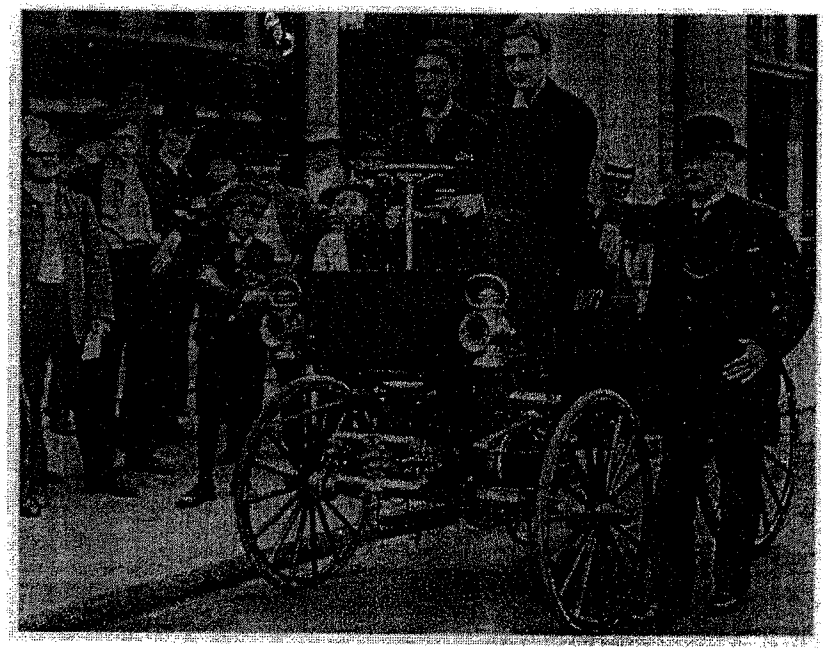
Winton suit and formation of the ALAM gave Ford pause. Fearing the consequences of a patent infringement suit, Ford and his associates held several discussions with leaders of the ALAM. Later reports of these private conversations seem to conflict in detail, but the certain result of them was that the Ford Motor Company was denied membership in the ALAM. The ALAM, its leaders said, was formed in part to discourage "fly-by-night" automobile makers, among them "mere assemblers." An insulted Henry Ford later maintained that the ALAM was prepared to admit him to the club if he sold his cars for no less than $1,000 and moreover limited annual production.

During its eight-year existence the ALAM was a high-priced preserve. With a few exceptions, its members marketed automobiles chiefly in the $3,000 to 6,000 range. The exceptions included the Olds Motor Works, the Buick Motor Company, and Hudson Motor Car Company, who offered automobiles at around $1,000 or less. More typical ALAM members (listed in the official 1910 *Hand Book*) were Pierce-Arrow with its $7,200 touring car or Studebaker and American Locomotive with limousines costing $5,000 and $6,750 respectively. (By contrast, in 1909 American independent makers like Ford offered 26 models at less then $1,000.)

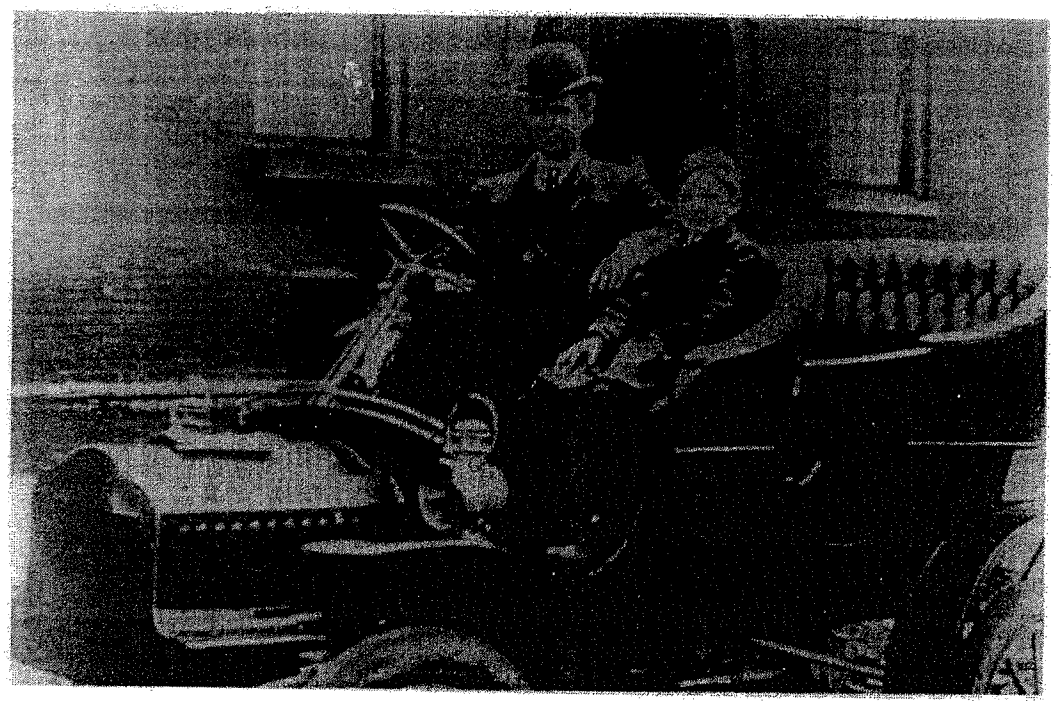
The battle line between the ALAM and Ford and the other independents was well drawn. At its center was the Selden patent, and its visible symbol a small brass plate affixed to the products of the licensed automobile manufacturers. The plate "protected" licensed automobile dealers and owners. Prospective buyers of non-licensed cars received a stern warning in ALAM advertising: "Don't buy a lawsuit with your car." Independents and especially Ford denounced the ALAM as a trust, and the Selden patent as no good. The Ford Motor Company promised to indemnify purchasers and welcomed prosecution.

Ford has not long to wait. At the end of 1903 the Electric Vehicle Company and George B. Selden lodged suit against a list of defendants. These included the Ford Company; its New York City agents Duerr and John Wanamaker; the Gude Company, a hapless Ford purchaser; Panhard et Levassor, a French exporter; and Henry and A.C. Neubauer, foreign car importers. The five suits were eventually consolidated into two, to become known as the "Ford and Panhard" suits. The Ford Company shouldered the bulk of the legal defense costs.

The trial and its appeal dragged on for the next eight years, one of the longest patent litigations in United States history and one which



The Seldens pose with the road engine in 1905. George, Sr., leans on the machine while his sons sit at the wheel.



Henry Ford and his son, Edsel, seated in a Model "F" in 1905

produced one of the greatest quantities of written evidence ever submitted in a case at equity. The Selden case, like other patent suits, was a civil trial; under the law a patent confers nothing more than a "license to sue." Rules and regulations of the day demanded evidence gathering for years by opposing attorneys, not in court but under supervision of referees with limited powers. Testimony by participants in the case and expert witnesses was taken in Rochester, New York, Detroit, and several other cities. The completed court record finally exceeded 14,000 pages and 5,000,000 words.

Bulkier even than the written testimony in the case were the working models of vehicles assembled by the two sides. Records of their performance were submitted in evidence. Of greatest interest was the Selden auto fashioned in Rochester in 1905 under the supervision of the inventor's two sons. It incorporated the actual experimental engine Selden had made almost thirty years earlier; all three cylinders were now placed in working order. Emblazoned on the side of the carriage was the year "1877." That was two years earlier than Selden filed for his patent and eighteen years earlier than its issuance but was meant to correspond with the inventor's first conception. A second Selden auto, which came to be known as the "Hartford Selden" to differentiate it from the "Rochester Selden" was built in secret by the Electric Vehicle Company.

The performance of the Rochester Selden, also known as Exhibit 89, proved extremely disappointing. During trial runs at a test track near Guttenberg, New Jersey, the car was devilishly hard to start and keep running, and it quickly overheated. Its engine developed only two horsepower. (Exhibit 89 is now somewhat ironically housed at the Henry Ford Museum in Dearborn).

The Hartford Selden, developing fifteen horsepower with the aid of a host of technical improvements found nowhere in Selden's patent, was a better performer. It proved unable to start without the aid of a horse-drawn air compressor, however.

A third vehicle, built in the Ford Motor Company factory, was meant to demonstrate "prior state of the art." If Selden's patent contributed nothing new to automobile technology as it was known (or unknown) in 1879, the patent might be declared invalid. Ford's technicians fashioned a vehicle based on an engine described by a Belgian, Jean Joseph Etianne Lenoir, in 1860. The Ford-Lenoir vehicle ran smoothly. But it was of course no more a true antique than was Exhibit 89.

Much of the testimony given in the trial centered on whether Selden's "improved liquid hydrocarbon engine" represented real

different from the device Selden sketched in 1879, and they infringed the patent.

The ALAM forces were elated. Independents were forced to make peace with the association. William C. Durant, founder of General Motors, reportedly paid a million dollars in back royalties. But Ford posted a $350,000 bond and took the case to the United States Circuit Court of Appeals.

Walter C. Noyes, rendering a new decision for the three-judge panel in early 1911, was said to be "a patent judge." He was far more impressed with the technical differences among gasoline engines than Judge Hough had been. Noyes again upheld the validity of the Selden patent--but with the fatal qualification that it covered only the type of engine described by Selden in 1879. Noyes felt that modern automobiles with their four-cycle compression Otto engines were exempt from the protection it afforded.

Although the Selden patent had not been nullified, the effect of the decision was a complete victory for Ford and the other independents. There was some talk by Selden of appealing to the Supreme Court, but, as he realized, the patent had less than two years to run and the expense could not be justified. According to Selden, he had gone "into this enterprise hoping to make a little money" and had succeeded much better than anticipated. A generally accepted estimate of Selden's personal profit from the patent is something less than $200,000.

Ford and Selden were not embittered. While testifying at the trial in New York in 1909 Selden wore a jeweled stickpin with the figure of his "1877" gas buggy emblazoned on it. He sent Ford a duplicate. Ford remarked that Selden "was a decent old fellow." Selden said that "I am on good terms with Mr. Ford, and I rather admire the business skill with which he has managed his enterprise."

Even from the distance of seventy years it is impossible to say which side was "right" in the Selden patent affair. Although in the end his patent had been rendered ineffective on what seemed a technicality, George B. Selden could cling to some satisfaction. He had, after all, been acknowledged as the pioneer inventor of the gasoline automobile by decisions of the Patent Office and by two separate judges who did not invalidate his claim. Henry Ford and others who had ceaselessly denounced the ALAM combination as a trust had legitimate grounds for complaint. But if the Selden patent had been used as an instrument to exclude competition, it seems to have been conspicuously ineffective. During the period of the ALAM's operation Henry Ford himself had managed to lay the

groundwork for an automotive empire, even benefiting from the publicity generated by the legal contest. And hundreds of other independents, inattentive to the Selden patent, had begun operations during the period of the suit. A few were successful, but most, as the ALAM feared, were mayflies.

The ALAM itself as it had evolved in the few year after the Winton settlement, came to resemble not so much a monstrous oligopoly as a democratic trade association--whose dues, to be sure, were collected in the form of royalties. This fact is illustrated by an episode which occured in the midst of the Selden lawsuit. The Electric Vehicle Company, despite its steady income from the Selden patent, had always been heavily mortgaged and in 1907 it passed into receivership. Almost simultaneously George H. Day, the guiding spirit of the ALAM, died. These developments were disheartening enough to the ALAM leadership then waging the legal battle against Ford, but they were soon faced with a revolt from within. Member firms demanded, and received, a reduction in the royalty rate from one and one-quarter percent to four-fifths of one percent. And William C. Durant, the owner of the licensed Buick company, declared his intention to withhold even the reduced royalty. Both he and the recalcitrant owners of Olds Motor Works had to be pressured into line.

The ALAM dissolved soon after the 1911 decision, but not without leaving valuable marks on the American automobile industry. During its lifetime the organization sponsored a Mechanical Branch that promoted standardization of parts and dimensions among manufacturers. This useful work was subsequently carried on by the Society of Automotive Engineers which absorbed the Mechanical Branch.

At least part of the revenue George B. Selden garnered from his patent he invested in a Rochester automobile manufacturing enterprise which bore his name.

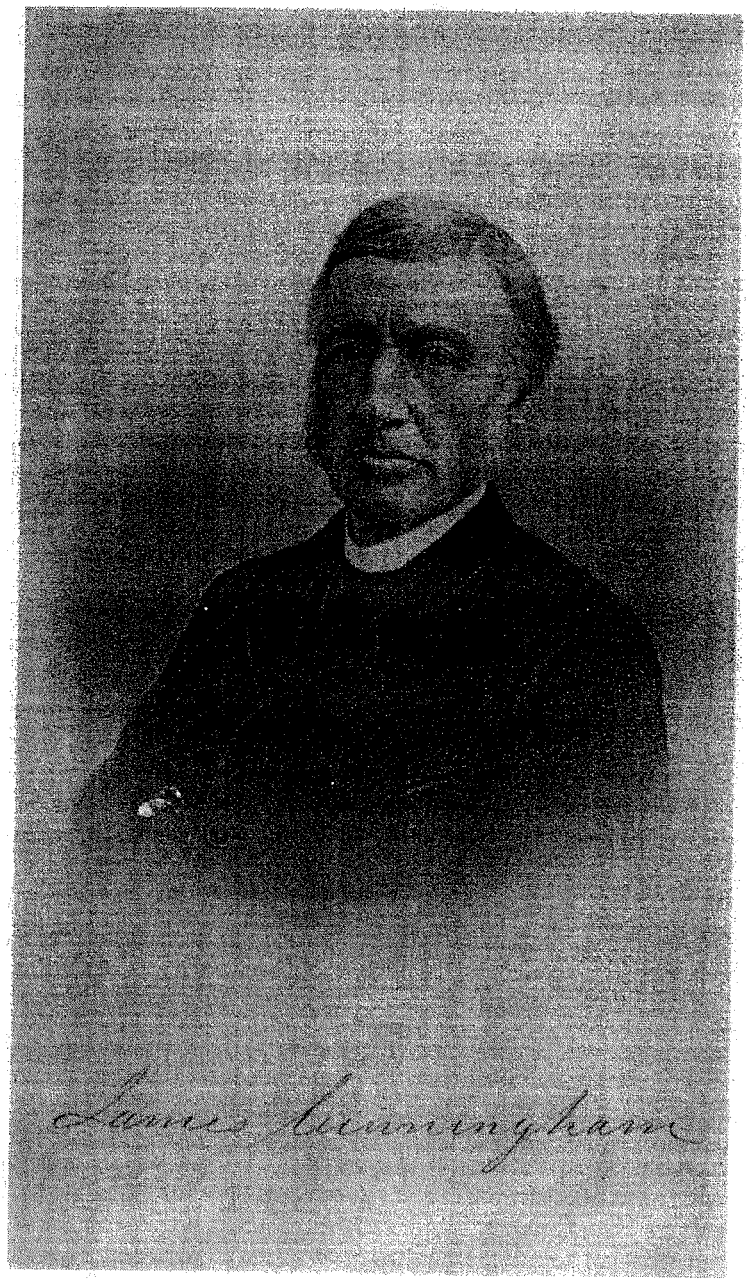
Made in Rochester

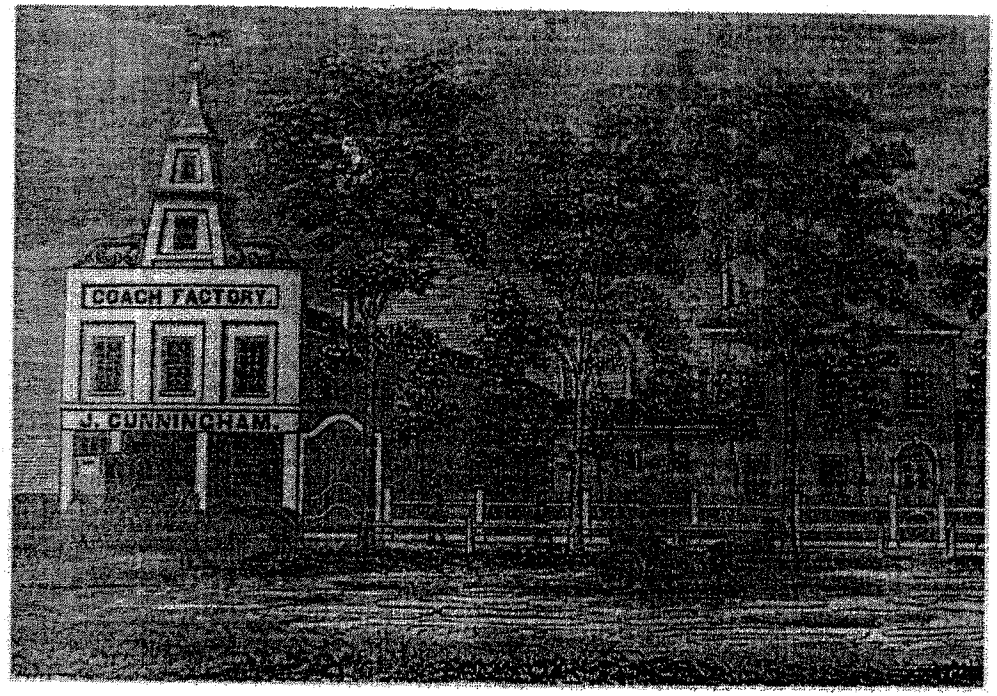
The Selden Motor Vehicle Company and James Cunningham, Son & Company were Rochester's two major automobile manufacturers. Cunningham, which enjoyed a much longer corporate history, produced finished automobiles from about 1908 until the early '30s. The Selden company, which likewise began serious production about 1908, switched to the manufacture of trucks in 1913.

The Cunningham company in 1908 was already one of Rochester's oldest business concerns. Its founder was born in 1815 in County Down, Ireland. Four years later his father died and the widowed mother and her five children emigrated to Canada. At an early age James Cunningham exhibited unusual talents in carpentry, mechanics, and construction. Cunningham moved across the lake to the newly chartered City of Rochester in 1834. After several apprenticeships he formed a carriage-making partnership with Blanchard Dean and James W. Kerr in 1838 known as Kerr, Cunningham, & Company. Rochester and the nation as a whole were sliding into a severe despression that year and the partnership was dissolved after a few years. Cunningham personally assumed the burden of a $6,000 debt that remained from the venture.

Undaunted, Cunningham carried on the carriage making business alone and enjoyed a steady expansion. About 1850 he purchased land between Canal and Litchfield Streets. The site was north of Buffalo Street (Main Street West) and conveniently located near the Ohio Basin of the Genesee Valley Canal and the yards of the Tonawanda Railroad. With later additions, the site remained the location of the Cunningham concern for over a century.

Cunningham's carriage factory grew to one of the largest in the world. At the time of his death in 1886 it employed some 500 men. The Cunningham name was associated with durable, high quality carriages of all types; many are today the prized possessions of collectors. Cunningham made vehicles of all sizes and shapes, but if the factory could be said to have had a speciality, it was in the manufacture of hearses, funeral carriages, and ambulances. At the Columbian Exposition of 1893 in Chicago, the Cunningham exhibit consisted of two hearses, one finished entirely in white and the other in black.





The Cunningham coach factory *ca.* 1860

Five years before his death Cunningham incorporated his business as James Cunningham, Son & Company. Its initial officers were James Cunningham, president, Joseph T., a son, secretary, and Rufus K. Dryer, a son-in-law, treasurer. Early in the twentieth century several grandsons assumed leadership of the company, which remained under family control until 1968.

The conversion of the Cunningham carriage works into an automobile factory was undertaken gradually. For some time Cunningham produced both horse-drawn and gasoline powered vehicles. Its initial experiment in the automotive field was the production of some electric automobiles used by company officers.

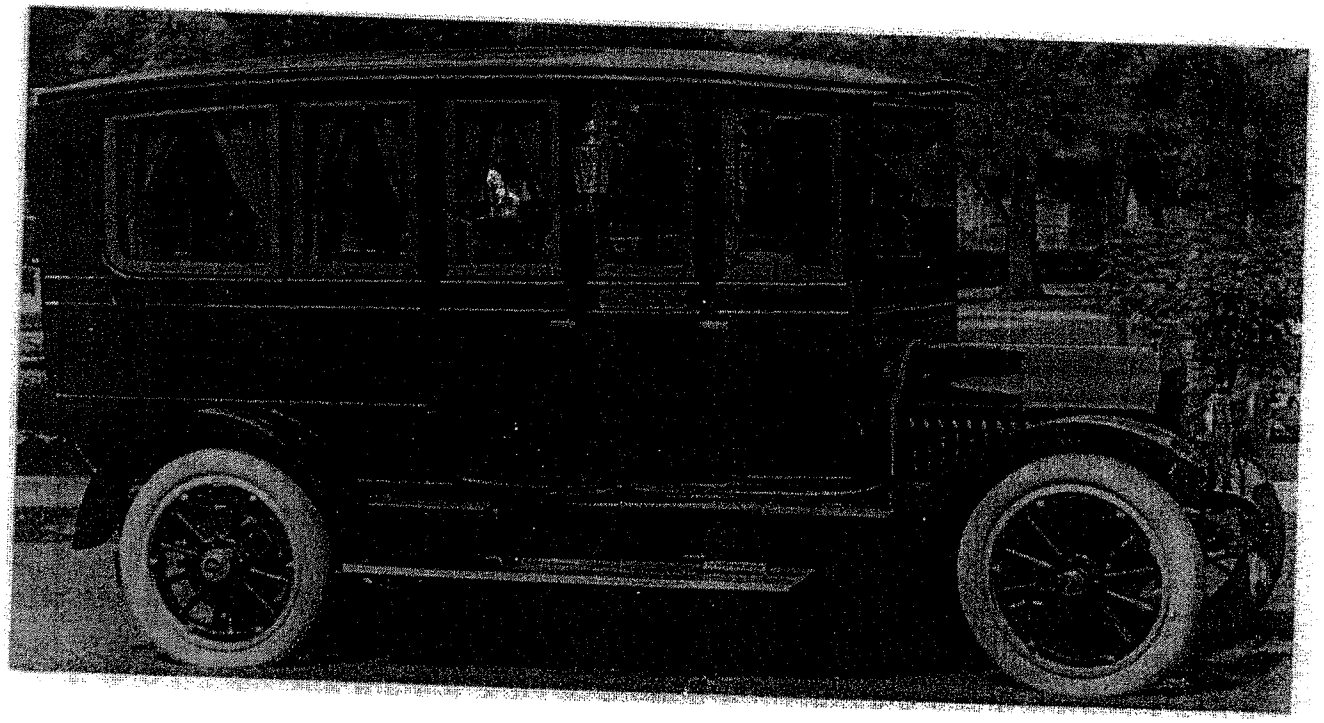
By 1908 the company offered a full line of gasoline automobiles. Its advertisements, which had earlier read "Manufacturers of Fine Coaches, Hearses And Family Carriages" now read "Manufacturers of Touring Cars, Baby Tonneaus, Limousines and Landauletts." (The company did not, incidentally, bother to obtain an ALAM license.)

For its first automobiles Cunningham relied to some degree on outside manufacturers of components. But by 1910 its cars were mounted on a rugged chassis with a four cylinder overhead valve engine of Cunningham design and manufacture. In 1914, with its four cylinder model "S", Cunningham introduced a Westinghouse self-starter. In 1916 it began offering the first of its V-8 models in a variety of body styles.

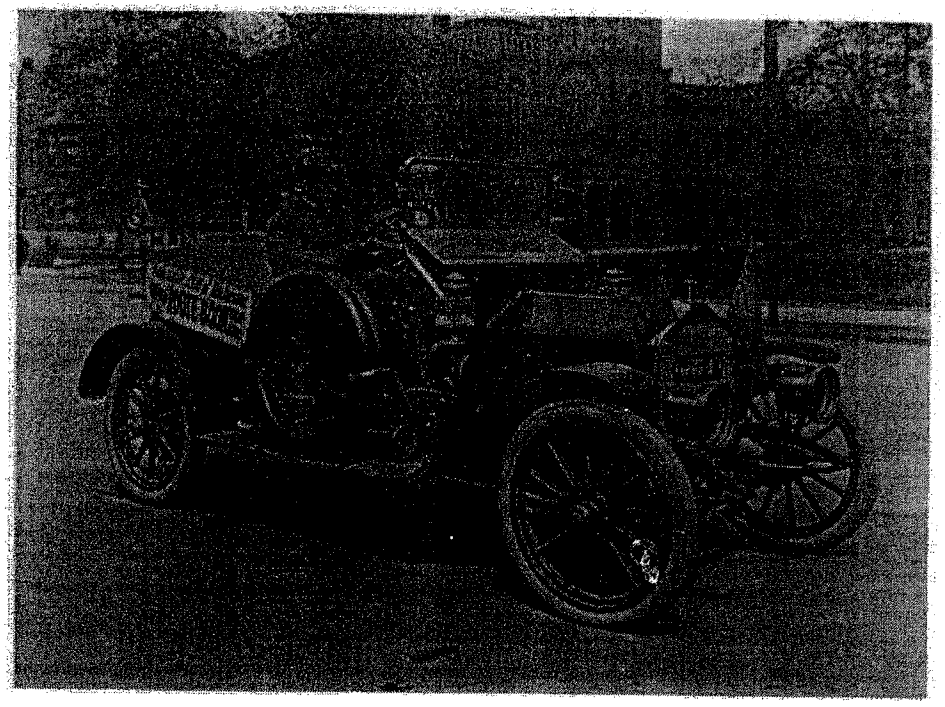
In World War I Cunningham ventured for the first time into military production. It filled an order from the Bureau of Aircraft Production for 115 balloon windlasses. Called "Cunningham-Caquot" windlasses, these odd-looking machines combined a Cunningham V-8 engine with a reel containing a mile of steel cable with a telephone wire core. The mechanism was mounted on a truck chassis.

In the prosperous 1920s Cunningham established itself as a leading producer of luxury automobiles. Not that its output was ever very large: its work force at the beginning of the decade numbered 800, and its annual production about 650 vehicles. The figures grew but little, for the Cunningham automobile was a hand made product until the end. In an era when mass producers like Ford and General Motors were perfecting the assembly line, Cunningham clung to the dignified standards of its carriage making days.

The majority of Cunningham workers were body craftsmen. Major components of the car bodies were fashioned from whitewood and ash, strengtened with iron braces, and covered with sheet



Cunningham funeral car, Style 942



Selden 35 R Roadster, 4 cylinder

aluminum shaped by hand. Hoods and fenders were of steel. The exterior finish began with a coat of priming, two coats of lead, and five coats of "rough" paint. The rough paint was stained and rubbed, and followed by two coats of "color". The car was then varnished no fewer then three times, each coat of varnish being smoothed by men using powdered stone. The final step was enameling in a dust-proof room.

Cunningham paid similar attention to interior woodwork, upholstery, and fittings. Nickel plating was done "in house." Even glass shaping and polishing was performed in the plant on Canal Street. For the most part, Cunningham purchased only electrical equipment from outside manufacturers. Its mechanical department set exacting standards. Every completed chassis was, for example, put through a road test of 300 miles.

Cunningham's willingness to undertake custom work attracted famous and wealthy customers. Owners of Cunningham automobiles included William Randolph Hearst, Marshall Field, William and Philip Wrigley, Harold Lloyd, and Mary Pickford.

The company's success with wealthy purchasers, however, only underlined its failure to reach the mass market it never attempted to gain. Like other manufacturers of luxury automobiles, Cunningham was unable to pursue this line of business beyond the early 1930s. It did continue to produce car bodies for other automobile makers, notably the Ford Motor Company, as late as 1937. Cunningham's engineers and skilled workmen proved adaptive. As we have seen, the company produced large windlasses during World War I. In the 1920s Cunningham cooperated with the War Department in making a series of fast, light tanks and other armored vehicles.

In 1928 Cunningham launched a new venture, the Cunningham-Hall Aircraft Corporation. Relying on slotted wing patents held by the inventor Randolph Hall, the aircraft company used the production facilities on Canal Street. Like its parent corporation, it was a family held affair. Cunningham turned out numbers of single-engined cabin airplanes during succeeding years, including the one in which George Eastman took his first plane ride. Although abandoning the construction of complete aircraft, Cunningham produced airplane parts (as well as other defense goods) during World War II.

In the post-war era the company survived through additional diversification. In the mid-50s it produced electronic goods, notably crossbar switches used in the broadcasting industry. In 1961 Cunningham moved to Honeoye Falls; in 1968 it became a division of Gleason Works.

The Selden Motor Vehicle Company was the belated fulfillment of George B. Selden's ambition to actually manufacture automobiles. Selden lent his name to the company, organized in 1905. His two sons, Henry R. and George B., Jr., served as engineer employees.

Ironically enough, given the association of the Selden name with the ALAM and its disdain for fly-by-night auto makers, the Selden company was in fact a mere assembler of automobiles. Its factory near Probert Street on the city's east side produced cars for only about three years, 1909-1912.

In 1913 the company underwent major reorganization. A new Selden Truck Sales Corporation converted the company's entire production to trucks, ranging in size from three-quarters to five tons. As Selden Truck Sales the company achieved noteworthy success. After the outbreak of war in 1914 it secured contracts with Russia and France. In 1918 it also produced machines for the United States, completing over a thousand Model B Liberty Trucks.

In the domestic market, Selden Truck Sales was an important innovator of the time payment plan. In 1930 it was absorbed by the Bethlehem Truck Company of Pennsylvania which removed the operation from Rochester and retired the Selden name.

A Pioneer and Some Minor Makers

If George B. Selden became the acknowledged automobile pioneer of Rochester, its less-well known but perhaps more legitimate pioneer was local inventor and industrialist J.B. West. In 1896, one year after the government issued the Selden patent--very possibly unknown to him--West produced the first horseless carriage in the city. West experienced his share of difficulty: his original homemade engine proved unreliable, and so he imported one from France. That, too, was unreliable, and so he crafted a steam powered car which ran for several years.

The chief interest in West's pioneering efforts lies in a legal battle he successfully weathered. In the late '90s it was as yet by no means

certain that horseless carriages were safe or legal. One day motoring past the Rochester Theological Seminary, then located at East Avenue and Alexander Street, West frightened a horse hitched to a laundry wagon. According to legend, clean laundry was scattered the length of Alexander Street. The laundry wagon was wrecked and its owner sued West for damages. West's initial defense was that the laundry horse was prone to "spook." The first court test went against West. On appeal, however, he won a decision from Federal Judge Alfred E. Coxe that mechanically driven vehicles could legitimately use the roadways. Highways, said the Judge, were made for men to use no matter what means of propulsion they chose. Thus a Rochester incident contributed to the case law which was gradually building in favor of the automobile.

As was the case with other northeastern cities Rochester spawned a number of evanescent automobile makers during the pioneer days of the industry. None of these approached the success of Cunningham or even of the Selden enterprise, although one, the Sullivan Motor Truck Corporation, turned out light and medium trucks from 1914 to 1922. An outgrowth of Sullivan Brothers, carriage makers, the firm's factory was south of East Avenue a little distance east of the Park Avenue intersection. Some of the Sullivan plant still stands.

More typical of Rochester's short-lived ventures were the Foster Steam Automobile Company, the Empire State Auto Company, and the Rochester Cycle Manufacturing Company, all of which turned out a few steam cars and quit the business by 1906. Another group of local companies devoted to gasoline powered automobiles, starting business in 1910 or 1911, included Gearless, Genesee, Jenkins, Parsons and Regas. All but Jenkins produced fewer than a dozen cars.

In the early 1920s a Rochester manufacturer supplied engines for an exotic luxury automobile known as the Richelieu--assembled in, of all places, Asbury Park, New Jersey. The president of the Richelieu company was an officer of Rochester Motors Corporation, a gasoline engine maker earlier known as the F.A. Brownell Motor Company and now (1921) controlled by the Symington interests. If this is not confusing enough, the engine supplied to the assembly plant in Asbury Park was called the Rochester Duesenberg. Following World War I the Duesenberg brothers abandoned their "Model G" racing engine, selling the rights to manufacture it to Rochester Motors. This four-cylinder, 85 horsepower engine was apparently the major *raison d etre* for the Richelieu. However, the buying public

was surfeited with expensive high-powered makes at the time and in early 1923 Richelieu filed for bankruptcy.

A manufacturing venture of the late 1930s shared in that era's enthusiastic schemes for small, lightweight, inexpensive cars--cars wedded in design elements if not in practical terms to the airplane. Nationally, the best known example of the type was the Dymaxion car of Buckminster Fuller. Between 1932 and 1935 three Dymaxion prototypes were sold. Fuller, a visionary designer rather than a practical industrialist, could not secure the means for mass production.

Rochester's contribution to the field, a three-wheeled automobile called the Airomobile, was born in Denver, Colorado. Paul M. Lewis, the designer, organized a company originally known as Lewis American Airways Incorporated. In early 1937 the firm moved to 1042 University Avenue in Rochester. A prototype constructed on University Avenue incorporated front-wheel drive, monocoque body, and a wheel base of 126 inches. Syracuse engineers supplied a four-cylinder, 60-horsepower, air-cooled engine. The body style of the Airomobile was "tear-dropped," with a single tracking wheel in the back.

The Rochester prototype Airomobile, painted red, was driven about the country in search of investors. As many as fourteen workers including some former Cunningham sheet metal men worked in the Airomobile plant. By 1938 the company moved again, to East Rochester, but never achieved real production.

Accessory and Auxiliary Industries

Thus Rochester never did become a major production center for finished automobiles. In this respect its automobile history does not rival even that of its near neighbors. Buffalo's Pierce-Arrow and Syracuse's Franklin companies occupied important places in those cities' industrial histories. The same cannot quite be said for Rochester's Cunningham and Selden companies.

However, Rochester has played a major supporting role in American automobile history through its contributory industries and even today automobile parts manufacturing supplies a large portion of Rochester's industrial jobs--a fact not generally known outside the city.

One of Rochester's first important auxiliary industries was the Vacuum Oil Company. The company was organized to refine petroleum into useful products in 1866, seven years after Drake's pioneer well was drilled in Titusville, Pennsylvania. The oil regions of Pennsylvania and New York were experiencing the initial stage of America's first oil rush.

Men had collected and sold petroleum in small quantities for many years, in North America and elsewhere, chiefly for medicinal purposes. The new oil boom was based on its use in a refined state as a fuel for illumination, replacing whale oil and other smelly animal fats.

In 1866 Hiram Everest, a Wyoming County native, was a grocer in Rochester. He joined forces with Matthew P. Ewing, an inventor, in his experiments with the distillation of petroleum under a partial vacuum. Their intention was to extract larger quantities of good kerosene from the crude oil. The vacuum process proved, however, to be especially useful for producing a clean residue which could be sold as harness oil. Everest bought out Ewing and organized the Vacuum Oil Company to market the product.

Everest soon discovered that another product, lubricating oil, could be refined from the petroleum residue. At the time steam engines and other machinery were lubricated with lard. Everest's substitute was a success, particularly for such harsh applications as steam engine cylinders. He patented the product as "Gargoyle 600-W." By 1876 the Vacuum Oil refinery had three stills with a capacity of 170 barrels. The refinery was located in the southern part of the city, initially west of the Genesee Valley Canal; ultimately it stretched along a half mile of the west bank of the Genesee River in the Nineteenth Ward.

Early Vaccum Oil lithograph, date unknown

NAPHTHA!
TRY IT! EXPLOSIVE WHICH
DESTROYS THOSE MINES.
FLAMES IN THE DEEP
Three Men Killed and Twenty
Seriously Injured By
FLYING ROCKS
The Twenty-Third

Judging from his advertising in the mid-1870s, Everest was an early believer in diversification. The Vacuum Oil Company proclaimed themselves as not only "Manufacturers of Lubricating Oils" but also of "the celebrated Vacuum Oil Blacking" for harness. In addition, one could purchase "sperm, whale, elephant, lard, and signal oils" in wholesale lots from Vacuum. The Vacuum Oil Company's Printing Office also offered "plain and ornamental job printing" at its office on State Street!

George B. Selden, it is said, approached Hiram Everest with a difficult problem in 1877. The use of lard oil in his experimental engine created intolerable smoke and odor and fouled the cylinder. Everest produced a lubricating oil lighter than that used in steam cylinders but heavy enough to endure use within an internal combustion engine.

In 1879 Everest leased a large tract of land in the Oatka valley with a view toward finding a nearby source of crude oil. Fortunate even in misfortune, Everest found no oil, but his test well near Le Roy struck a valuable vein of rock salt at about 1,300 feet. Everest's test well marked the beginning of western New York's salt mining, an industry that continues to this day.

In the same year Vacuum Oil became a division of John D. Rockefeller's great Standard Oil trust. Hiram Everest and his son, Charles, were paid $200,000 for the company. Hiram retired to California. Charles became the active manager of Vacuum, a job he retained until his death in 1917.

Not even a brief history of Vacuum Oil in Rochester would be complete without a description of the great naphtha disaster of 1887. On an otherwise quiet afternoon in late December the city's peace was suddenly shattered by a series of muffled but powerful explosions. Some citizens at work downtown were certain there was an earthquake. Others concluded it was a dynamite conspiracy--anarchists at work. The mystery seemed partly clarified when the City Hall fire bell tolled the coded alarm for the Mill Street-Brown's Race factory district. This densely packed area of shops and mills, some already antiquated in 1887, was the frequent location for the city's worst disasters. A mob chased the fire companies to the intersection of Mill Street and Brown's Race, only to gape at a great crater which had appeared in the street above the race.

Although streets had been torn up in several places, the most severe eruption had taken place at that intersection. Three flour mills, the Washington, Jefferson, and Clinton, were entirely destroyed in the explosion and ensuing fire. Numerous other

buildings were damaged by concussion and flying debris. The fire alarm was registered at 3:00 P.M. As the afternoon wore on, additional underground explosions blew manhole covers hundreds of feet. When this phenomenon spread to State Street panic nearly ensued among the crowd.

Three men were killed in the disaster, and there were numerous injuries. Initially, it was belived that a gas leak was responsible. When it was apparent that a volatile substance was burning underground, it was believed that Vacuum Oil--some two miles away--had discarded residues into the sewers which had clogged and backed up in the system.

As investigation proved the Vacuum Oil refinery had no connection with the city sewers, since it sold all fractions of its petroleum. Naphtha, an explosive distillate halfway between kerosene and gasoline, was sent to the Municipal Gas Company through a pipeline along the right-of-way of the Genesee Valley Canal. The Municipal Gas Works were located south of the Erie Canal and east of Canal Street. On the day of the disaster Vacuum Oil pumped 14,000 gallons of naphtha to its customer. Municipal Gas waited hours before alerting the Vacuum refinery that no naphtha was received. A leak in the pipe had allowed the dangerous fluid to enter the sewer system. Following a tortuous path, the naphtha at last collected beneath the streets of the industrial district. Here fumes collected and slowly rose. Many workers complained of the odor of "gas" for hours before the first explosion, and some had been ready to lay down their tools. At last the fumes were ignited, probably by an engine in the ground floor of one of the factories.

Early in this century Vacuum Oil acquired a second refinery in Olean, New York, and a third in Paulsboro, New Jersey. The company prospered along with the growth of the automobile industry. Its lubricating products, marketed under the Gargoyle trade name, dominated the industry.

In 1911 a landmark United State Supreme Court order dissolved the trust which had by now assumed the name Standard Oil of New Jersey. Coincidentally, that was the first year the oil industry produced more gasoline than kerosene. Vacuum Oil underwent a series of corporate reorganizations. In 1931 Vacuum merged with Standard Oil of New York and in 1934 became the Socony-Vacuum Oil Company, Incorporated. Another merger with Standard Oil of New Jersey resulted in a name change to Standard-Vacuum Oil Company. After World War II the company became a partner, with other oil giants, in the Arabian American Oil Company (ARAMCO).

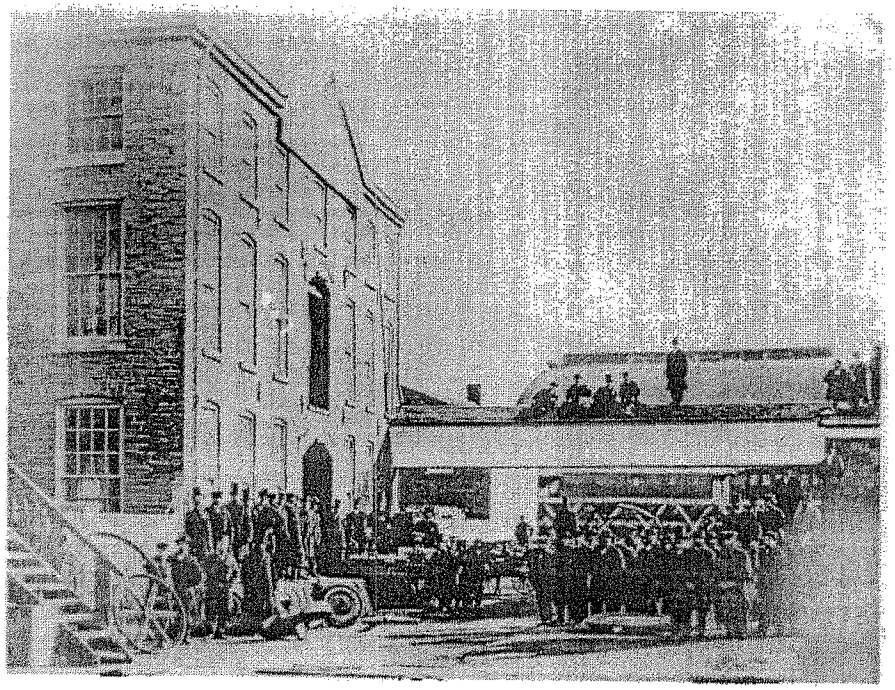
In 1955 the company placed one of its trademarks in the corporate name: Socony Mobil Oil Company, Inc. It is now known as Mobil Oil Corporation. Although the company dismantled its Rochester refinery in 1931, since 1962 it has again become a major factor in the regional economy. Nearby Macedon is the headquarters and largest manufacturing facility of the Plastics Division of Mobil. The Plastics Division is the descendant of the Kordite Corporation, a business begun just after World War II by the Rochester brothers Howard and Richard Samuels.

The Gleason Works, a major supplier world-wide of production equipment for the automotive industry, began as a modest machine shop near the head of Brown's Race. William Gleason, the founder, came to Rochester from Ireland 1851. He served as an apprentice machinist here and during the Civil War worked in the Colt Armory in Connecticut. Returning to Rochester, he immediately set up shop with first one, and then a second partner in the manufacture of various machinery. For a time he was associated with the Kidd Iron Works, also on Brown's Race. Gleason began operating independently as William Gleason, Tool Builder and, in 1888, organized the Genesee Foundry. The foundry was destroyed by fire in 1889 and rebuilt on an enlarged scale in 1890 as the Gleason Tool Company. At last the business was renamed The Gleason Works, a New York State corporation, in 1903. The company traces its birthdate to 1865, when the predecessor firm of Connel and Gleason began.

But a landmark year of at least equal significance to the enterprise was William Gleason's invention of the bevel gear planer in 1874 (patented 1876). The teeth and the working surface of a bevel gear are set at an angle not parallel with the shaft that drives the gear (or is driven by it). Such gears work in pairs to convey power in different directions, or "around corners." Until Gleason's invention, bevel gears were extremely time consuming and expensive to make. Each gear casting was finished by hand; for some applications wooden gear teeth were inserted in metal rings. Handmade gears were imprecise, wasted power, and had little endurance. The gears produced by Gleason's automatic machine were far superior and less expensive.

Gleason's gear-cutting invention, improved and enlarged over the years, proved invaluable to the growth of the automobile industry. One major application of the bevel gear in automobiles is in the rear axle, where power from the drive shaft must be distributed at right angles to each rear wheel.

William Gleason



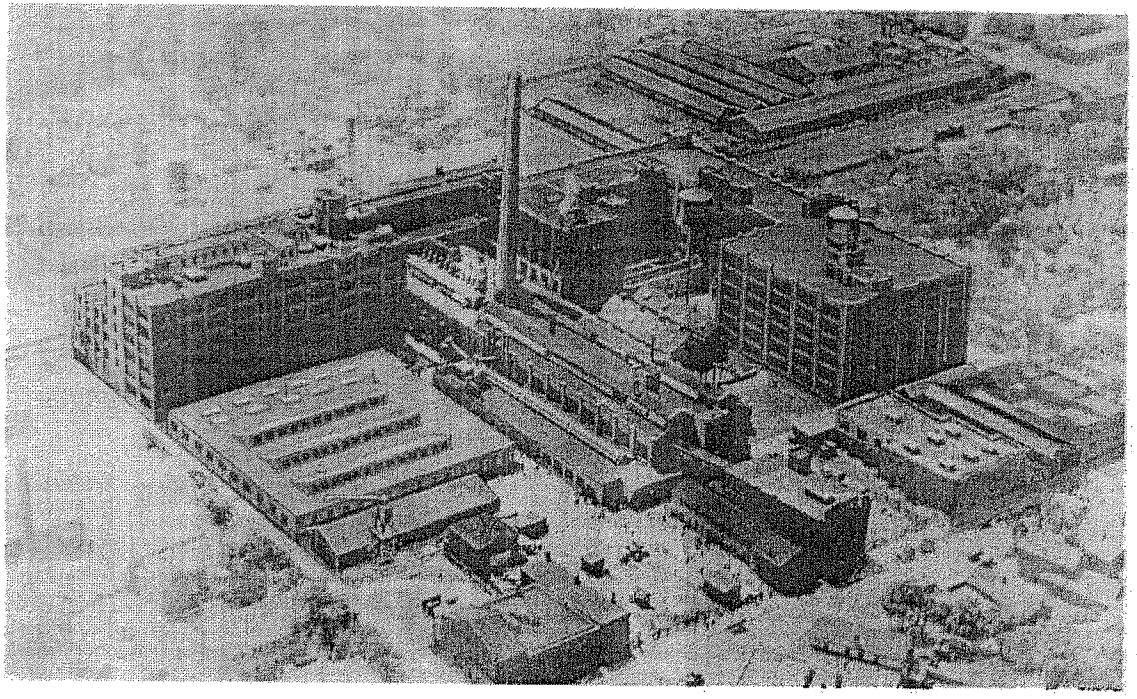
Gleason's shop on Brown's Race, 1865

designed and built a practical automobile electric starting system. North East sold its starting systems, and later ignition, lighting, and related devices both to auto manufacturers and to owners as "add-on" equipment.

The fortunes of the company prospered along with rising automobile registrations and consumers' dislike of hand starting. Soon it occupied a substantial cluster of buildings south of Lyell Avenue just west of the Broad Street intersection. In 1929 General Motors acquired the firm. General Motors already owned a conglomerate division known originally as the Dayton Engineering Laboratories Company (DELCO) which in turn managed such diverse enterprises as Delco-Remy, Frigidaire, Inland Manufacturing, and Delco Aviation. As part of a complex reorganization General Motors first made Frigidaire independent. Then in 1930 it merged the Delco Lighting Company with North East Electric and physically moved much of Delco to Lyell Avenue in Rochester. A new North East Appliance Corporation under the management of Edward Halbleib was given the task of manufacturing a line of Delco products for automobiles; the Delco Lighting Company was to continue producing its line of water-pumping and gas and electric plants for rural customers. During the next few decades Delco Appliance (as it was renamed) in Rochester also turned out such products as electric fans, air conditioner motors, and home oil burners.

Meanwhile General Motors required more and more assembled automotive parts from its factory here. In 1939 a new plant was built on Lexington Avenue to handle the need for automobile parts. At first a subdivision of Delco Appliance, Rochester Products Division manufactured tubing, automobile locks and keys, carburetors, and a host of other automobile components. Gradually Rochester Products has come to specialize in carburetors, fuel injection systems, and emission control devices, and is now known as "the fuel systems division" of General Motors.

Delco, which occupied a new factory complex on Lyell Avenue in the city's outskirts during the 1950s, abandoned the manufacture of home products. Renamed Delco Products Division in 1965, it now specializes in the production of electric motors and accessory components. Delco motors are used for General Motors windshield wipers, heater and air conditioner fans, power windows and seats, power door locks, and the like.



North East Electric Company, 1926

At the turn of the century Gleason Works made a crucial decision to abandon the manufacture of most other types of machinery and the production of parts. Instead, Gleason concentrated on the sale of its gear machines to those who needed the gears in their own manufacturing. That strategy helped establish the company as the world leader in its specialized field. As its business expanded, the Brown's Race factory became cramped. In 1911 Gleason Works moved to its present thirty-six acre site at 1100 University Avenue, formerly the location of the "Culver Field" baseball park.

In recent years the wholesale shift toward front-wheel drive vehicles, which require no rear-axle mechanism, has weakened the demand for Gleason's sophisticated bevel gear cutting and finishing machines. Anticipating the change, in 1979 Gleason introduced machinery for high-speed production of large helical and spur gears. Such gears operate in parallel planes and are used in the drive chains of the newer cars.

At present only about forty percent of the company's sales are in automotive production machinery. The nearly revolutionary shift in demand away from the company's traditional line of capital products has required Gleason to diversify. In 1978 Gleason acquired Alliance Tool and Die, one of Rochester's largest and newest precision machine builders. Alliance was (and is) a significant manufacturer of production equipment for the automotive industry in its own right. It makes machines for the assembly and testing of a variety of components. It manufactures parts for automotive and non-automotive industries, supplies plastic molding machines, and even builds entire factories under "turnkey" arrangements. Two other Gleason subsidiaries acquired in 1980 and 1981 are Pennsylvania Pressed Metals of Emporium, Pennsylvania and Hackett Precision of Nashville, Tennessee. These divisions manufacture metal parts using the exotic new technologies of flow- and cold-forming. At present Gleason Works employs about 3,500 persons in Rochester.

Delco Products Division and Rochester Products Division together employ over 10,000 workers in good times, making General Motors Rochester's third largest industrial employer when automobile sales are strong.

The two Rochester divisions of General Motors may trace their ancestry to the Rochester Coil Company, a small North Water Street concern launched in 1908. The organizers of the shop, whose principal business was the repair of trolley car motors, were Joseph C. and Edward A. Halbleib. The company was presently renamed the North East Electric Company and in 1911 Edward Halbleib

Voplex and Schlegel, two Rochester corporations which supply specialized body materials to the automobile industry, had strikingly similar origins.

The company begun by Albrecht Vogt is the older of the two. In the early 1870s Vogt and a partner, Frederick Haiger, operated a narrow loom shop in an Exchange Street loft. At first the shop made woven fringes that were then popular on women's dresses. Haiger soon moved to Buffalo and Vogt shifted operations to the St. Paul Street industrial district. There he gradually expanded his line of merchandise, first with upholstery trimming and then with broadlaces used to trim horse-drawn broughams and coupes. Doubtless Vogt was a supplier to Cunningham and other Rochester carriage makers.

With the coming of the automobile Vogt Manufacturing concentrated on all types of cloth interior trim materials. In 1927 the company built a new factory on Fernwood Avenue. It shortly acquired the Waterloo Woolen Mills and the George Carter Company of Detroit, enabling it to supply automobile cloth and concealed nail bindings.

Since the 1920s the company has continued its expansion through the acquisition of generally small, advanced-technology manufacturing firms, among them Leaming Industries of Canandaigua (1961) and Allerton Chemical of Rochester (1964). By shifting from a concentration in textiles towards one in plastics the company maintained its role as a supplier of automobile interior components. At present it counts sixty percent of its business as automobile related. In 1970, at the time of construction of its ultramodern headquarters in outlying Pittsford, the company's name was changed to Voplex, an amalgam of Vogt and plastics.

In the late 1880s Charles P. Schlegel with his partner Henry A. Schaefer began a similar narrow loom enterprise. After a short stay on North Water Street, Schlegel moved the shop to Canal Street near the Cunningham factory, finally to Goodman Street at the corner of College Avenue. The Schlegel product line, as advertised well into the twentieth century, consisted of "carriage, basket, and dress trimmings." Schlegel Manufacturing also supplied textile trimmings to the automobile industry. Eventually it developed a specialty within that field of producing the door and window weather seals for autos.

After World War II, Schlegel turned its experience in weathersealing automobiles to the broader field of sealing doors and windows of all types. It has become an acknowledged leader in this

area, prospering greatly because of the demand for greater energy conservation in recent years. Today Schlegel is a far-flung conglomerate of over thirty divisions, still based in Rochester where its headquarters is the adapted Sibley mansion on East Avenue. The corporation's Rochester Division in nearby Henrietta is one of its important manufacturing centers. Products for the automobile industry are no longer made by Schlegel in Rochester; however, automobile door seals are made by a division elsewhere.

Because of Rochester's historically diverse manufacturing base and the importance of the automobile industry in the scale of the national economy, dozens of local firms at one time or another have served as suppliers. It would seem impractical to describe them all, but at least a few additional companies deserve some mention before bringing this account to a close.

Besides Gleason Works, one other Rochester company supplies heavy production equipment to the industry. Now known as Farrel Rochester Division of Emhart Corporation, the plant in the triangular junction of Blossom Road and University Avenue was first operated in the 1920s as the Consolidated Machine Tool Corporation. Farrel produces many types of large machinery for working in metal and plastic. The automobile industry is a customer for its plastic injection molding machines and aluminum extrusion presses. Such machines are valuable (among other things) for producing lighter automobile components which contribute to energy efficiency.

The Dollinger Corporation, which today produces industrial filters and filtering systems, began in 1920 as the Staynew Filter Company. The Staynew Protectomotor was an improved air filter invented by Lewis Dollinger and sold at first to truck operators. For decades Staynew filters were supplied as original equipment on a wide variety of automobile makes.

Bastian Brothers and Metal Arts Companies, recently merged under the latter's name (although it was an offshoot of the former) have been manufacturers since the turn of the century of jewelery, novelties, medallions, commemorative objects, campaign buttons, and decorative insignia. Both companies have made the nameplates which identify automobiles by maker or model. F.A. Smith Company (FASCO) manufactured small motors and defrosting fan units, switches, and circuit breakers. It left Rochester in 1975.

Note on Sources

Because of its importance to the history of the American automobile industry and to the evolution of patent law, an extensive literature on the Selden patent case exists. The definitive work is William Greenleaf, **Monopoly on Wheels** (Detroit, 1961). Greenleaf's monograph is comprehensively documented and may serve as an introduction to most of the literature. **Monopoly on Wheels** approaches the story with a detectable pro-Ford bias. Also dealing with Selden from the Ford point of view is Alan Nevins, **Ford, the Times, the Man, the Company** (New York, 1954); Nevins acknowledges the research contributions of Greenleaf. A thoughtful, if much briefer, account of the Selden controversy may be found in Robert F. Scott, "I Invented the Automobile," **Automobile Quarterly** 4 (Winter 1966), 314-325. Scott, like J. Harold Byers, "The Selden Case," **Journal of the Patent Office Society** 22 (October 1940), 719-736, points out that Selden's patent never was held invalid. Selden's sons left behind their personal accounts: Henry R. and George B. (Jr.) Selden, "Some Rochester Inventions," Rochester Historical Society **Publications** 14 (1936), 191-211; George B. Selden, Jr., "Horses Hated Rochester Alumnus, Pioneer, Inventor of Automobile," **Rochester Alumni-Alumnae Review** 18/14 (February-March 1940), 16-17; Selden Jr. interview, by Lee McCanne and Katharine Thompson (January-February 1965), untranscribed, in Monroe County Historian's Office.

For the history of Rochester automotive manufacturing this account owes a great debt to W. G. Yengst, "The Automotive History of Rochester, N.Y.," **Antique Automobile** 33 (November-December 1969), 4-17, reprinted substantially in **Rochester Engineer** 55 (January 1977), 112-116. Another published source is Percy R. Gilbert, "Richelieu Motor Car Corporation," **Antique Automobile** 42 (September-October 1978), 14-18. In the Local History Division, Rochester Public Library, Rochester Industries Scrapbooks III, p. 2, is an anonymous clipping, *ca.* 1920 which describes the progress and operations of the Cunningham company to that date. Also in the Division is Raymond J. Diringer, "The Airomobile Motor Car," 2pp. typescript, n.d.

These sources aside, much of Rochester's automotive manufacturing history has been pieced from the Division's newspaper clipping files, City Directories, uncatalogued pamphlets, and the like. For Vacuum Oil, however, there is a useful account in John P. Herrick, **Empire Oil; The Story of Oil in New York State** (New York, 1949), pp. 245-253; (Mobil Oil Corporation), "A Brief History of Mobil" (12 pp. pamphlet, 1980?) provides dates and genealogical detail. The Rochester naphtha disaster was extensively covered in the local press, and clippings were collected in the Barton Scrapbooks II, pp. 18-24 (Local History Division). The Gleason Works has twice issued (anonymous) memorial volumes which contain corporate histories: **The Story of the Gleason Works 1865-1950** (Rochester, 1950), pp. 9-24 and **The Gleason Works 1865-1965** (Rochester, 1965?) pp. 1-14. Finally, helpful corporate histories (including those of Alliance Tool Corporation, Dollinger Corporation, Gleason Works, Mobil Chemical Company, Rochester Products Division, and Schlegel Corporation) are contained in Howard Hosmer, "Partners in Progress" in Blake McKelvey, **A Panoramic History of Rochester** (Woodland Hills, Calif., 1979), pp. 193-253.

Appendix K

Summary of City of 1989 Rochester Site Investigation

APPENDIX D

SUMMARY OF CITY OF 1989 ROCHESTER SITE INVESTIGATION

OIL & HAZARDOUS MATERIAL
SITE EVALUATION
FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

by

H&A of New York
Rochester, New York

for

Rochester City School District
Rochester, New York

File No. 70082-40

August 1989

EXECUTIVE SUMMARY

This investigation is a preliminary evaluation of the potential for oil and hazardous material to exist on the subject property, and potential site construction considerations (foundation types and disposal of site materials) so as to assist RCSD in evaluating the potential liability associated with ownership, financing and development of a school on the property. The site consists of an area generally bounded by the Genesee River, Violetta St., Exchange St., Fenwick St., Plymouth Ave., and Flint St. in Rochester, New York. The investigation consisted of a review of readily available information in public files; interviews with individuals familiar with the site use and history; limited subsurface exploration on the site consisting of 28 soil vapor sampling locations and 3 test borings; limited analyses of site soils; and visual observation of readily apparent surface and environmental conditions. Based on a review of this information, H&A has the following conclusions and recommendations:

- The Vacuum Oil Company was located on most of the site from 1866 to 1936. Vacuum Oil performed distillation of unrefined oil to produce petroleum products and derivatives. Available site historical information indicates the site was also used for the storage (in above ground tanks) and disposal of these products. Since 1936 the site has been used for warehouse, manufacturing and tool and die operations. Several underground storage tanks are reported to exist on the site; the locations and/or condition of the tanks could not be determined from available records.

- Twenty-eight soil vapor samples were analyzed and three test boring explorations completed on the site. Each of the borings was located within the former Genesee Valley Canal. The borings were terminated at the apparent top of bedrock, approximately 11-13 feet below the ground surface. Fill materials encountered in the borings generally consisted of sand, cinders, brick and concrete.

- Laboratory analyses for volatiles, semi-volatiles, priority pollutant metals, petroleum hydrocarbons and hazardous waste characteristics were conducted on site soils. A fill sample which had a petroleum odor was analyzed for volatile organics and petroleum hydrocarbons. No petroleum hydrocarbon compounds or volatile organic compounds were detected above the laboratory detection limits (0.0003

parts per million or less). A composite soil sample from site borings was analyzed for semi-volatile organic compounds. Ten compounds were possibly present at the detection limit (0.00033 ppm) but could not be quantified. The compounds detected are common by-products of fossil fuel combustion and, where criteria have been established, sample concentrations fall below published USEPA Health Based Criteria for residues in soil. A composite of surficial soils was submitted for analysis for priority pollutant metals because of the higher likelihood of human contact with shallow soils. Each metal concentration detected in the sample fell below the reported average for metal compounds naturally present in soils. Analysis for hazardous waste characteristics (EP Toxicity, Reactivity, Corrosivity, Ignitability) was also performed on a shallow soil sample. The sample was not hazardous based on these characteristics.

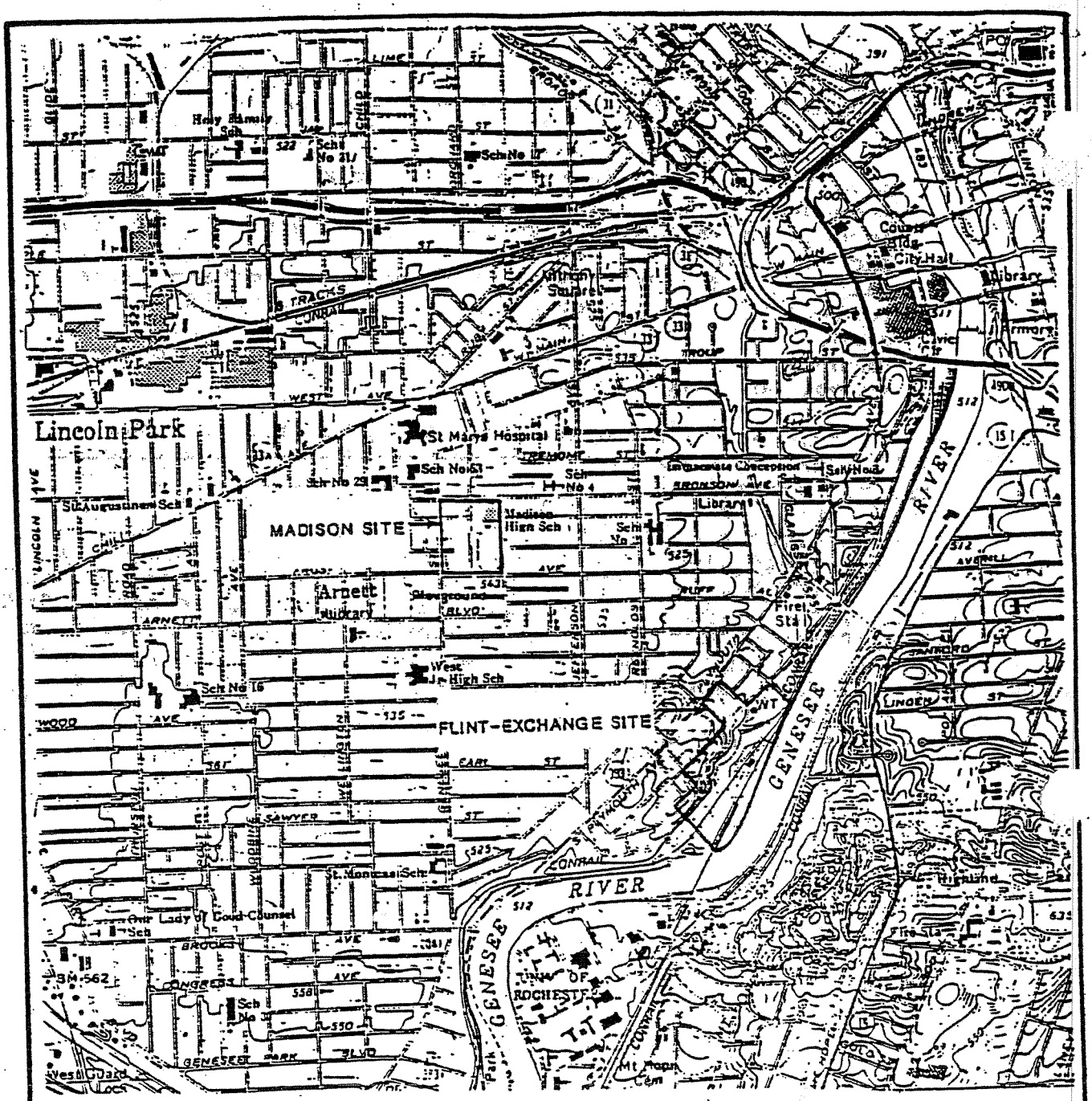
- Loose fill was encountered in all three site borings up to a depth of 11± ft. below ground surface and approximately 1 to 2± ft. above the apparent top of bedrock. Depending on the building configuration considered for the site, recommended foundation types appropriate for this site may include drilled-in piers with slab-on-grade floors or spread footings. These may require partial or total removal of site fill. Relatively high groundwater conditions were also encountered which should be considered if a basement is contemplated.

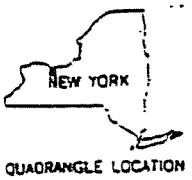
- Removal of site fill may require one or more types of special handling. Cinder fill from the Genesee Valley Canal area is classified as a solid waste and would likely require disposal at a sanitary landfill. If site soils are found to contain petroleum products or derivatives (from Vacuum Oil operations) they may require disposal as a hazardous waste (if reactive, ignitable, corrosive, EP toxic, or containing a listed organic substance), or a special waste (if found to contain a petroleum product but not exhibit hazardous characteristics). Hazardous waste would have to be disposed at a NYSDEC permitted hazardous waste treatment storage and disposal facility; petroleum stained soils could be landfilled at a NYSDEC permitted sanitary landfill.

- The walkover and subsurface investigations were limited to the city owned, vacant portion of the site from the end of Flint and Violetta Streets to the Genesee River. The remainder of the site is privately owned warehouse,

industrial and manufacturing properties where many of the Vacuum Oil Company tanks and buildings formerly were located. Neither a walkover nor subsurface investigations were performed on the portion of the site where the highest potential for oil or hazardous materials appears to be present. Vacuum Oil operations and subsequent permitted underground storage tanks are or were on the portions of the site H&A personnel were unable to view. A thorough walkover and additional subsurface investigations (test borings and soil vapor sample locations) should be conducted on the remainder of the site with particular emphasis on the portion of the site considered for the school building location.

In summary, based on the scope of work performed, and our conclusions and recommendations described above, the property evaluated appears to be capable of undergoing re-development provided that prior to development evaluation of and accommodations for the fill material and soils potentially containing petroleum derivatives are made. Of the compounds detected on site (volatile organics, semi-volatile organics and metals), none appear to be present in concentrations above USEPA Health Based Criteria or levels naturally expected to occur in soil at the limited locations sampled. However, the potential for hazardous materials to be present in areas not explored during this investigation appears to be high based on past and present site land use.





QUADRANGLE LOCATION

N

USGS QUADRANGLES
ROCHESTER, EAST AND
ROCHESTER, WEST

H&A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

MADISON/FLINT-EXCHANGE SITES
ROCHESTER, NEW YORK

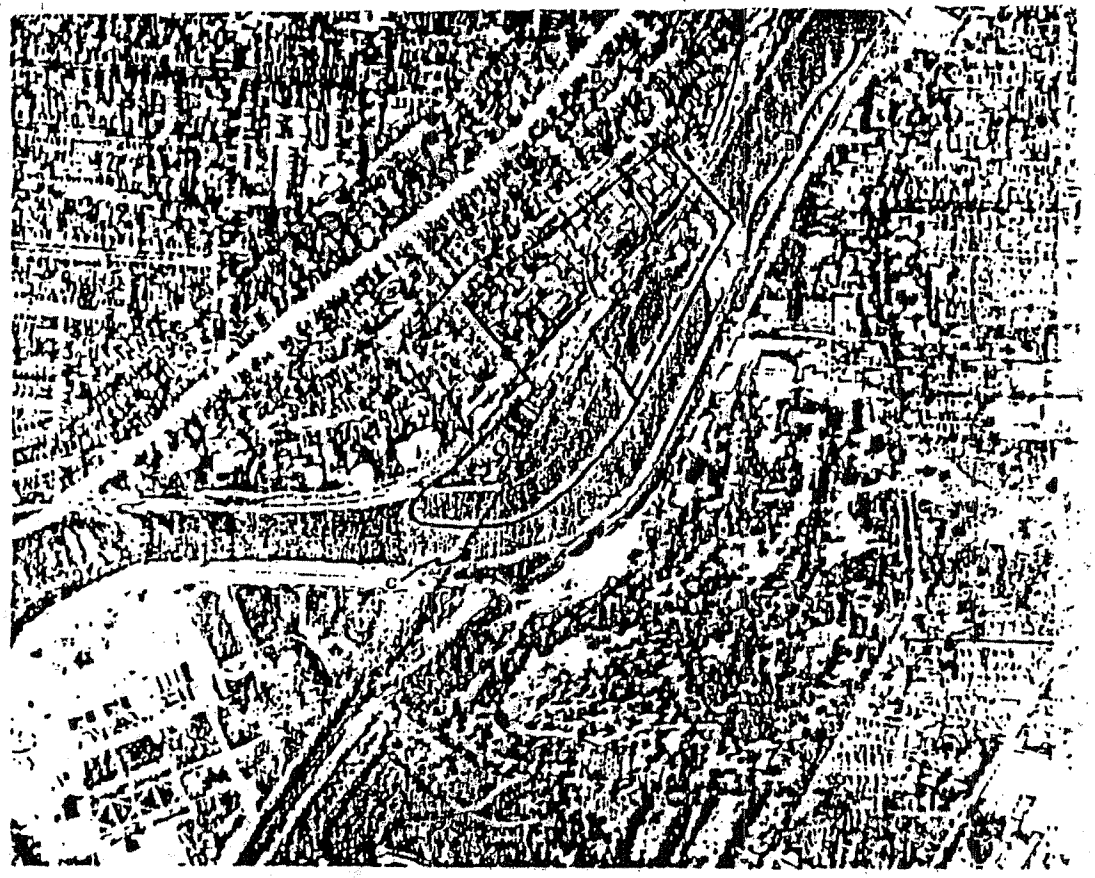
PROJECT LOCUS

SCALE: 1IN=2000FT

JULY 1989

FILE NO. 70082-40

FIGURE 1



N

LEGEND:

A — VACUUM OIL COMPANY (NOTE STORAGE TANKS AND APPARENT ELEVATED PIPELINE/BARREL CONVEYOR)

B GENESEE RIVER

C RAILROAD BRIDGE

D -- APPROXIMATE SITE BOUNDARY

NOTES:

1. AIR PHOTO SUPPLIED BY MONROE COUNTY ENVIRONMENTAL MANAGEMENT COUNCIL, ROCHESTER, NEW YORK.
2. AIR PHOTO TAKEN IN 1930.
3. ALL SITE BOUNDARIES AND SITE FEATURE LOCATIONS APPROXIMATE.
4. SEE ACCOMPANYING REPORT FOR ADDITIONAL INFORMATION.

0 500 1000

SCALE IN FEET

FILE NO. 70082-40

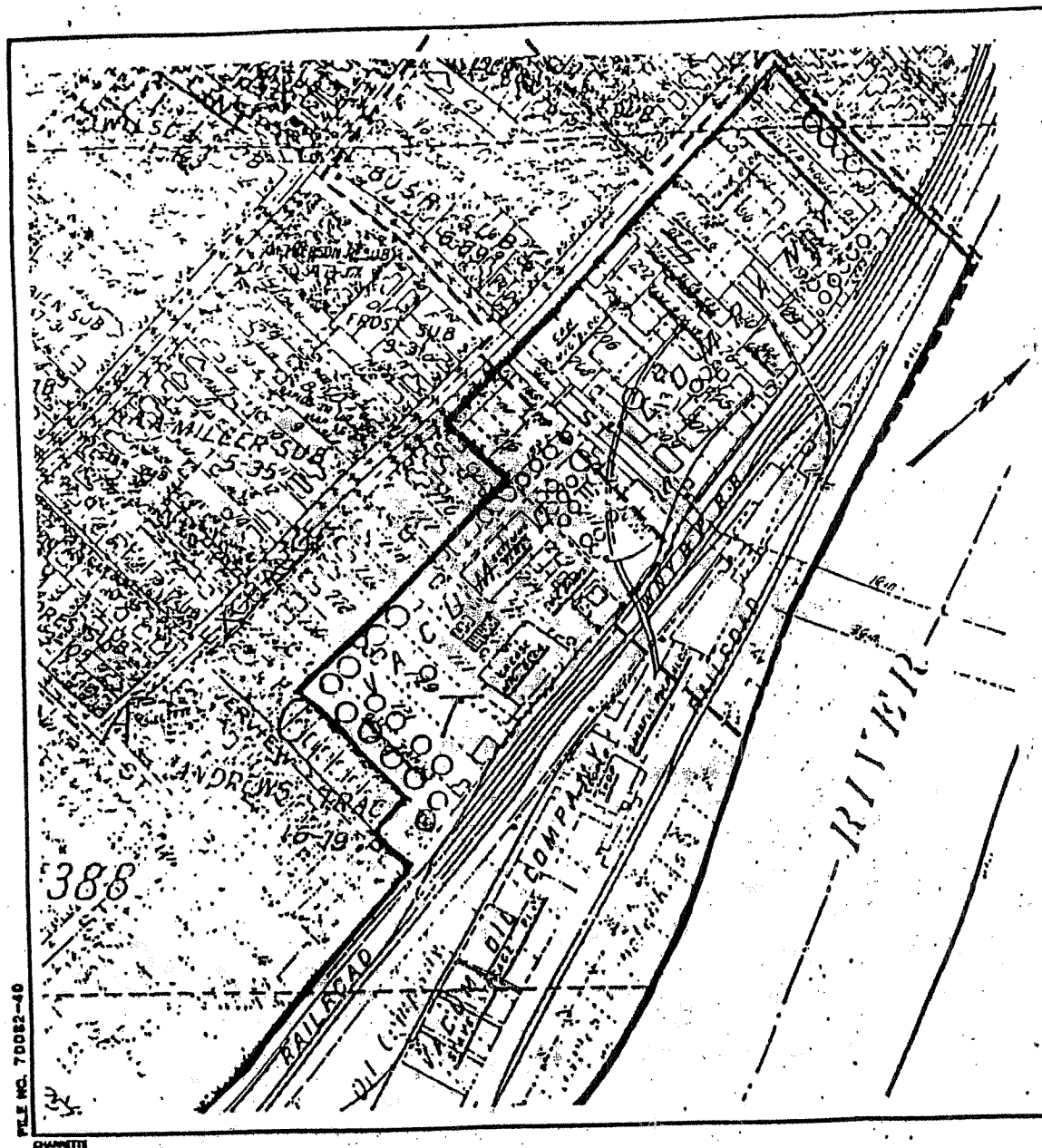
H & A of New York

FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

1930 SITE AERIAL PHOTOGRAI

SCALE AS SHOWN JULY 19

FIGURE



LEGEND:

——— APPROXIMATE BOUNDARY OF VACUUM OIL COMPANY

– – – APPROXIMATE BOUNDARY OF PROPOSED SITE

○ ABOVE GROUND STORAGE TANKS

NOTES:

1. BASE PLAN FROM G.M. HOPKINS 1926 PLAT BOOK.
2. ALL SITE LOCATIONS APPROXIMATE.
3. SEE ACCOMPANYING TEXT FOR ADDITIONAL INFORMATION.

0 50 100 200

SCALE IN FEET

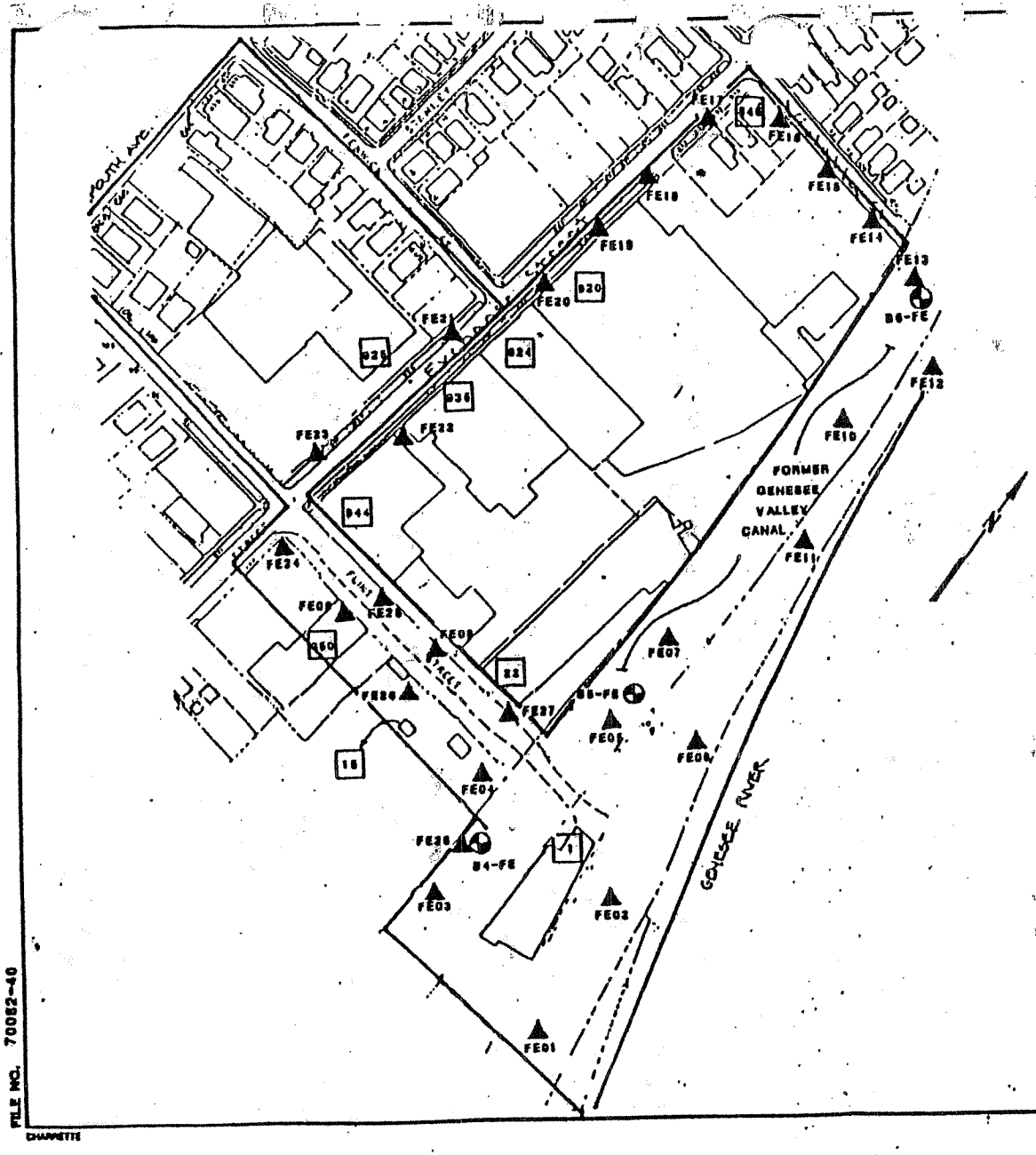
HRA of New York

FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

**1926 SITE PLAN-
VACUUM OIL COMPANY**

SCALE AS SHOWN - JULY 1

FIGURE



LEGEND:

- APPROXIMATE SITE BOUNDARY
- 820 SITE ADDRESS
- FE08 LOCATION AND NUMBER OF SOIL VAPOR SAMPLE POINT
- B6-FE APPROXIMATE LOCATION AND NUMBER OF TEST BORING EXPLORATION
- EXISTING STRUCTURE

NOTES:

1. BASE PLAN FROM 1986 PROVIDED BY CITY OF ROCHESTER, DEPARTMENT OF PLANNING.
2. ALL SITE LOCATIONS APPROXIMATE.
3. SOIL VAPOR SAMPLING PERFORMED BY H&A OF NEW YORK PERSONNEL BETWEEN 24 MAY AND 12 JUNE 1989 USING A PHOTOVAC 10S50 PORTABLE GAS CHROMATOGRAPH. SEE TABLE II FOR RESULTS.
4. TEST BORINGS PERFORMED BY ROCHESTER DRILLING CO., INC. ON 7 AND 8 JUNE 1989. SEE FIGURE 4 FOR BORING INFORMATION SUMMARY.
5. SITE AND ADJACENT PROPERTIES ARE LISTED BY ADDRESS ON TABLE I.
6. SEE ACCOMPANYING TEXT FOR ADDITIONAL INFORMATION.

0 50 100 200

SCALE IN FEET

H&A of New York

FLINT-EXCHANGE SITE

ROCHESTER, NEW YORK

SITE PLAN

SCALE AS SHOWN

JULY 8

FILE NO. 70052-40

CHARRETTE

FIGUR

TABLE I
SITE USAGE
FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

ADDRESS	YEAR	NAME	USAGE (POSSIBLE/DOCUMENTED O&HM USAGE)
932-948 EXCHANGE	1945-1947?	GENESEE BREWING	INDUSTRIAL ALCOHOL (BULK STORAGE OF 10,000 GAL. ALCOHOL FOR DISTILLING USE, FIRE MARSHAL)
" "	1950	RG&E WAREHOUSE	
		BACUM CORP.	WAREHOUSE
		CHAMBERLAIN CO.	WEATHER STRIPPING
		GENESEE TILE	WAREHOUSE
		STROMBERG/CARLSON	
		ROCHESTER CONVEYOR	
		MACHINE MFG.	MANUFACTURING
		ROCHESTER DISTILLING	PETROLEUM DISTILLING (POSSIBLE PETROLEUM PRODUCT STORAGE)
" "	1960	WEATHER MASTER	WEATHER STRIPPING
		ONTARIO LIQUOR	DISTRIBUTOR
		ALLISON CORP.	FURNITURE WHOLESALE
" "	1969-1983	KOLKO PAPER	(2000 GAL. GAS, FIRE MARSHAL)
" "	1970	KOLKO PAPER	
		ROCH. MUNICIPAL	WAREHOUSE
		ALLISON CORP.	FURNITURE WHOLESALE
" "	1978	KOLKO PAPER	1000 GAL. GAS REMOVED, (FIRE MARSHAL) FURNITURE WAREHOUSE
		ALLISON CORP.	
" "	1983	KOLKO PAPER	
		VACANT	
" "	1985	KOLKO PAPER	(2000 GAL. GAS REMOVED, FIRE MARSHAL)
" "	1989	H.P. NEUN	
		KOLKO PAPER	
		ALLISON CORP.	FURNITURE WAREHOUSE
950 EXCHANGE	1950	LUCAS SCREW	SCREW PRODUCTS (POSSIBLE OILS AND METAL CLEANING SOLVENTS)
" "	1960-1970	ONTARIO MACH.	TOOL & DIE (POSSIBLE OILS AND METAL CLEANING SOLVENTS)
" "	1978-1989	XL TOOL & DIE	(POSSIBLE OILS AND METAL CLEANING SOLVENTS)

FILE NO 70082-40

TABLE I
SITE USAGE
FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

ADDRESS	YEAR	NAME	USAGE (POSSIBLE/DOCUMENTED O&HM USAGE)
846 EXCHANGE	1960-1989	ROCHESTER SANITARY PRODUCTS	DISINFECTANT SALES/DISTRIBUTION
920 EXCHANGE	1960-1970	SEARS	SERVICE CENTER
" "	1971	BEVACO FOOD	FREEZER/WAREHOUSE (1000 GAL., 2000 GAL AND 3000 GAL. GAS TANKS, FIRE MARSHAL)
" "	1978	EGAN FOOD	FREEZER/WAREHOUSE
" "	1979	NORTH ATLANTIC FISHERIES	(2000 GAL. GAS TANK REMOVED, FIRE MARSHAL)
" "	1983	BEVACO FOOD	FREEZER/WAREHOUSE
" "	1986	EGAN FOOD	(3000 GAL. GAS TANK, FIRE MARSHAL)
		NORTH ATLANTIC FISHERIES	(2 FUEL OIL TANKS FILLED WITH CONCRETE, FIRE MARSHAL)
" "	1989	NORTH ATLANTIC FISHERIES	FREEZER/WAREHOUSE (GAS PUMP OBSERVED)
		BUDGET BALANCER FOOD CLUB	
924 EXCHANGE	1950-1970	SEARS	WHOLESALE, REPAIRS (POSSIBLE OILS AND SOLVENTS)
" "	1977	EGAN FOOD	(3000 GAL. GAS TANK, FIRE MARSHAL)
" "	1978	SPECIALIZED	WAREHOUSE
" "	1983	VACANT	

TABLE I
SITE USAGE
FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

ADDRESS	YEAR	NAME	USAGE (POSSIBLE/DOCUMENTED O&M USAGE)
925 EXCHANGE	1960	TALLMAN TOOL AND MACHINE	MANUFACTURER (POSSIBLE SOLVENTS AND OILS)
" "	1970	WOODHILL PRODUCTS	
" "	1978	PRECISION PRODUCTS	
" "	1983	NATIONWIDE PRECISION PRODUCTS	
" "	1989	CANFIELD & TACK	
926 EXCHANGE	1936	VACUUM OIL ROCHESTER DISTILLING	PETROLEUM DISTILLATE PRODUCTS
" "	1950	GENERAL SOLVENTS	(POSSIBLE SOLVENT STORAGE)

TABLE I
SITE USAGE
FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

ADDRESS	YEAR	NAME	USAGE (POSSIBLE/DOCUMENTED O&HM USAGE)
22 FLINT STREET	1950	SCHWARTZ	ELECTRICAL EQUIPMENT (POSSIBLE METAL CLEANING SOLVENTS OR PCBS)
" "	1960	MILLS TALBOT	ELECTRICAL EQUIPMENT (POSSIBLE METAL CLEANING SOLVENTS OR PCBS)
" "	1960-1967	?	(1000 GAL. GAS TANK, FIRE MARSHAL)
" "	1970	EAT CORP.	WAREHOUSE
" "	1974	?	(MAINTAIN 1000 GAL. GAS TANK, FIRE MARSHAL)
" "	1978	SPECIALIZED	WAREHOUSE
" "	1983	NIBLACK	FOOD WAREHOUSE
" "	1983	NIBLACK TADCO CORN HILL EX. PRINTER'S WRHSE UPSTATE TRADING	BULK FOODS WAREHOUSE (POSSIBLE INKS, SOLVENTS)

TABLE I
SITE USAGE
FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

ADDRESS	YEAR	NAME	USAGE (POSSIBLE/DOCUMENTED O&M USAGE)
AREA BOUND BY GENESEE RIVER, VIOLETTA, EXCHANGE AND FLINT STREETS	1866-1936	VACUUM OIL CO.	PETROLEUM DISTILLING PLANT (PRODUCTS INCLUDED NAPTHA, KEROSENE AND OILS; NEWS ACCOUNTS REFER TO DISPOSAL OF PROCESS WASTES BY DUMPING INTO THE GENESEE VALLEY CANAL, GENESEE RIVER, AND BY LAND BURIAL
1 FLINT STREET	1950	VACUUM OIL CO.	VACANT BARREL BUILDING
" "	1960	DANNEMILLER	COFFEE WAREHOUSE
" "	1970	FASCO	WAREHOUSE
" "	1978	VACANT	VACANT WAREHOUSE
" "	1983	KNEPPAR METAL	METAL BUYERS
" "	1989	KNEPPAR	LICENSED HAZARDOUS WASTE TRANSPORTER
15 FLINT STREET	1950	ROCHESTER SCRAP BAILING CO.	METAL DEALERS
" "	1960	" " "	
" "	1946-1961?	"	METAL DEALERS (1000 GAL. GAS TANK, FIRE MARSHAL)
" "	1970	VACANT	VACANT
" "	1978-1989	FLINT AUTO WRECKERS	AUTO JUNKYARD (POSSIBLE PETROLEUM PRODUCT STORAGE)

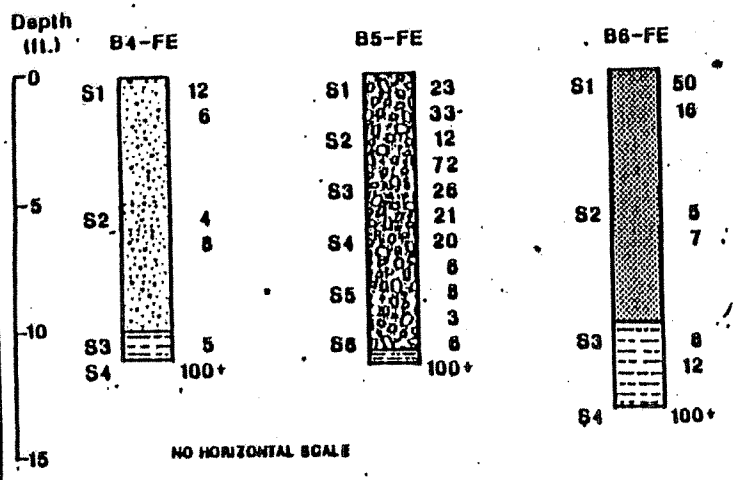
FILE NO 70082-40

TABLE II
SOIL VAPOR SURVEY RESULTS
FLINT-EXCHANGE SITE
ROCHESTER CITY SCHOOL DISTRICT

Sample	Date	Depth (ft.)	HEX	BNZ	TOL	EBZ	M-XYL	O-XYL	Unknowns**	Total Detected
Probe Blank	6-7-89	--	--	--	--	--	--	--	--	--
FE01		3.25	--	--	--	--	--	--	0.077	0.077
FE02		3.25	--	--	--	--	--	--	0.159*	0.159
FE02D		3.25	--	--	--	--	--	--	0.145*	0.145
FE03		3.25	--	--	--	--	--	.049	0.625	0.674
FE03D		3.25	--	--	--	--	--	.062	0.861	0.923
FE04		3.25	--	--	--	--	--	--	TR	0.012
FE05		3.25	--	--	--	--	--	--	TR	0.019
FE06		3.25	--	--	--	--	--	--	0.040	0.040
FE07		3.25	--	--	--	--	--	--	0.033	0.033
FE08		3.25	--	--	--	--	--	--	TR	0.027
FE09		3.25	--	--	--	--	--	--	0.030	0.030
Probe Blank	6-8-89	--	--	--	--	--	--	--	0.040	0.040
Probe Blank		--	--	--	--	--	--	--	TR	0.015
FE10		3.25	--	--	--	--	--	--	0.060*	0.060
FE11		3.25	--	--	TR	--	--	--	0.179*	0.193
FE11D		3.25	--	--	TR	--	--	--	0.190*	0.204
FE12		3.25	--	--	--	--	--	--	0.057*	0.057
Carrier Gas	6-12-89	--	--	--	--	--	--	--	--	--
Probe Blank		--	--	--	--	--	--	--	--	--
FE13		3.25	--	--	--	--	--	--	0.143*	0.143
FE14		3.25	--	--	--	--	--	--	TR	0.014
FE15		3.25	--	--	--	--	--	--	0.036	0.036
FE16		3.25	--	--	--	--	--	--	0.034	0.034
FE17		3.25	--	--	--	--	--	--	TR	0.018
FE17D		3.25	--	--	--	--	--	--	TR	0.019
FE18		3.25	--	--	--	--	--	--	TR	0.020
FE19		3.25	--	--	--	--	--	--	0.042	0.042
FE20		3.25	--	--	--	--	--	--	0.054	0.054
Probe Blank	6-13-89	--	--	--	--	--	--	--	TR	0.012
FE21		3.25	--	--	--	--	--	--	TR	0.012
FE22		3.25	--	--	--	--	--	--	--	--
FE23		3.25	--	--	--	--	--	--	--	--
FE24		3.25	--	--	--	--	--	--	--	--
FE25		3.25	--	--	--	--	--	--	0.034	0.034
FE26		3.25	--	--	--	--	--	--	0.051	0.051
FE27		3.25	--	--	--	--	--	--	TR	0.015
FE28		3.25	--	--	--	--	--	--	TR	0.022

Notes:
1. All concentrations listed in parts per million (ppm).
2. Compound Abbreviations:
   HEX = hexane TOL = toluene M-XYL = m-xylene
   BNZ = benzene EBZ = ethyl benzene O-XYL = o-xylene
3. ** Unknown volatile compounds quantified as sum of unidentified peak areas compared to the signal response of toluene.
4. * Possible presence of methane.
5. TR Trace (concentration between 0.01 and 0.03 ppm).
   -- Not detected (concentrations less than 0.01 ppm).
6. D Duplicate Sample.
7. See Figure 2, Site and Subsurface Exploration Plan, for sample locations.
8. Soil vapor sampling performed by H&A of New York personnel between 7 and 13 June 1989 using a Photovac 10S50 Portable Gas Chromatograph.
9. See accompanying text for additional information.

FILE NO. 42-40



NOTES:

1. SUBSURFACE CONDITIONS DEPICTED IN THE BORING REPRESENTATIONS ABOVE:
   - SANDY FILL
   - FLUVIAL SILT
   - CINDER, SAND & GRAVEL FILL
   - SILT, SAND & GRAVEL FILL
2. EACH TWO FOOT SPLIT-SPOON SAMPLE IS INDICATED BY THE LETTER "S" FOLLOWED BY THE SAMPLE NUMBER, SHOWN TO THE LEFT OF EACH BORING REPRESENTATION ABOVE.
3. THE NUMBERS TO THE RIGHT OF EACH BORING REPRESENTATION ARE THE STANDARD PENETRATION RESISTANCE, THE NUMBER OF BLOWS NEEDED TO ADVANCE THE STANDARD SPLIT SPOON SAMPLER 1.0 FT. INTO UNDISTURBED SOIL WITH A 140-LB. WEIGHT FALLING FREELY FOR 30 INCHES.
4. SEE ACCOMPANYING REPORT FOR ADDITIONAL INFORMATION AND TEST BORING REPORTS.

SAMPLE NAME	SAMPLE COMPOSITION	ANALYSES CONDUCTED	ANALYTICAL RESULTS (COMPARISON VALUES)
FEMET	B4-FE, S1 B2-H, S1 B3-H, S1	Priority Pollutant Metals	Arsenic 0.0095 (5.0) Cadmium 0.0007 (0.06) Chromium 0.011 (0.4) Copper 0.029 (20.0) Lead 0.3 (10.0) Mercury 0.00024 (0.03) Nickel 0.011 (2.0) Zinc 0.11 (50.0)
B4-S3	B4-FE, S3	Volatile Organic Compounds	Methylene Chloride ≤0.0003 (93.0) Toluene ≤0.0007 (20.0)
B4-S3	B4-FE, S3	Petroleum Hydrocarbons	None detected
FEXAN	B4-FE, S1 B4-FE, S2 B5-FE, S2 B6-FE, S2	Semi-Volatile Organic Compounds	Acenaphthene ≤0.00033 Anthracene ≤0.00033 Benzo(A)anthracene ≤0.00033 (0.224) Benzo(A)pyrene ≤0.00033 (0.0609) Benzo(B)fluoranthene ≤0.00033 Chrysene ≤0.00033 Fluoranthene ≤0.00033 Fluorene ≤0.00033 Phenanthrene ≤0.00033 Pyrene ≤0.00033
FEXAN	B4-FE, S1 B4-FE, S2 B5-FE, S2 B6-FE, S2	Hazardous Waste Characteristics	Extractible Barium 0.16 (100.0) Extractable Cadmium 0.011 (1.0) Extractable Lead 0.16 (5.0)

Notes:

1. All concentrations above in parts per million (ppm). Note, most concentrations in lab report, Appendix B, are in parts per billion (ppb).
2. NA Comparison value not available.
3. See References at end of report text for comparison criteria sources.

H&A of New York

FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

SUMMARY OF SUBSURFACE CONDI
AND LABORATORY ANALYTICAL RESI

SCALE AS SHOWN JULY 8

TAI

FILE NO. 70082-40

CHARRETTE

APPENDIX A

Test Boring Reports

H&A OF NEW YORK, ROCHESTER, NEW YORK Consulting Geotechnical Engineers, Geologists and Hydrogeologists	TEST BORING REPORT	BORING NO. B4-FE

PROJECT: FLINT-EXCHANGE SITE
CLIENT: ROCHESTER CITY SCHOOL DISTRICT
CONTRACTOR: ROCHESTER DRILLING CO., INC.

FILE NO. 70082-40
SHEET NO. 1 OF 1
LOCATION: See Plan

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	AUGER	SS	---
INSIDE DIAMETER (IN)	4-1/4	1-3/8	---
HAMMER WEIGHT (LB)	---	140	---
HAMMER FALL (IN)	---	30	---

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE: CME 75, Truck-Mounted
BIT TYPE: ---
DRILL MUD: ---
OTHER: Advanced augers to 11.1 ft.

ELEVATION: ---
DATUM: ---
START: 8 June 1989
FINISH: 8 June 1989
DRILLER: T. Smith
H&A REP: W. Lanik

DEPTH (FT)	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	STRATA CHANGE (FT)	VISUAL CLASSIFICATION AND REMARKS
0		7 5 3 3	S1 4"/24"	0.0 2.0		Loose light brown coarse to fine SAND, little fine gravel with asphalt fragments. -FILL-
5		2 2 3 5	S2 8"/24"	5.0 7.0		Loose dark brown to black coarse to medium SAND, trace fine gravel, with brick fragments, wet. Slight petroleum odor.
10		2 3 100/0.1 100/0.1	S3 13"/13" S4 1"/1"	10.0 11.1 11.1 11.2	10.0 11.1	Loose dark gray fine sandy SILT, little gravel, trace clay. Slight petroleum odor. -FLUVIAL- Top of rock at 11.1 ft. Very dense dark gray DOLOMITE FRAGMENTS, little silt. -SEVERELY WEATHERED BEDROCK-
15						Notes: 1. Completed borehole backfilled with borehole cuttings.
20						
25						

WATER LEVEL DATA

DATE	TIME	ELAPSED TIME (HR)	DEPTH (FT) TO: BOTTOM OF CASING	BOTTOM OF HOLE	WATER
6/8/89	1600	0.5	11.0	11.2	4.6

SAMPLE IDENTIFICATION

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon

SUMMARY

OVERBURDEN (LIN FT):	11.2 ft.
ROCK CORED (LIN FT):	---
SAMPLES:	4S
BORING NO.	B4-FE

H&A OF NEW YORK, ROCHESTER, NEW YORK Consulting Geotechnical Engineers, Geologists and Hydrogeologists	TEST BORING REPORT	BORING NO. B5-FE

PROJECT: FLINT-EXCHANGE SITE
CLIENT: ROCHESTER CITY SCHOOL DISTRICT
CONTRACTOR: ROCHESTER DRILLING CO., INC.

FILE NO. 70082-40
SHEET NO. 1 OF 1
LOCATION: See Plan

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	AUGER	SS	---
INSIDE DIAMETER (IN)	4-1/4	1-3/8	---
HAMMER WEIGHT (LB)	---	140	---
HAMMER FALL (IN)	---	30	---

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE: CME 75, Truck-Mounted
BIT TYPE: ---
DRILL MUD: ---
OTHER: Advanced augers to 11.4 ft.

ELEVATION: ---
DATUM: ---
START: 9 June 1989
FINISH: 9 June 1989
DRILLER: T. Smith
H&A REP: W. Lanik

DEPTH (FT)	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	STRATA CHANGE (FT)	VISUAL CLASSIFICATION AND REMARKS
		7 16 23 10	S1 7"/24"	0.0 2.0		Dense light brown gravelly coarse to fine SAND, trace roots. -FILL-
		6 6 42 30	S2 15"/24"	2.0 4.0		Dense black CINDER PARTICLES and red BRICK FRAGMENTS.
5		12 14 11 10	S3 13"/24"	4.0 6.0		Medium dense dark brown to black CINDER PARTICLES. -FILL-
		10 10 4 2	S4 6"/24"	6.0 8.0		Medium dense dark brown coarse sandy coarse to fine GRAVEL, wet.
		4 4 1 2	S5 6"/24"	8.0 10.0		Loose dark brown coarse to fine GRAVEL, trace coarse sand. -FILL-
10		4 2 100/0.4	S6 12"/17"	10.0 11.4	11.0 11.4	Same. Dark gray fine sandy SILT. -FLUVIAL-
						Top of Rock at 11.4 ft.
15						Note: 1. Completed borehole backfilled with borehole cuttings.
20						
25						

WATER LEVEL DATA

DATE	TIME	ELAPSED TIME (HR)	DEPTH (FT) TO: BOTTOM OF CASING	DEPTH (FT) TO: BOTTOM OF HOLE	DEPTH (FT) TO: WATER
6/9/89	0900	0.5	8.0	11.4	7.7

SAMPLE IDENTIFICATION

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon

SUMMARY

OVERBURDEN (LIN FT):	11.4 ft.
ROCK CORED (LIN FT):	---
SAMPLES:	6S
BORING NO.	B5-FE

H&A OF NEW YORK, ROCHESTER, NEW YORK
Consulting Geotechnical Engineers,
Geologists and Hydrogeologists

TEST BORING REPORT

BORING NO. B6-FE

PROJECT: FLINT-EXCHANGE SITE
CLIENT: ROCHESTER CITY SCHOOL DISTRICT
CONTRACTOR: ROCHESTER DRILLING CO., INC.

FILE NO. 70082-40
SHEET NO. 1 OF 1
LOCATION: See Plan

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	AUGER	SS	---
INSIDE DIAMETER (IN)	4-1/4	1-3/8	---
HAMMER WEIGHT (LB)	---	140	---
HAMMER FALL (IN)	---	30	---

DRILLING EQUIPMENT & PROCEDURES
RIG TYPE: CME 75, Truck-Mounted
BIT TYPE: ---
DRILL MUD: ---
OTHER: Advanced augers to 13.0 ft.

ELEVATION: ---
DATUM: ---
START: 9 June 1989
FINISH: 9 June 1989
DRILLER: T. Smith
H&A REP: W. Lanik

DEPTH (FT)	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	STRATA CHANGE (FT)	VISUAL CLASSIFICATION AND REMARKS
0		23 27 10 6	S1 8"/24"	0.0 2.0		Dense gray to black coarse to fine gravelly coarse to medium SAND, with concrete fragments. -FILL-
5		2 3 3 4	S2 10"/24"	5.0 7.0		Loose brown fine sandy SILT, trace gravel, trace coarse sand. -FILL-
10		3 5 6 6	S3 14"/24"	10.0 12.0	10.0	Medium dense gray fine sandy SILT, trace clay; wet. -FLUVIAL-
15		100/0.2	S4 2"/2"	13.0 13.2	13.0	Top of Rock at 13.0 ft. Very dense dark gray silty DOLOMITE FRAGMENTS. Notes: 1. Completed borehole backfilled with borehole cuttings.
20						
25						

WATER LEVEL DATA

DATE	TIME	ELAPSED TIME (HR)	DEPTH (FT) TO: BOTTOM OF CASING	BOTTOM OF HOLE	WATER
6/9/89	1100	1.0	12.5	13.2	9.2

SAMPLE IDENTIFICATION
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon

SUMMARY
OVERBURDEN (LIN FT): 13.2
ROCK CORED (LIN FT): ---
SAMPLES: 4S
BORING NO. B6-FE

TABLE I
SITE USAGE
FLINT-EXCHANGE SITE
ROCHESTER, NEW YORK

ADDRESS	YEAR	NAME	USAGE (POSSIBLE/DOCUMENTED O&HM USAGE)
22 FLINT STREET	1950	SCHWARTZ	ELECTRICAL EQUIPMENT (POSSIBLE METAL CLEANING SOLVENTS OR PCBS)
" "	1960	MILLS TALBOT	ELECTRICAL EQUIPMENT (POSSIBLE METAL CLEANING SOLVENTS OR PCBS)
" "	1960-1967	?	(1000 GAL. GAS TANK, FIRE MARSHAL)
" "	1970	EAT CORP.	WAREHOUSE
" "	1974	?	(MAINTAIN 1000 GAL. GAS TANK, FIRE MARSHAL)
" "	1978	SPECIALIZED	WAREHOUSE
" "	1983	NIBLACK	FOOD WAREHOUSE
" "	1983	NIBLACK	BULK FOODS
		TADCO	
		CORN HILL EX.	
		PRINTER'S WRHSE	WAREHOUSE (POSSIBLE INKS, SOLVENTS)
		UPSTATE TRADING	

FILE NO. 1082-40

H & A OF NEW YORK
ROCHESTER, NEW YORK

TABLE I

TABLE II
SOIL VAPOR SURVEY RESULTS
FLINT-EXCHANGE SITE
ROCHESTER CITY SCHOOL DISTRICT

Sample	Date	Depth (ft.)	HEX	BNZ	TOL	EBZ	M-XYL	O-XYL	Unknowns**	Total Detected
Probe Blank	6-7-89	--	--	--	--	--	--	--	--	--
FE01		3.25	--	--	--	--	--	--	0.077	0.077
FE02		3.25	--	--	--	--	--	--	0.159*	0.159
FE02D		3.25	--	--	--	--	--	--	0.145*	0.145
FE03		3.25	--	--	--	--	--	.049	0.625	0.674
FE03D		3.25	--	--	--	--	--	.062	0.861	0.923
FE04		3.25	--	--	--	--	--	--	TR	0.012
FE05		3.25	--	--	--	--	--	--	TR	0.019
FE06		3.25	--	--	--	--	--	--	0.040	0.040
FE07		3.25	--	--	--	--	--	--	0.033	0.033
FE08		3.25	--	--	--	--	--	--	TR	0.027
FE09		3.25	--	--	--	--	--	--	0.030	0.030
Probe Blank	6-8-89	--	--	--	--	--	--	--	0.040	0.040
Probe Blank		--	--	--	--	--	--	--	TR	0.015
FE10		3.25	--	--	--	--	--	--	0.060*	0.060
FE11		3.25	--	--	TR	--	--	--	0.179*	0.193
FE11D		3.25	--	--	TR	--	--	--	0.190*	0.204
FE12		3.25	--	--	--	--	--	--	0.057*	0.057
Carrier Gas	6-12-89	--	--	--	--	--	--	--	--	--
Probe Blank		--	--	--	--	--	--	--	--	--
FE13		3.25	--	--	--	--	--	--	0.143*	0.143
FE14		3.25	--	--	--	--	--	--	TR	0.014
FE15		3.25	--	--	--	--	--	--	0.036	0.036
FE16		3.25	--	--	--	--	--	--	0.034	0.034
FE17		3.25	--	--	--	--	--	--	TR	0.018
FE17D		3.25	--	--	--	--	--	--	TR	0.019
FE18		3.25	--	--	--	--	--	--	TR	0.020
FE19		3.25	--	--	--	--	--	--	0.042	0.042
FE20		3.25	--	--	--	--	--	--	0.054	0.054
Probe Blank	6-13-89	--	--	--	--	--	--	--	TR	0.012
FE21		3.25	--	--	--	--	--	--	TR	0.012
FE22		3.25	--	--	--	--	--	--	--	--
FE23		3.25	--	--	--	--	--	--	--	--
FE24		3.25	--	--	--	--	--	--	--	--
FE25		3.25	--	--	--	--	--	--	0.034	0.034
FE26		3.25	--	--	--	--	--	--	0.051	0.051
FE27		3.25	--	--	--	--	--	--	TR	0.015
FE28		3.25	--	--	--	--	--	--	TR	0.022

Notes:
1. All concentrations listed in parts per million (ppm).
2. Compound Abbreviations:
   HEX = hexane TOL = toluene M-XYL = m-xylene
   BNZ = benzene EBZ = ethyl benzene O-XYL = o-xylene
3. ** Unknown volatile compounds quantified as sum of unidentified peak areas compared to the signal response of toluene.
4. * Possible presence of methane.
5. TR Trace (concentration between 0.01 and 0.03 ppm).
   -- Not detected (concentrations less than 0.01 ppm).
6. D Duplicate Sample.
7. See Figure 2, Site and Subsurface Exploration Plan, for sample locations.
8. Soil vapor sampling performed by H&A of New York personnel between 7 and 13 June 1989 using a Photovac 10S50 Portable Gas Chromatograph.
9. See accompanying text for additional information.

FILE NO 7

H & A OF NEW YORK
ROCHESTER, NEW YORK

APPENDIX A

Test Boring Reports

H&A OF NEW YORK, ROCHESTER, NEW YORK Consulting Geotechnical Engineers, Geologists and Hydrogeologists	TEST BORING REPORT	BORING NO. B5-FE

JECT: FLINT-EXCHANGE SITE
NT: ROCHESTER CITY SCHOOL DISTRICT
NTRACTOR: ROCHESTER DRILLING CO., INC.

FILE NO. 70082-40
SHEET NO. 1 OF 1
LOCATION: See Plan

ELEVATION: ---
DATUM: ---
START: 9 June 1989
FINISH: 9 June 1989
DRILLER: T. Smith
H&A REP: W. Lanik

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	AUGER	SS	---
INSIDE DIAMETER (IN)	4-1/4	1-3/8	---
HAMMER WEIGHT (LB)	---	140	---
HAMMER FALL (IN)	---	30	---

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE: CME 75, Truck-Mounted
BIT TYPE: ---
DRILL MUD: ---
OTHER: Advanced augers to 11.4 ft.

DEPTH (FT)	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	STRATA CHANGE (FT)	VISUAL CLASSIFICATION AND REMARKS
0		7 16 23 10	S1 7"/24"	0.0 2.0		Dense light brown gravelly coarse to fine SAND, trace roots. -FILL-
		6 6 42 30	S2 15"/24"	2.0 4.0		Dense black CINDER PARTICLES and red BRICK FRAGMENTS.
5		12 14 11 10	S3 13"/24"	4.0 6.0		Medium dense dark brown to black CINDER PARTICLES. -FILL-
		10 10 4 2	S4 6"/24"	6.0 8.0		Medium dense dark brown coarse sandy coarse to fine GRAVEL, wet.
		4 4 1 2	S5 6"/24"	8.0 10.0		Loose dark brown coarse to fine GRAVEL, trace coarse sand. -FILL-
10		4 2 100/0.4	S6 12"/17"	10.0 11.4	11.0 11.4	Same. Dark gray fine sandy SILT. -FLUVIAL-
						Top of Rock at 11.4 ft.
15						Note: 1. Completed borehole backfilled with borehole cuttings.
20						
25						

WATER LEVEL DATA

DATE	TIME	ELAPSED TIME (HR)	DEPTH (FT) TO: BOTTOM OF CASING	DEPTH (FT) TO: BOTTOM OF HOLE	DEPTH (FT) TO: WATER
6/9/89	0900	0.5	8.0	11.4	7.7

SAMPLE IDENTIFICATION

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon

SUMMARY

OVERBURDEN (LIN FT):	11.4 ft.
ROCK CORED (LIN FT):	---
SAMPLES:	6S
BORING NO.	B5-FE

APPENDIX E

1999 SOIL GAS SURVEY REPORT

EMFLUX® Report No. EM1138

EMFLUX® Passive, Non-Invasive Soil-Gas Survey

RE...
NOV 29 1999
DER,HA... REMED
FEE...

FORMER VACUUM OIL FACILITY
ROCHESTER, NY

Prepared for

International Technology Corporation
2200 Cottontail Lane
Somerset, NJ 08873-1248

by

BEACON Environmental Services, Inc.
2000 Grafton Shop Road
Forest Hill, MD 21050

November 19, 1999

Applying Results from Soil-Gas Surveys

The utility of soil-gas surveys is directly proportional to their accuracy in reflecting and representing changes in the subsurface concentrations of source compounds. An EMFLUX® soil-gas survey measures the mass collected from the vapor-phase of the source. The vapor-phase is merely a fractional trace of the source, so, as a matter of convenience, the units used in reporting detection values from EMFLUX® surveys are smaller than those employed for source-compound concentrations.

The critical fact is that, whatever the relative concentrations of source and associated soil gas, best results are realized when the ratio of soil-gas measurements to actual subsurface concentrations remains as close to constant as the real world permits. It is the reliability and consistency of this ratio, not the particular units of mass (*e.g.*, nanograms) that determine usefulness. Thus, BEACON emphasizes the necessity of conducting – at minimum – follow-on intrusive sampling at one or two points which show relatively high EMFLUX® values to obtain corresponding concentrations of soil and ground-water contaminants. These correspondent values furnish the basis for approximating the required ratio. Once that ratio is established, it can be used in conjunction with EMFLUX® measurements (regardless of the units adopted) to estimate subsurface contaminant concentrations across the survey field. It is important to keep in mind, however, that specific conditions at individual sample points, including soil porosity and permeability, depth to contamination, and perched ground water, can have significant impact on soil-gas measurements at those locations.

When EMFLUX® Surveys are handled in this way, the data provide information which can yield substantial savings in drilling costs and in time. They furnish, among other things, a checklist of compounds expected at each survey location and help to determine how and where drilling budgets can most effectively be spent.

EMFLUX® Survey Number: EM1138

Former Vacuum Oil Facility
Rochester, NY

This EMFLUX® Soil-Gas Survey Report has been prepared for International Technology Corporation (IT) by Beacon Environmental Services, Inc. (BEACON) in accordance with the terms of Purchase Order No.127282, dated October 14, 1999. IT performed this project under contract to New York State Department of Environmental Conservation (NYSDEC). BEACON's principal contact at IT for this project has been Mr. Prabal Amin.

1. Objectives

Soil-gas samples were collected to determine the presence, identity, and relative strength of targeted contaminants in soil and/or ground water at the Former Vacuum Oil Facility. Survey results will be used to determine the distribution of contaminants and to guide further site investigation.

2. Target Compounds

This survey targeted the 25 compounds listed in **Attachment 1**, which supplies the resulting laboratory data in nanograms (ng) of specific compound per cartridge.

3. Survey Description

• No. of Field Sample Points:	53
• No. of Trip Blanks:	2
• Total No. of EMFLUX® Cartridges:	55

4. Field Work

NYSDEC was provided an EMFLUX® Field Kit with the equipment needed to conduct a 53-point EMFLUX® Soil-Gas Survey. Collectors were deployed on October 20, 1999 and retrieved November 4, 1999. **Attachment 2** describes the field procedures used. Individual deployment and retrieval times will be found in the Field Deployment Report (**Attachment 3**).

5. Analysis and Reporting Dates

- BEACON's laboratory received 55 sample cartridges for analysis on November 5, 1999.
- BEACON's laboratory analyzed the samples for the specified compounds, using thermal desorption and a capillary-column gas chromatograph (GC) with a photoionization detector

(PID), a flame ionization detector (FID), and a dry electrolytic conductivity detector (DELCD) in accordance with EPA Method 8015B/8021 (Modified), as described in **Attachment 4.**

- Analysis was completed on November 11, 1999, and following a laboratory review, results were provided to IT that same day.

6. Report Notes and Quality Assurance/Quality Control Factors

- **Attachment 1** provides survey results in nanograms per cartridge by sample-point number and compound name. The quantitation levels represent values above which quantitative laboratory results can be achieved within specified limits of precision and with a high degree of confidence. The quantitation level of each compound, therefore, provides a reliable basis for comparison of the relative strength of individual detections of that compound.

- **Data Compatibility.** It is important to note that when sample locations are covered with or near the edge of an artificial surface (*e.g.*, asphalt or concrete), sample measurements are often distorted (increased) significantly. Such distortion can be attributed to the fact that gas rising from sources beneath impermeable caps tends to reach equilibrium in relatively short periods of time and that, once equilibrium is reached, the soil-gas concentration measured at any point in a vertical line between source and cap is theoretically the same. Thus, a reading taken immediately below or near an impermeable surface is much higher than it would be in the absence of such a cap.

- The **Chain-of-Custody** form, which was shipped with the samples for this survey, is supplied as **Attachment 5.**

- **Laboratory QA/QC procedures** consist of control blanks and verifications, as well as system calibration, as specified for EPA Method 8015B/8021. Laboratory personnel conducted internal control blanks and internal control verification analyses daily to ensure that the system was contaminant free and properly calibrated. The system was calibrated using external-standard procedures to at least three different concentrations for each compound targeted.

- **QA/QC Contaminant Corrections.** Following EPA guidelines, EMFLUX® laboratory data is not corrected for method blank and trip blank contamination values; all contamination detected on QA/QC samples is reported in **Attachment 1.** Subsequent handling of QA/QC sample contamination depends upon the circumstances and origin of the sample; any corrective conventions noted below have proved highly useful in deriving accurate and reproducible interpretations of survey data in prior EMFLUX® Surveys. *No other methods thus far tested have produced comparable levels of quality.*

Laboratory method blanks are run each day with project samples to identify contamination present in the laboratory. If contamination is detected on a method blank, detections of identical compounds on samples analyzed the same day are considered to be suspect and are flagged in the laboratory report. The laboratory method blanks analyzed in connection with the present samples revealed no contamination.

Trip blanks are EMFLUX® cartridges prepared, transported, and analyzed with other samples but intentionally not exposed. The trip blanks (labeled Trip-1 and Trip-2 in **Attachment 1**) recorded none of the targeted compounds, indicating that the survey site itself is the source of detected contamination.

- As additional QA/QC, NYSDEC deployed a duplicate field sample for sample **C2** designated **C2D**. Because duplicates cannot be identically located with their base field samples and because it is possible for even small geophysical differences between sample locations to affect soil-gas-emission quantities, comparisons between duplicates and base samples should be made on a qualitative basis, as quantitative results may be subject to random distortions. In general, a duplicate correspondence should be defined as a difference of 50% or less between contaminant data for base and duplicate samples. Also, for the purpose of calculating correspondences, all non-detections should be assigned as a baseline value the quantitation level for the specific contaminant. Based on these assumptions, a 100% correlation was found between the duplicate sample and its base sample.

- **Survey findings** are relative exclusively to this project and should not routinely be compared with results of other EMFLUX® Surveys. *To establish a relationship between reported soil-gas measurements and actual subsurface contaminant concentrations, which will indicate those detections representing significant subsurface contamination, BEACON recommends the guidelines on the inside front cover of this report.*

- The following **Attachments** are included:

  -1- Laboratory Report
  -2- EMFLUX® Field Procedures
  -3- Field Deployment Report
  -4- Laboratory Procedures
  -5- Chain-of-Custody Form

Attachment 1

Laboratory Report

Attachment 1

Laboratory Report
Results in Nanograms (ng)
Analysis Completed: November 11, 1999

EMFLUX Project No. EM1138

In this analysis 55 EMFLUX samples were analyzed under the requirements of EPA Method 8021/8015B using an SRI 8610 Gas Chromatograph equipped with a thermal desorber, a photoionization detector, a flame ionization detector and a dry electrolytic conductivity detector.

SAMPLE NO.	A1	A2	A3	B2	B3	B4	C1	C2
COMPOUNDS								
1,1-Dichloroethene	U	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	87	U
Carbon Tetrachloride	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U
MTBE	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	34	U	U	U
Ethylbenzene	U	U	U	26	240	U	U	U
Xylenes (total)	U	40	1,100	74	250	U	U	U
1,3,5-Trimethylbenzene	U	U	170	U	180	180	U	U
1,2,4-Trimethylbenzene	U	U	120	60	93	U	U	U
Naphthalene	U	U	U	40	25	U	U	U
TPH Volatiles	U	U	3,600	1,400	14,000	2,500	U	280

Reported Quantitation Level = 25 nanograms for individual compounds
Reported Quantitation Level = 250 nanograms for TPH Volatiles
U = Below Reported Quantitation Level

Attachment 1
(continued)
Laboratory Report
Results in Nanograms (ng)
Analysis Completed: November 11, 1999

SAMPLE NO.	C2D	C3	C4	D2	D3	D4	D5	D6
COMPOUNDS								
1,1-Dichloroethene	U	27	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	62	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	980	U	U	140	U	U	29
Carbon Tetrachloride	U	U	U	U	U	U	U	U
Trichloroethene	U	27	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	54	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U
MTBE	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U
Toluene	U	35	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U
Xylenes (total)	U	49	140	U	U	U	U	U
1,3,5-Trimethylbenzene	U	28	U	U	U	U	U	U
1,2,4-Trimethylbenzene	U	U	U	U	U	U	U	U
Naphthalene	U	26	U	U	U	U	U	U
TPH Volatiles	U	1,100	580	U	U	U	U	U

Reported Quantitation Level = 25 nanograms for individual compounds
Reported Quantitation Level = 250 nanograms for TPH Volatiles
U = Below Reported Quantitation Level

Attachment 1
(continued)
Laboratory Report
Results in Nanograms (ng)
Analysis Completed: November 11, 1999

SAMPLE NO.	D7	E1	E2	E3	E4	E5	E6	F2
COMPOUNDS								
1,1-Dichloroethene	U	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U
MTBE	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U
Xylenes (total)	U	U	U	U	51	U	U	U
1,3,5-Trimethylbenzene	U	U	U	U	U	U	U	U
1,2,4-Trimethylbenzene	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U
TPH Volatiles	U	260	260	U	390	U	U	U

Reported Quantitation Level = 25 nanograms for individual compounds
Reported Quantitation Level = 250 nanograms for TPH Volatiles
U = Below Reported Quantitation Level

Attachment 1
(continued)
Laboratory Report
Results in Nanograms (ng)
Analysis Completed: November 11, 1999

SAMPLE NO.	F3	F4	F5	F6	G2	G3	G4	G5
COMPOUNDS								
1,1-Dichloroethene	U	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	42	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U
MTBE	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U
Toluene	U	U	46	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U
Xylenes (total)	39	U	3,100	U	U	U	U	U
1,3,5-Trimethylbenzene	U	U	860	U	U	U	U	U
1,2,4-Trimethylbenzene	U	U	2,100	U	38	79	U	U
Naphthalene	27	U	U	U	U	U	U	U
TPH Volatiles	U	U	53,000	1,100	U	2,500	330	430

Reported Quantitation Level = 25 nanograms for individual compounds
Reported Quantitation Level = 250 nanograms for TPH Volatiles
U = Below Reported Quantitation Level

Attachment 1
(continued)
Laboratory Report
Results in Nanograms (ng)
Analysis Completed: November 11, 1999

SAMPLE NO.	G6	H2	H3	H4	H5	H6	H7	H8
COMPOUNDS								
1,1-Dichloroethene	U	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U
MTBE	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U
Xylenes (total)	U	U	U	U	U	U	U	U
1,3,5-Trimethylbenzene	U	U	U	U	U	U	U	U
1,2,4-Trimethylbenzene	U	U	U	U	U	U	U	U
Naphthalene	86	U	U	42	U	U	U	U
TPH Volatiles	1,000	U	U	490	U	U	U	U

Reported Quantitation Level = 25 nanograms for individual compounds
Reported Quantitation Level = 250 nanograms for TPH Volatiles
U = Below Reported Quantitation Level

Attachment 1
(continued)
Laboratory Report
Results in Nanograms (ng)
Analysis Completed: November 11, 1999

SAMPLE NO.	I4	I5	I6	I7	J5	J6	J7	J8
COMPOUNDS								
1,1-Dichloroethene	U	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U
MTBE	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U
Xylenes (total)	U	U	U	U	U	U	U	U
1,3,5-Trimethylbenzene	U	U	U	U	U	U	U	U
1,2,4-Trimethylbenzene	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U
TPH Volatiles	U	U	U	U	U	U	U	900

Reported Quantitation Level = 25 nanograms for individual compounds
Reported Quantitation Level = 250 nanograms for TPH Volatiles
U = Below Reported Quantitation Level

Attachment 1
(continued)
Laboratory Report
Results in Nanograms (ng)
Analysis Completed: November 11, 1999

SAMPLE NO.	K6	K7	K8	L6	L7	Trip-1	Trip-2
COMPOUNDS							
1,1-Dichloroethene	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
MTBE	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
Toluene	U	66	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Xylenes (total)	U	U	U	36	U	U	U
1,3,5-Trimethylbenzene	U	U	U	U	U	U	U
1,2,4-Trimethylbenzene	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U
TPH Volatiles	U	U	U	400	U	U	U

Reported Quantitation Level = 25 nanograms for individual compounds
Reported Quantitation Level = 250 nanograms for TPH Volatiles
U = Below Reported Quantitation Level

Attachment 2

FIELD PROCEDURES FOR EMFLUX® SOIL-GAS SURVEYS

The following field procedures are routinely used during EMFLUX® Soil-Gas Surveys. Modifications can be and are incorporated from time to time in response to individual project requirements. In all instances, BEACON adheres to EPA-approved Quality Assurance and Quality Control practices.

A. Field personnel carry EMFLUX® system components and support equipment to the site and deploy the EMFLUX® Collectors in a prearranged survey pattern. Although EMFLUX® Collectors require only one person for emplacement and retrieval, the specific number of field personnel required depends upon the scope and schedule of the project. Each Collector emplacement generally takes less than two minutes.

B. At each survey point, a field technician clears vegetation as needed and, using a slide hammer with a ½" diameter rod, creates a hole three-feet deep. The technician then uses a hammer and a ¾" diameter pointed metal stake to widen the top four inches of the hole. [Note: For locations covered with asphalt, concrete, or gravel surfacing, the field technician drills a 1"- to 1½"-diameter hole through the surfacing to the soils beneath. If necessary, the Collector can be sleeved with a ¾" i.d. metal sleeve.] The solid cap on a Sampler Vial, which contains an adsorbent cartridge, is removed and replaced with a Sampling Cap (a one-hole cap with a screen meshing insert). The stake is removed from the hole in the ground and the Sampler is inserted, with the Sampling Cap end facing down, in the top four inches of the hole. The date and time of emplacement and other relevant information are recorded on the Field Deployment Form.

C. One or more trip blanks are included as part of the quality-control procedures.

D. Once all EMFLUX® Collectors have been deployed, field personnel schedule Collector recovery (typically 72 hours after emplacement) and depart, taking all no-longer-needed equipment and materials with them).

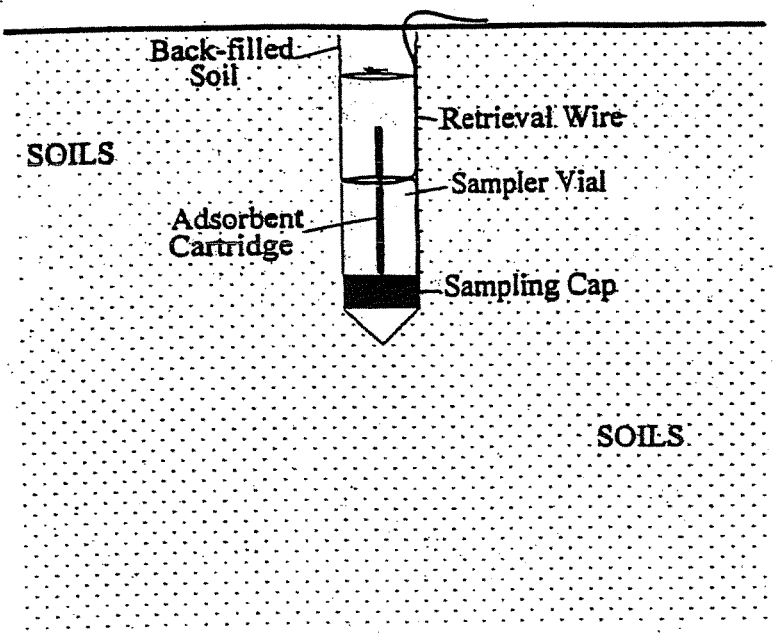
E. Field personnel retrieve the Collectors at the end of the exposure period. At each location, a field technician withdraws the Collector from its hole and wipes the outside of the vial clean using gauze cloth; following removal of the Sampling Cap, the threads of the vial are also cleaned. A solid plastic cap is screwed onto the vial and the sample location number is written on the label. The technician then records sample-point location, date, time, etc. on the Field Deployment Form.

F. Sampling holes are refilled with soil, sand, or other suitable material. If Collectors have been installed through asphalt or concrete, the hole is filled to grade and patched with similar material.

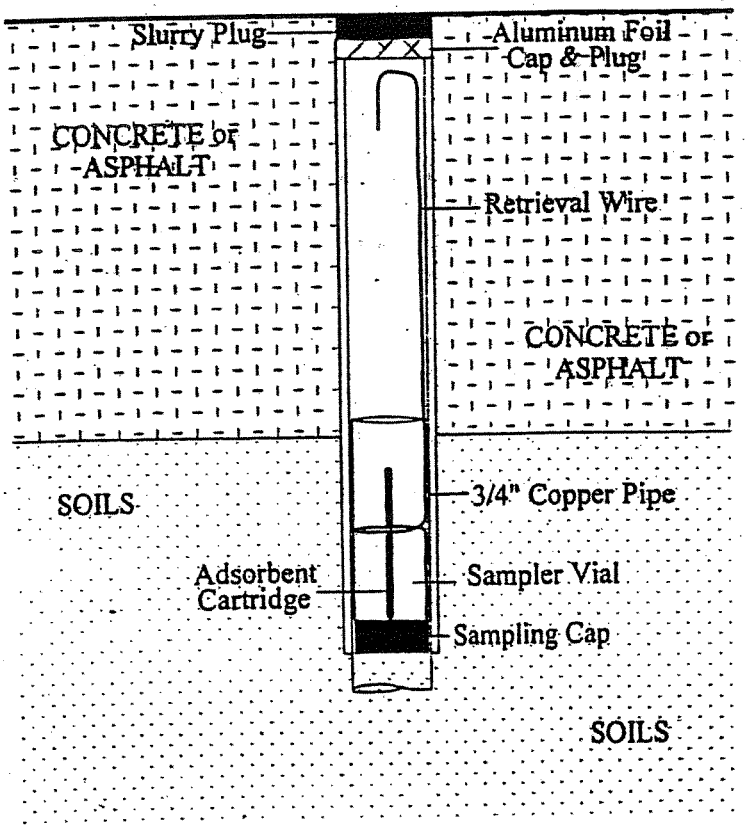
G. Following retrieval, field personnel ship the EMFLUX® Field Kits to BEACON's laboratory or an analytical laboratory under contract to BEACON.

EMFLUX® COLLECTOR

DEPLOYMENT THROUGH SOILS



DEPLOYMENT THROUGH AN ASPHALT/CONCRETE CAP



Attachment 3

Field Deployment Report

BEACON ENVIRONMENTAL SERVICES, INC.
FIELD DEPLOYMENT REPORT

PROJECT #:	CLIENT:	SITE:
1138	IT Corp.	Vacuum O.I

INDIVIDUAL SAMPLE INFORMATION

EMPLACEMENT DATE: 10/20/99. RETRIEVAL DATE: 11/4/99

SAMPLE NUMBER	TIME		FIELD NOTES (e.g., asphalt/concrete covering, description of sample location, cartridge/vial condition)
	Emplaced	Retrieved	
A2	0945	0945	ON SLOPE WEST OF WALKWAY (WITHIN 10')
A3	0950	0947	10' BEHIND PL LOT (SW CORNER)
B2	1005	0953	NEXT TO WALKWAY
B3	1010	0955	
B4	1015	0957	50' FROM JUNKYARD (E)
C3	1020	1005	
C4	1025	1006	
D2	1035	1010	EAST OF WALKWAY 5'
D3	1040	1012	
D4	1045	1014	ON OLD RR BED
D5	1050	1017	TANK
D6	1100	1019	TANK
E2	1115	1032	
E3	1120	1030	RUBBLE AREA
E4	1125	1028	RR BED
F	1135	1026	SLOPE

SAMPLE NUMBER	TIME		FIELD NOTES (e.g., asphalt/concrete covering, description of sample location, cartridge/vial condition)
	Emplaced	Retrieved	
E6	1140	1045	TANK
D7	1150	1022	FORMER WEST TANK
F2	1300	1045	
F3	1305	1059	
F4	1310	1102	
F5	1315	1104	
G2	1325	1122	
G3	1340	1119	
G4	1345	1117	
G5	1350	1115	
G6	1355	1111	
H2	1405	1125	
H3	1410	1130	
H4	1545	1132	
H5	1420	1133	
H6	1425	1135	
H7	1435	1136	
H8	1430	1137	
I4	1435	1147	

SAMPLE NUMBER	TIME		FIELD NOTES (e.g., asphalt/concrete covering, description of sample location, cartridge/vial condition)
	Emplaced	Retrieved	
I5	1550	1145	
I6	1440	1143	
I7	1445	1142	
J6	1450	1150	
J5	1455	1152	
J7	1500	1153	
J8	1505	1155	
K6	1520	1204	
K7	1525	1202	
K8	1530	1200	
L6	1535		
L7	1540	1205	
A1	1550	0940	LAWN AREA NEXT TO RIVER (WITHIN 10')
C1	1555	1000	" " " "
E1	1600	1036	LAWN AREA " " "
C2	1605	1001	
C2D	1610	1002	
F6	1615	1168	SLUDGE

SAMPLE NUMBER	TIME		FIELD NOTES (*e.g.*, asphalt/concrete covering, description of sample location, cartridge/vial condition)
	Emplaced	Retrieved	
Trip-1	—	—	Do not open!
Trip-2	—	—	

Attachment 4

LABORATORY PROCEDURES FOR EMFLUX® ADSORBENT CARTRIDGES

Following are laboratory procedures used with the EMFLUX® Soil-Gas System, a screening technology for expedited site investigation. After exposure, EMFLUX® cartridges are analyzed using U.S. EPA Method 8015B/8021 as described in the Solid Waste Manual (SW-846) for screening purposes. This method, which is modified to accommodate thermal desorption screening of the adsorbent cartridges, uses a capillary column gas chromatograph (GC) with a photo ionization detector (PID) in series with a flame ionization detector (FID) and a dry electrolytic conductivity detector (DELCD). This procedure is summarized below:

A. EMFLUX® cartridges are placed in the thermal desorbtion chamber, where they are purged with carrier gas then desorbed into the capillary column. The capillary column separates the sample into single component analytes. Analytes in the carrier gas are detected by a PID, then by an FID and finally by a DELCD.

B. The laboratory uses a 105-m, 0.53-mm-i.d., 3 µm-film-thickness Rtx-502.2 capillary column for separation during analysis.

C. The PID, FID and DELCD are set to high gain.

D. Lab personnel conduct internal control blank and internal control verification analyses every 24 hours to ensure that the system is contaminant free and properly calibrated. The system is calibrated using the external standard calibration procedure to at least three different concentration levels for each compound targeted, with the lowest concentration level at or near the method detection limit.

E. The instrumentation used for these analyses is an SRI 8610 Gas Chromatograph, equipped with a thermal desorber and connected to a PID in series with an FID and a DELCD.

Attachment 5

Chain-of-Custody Form

BEACON ENVIRONMENTAL SERVICES, INC.

CHAIN-OF-CUSTODY FORM

PROJECT NUMBER: 1138	PROJECT NAME: Vacuum O.I
LOCATION: Rochester, NY	CLIENT: IT Corp.
TARGET COMPOUNDS: 8021/8015B	

SAMPLE NUMBER	LAB ID No. (for lab use only)	REMARKS			
		Condition of sample or vial	Date	Time	Init.
A2			10/20/99	0945	
A3			"	0950	
B2			"	1005	
B3			"	1010	
B4			"	1015	
C3			"	1020	
C4			"	1025	
D2			"	1030	
D3			"	1040	
D4			"	1045	
D5			"	1050	
D6			"	1100	
E2			"	1115	
E3			"	1120	
F4			"	1125	
E5			"	1135	
E6			"	1140	
E7			"	1150	
F2			"	1300	
F3			"	1305	
F4			"	1310	
F5			"	1315	
G2			"	1325	
G3			"	1340	
G4			"	1345	
G5			"	1350	
G6			"	1355	
H2			"	1405	
H3			"	1410	
H4			"	1545	
H5			"	1420	
H6			"	1425	

RELINQUISHED BY		DATE	TIME	RECEIVED BY	
Signature	Printed Name			Signature	Printed Name
SCA	Steve Thornley	10.14.99	1700	Fedex →	
Fedex →		10.15.99	1200	[signature]	Frank Sowers
[signature]	Frank Sowers	11.4.99	1500	UPS →	
UPS →		11.5.99	1100	[signature]	H. DiNovi II

[illegible] ENVIRONMENTAL SERVICES, INC.

CHAIN-OF-CUSTODY FORM

PROJECT NUMBER: 1138	PROJECT NAME: Vacuum O.I
LOCATION: Rochester, NY	CLIENT: IT Corp.
ARGET COMPOUNDS: 8021/8015B	

SAMPLE NUMBER	LAB ID No. (for lab use only)	REMARKS			
		Condition of sample or vial	Date	Time	Init.
H7			10/20/99	1455	
H8			"	1458	
I4			"	1437	
I5			"	1550	
I6			"	1440	
I7			"	1445	
J6			"	1450	
J5			"	1455	
J7			"	1500	
J8			"	1505	
K6			"	1520	
K7			"	1525	
K8			"	1530	
L6			"	1535	
L7			"	1540	
A1			"	1550	
C1			"	1555	
E1			"	1600	
C2			"	1605	
C2D			"	1610	
F6			"	1615	
			"		

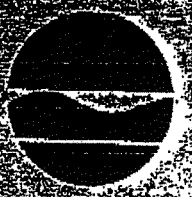
RELINQUISHED BY		DATE	TIME	RECEIVED BY	
Signature	Printed Name			Signature	Printed Name
SO	Steve Thornley	10.14.99	1700	Fedex →	
Fedex →		10.15.99	1200	[signature]	Frank Sowers
[signature]	Frank Sowers	11.4.99	1500	UPS →	
UPS →		11/5/99	1100	[signature]	K O'Neill

Appendix L

NYSDEC Site Investigation Report

SITE INVESTIGATION REPORT
Former Vacuum Oil Company
Site #828089P
City of Rochester, Monroe County

March 2001



Prepared for:
New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233
Erin M. Crotty, *Acting Commissioner*

Division of Environmental Remediation
Michael J. O'Toole, Jr. P.E., *Director*

By:
Frank Sowers, P.E.
Environmental Engineer I
New York State Department of Environmental Conservation
Division of Environmental Remediation
Region 8
6274 East Avon-Lima Road

12/02/2004 16:27 NO. 112 D02

SITE INVESTIGATION REPORT
Former Vacuum Oil Company
Site #828089P
Rochester, Monroe County

Prepared for:

Division of Environmental Remediation
New York State Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233

Prepared by:

Frank Sowers, P.E.
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6274 East Avon-Lima Road
Avon, NY 14414

March 2001

12/02/2004 16:27 NO.112 D03

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Former Vacuum Oil Company - 1999-2000 Site Investigation

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APPENDICES

APPENDIX A.....	1999-2000 SITE INVESTIGATION; TEST PIT LOGS, SOIL BORING LOGS; WELL INSTALLATION LOGS; WELL DEVELOPMENT LOGS; AND GROUNDWATER SAMPLING FIELD PARAMETER MEASUREMENTS
APPENDIX B.....	HISTORICAL SITE MAPS
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APPENDIX D.....	SUMMARY OF 1989 CITY OF ROCHESTER SITE INVESTIGATION
APPENDIX E.....	1999 SOIL GAS SURVEY REPORT

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1.0 EXECUTIVE SUMMARY

The site for this 1999-2000 investigation consisted of a 24-acre portion of the former Vacuum Oil Company facility located on the western bank of the Genesee River (see Figure 1 and Figure 2) in the City of Rochester, New York, Monroe County.

The Vacuum Oil Company (the predecessor of Mobil Oil) operated an oil refinery at this location from c.1866 to c.1935. The Vacuum Oil facility consisted of several process and storage buildings, a railyard, tank farms, and pipelines. The processing operations reportedly entailed distilling crude petroleum under pressure to produce a variety of petroleum products. Reports from 1887 indicated that there were 135 tanks and six boilers at the works, and that the facility refined over 4 million gallons of crude oil per year. Many of the Vacuum Oil refinery structures were reportedly demolished in place. Remnants of the Vacuum Oil facility were observed at the site during the 1999-2000 site investigation. These remnants included concrete tank foundations, fire hydrants and building foundations.

The site is currently under multiple ownership and most of the properties are either vacant or under utilized. The site is located in a commercial, residential, and recreational area south of downtown Rochester. Commercial businesses are primarily located northwest and southwest of the site. A residential area is adjacent to the site to the west, and there is a bike path through the site. There are no known private or public wells nearby.

In September 1992, the NYSDEC removed approximately 400-500 tons of petroleum sludge located in the former railyard area at the southeastern portion of the Vacuum Oil facility near what is currently the Genesee River bike trail (Figure 3). The sludge was tested and was found to be non-hazardous.

In 1999-2000, the NYSDEC conducted an investigation of a 24-acre portion of the former Vacuum Oil facility. The investigation consisted of a point passive soil gas survey, surface soil samples, subsurface soil samples, and groundwater samples from three monitoring wells. Sample locations are provided on Figure 4. The results of the NYSDEC investigation indicated widespread petroleum-related contamination (SVOCs and BTEX) in the surface soil, subsurface soil, and groundwater at the site. The most significant petroleum contamination was detected in the northern section of the site in the vicinity of MW-1 and MW-2. To a lesser extent, chlorinated VOCs, metals, and pesticides were also detected above NYS standards at the site.

The results of the 1999-2000 investigation indicated that site contamination was not the result of disposal of a consequential amount of hazardous waste. NYSDEC will not include the site in the New York State Listing of Inactive Hazardous Waste Disposal Sites at this time.

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2.0 PURPOSE

The site for this investigation consisted of approximately 24 acres located on the western bank of the Genesee River south of Flint Street in the City of Rochester, New York, Monroe County (Figures 1 and 2). The purpose of this site investigation was to obtain initial information regarding environmental contamination at the site. Specific objectives for this investigation, as stated in the document entitled "Former Vacuum Oil Preliminary Site Investigation Project Work Plan January 22, 1999" (work plan) were to:

- further define the nature and extent of contamination at the site; and
- determine if this site should be listed in the NYS Listing of Inactive Hazardous Waste Disposal Sites. If listed, determine the appropriate classification.

2.1 EXTENT OF CONTAMINATION

In September 1992, the NYSDEC removed approximately 400 to 500 tons of petroleum sludge located in the former railyard area at the southeastern portion of the property near what is currently the Genesee River bike trail. The sludge was discovered during construction of the bike trail. The approximate location of the sludge pits are shown on Figure 3. The 1999-2000 investigation was designed to provide additional information concerning the nature and extent of contamination in the overburden on the Vacuum Oil property.

2.2 THE NYS LISTING OF INACTIVE HAZARDOUS WASTE DISPOSAL SITES

The New York State Department of Environmental Conservation (NYSDEC) is charged by ECL Section 27-1305 with maintaining a list of inactive hazardous waste disposal sites in a statewide Registry and updating it on an annual basis. The Division of Environmental Remediation (DER) is responsible for listing all sites in the Registry where it believes there is confirmed disposal of a consequential amount of waste which conforms with the characteristics of a hazardous waste (as defined in 6 NYCRR Part 371.3) or listed hazardous wastes (as defined in 6 NYCRR Part 371.4). The results of site investigations will be evaluated to help determine if the disposal of a consequential amount of hazardous waste has occurred.

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3.0 SCOPE OF WORK

A work plan specifying the scope of work for this investigation was prepared by the NYSDEC Region 8 and reviewed by personnel from the NYSDEC in Albany, the New York State Department of Health (NYSDOH), the Monroe County Health Department (MCHD), and the City of Rochester Division of Environmental Quality. Included in the work plan were the data collection procedures identified to fulfill the objectives of the investigation. These data collection activities included the following tasks:

- a passive soil gas survey;
- surface and subsurface soil sampling and analysis;
- monitoring well installation and groundwater sampling and analysis; and
- site survey and map preparation.

Details of the specific procedures used in performing each task are presented in the following sections.

3.1 PASSIVE SOIL GAS SURVEY

A passive soil gas survey was conducted across the site in an effort to identify potential sources of contamination. The survey consisted of 53 EMFLUX modules plus two trip blank modules. The modules were deployed on October 20, 1999 and retrieved November 4, 1999. Fifty of the modules were placed in a roughly 120'x120' grid across the site. Two modules (E-6 and H-8) were placed in potentially contaminated areas based on field observations and one module (C-2D) was collocated with module C-2. Figure 4 shows the location of each soil gas module.

At each survey point, the soil gas module was placed into a hole approximately 4" deep and 3/4" in diameter. The holes were created using a pointed metal stake provided by the vendor. After retrieval, the modules were sent to a laboratory for analyses. The modules were analyzed for 25 specific compounds including some volatile organic compounds (VOCs), some semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPH).

3.2 SUBSURFACE SOIL SAMPLING AND ANALYSIS

The subsurface soil sampling program used during this project was designed to aid in the collection of subsurface information relative to the overburden materials at the site. The subsurface soil sampling program consisted of two phases:

- test pit excavations; and
- soil borings.

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3.2.1 Test Pit Excavations

The primary goals of the test pit program were to:

- characterize the overburden materials with respect to textural classifications;
- collect soil samples for analysis;
- determine if there is a water bearing zone in the overburden; and
- characterize and describe the bedrock surface.

Ten test pit excavations were completed at the site on December 6, 1999. Prior to mobilization, an Underground Facility Protection Organization (UFPO) underground utility stakeout was performed to document the position of public utilities. The test pits were primarily located in areas of elevated soil gas concentrations. The test pits were completed using a track mounted Komatsu PC35R excavator. Test pit locations are shown on Figure 4.

For each excavation, a geologist described and logged the subsurface soils with respect to their geologic character features and properties. Bedrock was not encountered in any of the test pits; therefore the bedrock surface was not characterized. The excavated pits were also photographed. Test pit logs and photographs are provided in Appendix A.

Excavated soil was screened for VOCs using a hand held photoionization detector (PID) instrument. The PID measurements included in the test pit logs were collected from just above the soil in the excavator bucket. PID measurements were also obtained in the breathing zone.

A concrete slab was encountered at about one foot below the ground surface at several locations in the vicinity of test pits TP-2 and TP-3. The excavator was not capable of penetrating the slab. When a slab was encountered, the excavation was backfilled and a new test pit was attempted several yards away. The full extent of the concrete slab was not determined, but it can be estimated by reviewing building locations from aerial photograph or site maps of the Vacuum Oil facility (See Appendix B).

The work plan specified that two soil samples from each test pit would be collected for analysis. A total of 8 soil samples were actually collected from the 10 test pits. Two samples were collected from test pit TP-1. No samples were collected from test pits TP-6, TP-7 and TP-9 as there were no indications that these soils were contaminated (i.e. no visual signs of staining, no detectable odors, and no detections on the PID). One sample was collected from each of the remaining test pits (TP-2, TP-3, TP-4, TP-5, TP-8, and TP-10) either because the subsurface materials were homogeneous or there were no indications of contamination (i.e. no visual signs of staining, no detectable odors, and no detections on the PID).

The work plan specified that each soil sample from the test pits would be analyzed for volatile organics, semi-volatile organics, and metals, and that one sample from each test pit would be analyzed for cyanide, pesticides, and polychlorinated biphenyls (PCBs). This protocol was followed for the test pits where samples were collected. Additionally, the Toxicity Characteristic Leachate Procedure (TCLP) analysis was performed on both soil samples from test pit TP-1 as these soils were stained black, PID readings up to 200 ppm were measured just above the soil, and there was

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a strong petroleum odor. A sample collection and analytical matrix is provided in Table 1. Samples were placed into glass jars, labeled, and placed into a cooler chilled with ice or ice packs. The samples were shipped for analysis via UPS to RECRA LabNet, Lionville, Pennsylvania. Chain of Custody forms are provided in Appendix C.

3.2.2 Soil Borings

Three soil borings, which were all later completed as groundwater monitoring wells, were advanced at the site from February 7-9, 2000. Prior to mobilization, an Underground Facility Protection Organization (UFPO) underground utility stakeout was performed to document the position of public utilities. Soil boring locations were selected based on:

- test pit soil sample results;
- locations of site features such as tank foundations and concrete slabs; and
- results of the UFPO stakeout.

The soil boring locations are shown on Figure 4. Boring MW-1 was located in the vicinity of test pit TP-1, boring MW-2 was located in the vicinity of test pit TP-2, and boring MW-3 was located in the vicinity of test pit TP-10 at the base of a former tank farm.

The work plan specified that additional soil classification and sampling were optional activities during the monitoring well installation task. It was determined that these activities were necessary based on the following:

- the test pits did not extend to bedrock, so split spoon sampling was necessary to characterize soil conditions below the base of the test pits;
- one of the borings, MW-2, was located where a concrete slab was encountered during test pitting, so split spoon sampling was necessary to characterize soil conditions below the concrete slab; and
- the analytical results of the test pit soil samples indicated the presence of petroleum compounds, so additional soil samples were required for Total Petroleum Hydrocarbon (TPH) analysis.

A track-mounted CME 850 drill rig was used to advance the soil borings. Continuous split-spoon samples were collected to refusal (presumed top of bedrock) at each of the soil boring locations. Depth to refusal varied from 6 to 16.5 feet below the ground surface. All down-hole tools and equipment used during the advance of the borings were steam cleaned prior to their introduction into a boring. Split spoons were cleaned with an Alconox solution after each sample was collected.

A qualified geologist described and logged the extracted subsurface soil materials with respect to their geologic character, features, and properties. The extracted subsurface soil materials were also screened visually for signs of obvious contamination. Additionally, soil from each spoon was screened for the presence of volatile organic vapors using a PID monitoring instrument. Information on sample characterization was later used to prepare boring logs which are presented in Appendix A.

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Two soil samples were collected for analysis from each of the borings, except MW-3. No soil samples were collected from boring MW-3 since there were no indications of contamination (i.e. no visual signs of staining, no detectable odors, and no detections on the PID). A duplicate soil sample was also collected at boring MW-1. All of the soil samples were analyzed for TPH. In addition to TPH, soils from boring MW-2 were analyzed for VOCs, SVOCs, and metals, and soils from boring MW-1 were analyzed for metals. A sample collection/analytical matrix for this investigation is provided in Table 1. Samples were placed into glass jars, labeled, and placed into a cooler chilled with ice or ice packs. The samples were shipped for analysis via UPS to RECRA LabNet, Lionville, Pennsylvania. Chain of Custody forms are provided in Appendix C.

3.3 SURFACE SOIL SAMPLING AND ANALYSIS

As specified in the work plan, five surface soil samples were collected at the site. Each sample was analyzed for:

- TAL metals;
- Cyanide;
- TCL VOCs;
- TCL SVOCs; and
- TCL pesticides and PCBs.

All of the surface soil samples obtained during this investigation were collected on December 7, 1999. Surface soil sample locations were selected based on the soil gas survey results, visual indications of contamination, and a desire to collect data from across the entire site. Surface soil sample SS-4 was collected from a wet, low-lying area at the site. The surface soil sample locations are shown on Figure 4.

Surface soil samples obtained from the site were collected from the first two inches of soil after sod, surface debris, or gravel cover were removed. A new disposable plastic scoop was used to collect each sample. A sample collection/analytical matrix for this investigation is provided in Table 1. Samples were placed into glass jars, labeled, and placed into a cooler chilled with ice or ice packs. The samples were shipped for analysis via UPS to RECRA LabNet, Lionville, Pennsylvania. Chain of Custody forms are provided in Appendix C.

3.4 MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING AND ANALYSIS

The groundwater sampling program implemented during this project was designed to aid in the collection of subsurface information relative to the overburden materials at the site. More specifically, the program was designed to further define the extent of contamination at the site and evaluate suspected source areas. The groundwater sampling program consisted of completing the three soil borings as monitoring wells and collecting groundwater samples for analyses.

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3.4.1 Groundwater Monitoring Well Installation

All three of the soil borings advanced on February 7, 8 and 9, 2000 were completed as 2-inch diameter overburden monitoring wells. The purpose of these wells was to allow long-term monitoring of overburden groundwater conditions at the site. The monitoring wells were located to investigate groundwater conditions in areas where soil contamination was identified, and allow development of groundwater flow contours. Monitoring well locations are shown on Figure 4.

The borings were advanced to the top of bedrock using 4.25-inch I.D. hollow stem augers. The monitoring wells consisted of 2-inch diameter schedule 40 PVC casing. The well screens consisted of 0.010-inch slotted PVC and varied in length from 4 feet at MW-3 to 10 feet at MW-1 and MW-2. Construction logs for each monitoring well are provided in Appendix A.

The wells were developed on February 9, 10, and 11, 2000 using new dedicated polyethylene bailers. Several days were needed to develop the wells because they would become dry after several well volumes of water were removed and recovery was slow. Well development logs, including field parameter measurements, are provided in Appendix A.

3.4.2 Groundwater Monitoring Well Sampling

The three groundwater monitoring wells were sampled on February 23, 2000. Prior to sampling, approximately 3 well volumes of groundwater were purged from each well using dedicated polyethylene bailers.

After being purged, each well was allowed to recover for approximately one hour before samples were collected. The three wells were sampled for VOCs, SVOCs, metals, and TPH using dedicated polyethylene bailers. There was not enough water in the wells to collect all of the samples at one time. The VOC, SVOC, and TPH samples were collected in the morning, then the wells were allowed to recover for several hours and the metals samples were collected in the afternoon. Water samples were also collected from each well during sampling to measure pH, specific conductivity, temperature, and turbidity. Field parameter measurements are provided in Appendix C. A sample collection/analytical matrix for this investigation is provided in Table 1.

Samples were placed into the appropriate container, labeled, and placed into a cooler chilled with ice or ice packs. The samples were shipped for analysis via UPS to RECRA LabNet, Lionville, Pennsylvania. Chain of Custody forms are provided in Appendix C.

3.5 SITE SURVEY AND MAP PREPARATION

A survey was performed at the site in two phases. First a surveyor was on-site in March 2000 to make such measurements as were necessary to create a plot plan of the site showing the locations of the property boundaries, buildings, the bike path, monitoring wells, and test pits. The surveyor also established well elevations at the top of the PVC riser for each of the three wells plus a location along the concrete wall at the edge of the Genesee River.

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The second phase of the survey was completed on April 12 and 13, 2000. NYSDEC personnel used a Corvallis Microtechnology Inc. March II hand-held Global Positioning System (GPS) unit to record the location of soil gas sample points which were marked in the field by flagging. The raw GPS data collected in the field were corrected using PC-GPS version 3.6D. The corrected data were provided to the surveyor for inclusion on the plot plan. The survey data are provided in Table 2.

After plotting the soil gas points, one sample (I-7) appeared to be incorrect. NYSDEC personnel re-visited the site and manually measured the location of soil gas point I-7 using a tape measure. The correct location of I-7 was determined to be approximately 100 ft. south-southwest from the location measured by the GPS. The plot plan (Figure 4) was corrected to better reflect the actual location of I-7.

The location of the surface soil sample points on the plot plan (Figure 4) are based on field observations of the distance of the surface soil sample location to the nearest soil gas sample location.

3.6 GROUNDWATER ELEVATION MEASUREMENTS

Groundwater elevations at the site were measured twice during this investigation. The first measurements, obtained on February 23, 2000, included only the three overburden monitoring wells. The second measurements, obtained on May 4, 2000, included the three overburden monitoring wells and the elevation of the Genesee River. The water level measurements are provided in Table 3. Groundwater contours for May 4, 2000 are provided in Figure 5.

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4.0 SITE ASSESSMENT

4.1 SITE HISTORY

The former Vacuum Oil Company occupied approximately 40 acres on the western bank of the Genesee River (see Figure 1 and Figure 6) in the City of Rochester, New York, Monroe County. The Vacuum Oil Company (the predecessor of Mobil Oil) operated an oil refinery at this location from c.1866 to c.1935.

The "site" for the 1999-2000 investigation was an approximately 24-acre portion of the former Vacuum Oil facility consisting of seven parcels of land (Figure 2). After 1935, the parcels were sold separately and used for a variety of commercial purposes. Owners included a university, a scrap bailing company, and government agencies. The site is currently under multiple ownership and most of the properties are either vacant or under utilized. The site is located in a commercial, residential, and recreational area south of downtown Rochester. Commercial businesses are primarily located northwest and southwest of the site. A residential area is adjacent to the site to the west, and there is a bike path through the site. There are no known private or public wells nearby.

The Vacuum Oil facility consisted of several process and storage buildings, a railyard, tank farms, and pipelines. The processing operations reportedly entailed distilling crude petroleum under pressure to produce a variety of materials including: lubricating oils, vacuum oil blacking for harnesses, naptha, refined petroleum and high test kerosene oils, neutral oils, also sperm whale, elephant, lard, neats foot, straits, bank, laborador, salad, signal, and other oils. Reports from 1887 indicated that there were 135 tanks and six boilers at the works, and that the facility refined over 4 million gallons of crude oil per year.

In 1989, a portion of the former Vacuum Oil facility (bounded by Flint St., Exchange St., Violetta St., and the Genesee River) was investigated as a potential site for a new elementary school by the City of Rochester, but environmental conditions at the site made it unfavorable for development. A summary of the 1989 investigation is provided in Appendix D.

In September 1992, the NYSDEC removed approximately 400-500 tons of petroleum sludge located in the former railyard area at the southeastern portion of the Vacuum Oil facility near what is currently the Genesee River bike trail. The sludge was tested and was found to be non-hazardous. The location of the sludge pits are shown on Figure 3.

Many of the Vacuum Oil refinery structures were reportedly demolished in place. For example, tank foundations in the former tank farm area are evident in the 1960s aerial photographs. Additionally, remnants of the Vacuum Oil facility were observed at the site during the 1999-2000 site investigation. These remnants included concrete tank foundations, fire hydrants and building foundations.

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4.2 SITE TOPOGRAPHY

The former Vacuum Oil site is located on the western bank of the Genesee River. A concrete retaining wall separates the river from the ground. On May 4, 2000, the top of the retaining wall was measured to be 6.5 ft. above the river. West of the river, the terrain appeared to slope gently downward before a steep rise to the residential area on Cottage Street and Riverview Place. The lowest spot on the site appeared to be in the vicinity of soil gas sample point H-8 and surface soil sample point SS-4 (See Figure 4). This area was consistently moist and often contained standing water. The portion of the bike path between soil gas sample points A-2 and H-3 was elevated with what appeared to be fill material. This portion of the bike path was formerly part of the Erie Railroad system. The building foundations observed at the site were generally located west of the bike bath. The tank foundations were roughly located in the area bounded by soil gas sample points D-5, D-7 and E-5.

With the exception of the bike path, most of the surface was overgrown with trees, bushes, wild grapevines, and weeds. Poison ivy was also prevalent at the site both as vines on trees and as patches of plants less than about 2 ft. tall. Dense swarms of insects, especially mosquitoes, were encountered at the site during the spring.

4.3 SITE GEOLOGY

Based on the test pits and soil borings, the site consisted of 6 to 16.5 feet of overburden on top of bedrock. The overburden generally consisted of three layers:

- topsoil;
- fill material; and
- native soil.

The topsoil layer was typically 3 to 6 inches thick. Fill material was encountered up to 6 ft. below the ground surface. The fill consisted of a variety of materials including:

- bricks;
- slag;
- sand;
- shingles;
- a material that resembled ground coal;
- gravel; and
- wood.

The native soil consisted of a mixture of silt, sand, and clay. The bedrock at the site is mapped as the Lockport Dolomite.

The depth to groundwater at the site ranged from 3 to 7.5 feet below ground. Groundwater elevations at the site were measured twice during this investigation. The first measurements, obtained on February 23, 2000, included only the three overburden monitoring wells. The second

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measurements, obtained on May 4, 2000, included the three overburden monitoring wells and the elevation of the Genesee River. The water level measurements are provided in Table 3. The results indicated that the groundwater at the site flows to the west and away from the Genesee River. Figure 5 presents groundwater elevation contours for the overburden based on the May 4, 2000 measurements. Groundwater elevation contours developed using the February 23, 2000 measurements were similar to the May 4, 2000 contours and are not included in this report.

4.4 CONTAMINANT ASSESSMENT

The following sections provide the analytical data generated during the 1999-2000 investigation. The information is organized according to sample media (soil gas, surface soil, subsurface soil, and groundwater) and compounds of concern. Analytical data were compared to environmental New York State Standards, Criteria, and Guidance (SCGs) values. Groundwater SCGs for this site were based on the groundwater quality standards contained in 6 NYCRR Part 703 and the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. NYSDEC Technical Assistance Guidance Memorandum (TAGM) 4046 was used to evaluate surface and subsurface soils. TCLP analytical results were compared to the toxicity characteristic regulatory levels contained in 6 NYCRR 371.3(e).

Sample point locations are shown on Figure 4. The analytical data for the 1999 soil gas survey are provided in Appendix E. The analytical data for surface soil, subsurface soil, and groundwater samples collected by the NYSDEC as part of the 1999-2000 investigation are provided in Appendix C. Statistical summaries of the analytical results are provided in Tables 4 through 6. All detected values for field samples, field duplicates, and trip blanks are presented in Tables 7 through 25 in data summary forms.

4.4.1 Passive Soil Gas Survey

A passive soil gas survey was performed at the site to identify potential areas of contamination and to help focus later phases of the investigation. A 53 point passive soil gas survey was conducted across the site between October 20, 1999 and November 4, 1999. Figure 4 shows the location of each soil gas module. Upon retrieval, each module was analyzed for 25 specific compounds including some volatile organic compounds (VOCs), some semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPH) The complete list of compounds is provided in Appendix E.

The following limitations should be considered when reviewing the results of the soil gas survey:

- The soil gas sample points were placed approximately 120 feet apart. This spacing was considered acceptable for identifying large areas of contamination at this site, but this spacing may miss smaller contaminated areas and is not appropriate for defining the extent of contamination.
- Some of the soil gas results may be biased low. Buried building slabs were encountered during test pitting and these slabs may have restricted contaminated soil gas located below the slab from migrating to the soil gas modules located above the slab.

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Appendix E contains the data report from the vendor who supplied and analyzed the soil gas modules. Petroleum-related compounds and chlorinated compounds were the primary contaminants detected during the survey.

4.4.1.1 Petroleum-Related Compounds

The soil gas survey detected petroleum-related compounds in two categories: total petroleum hydrocarbons (TPH) and individual petroleum related compounds (benzene, toluene, ethyl benzene, xylene, trimethylbenzenes, and napthalene). The soil gas data in Appendix E indicate a strong correlation between elevated TPH results and elevated results for the individual petroleum-related compounds.

Figure 7 shows soil gas concentration contours for TPH at the site. Five distinct plumes are identified on Figure 7. The plumes are identified as follows (with maximum concentrations in parentheses) based on the soil gas point in the apparent center of the plume:

- the B-3 plume (14,000 nanograms);
- the F-5 plume (58,000 nanograms);
- the J-8 plume (900 nanograms);
- the L-6 plume (400 nanograms); and
- the E-1/E-2 plume (260 nanograms).

Of the five plumes, the B-3 and F-5 plumes were of the greatest significance in terms of lateral extent and maximum concentration. The B-3 and F-5 plumes were determined to have the greatest potential for contamination and were the focus of subsequent sampling activities for petroleum compounds.

4.4.1.2 Total Chlorinated Volatiles

Figure 8 shows soil gas concentration contours for total chlorinated compounds at the site. Chlorinated compounds were detected in the following five soil gas samples:

- C-3 at 1096 nanograms;
- D-3 at 194 nanograms;
- C-1 at 87 nanograms;
- F-5 at 42 nanograms; and
- D-6 at 29 nanograms.

C-3 was the focus of subsequent sampling activities for chlorinated compounds since the concentration of chlorinated compounds at C-3 was an order-of-magnitude greater than the other four locations.

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4.4.2 Surface Soil

A total of five surface soil samples were collected from five different locations across the site and analyzed for the parameters shown in Table 1. Metals, VOCs, SVOCs and pesticides were detected in some of the surface soil samples at levels above SCGs. Compounds detected at levels above SCGs in at least one surface soil sample, and the concentration range for each compound, are identified in the following sections.

The VOC and SVOC analyses also detected the presence of a number of additional compounds that are not on the standard Target Compound List (TCL). The laboratory only calibrates the analytical instruments to identify and quantify the TCL compounds. Compounds that are not on the TCL, but are detected during analysis, are called Tentatively Identified Compounds (TICs) and the identity and concentration of these compounds are estimated. As indicated in Tables 7,8, and 9, total TIC concentrations in the surface soil samples ranged from not detected to 20 ppb for VOCs and 15,800 to 114,000 ppb for SVOCs. Concentration estimates for individual TICs are provided with the analytical data in Appendix C.

Surface soil sample point locations are shown on Figure 4. Surface soil sample locations are denoted by "SS-" in the tables and figures. Figure 9 presents a summary of surface soil results exceeding SCGs and total TICs.

The results of the 1999-2000 investigation, including comparisons to SCGs, are summarized in the following tables:

- Table 4 provides a statistical summary of the surface soil results;
- Table 7 summarizes the SVOC results sorted by sample location;
- Table 8 summarizes the SVOC results sorted by compound;
- Table 9 summarizes the VOC results;
- Table 10 summarizes the inorganic compound results sorted by sample location;
- Table 11 summarizes the inorganic compound results sorted by compound; and
- Table 12 summarizes the pesticide and PCB results.

The analytical data from RECRA Environmental Inc. are provided in Appendix C.

4.4.2.1 Surface Soil - Semi-Volatile Organic Compounds

A total of 20 different SVOCs, plus TICs, were detected in the five surface soil samples analyzed for TCL SVOCs. Eight of the compounds were detected at concentrations above TAGM 4046 recommended soil cleanup values. SVOCs detected at levels above SCGs in at least one surface soil sample, and the concentration range for each compound, are identified below:

- benzo(a)anthracene (330 - 28,000 ppb);
- benzo(a)pyrene (440 - 23,000 ppb);
- benzo(b)fluoranthene (470 - 20,000 ppb);
- benzo(k)fluoranthene (420 - 22,000 ppb);

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- chrysene (480 - 30,000 ppb);
- dibenzo(a,h)anthracene (85 - 5,700 ppb);
- fluoranthene (700 - 63,000 ppb); and
- indeno(1,2,3-c,d)pyrene (310 - 14,000 ppb).

The remaining 12 SVOCs were detected at levels below TAGM 4046 recommended soil cleanup values. As indicated on Figure 9, surface soils containing SVOCs exceeding SCGs were located across the site; however, the TCL SVOC concentrations at SS-2 were typically a factor of 10 higher than the other four sample points. Surface soil sample SS-2 also contained the highest concentration of TICs (114,000 ppb). Surface soil sample SS-4, which had the lowest concentration of TCL SVOCs based on Figure 9, contained second highest TIC concentration (96,800 ppb).

4.4.2.2 Surface Soil - Volatile Organic Compounds

The following VOCs were detected in the surface soils at the site:

- acetone;
- methylene chloride; and
- TICs.

Acetone was detected in surface soil sample SS-3. Methylene chloride was detected in each of the five surface soil samples at concentrations between 24 ppb and 150 ppb. The methylene chloride concentration in sample SS-3 (150 ppb) exceeded the TAGM 4046 recommended soil cleanup value for methylene chloride of 100 ppb. As discussed in another section of this report, the methylene chloride surface soil sample results may be biased high due to laboratory contamination.

4.4.2.3 Surface Soil - Inorganic Compounds

A total of 22 different inorganic compounds were detected in the five surface soil samples analyzed for TAL metals. Eight of the compounds were detected at concentrations above TAGM 4046 recommended soil cleanup values. Inorganic compounds detected at levels above SCGs in at least one surface soil sample, and the concentration range for each compound, are identified below:

- arsenic (4.3 - 60.7 ppm);
- calcium (11,900 - 167,000);
- copper (17.9 - 75.8 ppm);
- lead (119 - 972 ppm);
- magnesium (2,490 - 30,600 ppm);
- mercury (0.12 - 2.1 ppm);
- selenium (not detected - 7.40 ppm); and
- zinc (103 - 772 ppm).

The remaining 14 inorganic compounds were detected at levels below TAGM 4046 recommended soil cleanup values. As indicated on Figure 9, surface soils containing inorganic compounds exceeding SCGs were located across the site. Additionally, the inorganic compound concentrations were fairly consistent in the five samples.

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4.4.2.4 Surface Soil - Pesticides and PCBs

A total of six pesticides were detected in the five surface soil samples at the site. Two of the pesticides were detected at concentrations above TAGM 4046 recommended soil cleanup values. Pesticides detected at levels above SCGs in at least one surface soil sample, and the concentration range for each compound, are identified below:

- dieldrin (not detected - 74 ppb); and
- heptachlor epoxide (not detected - 30 ppb).

No PCBs were detected in the five surface soil samples at the site.

The remaining four pesticides were detected at levels below TAGM 4046 recommended soil cleanup values. As indicated on Figure 9, SS-1 was the only surface soil sample location where pesticides exceeded SCGs.

4.4.3 Subsurface Soil

A total of twelve subsurface soil samples were collected from ten test pit excavations and three overburden monitoring wells completed at the site. The samples were analyzed for the parameters shown in Table 1. Several metals, VOCs, and SVOCs were detected in subsurface soil samples at levels above SCGs. Compounds detected at levels above SCGs in at least one subsurface soil sample, and the concentration range for each compound, are identified in the following sections.

The VOC and SVOC analyses also detected the presence of a number of additional compounds that are not on the standard TCL. The laboratory only calibrates the analytical instruments to identify and quantify the TCL compounds. Compounds that are not on the TCL, but are detected during analysis, are called TICs and the identity and concentration of these compounds are estimated. As indicated in Tables 13, 14, 16, and 17, total TIC concentrations in the subsurface soil samples ranged from not detected to 133,000 ppb for VOCs and 1,450 to 2,240,000 ppb for SVOCs. Concentration estimates for individual TICs are provided with the analytical data in Appendix C.

Sample point locations are shown on Figure 4. Subsurface soil sample locations from a test pit are denoted by "TP-" in the tables and figures. Subsurface soil sample locations from a soil boring that was later converted into a monitoring well are denoted by "MW-" in the tables and figures. Figure 10 presents a summary of subsurface soil results exceeding SCGs, total TICs, and TPH.

The results of the 1999-2000 investigation, including comparisons to SCGs, are summarized in the following tables:

- Table 5 provides a statistical summary of the results;
- Table 13 summarizes the SVOC results sorted by soil boring interval;
- Table 14 summarizes the SVOC results sorted by compound;
- Table 15 summarizes the TPH results;
- Table 16 summarizes the VOC results sorted by soil boring interval;

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- Table 17 summarizes the VOC results sorted by compound;
- Table 18 summarizes the inorganic compound results sorted by soil boring interval;
- Table 19 summarizes the inorganic compound results sorted by compound;
- Table 20 summarizes the pesticide and PCB results; and
- Table 21 summarizes the TCLP results.

The analytical data from RECRA Environmental Inc. are provided in Appendix C.

4.4.3.1 Subsurface Soil - Semi-Volatile Organic Compounds

A total of 21 different SVOCs, plus TICs, were detected in the nine subsurface soil samples analyzed for TCL SVOCs. Seventeen of the compounds were detected at concentrations above TAGM 4046 recommended soil cleanup values. SVOCs detected at levels above SCGs in at least one surface soil sample, and the concentration range for each compound, are identified below:

- acenaphthene (not detected - 170,000 ppb);
- anthracene (not detected - 510,000 ppb);
- benzo(a)anthracene (not detected - 760,000 ppb);
- benzo(a)pyrene (not detected - 530,000 ppb);
- benzo(b)fluoranthene (not detected - 480,000 ppb);
- benzo(g,h,i)perylene (not detected - 280,000 ppb);
- benzo(k)fluoranthene (not detected - 470,000 ppb);
- chrysene (not detected - 710,000 ppb);
- dibenzo(a,h)anthracene (not detected - 100,000 ppb);
- dibenzofuran ((not detected - 220,000 ppb);
- fluoranthene (not detected - 1,500,000 ppb);
- fluorene (not detected - 360,000 ppb);
- indeno(1,2,3-c,d)pyrene (not detected - 280,000 ppb);
- 2-methylnaphthalene (not detected - 110,000 ppb);
- naphthalene (not detected - 320,000 ppb);
- phenanthrene (29 - 1,600,000 ppb); and
- pyrene (not detected - 960,000 ppb).

The SVOC compounds most frequently detected above SCGs were:

- benzo(a)anthracene (5 of 9 samples exceeded SCG);
- benzo(a)pyrene (5 of 9 samples exceeded SCG);
- chrysene (5 of 9 samples exceeded SCG); and
- dibenzo(a,h)anthracene (5 of 9 samples exceeded SCG).

As indicated on Table 5, maximum concentrations for all 17 SVOCs detected at levels above SCGs were obtained from test pit TP-2 approximately 5 ft. below ground surface. Subsurface soils from test pit TP-2 also contained the highest concentration of SVOC TICs (2,240,000 ppb 5 ft. below ground surface). The second highest concentration of SVOC TICs was detected in test pit TP-1 (814,000 ppb 7 to 8 ft. below ground surface). TP-1 and TP-2 are located on the northern portion of

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the site (see Figure 10).

4.4.3.2 Subsurface Soil - Total Petroleum Hydrocarbons

Four subsurface soil samples were collected and analyzed for TPH during the installation of the groundwater monitoring wells. Two of the samples were collected from boring MW-1 (located adjacent to test pit TP-1), and two of the samples were collected from boring MW-2 (located adjacent to test pit TP-2). As shown on Table 15, TPH results ranged from 22.3 ppm at the 10 to 12 ft. interval of TP-2 to 1140 ppm at the 8 to 10 ft. interval of TP-1. There are no SCGs for TPH.

4.4.3.3 Subsurface Soil - Volatile Organic Compounds

A total of nine different VOCs, plus TICs, were detected in the nine subsurface soil samples analyzed for TCL VOCs. Two of the compounds were detected at concentrations above TAGM 4046 recommended soil cleanup values. VOCs detected at levels above SCGs in at least one subsurface soil sample, and the concentration range for each compound, are identified below:

- methylene chloride (24 - 750 ppb);and
- xylene (total) (not detected - 6,300 ppb)

Overall two analytical results (One result for each compound identified above) exceeded subsurface soil SCGs for VOCs. Four additional analytical results for acetone (2 results) and methylene chloride (2 results) were detected at levels above SCGs, but these results were considered invalid due to laboratory contamination.

The xylene analytical result exceeding the subsurface soil SCG was collected from test pit TP-1. The methylene chloride result exceeding the subsurface soil SCG was collected from boring MW-2. TP-1 and MW-2 are located on the northern portion of the site (see Figure 10).

Subsurface soils from test pit TP-1 also contained the highest concentration of VOC TICs (133,000 ppb 7 to 8 ft. below ground surface and 109,000 ppb 3 to 5 ft. below ground surface). None of the other subsurface soil samples had a VOC TIC concentration above 300 ppb.

4.4.3.4 Subsurface Soil - Inorganic Compounds

A total of 23 different inorganic compounds were detected in the 10 subsurface soil samples analyzed for TAL metals. Ten of the compounds were detected at concentrations above TAGM 4046 recommended soil cleanup values. Inorganic compounds detected at levels above SCGs in at least one subsurface soil sample, and the concentration range for each compound, are identified below:

- arsenic (4.7 - 113 ppm);
- barium (28.5 - 828 ppm);
- beryllium (0.15 - 2.20 ppm);
- calcium (1280 - 85,100 ppm);

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- chromium (9.40 - 59.3 ppm);
- copper (8.10 - 143 ppm);
- magnesium (396 - 35800 ppm);
- nickel (14 to 35.6 ppm);
- mercury (not detected - 4 ppm); and
- zinc (54.7 - 663 ppm).

The remaining 13 inorganic compounds were detected at levels below TAGM 4046 recommended soil cleanup values. As indicated on Figure 10, subsurface soils containing inorganic compounds exceeding SCGs were located across the site. Maximum concentrations for five of the nine inorganic compounds detected at levels above SCGs were obtained from test pit TP-2 approximately 5-ft. below ground surface.

4.4.3.5 Subsurface Soil - Pesticides and PCBs

Eight subsurface soil samples were collected and analyzed for pesticides and PCBs. PCBs were not detected in any of the subsurface soil samples. The pesticide Aldrin was detected at low levels (2.6 ppb) in one subsurface soil sample. No other pesticides were detected in the subsurface soil. The analytical results for pesticides and PCBs are summarized in Table 20.

4.4.3.6 Subsurface Soil -Toxicity Characteristic Leachate Procedure (TCLP)

Two subsurface soil samples from TP-1 were analyzed for TCLP parameters. No compounds were detected above regulatory levels in the two samples analyzed for TCLP compounds. The TCLP analytical results are provided in Table 21.

4.4.4 Groundwater Quality

A total of three groundwater samples were collected from the three overburden monitoring wells completed at the site and analyzed for the parameters shown in Table 1. Several metals, VOCs, and SVOCs were detected in groundwater samples at levels above SCGs. Compounds detected at levels above SCGs in at least one groundwater sample, and the concentration range for each compound, are identified in the following sections.

The VOC and SVOC analyses also detected the presence of a number of additional compounds that are not on the standard TCL. The laboratory only calibrates the analytical instruments to identify and quantify the TCL compounds. Compounds that are not on the TCL, but are detected during analysis, are called TICs and the identity and concentration of these compounds are estimated. As indicated in Tables 22 and 24, total TIC concentrations in the groundwater samples ranged from not detected to 650 ppb for VOCs and 67 to 1,250 ppb for SVOCs. Concentration estimates for individual TICs are provided with the analytical data in Appendix C.

Groundwater sample locations are shown on Figure 4. Groundwater locations are identified as MW-1, MW-2, and MW-3 in the tables and figures. Figure 11 presents a summary of groundwater results exceeding SCGs.

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People in the area are not using area groundwater for a source of drinking water. Residents and businesses in the area are served by a public water supply provided by the City of Rochester Water Bureau and there are no known private or public wells nearby.

The results of the 1999-2000 investigations are summarized in the following tables:

- Table 6 provides a statistical summary of the results;
- Table 22 summarizes the SVOC results sorted by compound;
- Table 23 summarizes the TPH results;
- Table 24 summarizes the VOC results sorted by compound;
- Table 25 summarizes the inorganic compound results sorted by sample location; and
- Table 26 summarizes the inorganic compound results sorted by compound.

The analytical data from RECRA Environmental Inc. are provided in Appendix C.

4.4.4.1 Groundwater - Semi-Volatile Organic Compounds

A total of eight different SVOCs, plus TICs, were detected in the three groundwater samples analyzed for TCL SVOCs. As indicated on Figure 11, the compound phenol was detected at a concentration above the TOGS 1.1.1groundwater standard in one sample (MW-1). The phenol concentration in the groundwater samples ranged from not detected to 7 ppb. The remaining seven SVOCs were detected at levels below TOGS 1.1.1 groundwater standards and guidance values.

SVOC TICs were detected in each of the three groundwater samples. The highest concentration of SVOC TICs was detected at well MW-1 (1,250 ppb), followed by well MW-2 (125 ppb) and well MW-3 (67 ppb).

4.4.4.2 Groundwater - Total Petroleum Hydrocarbons

One groundwater sample from each of the three wells was collected and analyzed for TPH. As shown on Figure 11, TPH was detected in the groundwater at one well, MW-1, at a concentration of 3.7 ppm. TPH was not detected at wells MW-2 or MW-3. There are no SCGs for TPH.

4.4.4.3 Groundwater - Volatile Organic Compounds

A total of seven different VOCs, plus TICs, were detected in the three groundwater samples analyzed for TCL VOCs. Five of the compounds were detected at concentrations above TOGS 1.1.1 groundwater standards and guidance values. VOCs detected at levels above SCGs in at least one groundwater sample, and the concentration range for each compound, are identified below:

- benzene (not detected - 95 ppb);
- 1,1,1-dichloroethane (not detected - 13 ppb);
- ethyl benzene (not detected - 49 ppb);
- 1,1,2-trichloroethane (not detected - 2 ppb); and
- xylene (total) (not detected - 190 ppb).

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Methylene chloride was also detected at levels above SCGs in the samples collected at the site, but the methylene chloride results were considered invalid due to laboratory contamination.

Table 6 also indicates that well MW-1 contained the highest groundwater concentration of each detected VOC except 1,1-dichloroethane. VOC TICs were detected in one of the three groundwater samples. VOC TICs were detected at well MW-1 at a concentration of 650 ppb (Figure 11).

4.4.4.4 Groundwater - Inorganic Compounds

A total of 19 different inorganic compounds were detected in the three groundwater samples analyzed for TAL metals. Five of the compounds were detected at concentrations above TOGS 1.1.1 groundwater standards and guidance values. Inorganic compounds detected at levels above SCGs in at least groundwater sample, and the concentration range for each compound, are identified below:

- iron (9360 - 21,700 ppb);
- lead (11.1 - 62.4 ppb);
- magnesium (49600 - 76,200 ppb);
- manganese (181 - 1,730 ppb);
- sodium (10800 - 152,000 ppb);

The remaining 14 inorganic compounds were detected at levels below TOGS 1.1.1 groundwater standards and guidance values. As indicated on Figure 11, inorganic compounds exceeding groundwater SCGs were detected in each of the three wells.

4.4.5 Quality Assurance/Quality Control (QA/QC) Sample Results

The QA/QC program implemented for this project included both field and analytical components. Field components included use of acceptable sample collection methods, use of clean equipment to minimize the potential for cross contamination, and trip blank samples. Analytical components included instrument calibration, laboratory blanks, and MS/MSD samples. Overall, the quantitative results of the QA/QC program indicated the data collected by the NYSDEC at Vacuum Oil were of acceptable quality for the objectives of the investigation except for methylene chloride. As discussed below, laboratory contamination of methylene chloride resulted in the sample results for methylene chloride to be invalidated or considered biased high.

Trip blanks consisted of vials filled in the RECRA Labnet laboratory with uncontaminated water. These vials accompanied sample collection personnel in the field and were treated identically to other water samples but were never opened. One (1) trip blank sample was collected by NYSDEC during this investigation for VOC analysis. The trip blank results provided in Table 24 indicate the presence of methylene chloride at a concentration of 9 ppb. The concentration of methylene chloride in the associated groundwater samples (B70622, B70623, and B70624) and method blank samples was 8 ppb. These results indicate that the methylene chloride detected in samples B70622, B70623, and B70624 was the result of laboratory contamination.

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MS/MSD results, method blank results and additional QA/QC data are provided along with the analytical results in Appendix C. The results of the analytical QA/QC program are summarized below:

SVOCs

- The samples were extracted and analyzed within required holding times.
- Non-target compounds were detected in the samples.
- Due to a suspected GPC malfunction, a reserve pre-GPC aliquot was analyzed and reported in association with sample B70617.
- Samples B70601 and B70602 required a 20-fold dilution due to high levels of non-target compounds.
- All samples B70603 to B70615 (except B70605 and B70612) required 2 to 1000-fold dilutions due to high levels of both target and non-target compounds.
- Sample B70623 required a 5-fold dilution due to high levels of non-target compounds.
- Three of 32 surrogate recoveries were outside EPA QC limits for samples B70601 and B70602. However, EPA CLP surrogate recovery criteria were met (i.e. no more than one outlier per fraction (acid and base neutral) and no recoveries less than 10%).
- Two of 104 obtainable surrogate recoveries were outside EPA QC limits for samples B70603 to B70615. However, EPA CLP surrogate recovery criteria were met (i.e. no more than one outlier per fraction (acid and base neutral) and no recoveries less than 10%).
- All surrogate recoveries were within EPA QC limits for samples B70617, B70622, B70623, and B70624.
- Five of 11 blank spike recoveries were outside EPA QC limits for samples B70601 and B70602. The out of limit recoveries were slightly high; however, there was no impact on the data.
- Five of 11 blank spike recoveries were outside EPA QC limits for samples B70603 to B70615.
- Two of 11 blank spike recoveries were outside EPA QC limits for sample B70617.
- Two of 11 blank spike recoveries were outside EPA QC limits for samples B70622 to B70624.
- Two of 22 matrix spike recoveries were outside EPA QC limits for samples B70603 to B70615. The spike concentration of Pyrene proved to be too low for the sample matrix (Pyrene was present in the sample).
- Five of 22 matrix spike recoveries were outside EPA QC limits for samples B70622 to B70624.
- Some method blanks contained the common laboratory contaminants Di-n-butylphthalate and bis(2-ethylhexyl)phthalate at levels less than the CRQL.
- All internal standard area and retention time criteria were met.

TPH

- For samples B70616 to B70620, the matrix spike recovery for total petroleum hydrocarbons was below the 75 to 125% control limits.
- For samples B70616 to B70620, the replicate analysis for percent solids was within the 20% RPD control limit, however replicate analysis for TPH was outside the control limit.
- The poor recovery and reproducibility for TPH for samples B70616 to B70620 may be

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attributed to low spike level and sample inhomogeneity.

VOCs

- The required holding time for analysis was met.
- Non-target compounds were detected in the samples.
- Samples B70601, B70602, and B70617 required medium level analysis due to high levels of both target and non-target compounds.
- Four of 18 surrogate recoveries were outside EPA QC limits for samples B70601 and B70602. The analysis of the method blank fulfills the reanalysis requirement of sample 99LVN492-MB1 BS. The surrogate recovery criteria were not met for samples B70601 and B70602 due to the TIC interferences; however, samples were not reanalyzed because no significant target compounds were detected in the samples.
- Two of 60 surrogate recoveries were outside EPA QC limits for samples B70603 to B70615. Sample B70610 was reanalyzed due to internal standard, surrogate recoveries being out of range and the contamination of methylene chloride. The initial analysis also had surrogate, internal standard out of criteria and higher concentration of methylene chloride contamination. Further analysis was not performed due to exceeded holding time.
- All surrogate recoveries were within EPA QC limits for samples B70617, B70622, B70623, and B70624.
- The soil method blank samples associated with samples B70603 to B70615 contained the common laboratory contaminants methylene chloride, acetone, and 2-butanone at concentrations not exceeding 23 ppb, 10 ppb, and 2 ppb, respectively. **The analytical results for these compounds, especially methylene chloride, for samples B70603 to B70615 may be biased high due to laboratory contamination as indicated by the method blank results.**
- The soil method blank, 99LVN490-MB1, contained the common laboratory contaminants methylene chloride, acetone, and 2-butanone at concentrations of 2000 ppb, 420 ppb, and 130 ppb, respectively. Method blank sample 99LVN490-MB1 is associated with samples B70601 and B70602. The analytical results for methylene chloride, acetone, and 2-butanone for samples B70601 and B70602 were similar to or less than the associated method blank results indicating that the methylene chloride detected in the samples was the result of laboratory contamination and not site soil contamination. **Based on this information, the analytical results for methylene chloride, acetone, and 2-butanone for samples B70601 and B70602 were considered invalid.**
- The soil method blank, 00LVH052-MB1, contained the common laboratory contaminants methylene chloride and acetone at concentrations of 530 ppb and 380 ppb, respectively. Method blank sample 00LVH052-MB1 is associated with sample B70617. Acetone was not detected in sample B70617. Methylene chloride was detected in sample B70617 at a concentration of 750 ppb. **The concentration of methylene chloride in sample B70617 may be biased high due to laboratory contamination as indicated by the method blank results.**
- The water method blank samples associated with samples B70622 to B70624 contained the common laboratory contaminants methylene chloride and acetone at concentrations of 8 ppb each. The analytical results for methylene chloride for samples B70622 to B70624 were the same as the associated method blank results indicating that the methylene chloride detected

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in the samples was the result of laboratory contamination and not groundwater contamination. **Based on this information, the analytical results for methylene chloride for samples B70622 to B70624 were considered invalid.**

- All matrix spike recoveries were within EPA QC limits.
- One blank spike recovery was outside EPA QC limits.
- All internal standard area and retention time criteria were met.

Inorganic Compounds

- All analyses were performed within the required hold times.
- All initial and continuing calibration verifications (ICV/CCVs) were within control limits.
- All initial and continuing calibration blanks (ICB/CCBs) were within control limits.
- All preparation/method blanks were within method criteria.
- All ICP interference check samples (ICSA and ICSAB) were within control limits with the exception of the ending ICSAB for selenium at 126.6% in TA1215A associated with samples B70601 and B70602. All of the samples were surrounded by CCVs which were within the control limits. The concentration of the interfering analytes was lower in the samples as compared to the ICSAB solution. Therefore, it is unlikely that the samples are significantly impacted.
- All laboratory control samples (LCS) were within the 80 to 120% control limits.
- All serial dilution percent differences were within method control limits.
- The TCLP extract from sample B70601 was selected for the matrix spike for this analytical batch. All TCLP matrix spike recoveries were greater than 50% as per method criteria.
- The matrix spike recovery for 1 analyte for samples B70617 to B70620, was outside the 75 to 125% control limits.
- The matrix spike recoveries for 2 analytes for samples B70603 to B70615 were outside the 75 to 125% control limits.
- The matrix spike recoveries for 2 analytes for samples B70622 to B70624 were outside the 75 to 125% control limits.
- The duplicate analysis for 1 analyte for samples B70617 to B70620 was outside the method criteria.

Pesticide/PCB

- Linearity and breakdown criteria were met for each of the analytical columns.
- Retention time criteria were met for all compounds on both analytical columns.
- Resolution of all pesticides in the Resolution Check Standard were within EPA QC limits.
- The RPDs of the pesticides in the Individual Mixes analyzed for calibration verification were within 25% for both analytical columns.
- The RPDs of the pesticides in the Performance Evaluation Mixes analyzed for calibration verification were within 25% for both analytical columns.
- All obtainable surrogate recoveries were within the advisory EPA QC limits.
- All blank spike recoveries were within EPA QC limits.
- Matrix spike recoveries for samples for samples B70603 to B70615 were unobtainable due to the dilution required for analysis.
- Recoveries of pesticides for the Florisil Cartridge Check were within EPA QC limits.
- Recoveries of pesticides for the GPC Calibration Check were within EPA QC limits.

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SVOCs - TCLP

- All required holding times for extraction and analysis were met.
- All surrogate recoveries were within EPA QC limits.
- All blank spike recoveries were within EPA QC limits.
- Internal standard area criteria were not met for the method blank spike 99LE1549-MB1 BS. The analysis of associated blank spike duplicate 99LE1549-MB1 BSD fulfills the reanalysis requirement.

VOC - TCLP

- The required holding time for analysis was met.
- The samples were analyzed at five-fold dilution due to the leachate matrix.
- All surrogate recoveries were within EPA QC limits.
- Internal standard area and retention time criteria were met.

Pesticide - TCLP

- All required holding times for extraction and analysis were met.
- All method blanks were below the reporting limits for all target compounds.
- All surrogate recoveries were within acceptance criteria.
- All blank spike recoveries were within acceptance criteria.
- All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria.

Herbicide - TCLP

- All required holding times for extraction and analysis were met.
- All method blanks were below the reporting limits for all target compounds.
- One of six surrogate recoveries were outside acceptance criteria.
- All blank spike recoveries were within acceptance criteria.
- All initial calibrations were within acceptance criteria.
- All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria.

4.5 CONCLUSIONS

Significant findings of this investigation relative to project objectives are provided below.

4.5.1 Extent of Contamination

The 1999-2000 investigation was designed to provide additional information concerning the nature and extent of contamination in the overburden on a portion of the property formerly occupied by the Vacuum Oil Company. The 1999-2000 investigation was not designed to completely define the nature and extent of contamination at the site. Rather the scope of work was designed to provide some information about all areas of the site, identify some heavily contaminated areas, and, if possible, determine if a consequential amount of hazardous waste was disposed of on the site.

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Elevated levels of SVOCs, VOCs, inorganic compounds, and pesticides were detected throughout the site. The extent of contamination for specific compounds is discussed below. No PCBs were detected at the site during the 1999-2000 investigation.

4.5.1.1 Semi-Volatile Organic Compounds and Total Petroleum Hydrocarbons

The TPH soil gas results indicated that there were two large areas with the potential for significant petroleum related contamination at the site. The first area was centered around soil gas sample point B-3 and the second area was centered around soil gas sample point F-5 (see Figure 7). All of the test pits, except TP-10, were located within these two TPH plumes. The test pit and soil boring sampling results indicated that the soils in the B-3 plume area contained more SVOC compounds at higher concentrations than the soils in the F-5 plume. For example, Figure 10 indicates that a total of 17 different SVOCs were detected at concentrations above SCGs in the subsurface soils at TP-2 (in the B3 plume area) and all of those compounds were detected at concentrations between 100,000 ppb and 1,600,000 ppb. By comparison, 7 different SVOCs were detected at concentrations above SCGs in the subsurface soils at TP-8 (in the F-5 plume area) and none of those compounds were detected at concentrations above 10,000 ppb.

SVOCs were detected above SCGs in surface and subsurface soil samples collected throughout the B-3 plume area. The most heavily SVOC contaminated soils were encountered in the vicinity of soil gas location C-3. The C-3 area included surface soil location SS-2, test pit TP-2 and well MW-2 (see Figures 7, 9, and 10). SVOCs exceeding SCGs were also detected in the B-3 plume in surface soil sample SS-1 and test pit TP-3 indicating that the SVOC contamination may be widespread.

Test pit TP-1 and well MW-1 were located immediately adjacent to soil gas point B-3 (Figure 7). No SVOCs were detected above SCGs in the subsurface soil samples collected from TP-1 or MW-1, but soils from MW-1 contained the highest TPH concentration (1,140 ppm) and soils from TP-1 contained the second highest concentration of SVOC TICs (814,000 ppb; Figure 10). The nature of the contamination in the soils at TP-1 and MW-1 also appeared to be different from TP-2, MW-2, and TP-3. The PID field screening results, provided in Appendix A, did not indicate the presence of contamination in the soils at TP-2 or TP-3. The PID did indicate the presence of some contamination in the 6 to 12 ft. interval of MW-2. At TP-1 and MW-1, the contamination was more volatile in nature, as the PID results indicated contamination was present from 4 ft. until refusal at 16.5 ft and the soils had a strong petroleum odor.

The groundwater results (see Figure 11), indicate that the SVOC contamination at the site has primarily impacted site soils as phenol was the only SVOC detected in the groundwater at concentrations above SCGs. Phenol was detected at a concentration of 7 ppb at well MW-1, the NYS groundwater standard for phenol is 1 ppb. Phenol was not detected in the groundwater at wells MW-2 or MW-3.

Figure 11 also indicates that the groundwater at MW-1 was more contaminated with SVOCs and TPH than MW-2. This is based on the following:

- Phenol at MW-1 was the only SVOC detected in the groundwater at concentrations above

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SCGs;

- The groundwater at MW-1 contained a higher concentration of SVOC TICS (1,250 ppb) than MW-2 (125 ppb); and
- The groundwater at MW-1 contained a higher concentration of TPH (3.7 ppm) than MW-2 (not detected).

These groundwater results do not correlate well with the soil results which indicated that the soils in the vicinity of MW-2 were more contaminated with SVOCs than the soils in the vicinity of MW-1.

4.5.1.2 Volatile Organic Compounds

The VOC soil gas results detected the presence of petroleum-related VOCs (BTEX, trimethylbenzenes, and naphthalene) and chlorinated VOCs (1,1,1-trichloroethane, trichloroethene, and tetrachloroethene). The soil gas data, presented in Appendix E, indicated a correlation between the petroleum VOC soil gas results and the TPH soil gas results. Subsequent sampling of the surface soil, subsurface soil and groundwater indicated that petroleum-related VOC contamination was present in the subsurface soil and groundwater in the vicinity of MW-1 and TP-1 (see Figures 10 and 11). In the subsurface soil from TP-1, xylene was detected at a concentration of 6,300 ppb at MW-1. The TAGM 4046 recommended soil cleanup objective for xylene is 1,200 ppb. Subsurface soil samples from TP-1 also contained the highest level of VOC TICs (133,000 ppb). The next highest level of VOC TICs in the subsurface soil was 237 ppb from TP-3. In the groundwater, the petroleum-related compounds benzene, ethyl benzene, and xylene were detected above NYS groundwater standards at well MW-1 which is adjacent to test pit TP-1 (see Figure 11). Petroleum-related VOCs were not detected in wells MW-2 or MW-3.

Chlorinated VOCs were detected less frequently in the soil vapor than the petroleum VOCs and there was not a strong correlation between the chlorinated VOC soil gas results and the soil gas results for other compounds. Total chlorinated VOC concentrations detected in the soil gas are shown on Figure 8. Figure 8 indicated that the area around soil gas points C-3 and D-3 was a potential source of chlorinated compound contamination, but additional sampling at the site did not identify the presence of a consequential chlorinated VOC source area. This conclusion was based on the following:

- Except for methylene chloride, no chlorinated VOCs were detected in the surface soil samples (Table 9).
- In the subsurface, chlorinated VOCs (excluding methylene chloride) were detected in one sample (TP-3) at a total concentration of about 42 ppb. Trichloroethene was the individual chlorinated VOC detected at the highest concentration, 28 ppb, which was much lower than the TAGM 4046 recommended soil cleanup objective of 700 ppb (see Tables 16 and 17).
- In the groundwater, chlorinated compounds (excluding methylene chloride) were detected at concentrations above NYS groundwater standards at wells MW-1 and MW-2 (Figure 11). 1,1-Dichloroethane was detected at the highest concentration, 13 ppb, which is only slightly higher than the NYS groundwater standard of 5 ppb.
- As discussed in Section 4.4.5, laboratory contamination resulted in invalid and biased high

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analytical data for methylene chloride.

4.5.1.3 Inorganic Compounds

A total of 14 different inorganic compounds that were detected at concentrations above SCGs in either the surface soil, subsurface soil, or groundwater during the 1999-2000 investigation. The following two compounds were identified as compounds of concern for additional review:

- arsenic; and
- mercury.

These compounds were identified based on the number and magnitude of SCG exceedances (see Tables 4, 5 and 6) and the potential hazards of the compound in the environment.

Arsenic: Elevated levels of arsenic were detected throughout the site, particularly in the surface soil and subsurface soil. In the surface soil, elevated levels of arsenic (greater than the Eastern USA background concentration of 12 ppm) were detected in two of the five surface soil samples: SS-2 (60.7 ppm) and SS-5 (13.5 ppm). As shown on Figure 9, SS-2 was located in the northern portion of the site. SS-5 was located in the southern portion of the site in the vicinity of former "sludge pits" that were excavated in 1992 (Figure 3). The sludge pit soils reportedly contained arsenic at concentrations up to 930 ppm.

In the subsurface soils, elevated levels of arsenic (greater than the Eastern USA background concentration of 12 ppm) were detected in three of the nine test pits and borings sampled for metals at concentrations ranging from 16.1 ppm to 113 ppm (see Figure 10). The highest concentration of arsenic detected in the subsurface soil was 113 ppm at test pit TP-8. Elevated levels of arsenic were also detected in TP-5 (37.7 ppm) and TP-2 (16.1 ppm). Test pit TP-2 was located in the vicinity of surface soil sample location SS-2 where elevated levels of arsenic were also detected. Test pit TP-8 was located in the western portion of the site and TP-5 was located in the southeastern portion of the site. There were no other sample locations in the immediate vicinity of either TP-8 or TP-5. Figure 9 and Figure 10 indicate that there may be a correlation between elevated arsenic concentrations and elevated SVOC concentrations in the soil.

Site specific background samples were not collected as part of the 1999-2000 investigation, but samples collected at other sites in the City of Rochester indicated that the Eastern USA background concentration of 12 ppm identified in TAGM 4046 is an appropriate upper limit to use as a background level for arsenic. Based on these data, the elevated levels of arsenic detected at the site are likely the result of past site activities.

Arsenic was detected in each of the three groundwater samples, but the results were all less than the NYS groundwater standard of 25 ppb (Tables 25 and 26). The highest concentration of arsenic detected in the groundwater was 17 ppb at well MW-2. Well MW-2 was located adjacent to surface soil sample point SS-2 and test pit TP-2 where elevated levels of arsenic were detected.

Mercury: Elevated levels of mercury were detected throughout the site in the surface and

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subsurface soils. In the surface soil, elevated levels of mercury (greater than the TAGM 4046 recommended cleanup value of 0.1 ppm) were detected in each of the five surface soil samples. The highest mercury concentration was 2.1 ppm at SS-4 located in the southwest portion of the site (see Figure 9).

In the subsurface soil, elevated levels of mercury (greater than the TAGM 4046 recommended cleanup value of 0.1 ppm) were detected in three of the nine test pits and borings sampled for metals at concentrations ranging from 0.12 ppm to 4 ppm (see Figure 10). The highest concentration of mercury detected in the subsurface soil was 4 ppm at test pit TP-1. Elevated levels of arsenic were also detected in TP-3 (0.12 ppm), TP-2 (1 ppm), and TP-10 (1.5 ppm). TP-1, TP-2, TP-3, and TP-10 are located in the northern portion of the site.

Site specific background samples were not collected as part of the 1999-2000 investigation, but samples collected at other sites in the City of Rochester indicated that approximately 1 ppm is an appropriate upper limit to use as a background level for mercury. Based on these data, two surface soil samples (SS-4 and SS-5) and three subsurface soil samples (TP-1, TP-2, and TP-10) contained levels of mercury that are likely the result of past site activities.

Mercury was not detected in the groundwater at concentrations above NYS groundwater standards.

4.5.1.4 Pesticides

The 1999-2000 investigation indicated the potential for limited pesticide contamination. Elevated levels of the pesticides dieldrin and heptachlor epoxide were detected in surface soil sample SS-1 (Figure 9). Dieldrin was detected at a concentration of 74 ppb and heptachlor epoxide was detected at a concentration of 30 ppb. The TAGM 4046 recommended cleanup objectives for dieldrin and heptachlor epoxide are 44 ppb and 20 ppb, respectively.

4.5.2 The NYS Listing of Inactive Hazardous Waste Disposal Sites

As discussed below, the results of the 1999-2000 investigation indicated that site contamination resulted from the disposal of petroleum-related compounds at the site. Some hazardous waste may have also been disposed of at the site, but the 1999-2000 investigation results did not identify a consequential amount of hazardous waste. Based on the results of the investigation NYSDEC will not include the Vacuum Oil site in the NYS Listing of Inactive Hazardous Waste Disposal Sites. This conclusion is based on the following:

- The primary contaminants at the site are petroleum related SVOCs and VOCs. This is consistent with the site's former use as an oil refinery.
- Site contamination could not be identified as a characteristic hazardous waste as defined in 6 NYCRR 371.3. Waste soils and water generated during the 1999-2000 investigation were tested and were not ignitable, corrosive, reactive, or toxic. TCLP analytical results for subsurface soil samples from TP-1 (see Table 21), were below regulatory levels. During the 1992 soil removal at the site, arsenic was detected in the sludge pit soils at concentrations up to 930 ppm, but TCLP results for the sludge pit soils were below regulatory levels. The

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highest arsenic concentration detected in the soil during the 1999-2000 investigation was 113 ppm.

- The petroleum contamination at the site could not be identified as a listed hazardous waste as defined in 6 NYCRR 371.4. The following hazardous waste codes apply to specific wastes from petroleum refineries: F037, F038, and K048 to K052. Since the NYSDEC has no knowledge as to what operations at Vacuum Oil caused the petroleum contamination, it is not appropriate to classify the site using the listed hazardous waste codes.
- The chlorinated compounds detected at the site may have been caused by the disposal of listed hazardous waste (either waste code F001 or F002), but the sampling results indicated that the amount of hazardous waste disposed was not consequential.

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5.0 RECOMMENDATIONS

In 1999-2000, the NYSDEC conducted a site investigation of a portion of the former Vacuum Oil Company facility in Rochester, New York. Soil gas, surface soil, subsurface soil, and groundwater samples were collected at the site and analyzed for TCL SVOCs, TPH, TCL VOCs, TAL metals, cyanide, pesticides, PCBs, and TCLP.

The results of the NYSDEC investigation indicated widespread petroleum contamination in the surface soil, subsurface soil, and groundwater at the site. To a lesser extent, chlorinated VOCs, metals, and pesticides were also detected above NYS standards at the site

The results of the 1999-2000 investigation indicated that site contamination was not the result of disposal of a consequential amount of hazardous waste. NYSDEC will not include the site in the New York State Listing of Inactive Hazardous Waste Disposal Sites at this time.

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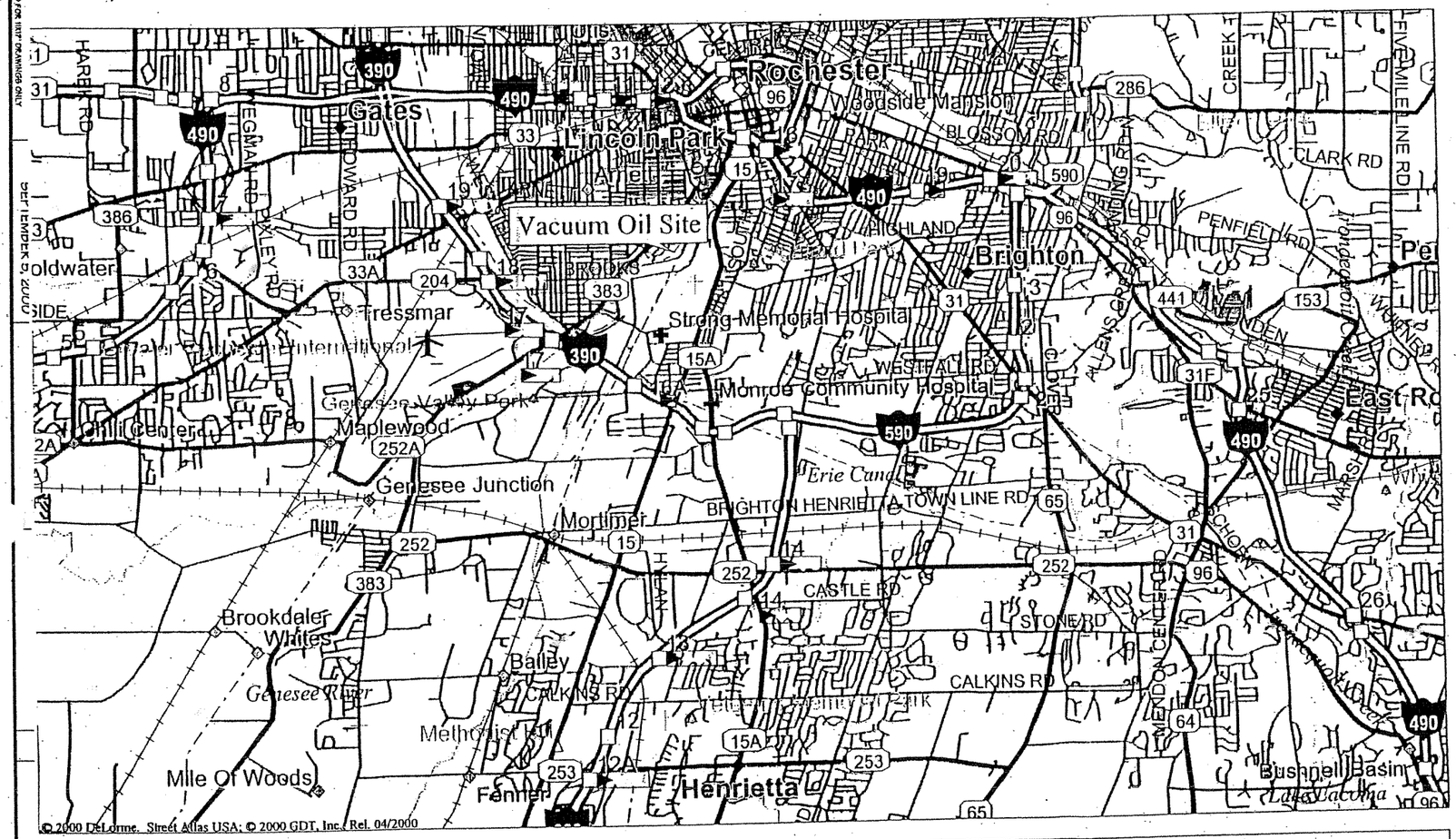
Figure 1. Rochester, New York Location of Former Vacuum Oil Facility



Survey Notes:

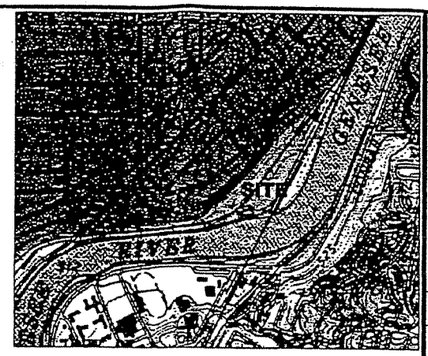
1) Horizontal information shown heron is referenced to the NAD '83 New York West Zone.

2) Vertical information shown heron is referenced to the NGVD '88 as generated from the Rochester City Datum.

General Notes:

1) No boundary survey was performed, ROW and property lines were developed from tax maps, and are approximate.

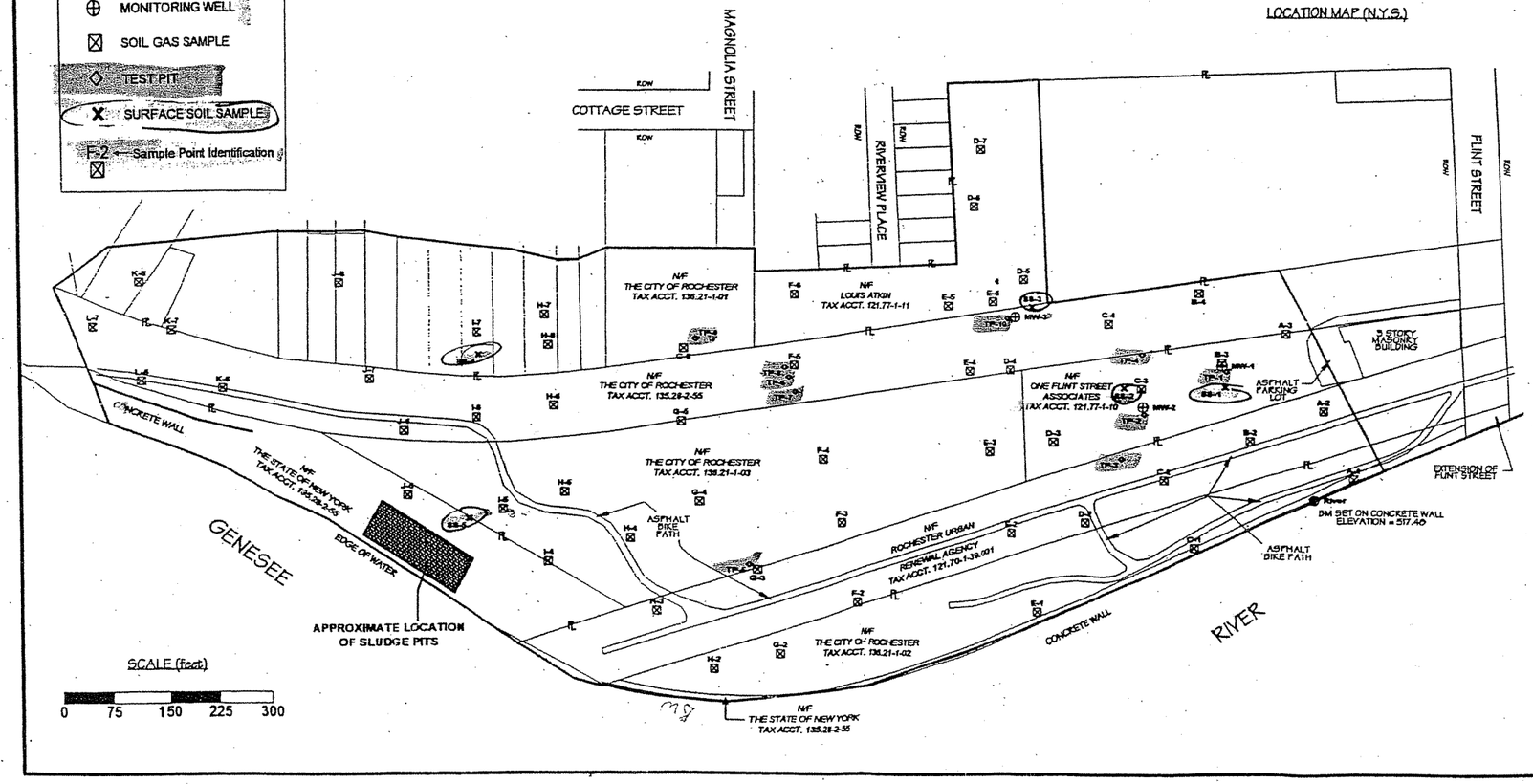
2) This map was originally prepared by Larson Engineers, for use by the NYSDEC. It is not to be used, in whole or in part, for any other project or purpose without the written consent of Larson Engineers, P.E., L.S., P.G.. The original map was prepared on April 15, 2000. This map was altered by C. Hauptfleisch, NYSDEC intern, on August 28, 2000.



LOCATION MAP (N.Y.S.)

LEGEND

- MONITORING WELL
- SOIL GAS SAMPLE
- TEST PIT
- SURFACE SOIL SAMPLE
- SP-2 ← Sample Point Identification



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REGION 8

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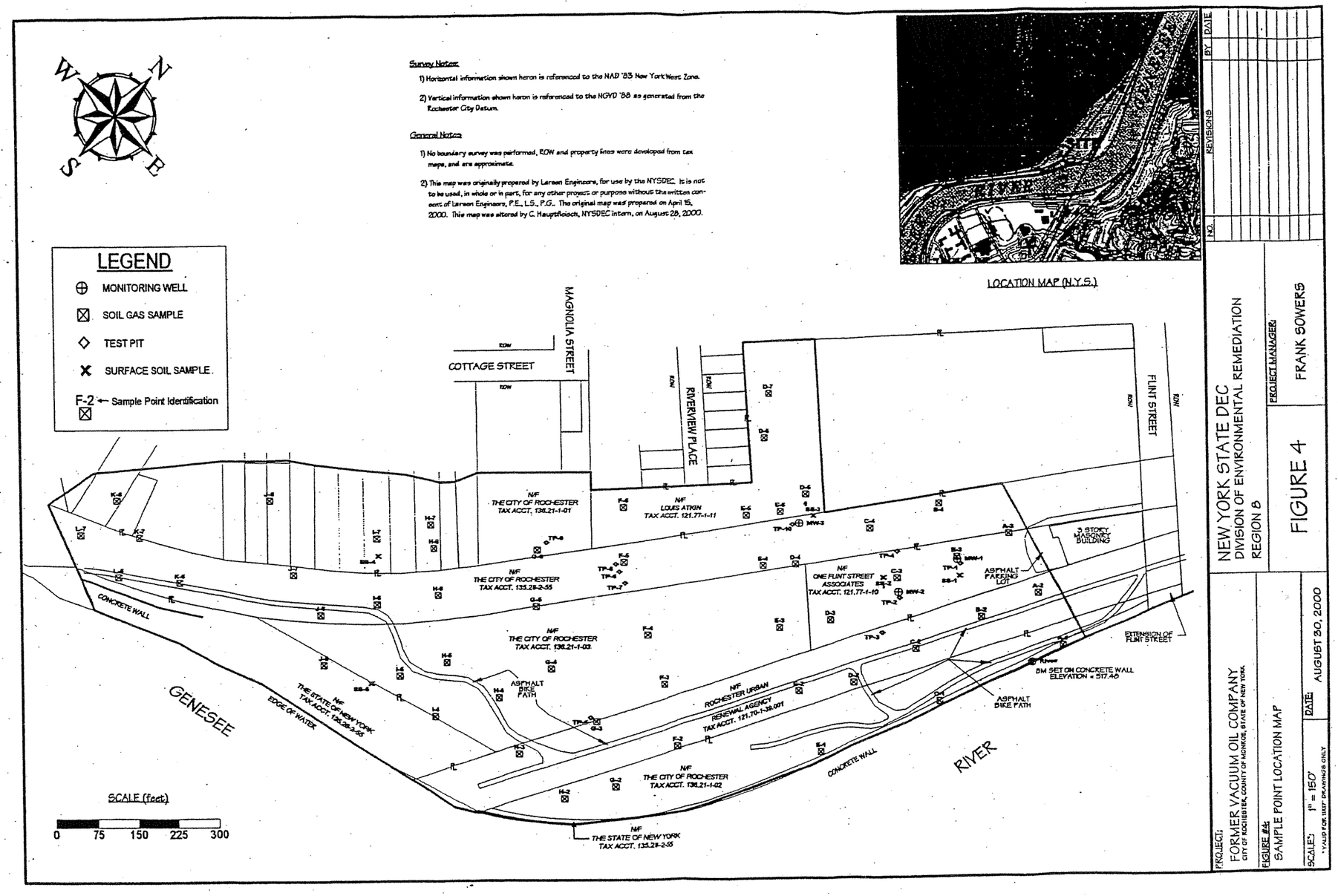
FIGURE 3

PROJECT:
FORMER VACUUM OIL COMPANY
CITY OF ROCHESTER, COUNTY OF MONROE, STATE OF NEW YORK

FIGURE #3:
LOCATION OF SLUDGE PITS REMOVED IN 1992

SCALE: 1" = 150'
*VALID FOR 11x17" DRAWINGS ONLY

DATE: SEPTEMBER 6, 2000



Survey Notes:

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2) Vertical information shown heron is referenced to the NGVD '88 as generated from the Rochester City Datum.

General Notes

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LOCATION MAP (N.Y.S.)

NO.	REVISIONS	BY	DATE

NEW YORK STATE DEC
DIVISION OF ENVIRONMENTAL REMEDIATION
REGION 8

PROJECT MANAGER: FRANK SOWERS

FIGURE 4

PROJECT: FORMER VACUUM OIL COMPANY
CITY OF ROCHESTER, COUNTY OF MONROE, STATE OF NEW YORK

FIGURE #4: SAMPLE POINT LOCATION MAP

SCALE: 1" = 150'
*VALID FOR 11X17 DRAWINGS ONLY

DATE: AUGUST 30, 2000

Survey Notes:

1) Horizontal information shown heron is referenced to the NAD '83 New York West Zone.

2) Vertical information shown heron is referenced to the NGVD '88 as generated from the Rochester City Datum.

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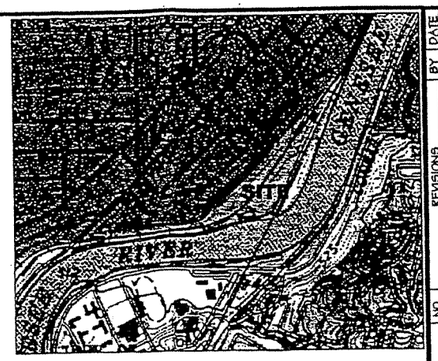
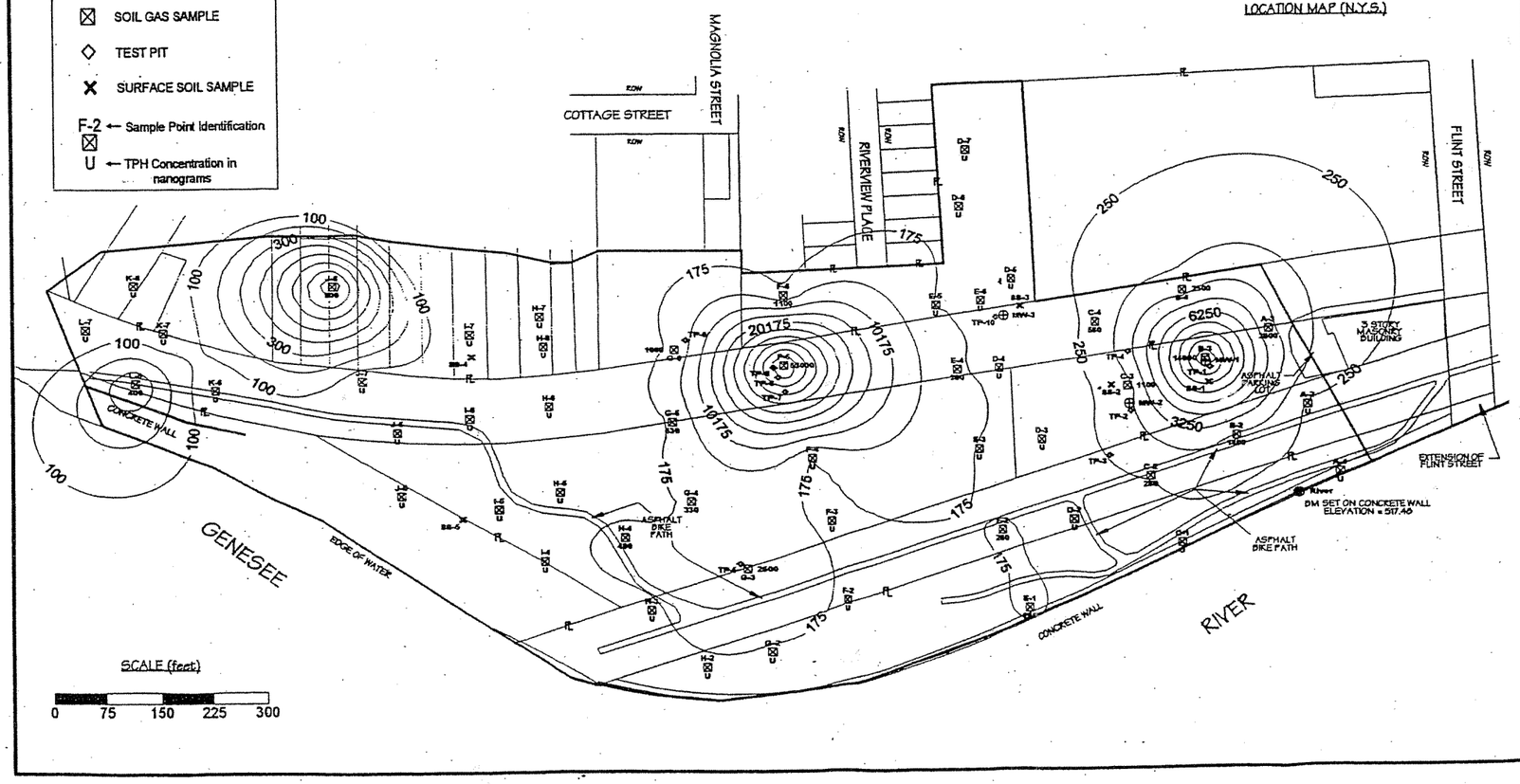
3) Contours were computed and added to this map using Golden Software Surfer, and the kriging method.



LOCATION MAP (N.Y.S.)

LEGEND

- MONITORING WELL
- SOIL GAS SAMPLE
- TEST PIT
- SURFACE SOIL SAMPLE
- F-2 ← Sample Point Identification
- U ← TPH Concentration in nanograms



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REGION 8

PROJECT MANAGER: FRANK GOWERS

FIGURE 7

PROJECT:
FORMER VACUUM OIL COMPANY
CITY OF ROCHESTER, COUNTY OF MONROE, STATE OF NEW YORK

FIGURE #3:
PASSIVE SOIL GAS SURVEY RESULTS AND CONTOUR MAP: TOTAL PETROLEUM HYDROCARBONS (TPH)

SCALE: 1" = 150'

DATE: SEPTEMBER 6, 2000

* VALID FOR 11X17" DRAWINGS ONLY

Survey Notes:

1) Horizontal information shown heron is referenced to the NAD '83 New York West Zone.

2) Vertical information shown heron is referenced to the NGVD '88 as generated from the Rochester City Datum.

General Notes

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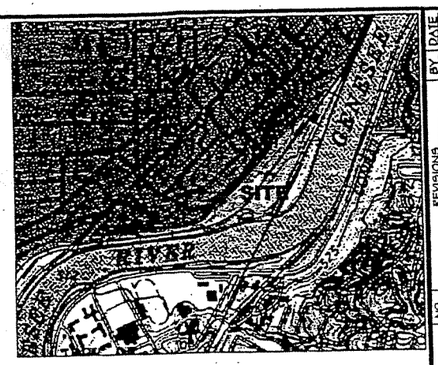
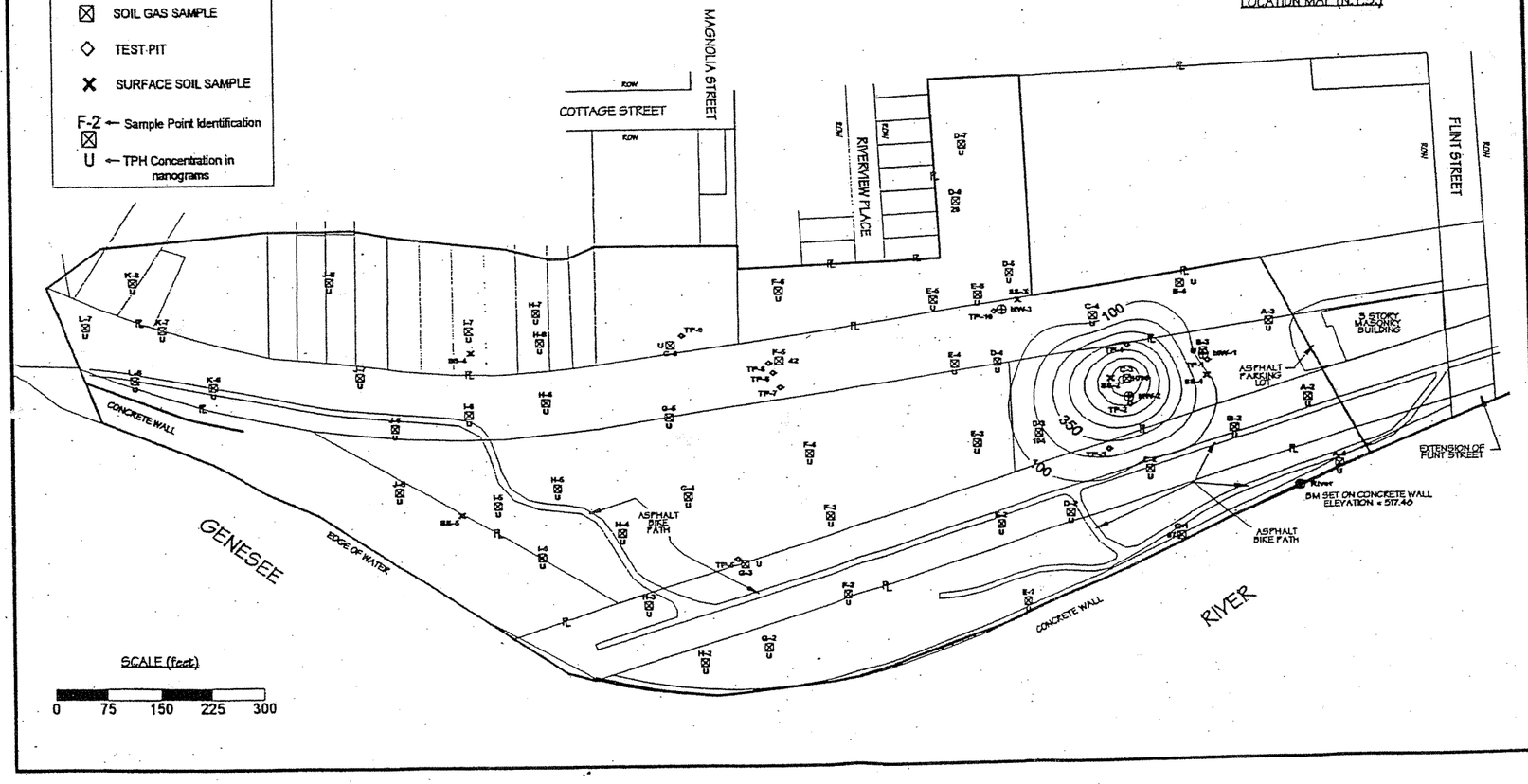
3) Contours were computed and added to this map using Golden Software Surfer, and the triging method.



LOCATION MAP (N.Y.S.)

LEGEND

- ⊕ MONITORING WELL
- ☒ SOIL GAS SAMPLE
- ◇ TEST-PIT
- ✕ SURFACE SOIL SAMPLE
- F-2 ← Sample Point Identification
- ☒ U ← TPH Concentration in nanograms



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REGION 8

FIGURE 8

PROJECT:
FORMER VACUUM OIL COMPANY
CITY OF ROCHESTER, COUNTY OF MONROE, STATE OF NEW YORK

PROJECT MANAGER: FRANK SOWERS

FIGURE #2:
PASSIVE SOIL GAS SURVEY RESULTS AND CONTOUR MAP: TOTAL CHLORINATED VOLATILES

SCALE: 1" = 150'
* VALID FOR 11X17" DRAWINGS ONLY

DATE: SEPTEMBER 6, 2000

NO.	REVISIONS	BY	DATE

Survey Notes:

1) Horizontal information shown hereon is referenced to the NAD '83 New York West Zone.

2) Vertical information shown hereon is referenced to the NGVD '88 as generated from the Rochester City Datum.

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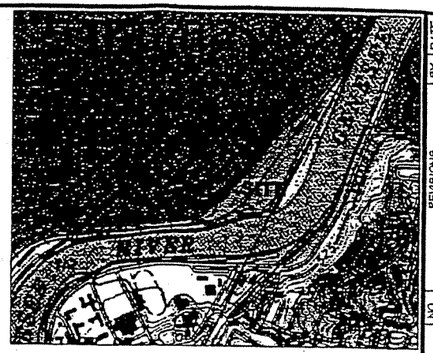
3) The term "TICs" stands for Tentatively Identified Compounds.

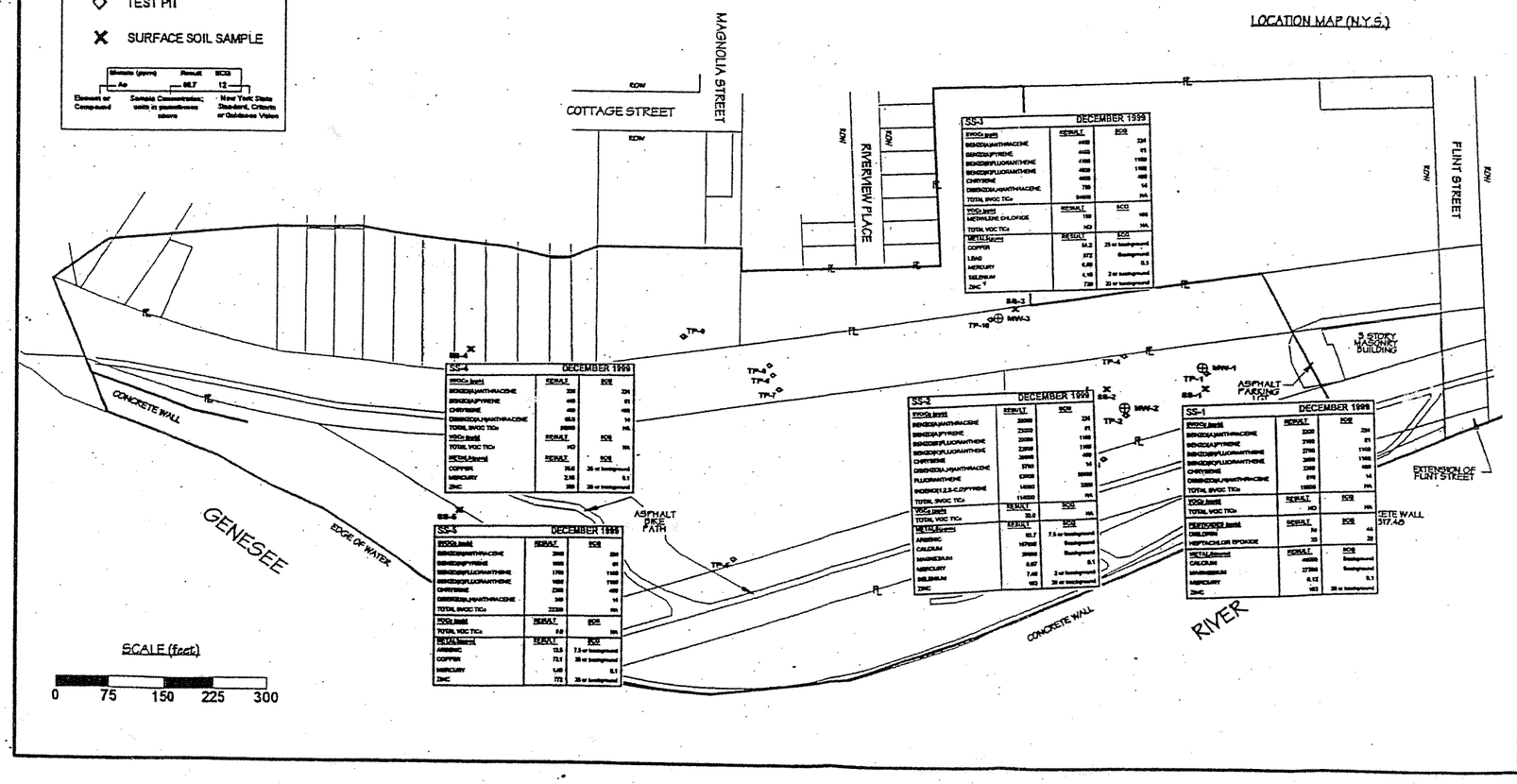
LEGEND

- MONITORING WELL
- TEST PIT
- SURFACE SOIL SAMPLE

Element or Compound | Sample Concentration; units in parentheses above | New York State Standard, Criteria or Guidance Value

LOCATION MAP (N.Y.S.)





NO.	REVISIONS	BY	DATE

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REGION 8

PROJECT MANAGER: FRANK SOWERS

FIGURE 9

PROJECT:
FORMER VACUUM OIL COMPANY
CITY OF ROCHESTER, COUNTY OF MONROE, STATE OF NEW YORK

FIGURE #9:
SUMMARY OF SURFACE SOIL RESULTS EXCEEDING SCGS PLUS TOTAL TENTATIVELY IDENTIFIED COMPOUNDS

SCALE: 1" = 150'
* VALID FOR 11x17" DRAWINGS ONLY

DATE: SEPTEMBER 27, 2000

Survey Notes:

1) Horizontal information shown heron is referenced to the NAD '83 New York West Zone.

2) Vertical information shown heron is referenced to the NGVD '88 as generated from the Rochester City Datum.

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3) The term "TICs" stands for Tentatively Identified Compounds.

LEGEND

- ⊕ MONITORING WELL
- ◇ TEST PIT
- ✕ SURFACE SOIL SAMPLE

Analyte (ppm)	Result	SCG
As	88.7	12
Element or Compound	Sample Concentration; bolds in parentheses above	New York State Standard, Criteria or Guidance Value

LOCATION MAP (N.Y.S.)

NO.	REVISIONS	BY	DATE

PROJECT MANAGER: FRANK SOWERS

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DIVISION OF ENVIRONMENTAL REMEDIATION
REGION 8

FIGURE 10

PROJECT:
FORMER VACUUM OIL COMPANY
CITY OF ROCHESTER, COUNTY OF MONROE, STATE OF NEW YORK

FIGURE #10
SUMMARY OF SUBSURFACE SOIL RESULTS EXCEEDING SCGS PLUS TOTAL TENTATIVELY IDENTIFIED COMPOUNDS AND TOTAL PETROLEUM HYDROCARBONS

SCALE: 1" = 150'

DATE: SEPTEMBER 27, 2000

*VALID FOR 11X17" DRAWINGS ONLY

W
N
S
E
Survey Notes:
1) Horizontal information shown heron is referenced to the NAD '83 New York West Zone.
2) Vertical information shown heron is referenced to the NGVD '88 as generated from the Rochester City Datum.
General Notes:
1) No boundary survey was performed, ROW and property lines were developed from tax maps, and are approximate.
2) This map was originally prepared by Larsen Engineers, for use by the NYSDEC. It is not to be used, in whole or in part, for any other project or purpose without the written consent of Larsen Engineers, P.E., L.S., P.G.. The original map was prepared on April 15, 2000. This map was altered by C. Hauptfleisch, NYSDEC intern, on August 28, 2000.
5) The term "TICs" stands for Tentatively Identified Compounds.
LEGEND
MONITORING WELL
TEST PIT
SURFACE SOIL SAMPLE
Element or Compound
New York State Standard, Criteria or Guidance Value
LOCATION MAP (N.Y.S.)
MAGNOLIA STREET
COTTAGE STREET
ROW
RIVERVIEW PLACE
FLINT STREET
MW-1 February 2000
SVOCs (ppb) RESULT SCG
PHENOL 7.00 1
TOTAL SVOC TICs 1250 NA
TPH (ppb) RESULT SCG
TPH 3.70 NA
VOCs (ppb) RESULT SCG
1,1,2-TRICHLOROETHANE 2.00 1
1,1-DICHLOROETHANE 7.00 5
BENZENE 95.0 1
ETHYL BENZENE 49.0 5
XYLENE (total) 190 5
TOTAL VOC TICs 650 NA
Metals (ppb) RESULT SCG
IRON 21700 300
MAGNESIUM 76200 35000
MANGANESE 1130 300
SODIUM 23600 20000
MW-3 February 2000
SVOCs (ppb) RESULT SCG
TOTAL SVOC TICs 67 NA
TPH (ppb) RESULT SCG
TPH ND NA
VOCs (ppb) RESULT SCG
TOTAL VOC TICs ND NA
Metals (ppb) RESULT SCG
IRON 9360 300
LEAD 82.4 25
MAGNESIUM 49600 35000
SODIUM 152000 20000
MW-2 February 2000
SVOCs (ppb) RESULT SCG
TOTAL SVOC TICs 125 NA
TPH (ppb) RESULT SCG
TPH ND NA
VOCs (ppb) RESULT SCG
1,1-DICHLOROETHANE 13.0 5
TOTAL VOC TICs ND NA
Metals (ppb) RESULT SCG
IRON 18700 300
MAGNESIUM 50500 35000
MANGANESE 1730 300
ASPHALT PARKING LOT
ASPHALT BIKE PATH
EXTENSION OF FLINT STREET
CONCRETE WALL
EDGE OF WATER
GENESEE
RIVER
SCALE (feet)
0 75 150 225 300
NO. REVISIONS BY DATE
NEW YORK STATE DEC
DIVISION OF ENVIRONMENTAL REMEDIATION
REGION 8
PROJECT MANAGER:
FRANK SOWERS
FIGURE 11
PROJECT:
FORMER VACUUM OIL COMPANY
CITY OF ROCHESTER, COUNTY OF MONROE, STATE OF NEW YORK
FIGURE #11: SUMMARY OF GROUNDWATER RESULTS EXCEEDING SCGS PLUS TOTAL TENTATIVELY IDENTIFIED COMPOUNDS AND TOTAL PETROLEUM HYDROCARBONS
SCALE: 1" = 150'
DATE: SEPTEMBER 27, 2000
*VALID FOR 11X17" DRAWINGS ONLY

TABLES

Table 1. Sample Collection/Analytical Matrix
Former Vacuum Oil Company - 1999-2000 Site Investigation

Sample Location	Matrix	Sample Collection Date	Analytical Parameter						
			VOCs (ASP Method 95-1)	SVOCs (ASP Method 95-2)	Pesticides/ PCBs (ASP Method 95-3)	Total Metals	Cyanide	TPH	TCLP
SS-1	Surface Soil	12/07/99	x	x	x	x	x		
SS-2	Surface Soil	12/07/99	x	x	x	x	x		
SS-3	Surface Soil	12/07/99	x	x	x	x	x		
SS-4	Surface Soil	12/07/99	x	x	x	x	x		
SS-5	Surface Soil	12/07/99	x	x	x	x	x		
TP-1 (3-5')	Soil	12/06/99	x	x	x	x	x		x
TP-1 (7-8')	Soil	12/06/99	x	x	x	x	x		x
TP-2 (5')	Soil	12/06/99	x	x	x	x	x		
TP-3 (8-9')	Soil	12/06/99	x	x	x	x	x		
TP-4 (4')	Soil	12/06/99	x	x	x	x	x		
TP-5 (3')	Soil	12/06/99	x	x	x	x	x		
TP-8 (3')	Soil	12/06/99	x (+MS/MSD)	x (+MS/MSD)	x (+MS/MSD)	x (+MS/MSD)	x (+MS/MSD)		
TP-10 (4')	Soil	12/06/99	x	x	x	x	x		
MW-2 (6-8')	Soil	2/08/00				x		x	
MW-2 (10-12')	Soil	2/08/00	x	x				x	
MW-1 (8-10')	Soil	2/08/00				xo		xo	
MW-1 (16-18')	Soil	2/08/00						x	
MW-1	Water	2/23/00	x	x		x		x	
MW-2	Water	2/23/00	x (+MS/MSD)	x (+MS/MSD)		x (+MS/MSD)		x (+MS/MSD)	
MW-3	Water	2/23/00	x	x		x		x	

Notes
X - Field sample.
O - Field duplicate sample.
VOC - Volatile Organic Compound
SVOC- Semi-Volatile Organic Compound
TPH - Total Petroleum Hydrocarbon
TCLP- Toxicity Characteristic Leachate Procedure
MS/MSD- Matrix Spike/Matrix Spike Duplicate

Table 2. Site Survey Data
Former Vacuum Oil Company
1999-2000 Site Investigation

SAMPLE	NORTH	EAST	ELEVATION (ft.)	DESCRIPTION
MW-1	1144237.05	1405147.46	515.67	TOP OF CONC. PAD
			518.02	CASE
			517.81	PVC RISER
MW-2	1144117.41	1405111.91	513.20	TOP OF CONC. PAD
			514.98	CASE
			514.88	PVC RISER
MW-3	1144095.65	1404885.62	510.12	TOP OF CONC. PAD
			512.42	CASE
			511.95	PVC RISER
GENESEE RIVER	NOT AVAILABLE	NOT AVAILABLE	517.48	TOP OF WALL
TP-1	1144237.1	1405147.5	515.7	TEST PIT
TP-2	1144117.4	1405111.9	512.9	TEST PIT
TP-3	1144040.4	1405143.9	511.8	TEST PIT
TP-4	1144175.2	1405056.0	511.2	TEST PIT
TP-5	1143561.6	1404863.0	514.0	TEST PIT
TP-6	1143804.2	1404707.7	510.1	TEST PIT
TP-7	1143794.9	1404729.8	510.5	TEST PIT
TP-8	1143811.8	1404693.1	509.6	TEST PIT
TP-9	1143760.8	1404576.0	513.6	TEST PIT
TP-10	1144084.9	1404878.3	509.3	TEST PIT
A-1	1144237.5	1405399.3	N/A	SOIL GAS SAMPLE
A-2	1144283.6	1405297.6	N/A	SOIL GAS SAMPLE
A-3	1144333.5	1405177.5	N/A	SOIL GAS SAMPLE
B-2	1144182.0	1405254.8	N/A	SOIL GAS SAMPLE
B-3	1144239.2	1405143.2	N/A	SOIL GAS SAMPLE
B-4	1144297.3	1405050.2	N/A	SOIL GAS SAMPLE
C-1	1144011.1	1405309.4	N/A	SOIL GAS SAMPLE
C-2	1144059.3	1405200.9	N/A	SOIL GAS SAMPLE
C-3	1144133.5	1405089.7	N/A	SOIL GAS SAMPLE
C-4	1144175.7	1404987.9	N/A	SOIL GAS SAMPLE
D-2	1143936.1	1405172.6	N/A	SOIL GAS SAMPLE
D-3	1143994.6	1405054.6	N/A	SOIL GAS SAMPLE
D-4	1144030.7	1404936.4	N/A	SOIL GAS SAMPLE
D-5	1144145.0	1404854.8	N/A	SOIL GAS SAMPLE
D-6	1144176.4	1404725.8	N/A	SOIL GAS SAMPLE
D-7	1144245.3	1404671.8	N/A	SOIL GAS SAMPLE
E-1	1143793.6	1405214.4	N/A	SOIL GAS SAMPLE
E-2	1143852.7	1405103.1	N/A	SOIL GAS SAMPLE
E-3	1143920.7	1404997.2	N/A	SOIL GAS SAMPLE
E-4	1143989.3	1404893.0	N/A	SOIL GAS SAMPLE
E-5	1144042.8	1404804.2	N/A	SOIL GAS SAMPLE
E-6	1144090.5	1404844.9	N/A	SOIL GAS SAMPLE
F-2	1143625.2	1405012.5	N/A	SOIL GAS SAMPLE
F-3	1143697.9	1404913.4	N/A	SOIL GAS SAMPLE
F-4	1143747.4	1404827.8	N/A	SOIL GAS SAMPLE
F-5	1143825.9	1404702.6	N/A	SOIL GAS SAMPLE
F-6	1143905.2	1404630.9	N/A	SOIL GAS SAMPLE
G-2	1143494.3	1404983.2	N/A	SOIL GAS SAMPLE

Table 2. Site Survey Data
Former Vacuum Oil Company
1999-2000 Site Investigation

SAMPLE	NORTH	EAST	ELEVATION (ft.)	DESCRIPTION
G-3	1143562.9	1404875.1	N/A	SOIL GAS SAMPLE
G-4	1143585.9	1404747.3	N/A	SOIL GAS SAMPLE
G-5	1143656.5	1404647.2	N/A	SOIL GAS SAMPLE
G-6	1143738.6	1404571.5	N/A	SOIL GAS SAMPLE
H-2	1143418.6	1404933.8	N/A	SOIL GAS SAMPLE
H-3	1143426.2	1404816.9	N/A	SOIL GAS SAMPLE
H-4	1143481.0	1404715.9	N/A	SOIL GAS SAMPLE
H-5	1143467.2	1404599.2	N/A	SOIL GAS SAMPLE
H-6	1143552.2	1404499.6	N/A	SOIL GAS SAMPLE
H-7	1143644.0	1404395.8	N/A	SOIL GAS SAMPLE
H-8	1143613.6	1404432.7	N/A	SOIL GAS SAMPLE
I-4	1143377.8	1404653.6	N/A	SOIL GAS SAMPLE
I-5	1143389.5	1404550.7	N/A	SOIL GAS SAMPLE
I-6	1143465.2	1404430.5	N/A	SOIL GAS SAMPLE
I-7	1143617.9	1404372.6	N/A	SOIL GAS SAMPLE
J-5	1143315.2	1404440.2	N/A	SOIL GAS SAMPLE
J-6	1143381.8	1404369.5	N/A	SOIL GAS SAMPLE
J-7	1143406.0	1404281.2	N/A	SOIL GAS SAMPLE
J-8	1143487.3	1404150.6	N/A	SOIL GAS SAMPLE
K-6	1143258.3	1404139.3	N/A	SOIL GAS SAMPLE
K-7	1143274.1	1404027.2	N/A	SOIL GAS SAMPLE
K-8	1143302.3	1403946.8	N/A	SOIL GAS SAMPLE
L-6	1143193.9	1404051.6	N/A	SOIL GAS SAMPLE
L-7	1143206.4	1403946.9	N/A	SOIL GAS SAMPLE

1. Vertical information is referenced to the NGVD '88 as generated from the Rochester City Datum.
2. Horizontal information is referenced to the NAD'83 New York West Zone.

Table 3. Groundwater Elevation Data
Former Vacuum Oil Company
1999-2000 Site Investigation

Location Id.	Date	Reference Elevation (ft. AMSL)	Depth to Water (ft.)	Water Elevation (ft. AMSL)
MW-1	02/23/2000	517.81	9.78	508.03
MW-2	02/23/2000	514.88	6.70	508.18
MW-3	02/23/2000	511.95	4.65	507.30
MW-1	05/04/2000	517.81	7.50	510.31
MW-2	05/04/2000	514.88	3.90	510.98
MW-3	05/04/2000	511.95	3.62	508.33
Genesee River	05/04/2000	517.48	6.51	510.97

AMSL - Above Mean Sea Level

Table 4. Surface Soil Statistical Summary of Detected Compounds
Former Vacuum Oil Company - 1999-2000 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TAGM 4046)	Eastern USA Background (ppm)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Aluminum	TAL Metals	5	5	Background	33,000	0	11,900 ppm	SS-4
Antimony	TAL Metals	5	2	Background	Not Available	0	3.7 ppm	SS-5
Arsenic	TAL Metals	5	5	7.5 ppm or background	3 - 12	2	60.7 ppm	SS-2
Barium	TAL Metals	5	5	300 ppm or background	15 - 600	0	366 ppm	SS-2
Beryllium	TAL Metals	5	4	0.16 ppm or background	0 - 1.75	0	0.63 ppm	SS-2
Cadmium	TAL Metals	5	5	10 ppm or background	0.1 - 1	0	3.5 ppm	SS-3
Calcium	TAL Metals	5	5	Background	130 - 35,000	2	167,000 ppm	SS-2
Chromium	TAL Metals	5	5	50 ppm or background	1.5 - 40	0	24 ppm	SS-4
Cobalt	TAL Metals	5	5	30 ppm or background	2.5 - 60	0	8.4 ppm	SS-4
Copper	TAL Metals	5	5	25 ppm or background	1 - 50	3	75.8 ppm	SS-4
Iron	TAL Metals	5	5	2000 ppm or background	2,000 - 550,000	0	22,800 ppm	SS-4
Lead	TAL Metals	5	5	Background	200 - 500	1	972 ppm	SS-3
Magnesium	TAL Metals	5	5	Background	100 - 5,000	2	30,600 ppm	SS-2
Manganese	TAL Metals	5	5	Background	50 - 5,000	0	1,500 ppm	SS-2

Table 4. Surface Soil Statistieal Summary of Detected Compounds (Continued)
Former Vacuum Oil Company - 1998-1999 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TAGM 4046)	Eastern USA Background (ppm)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Mercury	TAL Metals	5	5	0.1 ppm	0.001 - 0.2	5	2.1 ppm	SS-4
Nickel	TAL Metals	5	5	13 ppm or background	0.5 - 25	0	24.2 ppm	SS-4
Potassium	TAL Metals	5	5	Background	8,500 - 43,000	0	2,240 ppm	SS-2
Selenium	TAL Metals	5	4	2 ppm or background	0.1 - 3.9	2	7.4 ppm	SS-2
Silver	TAL Metals	5	4	Background	Not Available	0	1.2 ppm	SS-3
Sodium	TAL Metals	5	5	Background	6,000 - 8,000	0	497 ppm	SS-2
Vanadium	TAL Metals	5	5	150 ppm or background	1 - 300	0	28.6 ppm	SS-2
Zinc	TAL Metals	5	5	20 ppm or background	9 - 50	5	772 ppm	SS-5
4,4-DDE	ASP 95-3	5	1	2,100 ppb	Not Applicable	0	19 ppb	SS-5
4,4'-DDT (P,P'-DDT	ASP 95-3	5	1	2,100 ppb	Not Applicable	0	21 ppb	SS-5
Alpha Chlordane	ASP 95-3	5	1	540 ppb	Not Applicable	0	210 ppb	SS-1
Gamma Chlordane	ASP 95-3	5	1	540 ppb	Not Applicable	0	170 ppb	SS-1
Dieldrin	ASP 95-3	5	2	44 ppb	Not Applicable	1	74 ppb	SS-1
Heptachlor Epoxide	ASP 95-3	5	1	20 ppb	Not Applicable	1	30 ppb	SS-1
2-Methylnaphthalene	ASP 95-2	5	2	36,400 ppb	Not Applicable	0	140 ppb	SS-5
Acenaphthene	ASP 95-2	5	4	50,000 ppb	Not Applicable	0	3,700 ppb	SS-2

Table 4. Surface Soil Statistical Summary of Detected Compounds (Continued)
Former Vacuum Oil Company - 1998-1999 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TAGM 4046)	Eastern USA Background (ppm)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Acenaphthylene	ASP 95-2	5	1	41,000 ppb	Not Applicable	0	190 ppb	SS-3
Anthracene	ASP 95-2	5	4	50,000 ppb	Not Applicable	0	12,000 ppb	SS-2
Benzo(a)anthracene	ASP 95-2	5	5	224 ppb	Not Applicable	5	28,000 ppb	SS-2
Benzo(a)pyrene	ASP 95-2	5	5	61 ppb	Not Applicable	5	23,000 ppb	SS-2
Benzo(b)fluoranthene	ASP 95-2	5	5	1,100 ppb	Not Applicable	4	20,000 ppb	SS-2
Benzo(k)fluoranthene	ASP 95-2	5	5	1,100 ppb	Not Applicable	4	22,000 ppb	SS-2
Benzo(g,h,i)perylene	ASP 95-2	5	5	50,000 ppb	Not Applicable	0	15,000 ppb	SS-2
Bis(2-ethylhexyl)phthalate	ASP 95-2	5	2	50,000 ppb	Not Applicable	0	230 ppb	SS-3
Carbazole	ASP 95-2	5	4	Not Available	Not Applicable	0	4,000 ppb	SS-2
Chrysene	ASP 95-2	5	5	400 ppb	Not Applicable	5	30,000 ppb	SS-2
Dibenzo(a,h)anthracene	ASP 95-2	5	5	14 ppb	Not Applicable	5	5,700 ppb	SS-2
Dibenzofuran	ASP 95-2	5	5	6,200 ppb	Not Applicable	0	2,300 ppb	SS-2
Fluoranthene	ASP 95-2	5	5	50,000 ppb	Not Applicable	1	63,000 ppb	SS-2
Fluorene	ASP 95-2	5	4	50,000 ppb	Not Applicable	0	3,900 ppb	SS-2
Indeno(1,2,3-c,d)pyrene	ASP 95-2	5	5	3,200 ppb	Not Applicable	1	14,000 ppb	SS-2
Naphthalene	ASP 95-2	5	3	13,000 ppb	Not Applicable	0	2,400 ppb	SS-2
Phenanthrene	ASP 95-2	5	5	50,000 ppb	Not Applicable	0	46,000 ppb	SS-2
Pyrene	ASP 95-2	5	5	50,000 ppb	Not Applicable	0	47,000 ppb	SS-2
Acetone	ASP 95-1	5	1	200 ppb	Not Applicable	0	30 ppb	SS-3
Methylene Chloride	ASP 95-1	5	5	100 ppb	Not Applicable	1	150 ppb	SS-3

Table 5. Subsurface Soil Statistical Summary of Detected Compounds
Former Vacuum Oil Company - 1999-2000 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TAGM 4046)	Eastern USA Background (ppm)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Aluminum	TAL Metals	10	10	Background	33,000	0	22,200 ppm	TP-5; 3'
Antimony	TAL Metals	10	1	Background	Not Available	0	5.7 ppm	MW-1; 8-10'
Arsenic	TAL Metals	10	10	7.5 ppm or background	3 - 12	3	113 ppm	TP-8; 3'
Barium	TAL Metals	10	10	300 ppm or background	15 - 600	1	828 ppm	TP-2; 5'
Beryllium	TAL Metals	10	10	0.16 ppm or background	0 - 1.75	1	2.2 ppm	TP-2; 5'
Cadmium	TAL Metals	10	8	10 ppm or background	0.1 - 1	0	2.4 ppm	TP-2; 5'
Calcium	TAL Metals	10	10	Background	130 - 35,000	2	85,100 ppm	TP-2; 5'
Chromium	TAL Metals	10	10	50 ppm or background	1.5 - 40	1	59.3 ppm	TP-8; 3'
Cobalt	TAL Metals	10	10	30 ppm or background	2.5 - 60	0	11.5 ppm	TP-4; 5'
Copper	TAL Metals	10	10	25 ppm or background	1 - 50	4	143 ppm	TP-1; 7-8'
Iron	TAL Metals	10	10	2000 ppm or background	2,000 - 550,000	0	65,500 ppm	TP-8; 3'
Lead	TAL Metals	10	10	Background	200 - 500	0	473 ppm	TP-10; 4'

Table 5. Subsurface Soil Statistical Summary of Detected Compounds (Continued)
Former Vacuum Oil Company - 1999-2000 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TAGM 4046)	Eastern USA Background (ppm)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Magnesium	TAL Metals	10	10	Background	100 - 5000	5	35,800 ppm	TP-2; 5'
Manganese	TAL Metals	10	10	Background	50 - 5,000	0	3,480 ppm	TP-2; 5'
Mercury	TAL Metals	10	7	0.1 ppm	0.001 - 0.2	4	4.0 ppm	TP-1; 3-5'
Nickel	TAL Metals	10	10	13 ppm or background	0.5 - 25	1	35.6 ppm	TP-2; 5'
Potassium	TAL Metals	10	10	Background	8,500 - 43,000	0	3,400 ppm	TP-5; 3'
Selenium	TAL Metals	10	9	2 ppm or background	0.1 - 3.9	0	3.5 ppm	TP-10; 4'
Silver	TAL Metals	10	1	Background	Not Available	0	0.24 ppm	TP-2; 5'
Sodium	TAL Metals	10	10	Background	6,000 - 8,000	0	824 ppm	TP-5; 3'
Vanadium	TAL Metals	10	10	150 ppm or background	1 - 300	0	13.9 ppm	MW-2; 6-8'
Zinc	TAL Metals	10	10	20 ppm or background	9 - 50	9	663 ppm	TP-2; 5'
Cyanide	Cyanide	8	1	Site Specific	Not Available	0	1.1 ppm	TP-3; 8-9'
Aldrin	ASP 95-3	8	1	41 ppb	Not Applicable	0	2.6 ppb	TP-1; 7-8'
Acetone	ASP 95-1	9	3	200 ppb	Not Applicable	0	100 ppb	TP-10; 4'
2-Butanone	ASP 95-1	9	2	300 ppb	Not Applicable	0	240 ppb	TP-1; 7-8'
Carbon Disulfide	ASP 95-1	9	1	2700 ppb	Not Applicable	0	2 ppb	TP-3; 8-9'
1,1-Dichloroethane	ASP 95-1	9	1	200 ppb	Not Applicable	0	8 ppb	TP-3; 8-9'

Table 5. Subsurface Soil Statistical Summary of Detected Compounds (Continued)
Former Vacuum Oil Company - 1999-2000 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TAGM 4046)	Eastern USA Background (ppm)	Number of Valid Detections > SCG	Maximum	Location of Maximum
1,2-Dichloroethene (total)	ASP 95-1	9	1	Not Available	Not Applicable	0	6 ppb	TP-3; 8-9'
Methylene Chloride	ASP 95-1	9	7	100 ppb	Not Applicable	1	750 ppb	MW-2; 10-12'
Toluene	ASP 95-1	9	1	1,500 ppb	Not Applicable	0	3 ppb	TP-3; 8-9'
Trichloroethene	ASP 95-1	9	1	700 ppb	Not Applicable	0	28 ppb	TP-3; 8-9'
(m+p) Xylene	ASP 95-1	9	1	1,200 ppb	Not Applicable	1	6,300 ppb	TP-1; 7-8'
Total Petroleum Hydrocarbon	TPH	4	4	Not Available	Not Applicable	0	1,140 ppm	MW-1; 8-10'
Acenaphthene	ASP 95-2	9	3	50,000 ppb	Not Applicable	1	17,0000 ppb	TP-2; 5'
Acenaphthylene	ASP 95-2	9	3	41,000 ppb	Not Applicable	0	540 ppb	TP-8; 3'
Anthracene	ASP 95-2	9	4	50,000 ppb	Not Applicable	0	510,000 ppb	TP-2; 5'
Benzo(a)Anthracene	ASP 95-2	9	6	224 ppb	Not Applicable	5	760,000 ppb	TP-2; 5'
Benzo(a)Pyrene	ASP 95-2	9	6	61 ppb	Not Applicable	5	530,000 ppb	TP-2; 5'
Benzo(b)Fluoranthene	ASP 95-2	9	6	1,100 ppb	Not Applicable	3	480,000 ppb	TP-2; 5'
Benzo(k)Fluoranthene	ASP 95-2	9	6	1,100 ppb	Not Applicable	3	470,000 ppb	TP-2; 5'
Benzo(g,h,i)Perylene	ASP 95-2	9	6	50,000 ppb	Not Applicable	1	280,000 ppb	TP-2; 5'
Bis(2-Ethylhexyl)Phthalate	ASP 95-2	9	1	50,000 ppb	Not Applicable	0	440 ppb	TP-10; 4'
Carbazole	ASP 95-2	9	4	Not Available	Not Applicable	0	170,000 ppb	TP-2; 5'
Chrysene	ASP 95-2	9	7	400 ppb	Not Applicable	5	710,000 ppb	TP-2; 5'

Table 5. Subsurface Soil Statistical Summary of Detected Compounds (Continued)
Former Vacuum Oil Company - 1999-2000 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TAGM 4046)	Eastern USA Background (ppm)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Dibenzo(a,h)anthracene	ASP 95-2	9	5	14 ppb	Not Applicable	5	100,000 ppb	TP-2; 5'
Dibenzofuran	ASP 95-2	9	4	6,200 ppb	Not Applicable	1	220,000 ppb	TP-2; 5'
Di-n-octylphthalate	ASP 95-2	9	1	50,000 ppb	Not Applicable	0	130 ppb	TP-5; 3'
Fluoranthene	ASP 95-2	9	6	50,000 ppb	Not Applicable	1	1,500,000 ppb	TP-2; 5'
Fluorene	ASP 95-2	9	3	50,000 ppb	Not Applicable	1	360,000 ppb	TP-2; 5'
2-Methylnaphthalene	ASP 95-2	9	5	36,400 ppb	Not Applicable	1	110,000 ppb	TP-2; 5'
Indeno(1,2,3-c,d)pyrene	ASP 95-2	9	6	3200 ppb	Not Applicable	3	280,000 ppb	TP-2; 5'
Napthalene	ASP 95-2	9	3	13,000 ppb	Not Applicable	1	320,000 ppb	TP-2; 5'
Phenanthrene	ASP 95-2	9	9	50,000 ppb	Not Applicable	1	1,600,000 ppb	TP-2; 5'
Pyrene	ASP 95-2	9	7	50,000 ppb	Not Applicable	1	960,000 ppb	TP-2; 5'
Barium	TCLP	2	2	10,0000 ppb*	Not Applicable	0	910 ppb	TP-1; 3-5'
Lead	TCLP	2	2	5,000 ppb*	Not Applicable	0	62 ppb	TP-1; 7-8'
Mercury	TCLP	2	1	200 ppb*	Not Applicable	0	0.18 ppb	TP-1; 7-8'
Benzene	TCLP	2	1	500 ppb*	Not Applicable	0	97 ppb	TP-1; 7-8'
2-Butanone	TCLP	2	1	200,000 ppb*	Not Applicable	0	11 ppb	TP-1; 7-8'

*SCGs for TCLP analyses are from 6 NYCRR 371.3(e).

Table 6. Groundwater Statistical Summary of Detected Compounds
Former Vacuum Oil Company - 1999-2000 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TOGS 1.1.1)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Aluminum	TAL Metals	3	3	Not Applicable	0	7,380 ppb	MW-1
Arsenic	TAL Metals	3	3	25 ppb	0	17 ppb	MW-2
Barium	TAL Metals	3	3	1000 ppb	0	246 ppb	MW-2
Beryllium	TAL Metals	3	3	3 ppb	0	0.68 ppb	MW-1
Cadmium	TAL Metals	3	2	5 ppb	0	0.87	MW-2
Calcium	TAL Metals	3	3	Not Applicable	0	212,000 ppb	MW-1
Chromium	TAL Metals	3	3	50 ppb	0	10 ppb	MW-1
Cobalt	TAL Metals	3	3	Not Applicable	0	6.3 ppb	MW-1
Copper	TAL Metals	3	3	200 ppb	0	30 ppb	MW-3
Iron	TAL Metals	3	3	300 ppb	3	21,700 ppb	MW-1
Lead	TAL Metals	3	3	25 ppb	1	62.4 ppb	MW-3
Magnesium	TAL Metals	3	3	35,000 ppb	3	76,200 ppb	MW-1
Manganese	TAL Metals	3	3	300 ppb	2	1,730 ppb	MW-2
Mercury	TAL Metals	3	1	0.7 ppb	0	0.23 ppb	MW-3
Nickel	TAL Metals	3	3	100 ppb	0	19.4 ppb	MW-1
Potassium	TAL Metals	3	3	Not Applicable	0	10,700 ppb	MW-3
Sodium	TAL Metals	3	3	20,000 ppb	2	152,000 ppb	MW-3
Vanadium	TAL Metals	3	3	Not Applicable	0	12 ppb	MW-1

Table 6. Groundwater Statistical Summary of Detected Compounds (Continued)
FormerVacuum Oil Company - 1999-2000 Site Investigation

Compound	Analysis	Number of Samples	Number of Valid Detections	SCG (TOGS 1.1.1)	Number of Valid Detections > SCG	Maximum	Location of Maximum
Zinc	TAL Metals	3	3	2,000 ppb	0	274 ppb	MW-3
Acetone	ASP 95-1	3	2	50 ppb	0	28 ppb	MW-1
Benzene	ASP 95-1	3	1	1 ppb	1	95 ppb	MW-1
1,1-Dichloroethane	ASP 95-1	3	2	5 ppb	2	13 ppb	MW-2
Ethyl Benzene	ASP 95-1	3	1	5 ppb	1	49 ppb	MW-1
1,1,2-Trichloroethane	ASP 95-1	3	1	1 ppb	1	2 ppb	MW-1
Methylene Chloride	ASP 95-1	3	0	5 ppb	0	NA	NA
Toluene	ASP 95-1	3	1	5 ppb	0	4 ppb	MW-1
Xylene	ASP 95-1	3	1	5 ppb	1	190 ppb	MW-1
Total Petroleum Hydrocarbon	TPH	3	1	Not Available	0	3.7 ppm	MW-1
Acenaphthene	ASP 95-2	3	1	20 ppb	0	0.6 ppb	MW-2
Carbazole	ASP 95-2	3	1	Not Available	0	0.9 ppb	MW-2
Dibenzofuran	ASP 95-2	3	1	Not Available	0	0.6 ppb	MW-2
Di-n-octylphthalate	ASP 95-2	3	1	50 ppb	0	0.8 ppb	MW-2
Fluorene	ASP 95-2	3	1	50 ppb	0	0.8 ppb	MW-2
4-Methylphenol	ASP 95-2	3	1	1 ppb	0	0.8 ppb	MW-2
Naphthalenee	ASP 95-2	3	1	10 ppb	0	1 ppb	MW-2
Phenol	ASP 95-2	3	1	1 ppb	1	7 ppb	MW-1

Table 7. Summary of Surface Soil Sample Results
Semi-Volatile Organic Compounds Sorted by Location
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
SS-4	SURFACE	12/07/99	B70612	DIBENZO(A,H)ANTHRACENE	85.0	ppb	14	ppb
SS-4	SURFACE	12/07/99	B70612	FLUORANTHENE	700	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	INDENO(1,2,3-C,D)PYRENE	310	ppb	3200	ppb
SS-4	SURFACE	12/07/99	B70612	PHENANTHRENE	270	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	PYRENE	570	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	TOTAL SVOC TICs	96800	ppb	NA	ppb
SS-5	SURFACE	12/07/99	B70615	2-METHYLNAPHTHALENE	140	ppb	36400	ppb
SS-5	SURFACE	12/07/99	B70615	ACENAPHTHENE	310	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	ANTHRACENE	740	ppb	50000	ppm
SS-5	SURFACE	12/07/99	B70615	BENZO(A)ANTHRACENE	2000	ppb	224	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(A)PYRENE	1900	ppb	61	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(B)FLUORANTHENE	1700	ppb	1100	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(G,H,I)PERYLENE	1200	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(K)FLUORANTHENE	1600	ppb	1100	ppb
SS-5	SURFACE	12/07/99	B70615	CARBAZOLE	400	ppb	NA	ppb
SS-5	SURFACE	12/07/99	B70615	CHRYSENE	2300	ppb	400	ppb
SS-5	SURFACE	12/07/99	B70615	DIBENZO(A,H)ANTHRACENE	340	ppb	14	ppb
SS-5	SURFACE	12/07/99	B70615	DIBENZOFURAN	210	ppb	6200	ppb
SS-5	SURFACE	12/07/99	B70615	FLUORANTHENE	4800	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	FLUORENE	320	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	INDENO(1,2,3-C,D)PYRENE	1100	ppb	3200	ppb
SS-5	SURFACE	12/07/99	B70615	NAPHTHALENE	150	ppb	13000	ppb
SS-5	SURFACE	12/07/99	B70615	PHENANTHRENE	4100	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	PYRENE	3700	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	TOTAL SVOC TICs	22300	ppb	NA	ppb

NA- Not Applicable

Table 8. Summary of Surface Soil Sample Results
Semi-Volatile Organic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
SS-5	SURFACE	12/07/99	B70615	2-METHYLNAPHTHALENE	140	ppb	36400	ppb
SS-1	SURFACE	12/07/99	B70611	2-METHYLNAPHTHALENE	98.0	ppb	36400	ppb
SS-2	SURFACE	12/07/99	B70613	ACENAPHTHENE	3700	ppb	50000	ppb
SS-1	SURFACE	12/07/99	B70611	ACENAPHTHENE	780	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	ACENAPHTHENE	310	ppb	50000	ppb
SS-3	SURFACE	12/07/99	B70614	ACENAPHTHENE	180	ppb	50000	ppb
SS-3	SURFACE	12/07/99	B70614	ACENAPHTHYLENE	190	ppb	41000	ppb
SS-2	SURFACE	12/07/99	B70613	ANTHRACENE	12000	ppb	50000	ppm
SS-1	SURFACE	12/07/99	B70611	ANTHRACENE	1600	ppb	50000	ppm
SS-3	SURFACE	12/07/99	B70614	ANTHRACENE	920	ppb	50000	ppm
SS-5	SURFACE	12/07/99	B70615	ANTHRACENE	740	ppb	50000	ppm
SS-2	SURFACE	12/07/99	B70613	BENZO(A)ANTHRACENE	28000	ppb	224	ppb
SS-3	SURFACE	12/07/99	B70614	BENZO(A)ANTHRACENE	4400	ppb	224	ppb
SS-1	SURFACE	12/07/99	B70611	BENZO(A)ANTHRACENE	3200	ppb	224	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(A)ANTHRACENE	2000	ppb	224	ppb
SS-4	SURFACE	12/07/99	B70612	BENZO(A)ANTHRACENE	330	ppb	224	ppb
SS-2	SURFACE	12/07/99	B70613	BENZO(A)PYRENE	23000	ppb	61	ppb
SS-3	SURFACE	12/07/99	B70614	BENZO(A)PYRENE	4400	ppb	61	ppb
SS-1	SURFACE	12/07/99	B70611	BENZO(A)PYRENE	3100	ppb	61	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(A)PYRENE	1900	ppb	61	ppb
SS-4	SURFACE	12/07/99	B70612	BENZO(A)PYRENE	440	ppb	61	ppb
SS-2	SURFACE	12/07/99	B70613	BENZO(B)FLUORANTHENE	20000	ppb	1100	ppb
SS-3	SURFACE	12/07/99	B70614	BENZO(B)FLUORANTHENE	4100	ppb	1100	ppb
SS-1	SURFACE	12/07/99	B70611	BENZO(B)FLUORANTHENE	2700	ppb	1100	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(B)FLUORANTHENE	1700	ppb	1100	ppb
SS-4	SURFACE	12/07/99	B70612	BENZO(B)FLUORANTHENE	470	ppb	1100	ppb
SS-2	SURFACE	12/07/99	B70613	BENZO(G,H,I)PERYLENE	15000	ppb	50000	ppb
SS-3	SURFACE	12/07/99	B70614	BENZO(G,H,I)PERYLENE	2600	ppb	50000	ppb
SS-1	SURFACE	12/07/99	B70611	BENZO(G,H,I)PERYLENE	1900	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(G,H,I)PERYLENE	1200	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	BENZO(G,H,I)PERYLENE	350	ppb	50000	ppb
SS-2	SURFACE	12/07/99	B70613	BENZO(K)FLUORANTHENE	22000	ppb	1100	ppb
SS-3	SURFACE	12/07/99	B70614	BENZO(K)FLUORANTHENE	4000	ppb	1100	ppb
SS-1	SURFACE	12/07/99	B70611	BENZO(K)FLUORANTHENE	2600	ppb	1100	ppb
SS-5	SURFACE	12/07/99	B70615	BENZO(K)FLUORANTHENE	1600	ppb	1100	ppb
SS-4	SURFACE	12/07/99	B70612	BENZO(K)FLUORANTHENE	420	ppb	1100	ppb
SS-3	SURFACE	12/07/99	B70614	BIS(2-ETHYLHEXYL)PHTHALATE	230	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	BIS(2-ETHYLHEXYL)PHTHALATE	160	ppb	50000	ppb
SS-2	SURFACE	12/07/99	B70613	CARBAZOLE	4000	ppb	NA	ppb
SS-1	SURFACE	12/07/99	B70611	CARBAZOLE	850	ppb	NA	ppb
SS-3	SURFACE	12/07/99	B70614	CARBAZOLE	580	ppb	NA	ppb
SS-5	SURFACE	12/07/99	B70615	CARBAZOLE	400	ppb	NA	ppb
SS-2	SURFACE	12/07/99	B70613	CHRYSENE	30000	ppb	400	ppb
SS-3	SURFACE	12/07/99	B70614	CHRYSENE	4900	ppb	400	ppb
SS-1	SURFACE	12/07/99	B70611	CHRYSENE	3300	ppb	400	ppb
SS-5	SURFACE	12/07/99	B70615	CHRYSENE	2300	ppb	400	ppb
SS-4	SURFACE	12/07/99	B70612	CHRYSENE	480	ppb	400	ppb
SS-2	SURFACE	12/07/99	B70613	DIBENZO(A,H)ANTHRACENE	5700	ppb	14	ppb
SS-3	SURFACE	12/07/99	B70614	DIBENZO(A,H)ANTHRACENE	750	ppb	14	ppb
SS-1	SURFACE	12/07/99	B70611	DIBENZO(A,H)ANTHRACENE	510	ppb	14	ppb
SS-5	SURFACE	12/07/99	B70615	DIBENZO(A,H)ANTHRACENE	340	ppb	14	ppb
SS-4	SURFACE	12/07/99	B70612	DIBENZO(A,H)ANTHRACENE	85.0	ppb	14	ppb
SS-2	SURFACE	12/07/99	B70613	DIBENZOFURAN	2300	ppb	6200	ppb
SS-1	SURFACE	12/07/99	B70611	DIBENZOFURAN	420	ppb	6200	ppb
SS-5	SURFACE	12/07/99	B70615	DIBENZOFURAN	210	ppb	6200	ppb
SS-2	SURFACE	12/07/99	B70613	FLUORANTHENE	63000	ppb	50000	ppb
SS-1	SURFACE	12/07/99	B70611	FLUORANTHENE	9700	ppb	50000	ppb
SS-3	SURFACE	12/07/99	B70614	FLUORANTHENE	8100	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	FLUORANTHENE	4800	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	FLUORANTHENE	700	ppb	50000	ppb

Table 8. Summary of Surface Soil Sample Results
Semi-Volatile Organic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
SS-2	SURFACE	12/07/99	B70613	FLUORENE	3900	ppb	50000	ppb
SS-1	SURFACE	12/07/99	B70611	FLUORENE	730	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	FLUORENE	320	ppb	50000	ppb
SS-3	SURFACE	12/07/99	B70614	FLUORENE	240	ppb	50000	ppb
SS-2	SURFACE	12/07/99	B70613	INDENO(1,2,3-C,D)PYRENE	14000	ppb	3200	ppb
SS-3	SURFACE	12/07/99	B70614	INDENO(1,2,3-C,D)PYRENE	2500	ppb	3200	ppb
SS-1	SURFACE	12/07/99	B70611	INDENO(1,2,3-C,D)PYRENE	1700	ppb	3200	ppb
SS-5	SURFACE	12/07/99	B70615	INDENO(1,2,3-C,D)PYRENE	1100	ppb	3200	ppb
SS-4	SURFACE	12/07/99	B70612	INDENO(1,2,3-C,D)PYRENE	310	ppb	3200	ppb
SS-2	SURFACE	12/07/99	B70613	NAPHTHALENE	2400	ppb	13000	ppb
SS-1	SURFACE	12/07/99	B70611	NAPHTHALENE	260	ppb	13000	ppb
SS-5	SURFACE	12/07/99	B70615	NAPHTHALENE	150	ppb	13000	ppb
SS-2	SURFACE	12/07/99	B70613	PHENANTHRENE	46000	ppb	50000	ppb
SS-1	SURFACE	12/07/99	B70611	PHENANTHRENE	7300	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	PHENANTHRENE	4100	ppb	50000	ppb
SS-3	SURFACE	12/07/99	B70614	PHENANTHRENE	3300	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	PHENANTHRENE	270	ppb	50000	ppb
SS-2	SURFACE	12/07/99	B70613	PYRENE	47000	ppb	50000	ppb
SS-1	SURFACE	12/07/99	B70611	PYRENE	7200	ppb	50000	ppb
SS-3	SURFACE	12/07/99	B70614	PYRENE	7100	ppb	50000	ppb
SS-5	SURFACE	12/07/99	B70615	PYRENE	3700	ppb	50000	ppb
SS-4	SURFACE	12/07/99	B70612	PYRENE	570	ppb	50000	ppb
SS-2	SURFACE	12/07/99	B70613	TOTAL SVOC TICs	114000	ppb	NA	ppb
SS-4	SURFACE	12/07/99	B70612	TOTAL SVOC TICs	96800	ppb	NA	ppb
SS-3	SURFACE	12/07/99	B70614	TOTAL SVOC TICs	94800	ppb	NA	ppb
SS-5	SURFACE	12/07/99	B70615	TOTAL SVOC TICs	22300	ppb	NA	ppb
SS-1	SURFACE	12/07/99	B70611	TOTAL SVOC TICs	15800	ppb	NA	ppb

NA- Not Applicable

Table 9. Summary of Surface Soil Sample Results
Volatile Organic Compounds
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units	Comments
SS-3	SURFACE	12/07/99	B70614	ACETONE	30.0	ppb	200	ppb	
SS-3	SURFACE	12/07/99	B70614	METHYLENE CHLORIDE	150	ppb	100	ppb	Result biased high due to laboratory contamination.
SS-5	SURFACE	12/07/99	B70615	METHYLENE CHLORIDE	82.0	ppb	100	ppb	Result biased high due to laboratory contamination.
SS-4	SURFACE	12/07/99	B70612	METHYLENE CHLORIDE	63.0	ppb	100	ppb	Result biased high due to laboratory contamination.
SS-2	SURFACE	12/07/99	B70613	METHYLENE CHLORIDE	40.0	ppb	100	ppb	Result biased high due to laboratory contamination.
SS-1	SURFACE	12/07/99	B70611	METHYLENE CHLORIDE	24.0	ppb	100	ppb	Result biased high due to laboratory contamination.
SS-2	SURFACE	12/07/99	B70613	TOTAL VOC TICs	20.0	ppb	NA	ppb	
SS-5	SURFACE	12/07/99	B70615	TOTAL VOC TICs	9.0	ppb	NA	ppb	
SS-1	SURFACE	12/07/99	B70611	TOTAL VOC TICs	ND	ppb	NA	ppb	
SS-3	SURFACE	12/07/99	B70614	TOTAL VOC TICs	ND	ppb	NA	ppb	
SS-4	SURFACE	12/07/99	B70612	TOTAL VOC TICs	ND	ppb	NA	ppb	

ND- Not Detected
NA- Not Applicable

Table 10. Summary of Surface Soil Sample Results
Inorganic Compounds Sorted by Location
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
SS-1	SURFACE	12/07/99	B70611	ALUMINUM	6770	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	ARSENIC	4.60	ppm	7.5 or background	ppm
SS-1	SURFACE	12/07/99	B70611	BARIUM	51.0	ppm	300 or background	ppm
SS-1	SURFACE	12/07/99	B70611	BERYLLIUM	0.34	ppm	0.16 or background	ppm
SS-1	SURFACE	12/07/99	B70611	CADMIUM	0.34	ppm	10 or background	ppm
SS-1	SURFACE	12/07/99	B70611	CALCIUM	46500	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	CHROMIUM	10.1	ppm	50 or background	ppm
SS-1	SURFACE	12/07/99	B70611	COBALT	4.70	ppm	30 or background	ppm
SS-1	SURFACE	12/07/99	B70611	COPPER	17.9	ppm	25 or background	ppm
SS-1	SURFACE	12/07/99	B70611	IRON	14900	ppm	2000 or background	ppm
SS-1	SURFACE	12/07/99	B70611	LEAD	152	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	MAGNESIUM	27200	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	MANGANESE	440	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	MERCURY	0.12	ppm	0.1	ppm
SS-1	SURFACE	12/07/99	B70611	NICKEL	10.1	ppm	13 or background	ppm
SS-1	SURFACE	12/07/99	B70611	POTASSIUM	1000	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	SODIUM	118	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	VANADIUM	16.6	ppm	150 or background	ppm
SS-1	SURFACE	12/07/99	B70611	ZINC	103	ppm	20 or background	ppm
SS-2	SURFACE	12/07/99	B70613	ALUMINUM	7000	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	ANTIMONY	1.20	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	ARSENIC	60.7	ppm	7.5 or background	ppm
SS-2	SURFACE	12/07/99	B70613	BARIUM	366	ppm	300 or background	ppm
SS-2	SURFACE	12/07/99	B70613	BERYLLIUM	0.63	ppm	0.16 or background	ppm
SS-2	SURFACE	12/07/99	B70613	CADMIUM	2.30	ppm	10 or background	ppm
SS-2	SURFACE	12/07/99	B70613	CALCIUM	167000	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	CHROMIUM	14.1	ppm	50 or background	ppm
SS-2	SURFACE	12/07/99	B70613	COBALT	4.90	ppm	30 or background	ppm
SS-2	SURFACE	12/07/99	B70613	COPPER	44.1	ppm	25 or background	ppm
SS-2	SURFACE	12/07/99	B70613	IRON	17400	ppm	2000 or background	ppm
SS-2	SURFACE	12/07/99	B70613	LEAD	119	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	MAGNESIUM	30600	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	MANGANESE	1500	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	MERCURY	0.67	ppm	0.1	ppm
SS-2	SURFACE	12/07/99	B70613	NICKEL	23.6	ppm	13 or background	ppm
SS-2	SURFACE	12/07/99	B70613	POTASSIUM	2240	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	SELENIUM	7.40	ppm	2 or background	ppm
SS-2	SURFACE	12/07/99	B70613	SILVER	0.36	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	SODIUM	497	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	VANADIUM	28.6	ppm	150 or background	ppm
SS-2	SURFACE	12/07/99	B70613	ZINC	183	ppm	20 or background	ppm
SS-3	SURFACE	12/07/99	B70614	ALUMINUM	2970	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	ARSENIC	4.30	ppm	7.5 or background	ppm
SS-3	SURFACE	12/07/99	B70614	BARIUM	358	ppm	300 or background	ppm
SS-3	SURFACE	12/07/99	B70614	CADMIUM	3.50	ppm	10 or background	ppm
SS-3	SURFACE	12/07/99	B70614	CALCIUM	22600	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	CHROMIUM	10.4	ppm	50 or background	ppm
SS-3	SURFACE	12/07/99	B70614	COBALT	3.10	ppm	30 or background	ppm
SS-3	SURFACE	12/07/99	B70614	COPPER	54.2	ppm	25 or background	ppm
SS-3	SURFACE	12/07/99	B70614	IRON	21200	ppm	2000 or background	ppm
SS-3	SURFACE	12/07/99	B70614	LEAD	972	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	MAGNESIUM	2490	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	MANGANESE	189	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	MERCURY	0.50	ppm	0.1	ppm
SS-3	SURFACE	12/07/99	B70614	NICKEL	11.4	ppm	13 or background	ppm
SS-3	SURFACE	12/07/99	B70614	POTASSIUM	1300	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	SELENIUM	4.10	ppm	2 or background	ppm
SS-3	SURFACE	12/07/99	B70614	SILVER	1.20	ppm	Background	ppm

Table 10. Summary of Surface Soil Sample Results
Inorganic Compounds Sorted by Location
Former Vacuum Oil Company
1999-2000 Site Invesigation

ɔcation Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
SS-3	SURFACE	12/07/99	B70614	SODIUM	186	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	VANADIUM	12.9	ppm	150 or background	ppm
SS-3	SURFACE	12/07/99	B70614	ZINC	739	ppm	20 or background	ppm
SS-4	SURFACE	12/07/99	B70612	ALUMINUM	11900	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	ARSENIC	8.70	ppm	7.5 or background	ppm
SS-4	SURFACE	12/07/99	B70612	BARIUM	138	ppm	300 or background	ppm
SS-4	SURFACE	12/07/99	B70612	BERYLLIUM	0.58	ppm	0.16 or background	ppm
SS-4	SURFACE	12/07/99	B70612	CADMIUM	1.80	ppm	10 or background	ppm
SS-4	SURFACE	12/07/99	B70612	CALCIUM	11900	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	CHROMIUM	24.0	ppm	50 or background	ppm
SS-4	SURFACE	12/07/99	B70612	COBALT	8.40	ppm	30 or background	ppm
SS-4	SURFACE	12/07/99	B70612	COPPER	75.8	ppm	25 or background	ppm
SS-4	SURFACE	12/07/99	B70612	IRON	22800	ppm	2000 or background	ppm
SS-4	SURFACE	12/07/99	B70612	LEAD	164	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	MAGNESIUM	4510	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	MANGANESE	352	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	MERCURY	2.10	ppm	0.1	ppm
SS-4	SURFACE	12/07/99	B70612	NICKEL	24.2	ppm	13 or background	ppm
SS-4	SURFACE	12/07/99	B70612	POTASSIUM	1790	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	SELENIUM	3.10	ppm	2 or background	ppm
SS-4	SURFACE	12/07/99	B70612	SILVER	1.20	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	SODIUM	458	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	VANADIUM	24.8	ppm	150 or background	ppm
SS-4	SURFACE	12/07/99	B70612	ZINC	309	ppm	20 or background	ppm
SS-5	SURFACE	12/07/99	B70615	ALUMINUM	4400	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	ANTIMONY	3.70	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	ARSENIC	13.5	ppm	7.5 or background	ppm
SS-5	SURFACE	12/07/99	B70615	BARIUM	224	ppm	300 or background	ppm
SS-5	SURFACE	12/07/99	B70615	BERYLLIUM	0.39	ppm	0.16 or background	ppm
SS-5	SURFACE	12/07/99	B70615	CADMIUM	3.40	ppm	10 or background	ppm
SS-5	SURFACE	12/07/99	B70615	CALCIUM	19600	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	CHROMIUM	13.1	ppm	50 or background	ppm
SS-5	SURFACE	12/07/99	B70615	COBALT	5.90	ppm	30 or background	ppm
SS-5	SURFACE	12/07/99	B70615	COPPER	73.1	ppm	25 or background	ppm
SS-5	SURFACE	12/07/99	B70615	IRON	18700	ppm	2000 or background	ppm
SS-5	SURFACE	12/07/99	B70615	LEAD	261	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	MAGNESIUM	4870	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	MANGANESE	250	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	MERCURY	1.40	ppm	0.1	ppm
SS-5	SURFACE	12/07/99	B70615	NICKEL	17.3	ppm	13 or background	ppm
SS-5	SURFACE	12/07/99	B70615	POTASSIUM	853	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	SELENIUM	2.90	ppm	2 or background	ppm
SS-5	SURFACE	12/07/99	B70615	SILVER	0.66	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	SODIUM	180	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	VANADIUM	17.8	ppm	150 or background	ppm
SS-5	SURFACE	12/07/99	B70615	ZINC	772	ppm	20 or background	ppm

Table 11. Summary of Surface Soil Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
SS-4	SURFACE	12/07/99	B70612	ALUMINUM	11900	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	ALUMINUM	7000	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	ALUMINUM	6770	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	ALUMINUM	4400	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	ALUMINUM	2970	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	ANTIMONY	3.70	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	ANTIMONY	1.20	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	ARSENIC	60.7	ppm	7.5 or background	ppm
SS-5	SURFACE	12/07/99	B70615	ARSENIC	13.5	ppm	7.5 or background	ppm
SS-4	SURFACE	12/07/99	B70612	ARSENIC	8.70	ppm	7.5 or background	ppm
SS-1	SURFACE	12/07/99	B70611	ARSENIC	4.60	ppm	7.5 or background	ppm
SS-3	SURFACE	12/07/99	B70614	ARSENIC	4.30	ppm	7.5 or background	ppm
SS-2	SURFACE	12/07/99	B70613	BARIUM	366	ppm	300 or background	ppm
SS-3	SURFACE	12/07/99	B70614	BARIUM	358	ppm	300 or background	ppm
SS-5	SURFACE	12/07/99	B70615	BARIUM	224	ppm	300 or background	ppm
SS-4	SURFACE	12/07/99	B70612	BARIUM	138	ppm	300 or background	ppm
SS-1	SURFACE	12/07/99	B70611	BARIUM	51.0	ppm	300 or background	ppm
SS-2	SURFACE	12/07/99	B70613	BERYLLIUM	0.63	ppm	0.16 or background	ppm
SS-4	SURFACE	12/07/99	B70612	BERYLLIUM	0.58	ppm	0.16 or background	ppm
SS-5	SURFACE	12/07/99	B70615	BERYLLIUM	0.39	ppm	0.16 or background	ppm
SS-1	SURFACE	12/07/99	B70611	BERYLLIUM	0.34	ppm	0.16 or background	ppm
SS-3	SURFACE	12/07/99	B70614	CADMIUM	3.50	ppm	10 or background	ppm
SS-5	SURFACE	12/07/99	B70615	CADMIUM	3.40	ppm	10 or background	ppm
SS-2	SURFACE	12/07/99	B70613	CADMIUM	2.30	ppm	10 or background	ppm
SS-4	SURFACE	12/07/99	B70612	CADMIUM	1.80	ppm	10 or background	ppm
SS-1	SURFACE	12/07/99	B70611	CADMIUM	0.34	ppm	10 or background	ppm
SS-2	SURFACE	12/07/99	B70613	CALCIUM	167000	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	CALCIUM	46500	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	CALCIUM	22600	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	CALCIUM	19600	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	CALCIUM	11900	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	CHROMIUM	24.0	ppm	50 or background	ppm
SS-2	SURFACE	12/07/99	B70613	CHROMIUM	14.1	ppm	50 or background	ppm
SS-5	SURFACE	12/07/99	B70615	CHROMIUM	13.1	ppm	50 or background	ppm
SS-3	SURFACE	12/07/99	B70614	CHROMIUM	10.4	ppm	50 or background	ppm
SS-1	SURFACE	12/07/99	B70611	CHROMIUM	10.1	ppm	50 or background	ppm
SS-4	SURFACE	12/07/99	B70612	COBALT	8.40	ppm	30 or background	ppm
SS-5	SURFACE	12/07/99	B70615	COBALT	5.90	ppm	30 or background	ppm
SS-2	SURFACE	12/07/99	B70613	COBALT	4.90	ppm	30 or background	ppm
SS-1	SURFACE	12/07/99	B70611	COBALT	4.70	ppm	30 or background	ppm
SS-3	SURFACE	12/07/99	B70614	COBALT	3.10	ppm	30 or background	ppm
SS-4	SURFACE	12/07/99	B70612	COPPER	75.8	ppm	25 or background	ppm
SS-5	SURFACE	12/07/99	B70615	COPPER	73.1	ppm	25 or background	ppm
SS-3	SURFACE	12/07/99	B70614	COPPER	54.2	ppm	25 or background	ppm
SS-2	SURFACE	12/07/99	B70613	COPPER	44.1	ppm	25 or background	ppm
SS-1	SURFACE	12/07/99	B70611	COPPER	17.9	ppm	25 or background	ppm
SS-4	SURFACE	12/07/99	B70612	IRON	22800	ppm	2000 or background	ppm
SS-3	SURFACE	12/07/99	B70614	IRON	21200	ppm	2000 or background	ppm
SS-5	SURFACE	12/07/99	B70615	IRON	18700	ppm	2000 or background	ppm
SS-2	SURFACE	12/07/99	B70613	IRON	17400	ppm	2000 or background	ppm
SS-1	SURFACE	12/07/99	B70611	IRON	14900	ppm	2000 or background	ppm
SS-3	SURFACE	12/07/99	B70614	LEAD	972	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	LEAD	261	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	LEAD	164	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	LEAD	152	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	LEAD	119	ppm	Background	ppm

Table 11. Summary of Surface Soil Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
SS-2	SURFACE	12/07/99	B70613	MAGNESIUM	30600	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	MAGNESIUM	27200	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	MAGNESIUM	4870	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	MAGNESIUM	4510	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	MAGNESIUM	2490	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	MANGANESE	1500	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	MANGANESE	440	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	MANGANESE	352	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	MANGANESE	250	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	MANGANESE	189	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	MERCURY	2.10	ppm	0.1	ppm
SS-5	SURFACE	12/07/99	B70615	MERCURY	1.40	ppm	0.1	ppm
SS-2	SURFACE	12/07/99	B70613	MERCURY	0.67	ppm	0.1	ppm
SS-3	SURFACE	12/07/99	B70614	MERCURY	0.50	ppm	0.1	ppm
SS-1	SURFACE	12/07/99	B70611	MERCURY	0.12	ppm	0.1	ppm
SS-4	SURFACE	12/07/99	B70612	NICKEL	24.2	ppm	13 or background	ppm
SS-2	SURFACE	12/07/99	B70613	NICKEL	23.6	ppm	13 or background	ppm
SS-5	SURFACE	12/07/99	B70615	NICKEL	17.3	ppm	13 or background	ppm
SS-3	SURFACE	12/07/99	B70614	NICKEL	11.4	ppm	13 or background	ppm
SS-1	SURFACE	12/07/99	B70611	NICKEL	10.1	ppm	13 or background	ppm
SS-2	SURFACE	12/07/99	B70613	POTASSIUM	2240	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	POTASSIUM	1790	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	POTASSIUM	1300	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	POTASSIUM	1000	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	POTASSIUM	853	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	SELENIUM	7.40	ppm	2 or background	ppm
SS-3	SURFACE	12/07/99	B70614	SELENIUM	4.10	ppm	2 or background	ppm
SS-4	SURFACE	12/07/99	B70612	SELENIUM	3.10	ppm	2 or background	ppm
SS-5	SURFACE	12/07/99	B70615	SELENIUM	2.90	ppm	2 or background	ppm
SS-3	SURFACE	12/07/99	B70614	SILVER	1.20	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	SILVER	1.20	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	SILVER	0.66	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	SILVER	0.36	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	SODIUM	497	ppm	Background	ppm
SS-4	SURFACE	12/07/99	B70612	SODIUM	458	ppm	Background	ppm
SS-3	SURFACE	12/07/99	B70614	SODIUM	186	ppm	Background	ppm
SS-5	SURFACE	12/07/99	B70615	SODIUM	180	ppm	Background	ppm
SS-1	SURFACE	12/07/99	B70611	SODIUM	118	ppm	Background	ppm
SS-2	SURFACE	12/07/99	B70613	VANADIUM	28.6	ppm	150 or background	ppm
SS-4	SURFACE	12/07/99	B70612	VANADIUM	24.8	ppm	150 or background	ppm
SS-5	SURFACE	12/07/99	B70615	VANADIUM	17.8	ppm	150 or background	ppm
SS-1	SURFACE	12/07/99	B70611	VANADIUM	16.6	ppm	150 or background	ppm
SS-3	SURFACE	12/07/99	B70614	VANADIUM	12.9	ppm	150 or background	ppm
SS-5	SURFACE	12/07/99	B70615	ZINC	772	ppm	20 or background	ppm
SS-3	SURFACE	12/07/99	B70614	ZINC	739	ppm	20 or background	ppm
SS-4	SURFACE	12/07/99	B70612	ZINC	309	ppm	20 or background	ppm
SS-2	SURFACE	12/07/99	B70613	ZINC	183	ppm	20 or background	ppm
SS-1	SURFACE	12/07/99	B70611	ZINC	103	ppm	20 or background	ppm

Table 12. Summary of Surface Soil Sample Results
Pesticides and PCBs
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
SS-5	SURFACE	12/07/99	B70615	4,4'-DDE	19.0	ppb	2100	ppb
SS-5	SURFACE	12/07/99	B70615	4,4'-DDT (P,P'-DDT)	21.0	ppb	2100	ppb
SS-1	SURFACE	12/07/99	B70611	ALPHA CHLORDANE	210	ppb	540 (Chlordane)	ppb
SS-1	SURFACE	12/07/99	B70611	DIELDRIN	74.0	ppb	44	ppb
SS-3	SURFACE	12/07/99	B70614	DIELDRIN	15.0	ppb	44	ppb
SS-1	SURFACE	12/07/99	B70611	GAMMA CHLORDANE	170	ppb	540	ppb
SS-1	SURFACE	12/07/99	B70611	HEPTACHLOR EPOXIDE	30.0	ppb	20	ppb
SS-2	SURFACE	12/07/99	B70613	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb
SS-4	SURFACE	12/07/99	B70612	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb

ND- Not Detected
NA- Not Applicable

Table 13. Summary of Subsurface Soil Sample Results
Semi-Volatile Organic Compounds Sorted by Depth
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-2	10-12	02/08/00	B70617	PHENANTHRENE	29.0	ppb	50000	ppb
MW-2	10-12	02/08/00	B70617	TOTAL SVOC TICs	1360	ppb	NA	ppb
TP-1	3-5	12/06/99	B70601	2-METHYLNAPHTHALENE	1500	ppb	36400	ppb
TP-1	3-5	12/06/99	B70601	CHRYSENE	390	ppb	400	ppb
TP-1	3-5	12/06/99	B70601	FLUORANTHENE	500	ppb	50000	ppb
TP-1	3-5	12/06/99	B70601	PHENANTHRENE	1300	ppb	50000	ppb
TP-1	3-5	12/06/99	B70601	PYRENE	670	ppb	50000	ppb
TP-1	3-5	12/06/99	B70601	TOTAL SVOC TICs	625000	ppb	NA	ppb
TP-1	7-8	12/06/99	B70602	2-METHYLNAPHTHALENE	6400	ppb	36400	ppb
TP-1	7-8	12/06/99	B70602	PHENANTHRENE	1500	ppb	50000	ppb
TP-1	7-8	12/06/99	B70602	TOTAL SVOC TICs	814000	ppb	NA	ppb
TP-10	4	12/06/99	B70610	2-METHYLNAPHTHALENE	140	ppb	36400	ppb
TP-10	4	12/06/99	B70610	ACENAPHTHYLENE	71.0	ppb	41000	ppb
TP-10	4	12/06/99	B70610	ANTHRACENE	97.0	ppb	50000	ppb
TP-10	4	12/06/99	B70610	BENZO(A)ANTHRACENE	510	ppb	224	ppb
TP-10	4	12/06/99	B70610	BENZO(A)PYRENE	520	ppb	61	ppb
TP-10	4	12/06/99	B70610	BENZO(B)FLUORANTHENE	690	ppb	1100	ppb
TP-10	4	12/06/99	B70610	BENZO(G,H,I)PERYLENE	460	ppb	50000	ppb
TP-10	4	12/06/99	B70610	BENZO(K)FLUORANTHENE	560	ppb	1100	ppb
TP-10	4	12/06/99	B70610	BIS(2-ETHYLHEXYL)PHTHALATE	440	ppb	50000	ppb
TP-10	4	12/06/99	B70610	CARBAZOLE	55.0	ppb	NA	ppb
TP-10	4	12/06/99	B70610	CHRYSENE	920	ppb	400	ppb
TP-10	4	12/06/99	B70610	DIBENZO(A,H)ANTHRACENE	130	ppb	14	ppb
TP-10	4	12/06/99	B70610	DIBENZOFURAN	86.0	ppb	6200	ppb
TP-10	4	12/06/99	B70610	FLUORANTHENE	870	ppb	50000	ppb
TP-10	4	12/06/99	B70610	INDENO(1,2,3-C,D)PYRENE	380	ppb	3200	ppb
TP-10	4	12/06/99	B70610	NAPHTHALENE	86.0	ppb	13000	ppb
TP-10	4	12/06/99	B70610	PHENANTHRENE	580	ppb	50000	ppb
TP-10	4	12/06/99	B70610	PYRENE	720	ppb	50000	ppb
TP-10	4	12/06/99	B70610	TOTAL SVOC TICs	18300	ppb	NA	ppb
TP-2	5	12/06/99	B70603	2-METHYLNAPHTHALENE	110000	ppb	36400	ppb
TP-2	5	12/06/99	B70603	ACENAPHTHENE	170000	ppb	50000	ppb
TP-2	5	12/06/99	B70603	ANTHRACENE	510000	ppb	50000	ppb
TP-2	5	12/06/99	B70603	BENZO(A)ANTHRACENE	760000	ppb	224	ppb
TP-2	5	12/06/99	B70603	BENZO(A)PYRENE	530000	ppb	61	ppb
TP-2	5	12/06/99	B70603	BENZO(B)FLUORANTHENE	480000	ppb	1100	ppb
TP-2	5	12/06/99	B70603	BENZO(G,H,I)PERYLENE	280000	ppb	50000	ppb
TP-2	5	12/06/99	B70603	BENZO(K)FLUORANTHENE	470000	ppb	1100	ppb
TP-2	5	12/06/99	B70603	CARBAZOLE	170000	ppb	NA	ppb
TP-2	5	12/06/99	B70603	CHRYSENE	710000	ppb	400	ppb
TP-2	5	12/06/99	B70603	DIBENZO(A,H)ANTHRACENE	100000	ppb	14	ppb
TP-2	5	12/06/99	B70603	DIBENZOFURAN	220000	ppb	6200	ppb
TP-2	5	12/06/99	B70603	FLUORANTHENE	1500000	ppb	50000	ppb
TP-2	5	12/06/99	B70603	FLUORENE	360000	ppb	50000	ppb
TP-2	5	12/06/99	B70603	INDENO(1,2,3-C,D)PYRENE	280000	ppb	3200	ppb
TP-2	5	12/06/99	B70603	NAPHTHALENE	320000	ppb	13000	ppb
TP-2	5	12/06/99	B70603	PHENANTHRENE	1600000	ppb	50000	ppb
TP-2	5	12/06/99	B70603	PYRENE	960000	ppb	50000	ppb
TP-2	5	12/06/99	B70603	TOTAL SVOC TICs	2240000	ppb	NA	ppb
TP-3	8-9	12/06/99	B70604	2-METHYLNAPHTHALENE	670	ppb	36400	ppb
TP-3	8-9	12/06/99	B70604	ACENAPHTHENE	1700	ppb	50000	ppb
TP-3	8-9	12/06/99	B70604	ACENAPHTHYLENE	310	ppb	41000	ppb
TP-3	8-9	12/06/99	B70604	ANTHRACENE	4700	ppb	50000	ppb
TP-3	8-9	12/06/99	B70604	BENZO(A)ANTHRACENE	10000	ppb	224	ppb
TP-3	8-9	12/06/99	B70604	BENZO(A)PYRENE	8100	ppb	61	ppb
TP-3	8-9	12/06/99	B70604	BENZO(B)FLUORANTHENE	7000	ppb	1100	ppb
TP-3	8-9	12/06/99	B70604	BENZO(G,H,I)PERYLENE	4200	ppb	50000	ppb
TP-3	8-9	12/06/99	B70604	BENZO(K)FLUORANTHENE	6900	ppb	1100	ppb
TP-3	8-9	12/06/99	B70604	CARBAZOLE	2500	ppb	NA	ppb
TP-3	8-9	12/06/99	B70604	CHRYSENE	11000	ppb	400	ppb
TP-3	8-9	12/06/99	B70604	DIBENZO(A,H)ANTHRACENE	1400	ppb	14	ppb

Table 13. Summary of Subsurface Soil Sample Results
Semi-Volatile Organic Compounds Sorted by Depth
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
TP-3	8-9	12/06/99	B70604	DIBENZOFURAN	1500	ppb	6200	ppb
TP-3	8-9	12/06/99	B70604	FLUORANTHENE	24000	ppb	50000	ppb
TP-3	8-9	12/06/99	B70604	FLUORENE	2400	ppb	50000	ppb
TP-3	8-9	12/06/99	B70604	INDENO(1,2,3-C,D)PYRENE	3900	ppb	3200	ppb
TP-3	8-9	12/06/99	B70604	NAPHTHALENE	2300	ppb	13000	ppb
TP-3	8-9	12/06/99	B70604	PHENANTHRENE	25000	ppb	50000	ppb
TP-3	8-9	12/06/99	B70604	PYRENE	20000	ppb	50000	ppb
TP-3	8-9	12/06/99	B70604	TOTAL SVOC TICs	63000	ppb	NA	ppb
TP-4	5	12/06/99	B70605	BENZO(A)ANTHRACENE	65.0	ppb	224	ppb
TP-4	5	12/06/99	B70605	BENZO(A)PYRENE	54.0	ppb	61	ppb
TP-4	5	12/06/99	B70605	BENZO(B)FLUORANTHENE	55.0	ppb	1100	ppb
TP-4	5	12/06/99	B70605	BENZO(G,H,I)PERYLENE	43.0	ppb	50000	ppb
TP-4	5	12/06/99	B70605	BENZO(K)FLUORANTHENE	59.0	ppb	1100	ppb
TP-4	5	12/06/99	B70605	CHRYSENE	72.0	ppb	400	ppb
TP-4	5	12/06/99	B70605	FLUORANTHENE	130	ppb	50000	ppb
TP-4	5	12/06/99	B70605	INDENO(1,2,3-C,D)PYRENE	35.0	ppb	3200	ppb
TP-4	5	12/06/99	B70605	PHENANTHRENE	99.0	ppb	50000	ppb
TP-4	5	12/06/99	B70605	PYRENE	110	ppb	50000	ppb
TP-4	5	12/06/99	B70605	TOTAL SVOC TICs	1450	ppb	NA	ppb
TP-5	3	12/06/99	B70606	BENZO(A)ANTHRACENE	630	ppb	224	ppb
TP-5	3	12/06/99	B70606	BENZO(A)PYRENE	260	ppb	61	ppb
TP-5	3	12/06/99	B70606	BENZO(B)FLUORANTHENE	460	ppb	1100	ppb
TP-5	3	12/06/99	B70606	BENZO(G,H,I)PERYLENE	300	ppb	50000	ppb
TP-5	3	12/06/99	B70606	BENZO(K)FLUORANTHENE	220	ppb	1100	ppb
TP-5	3	12/06/99	B70606	CHRYSENE	3100	ppb	400	ppb
TP-5	3	12/06/99	B70606	DIBENZO(A,H)ANTHRACENE	310	ppb	14	ppb
TP-5	3	12/06/99	B70606	DI-N-OCTYLPHTHALATE	130	ppb	50000	ppb
TP-5	3	12/06/99	B70606	INDENO(1,2,3-C,D)PYRENE	190	ppb	3200	ppb
TP-5	3	12/06/99	B70606	PHENANTHRENE	1400	ppb	50000	ppb
TP-5	3	12/06/99	B70606	PYRENE	120	ppb	50000	ppb
TP-5	3	12/06/99	B70606	TOTAL SVOC TICs	56200	ppb	NA	ppb
TP-8	3	12/06/99	B70607	ACENAPHTHENE	270	ppb	50000	ppb
TP-8	3	12/06/99	B70607	ACENAPHTHYLENE	540	ppb	41000	ppb
TP-8	3	12/06/99	B70607	ANTHRACENE	2000	ppb	50000	ppb
TP-8	3	12/06/99	B70607	BENZO(A)ANTHRACENE	7900	ppb	224	ppb
TP-8	3	12/06/99	B70607	BENZO(A)PYRENE	7200	ppb	61	ppb
TP-8	3	12/06/99	B70607	BENZO(B)FLUORANTHENE	5800	ppb	1100	ppb
TP-8	3	12/06/99	B70607	BENZO(G,H,I)PERYLENE	4500	ppb	50000	ppb
TP-8	3	12/06/99	B70607	BENZO(K)FLUORANTHENE	5800	ppb	1100	ppb
TP-8	3	12/06/99	B70607	CARBAZOLE	650	ppb	NA	ppb
TP-8	3	12/06/99	B70607	CHRYSENE	9100	ppb	400	ppb
TP-8	3	12/06/99	B70607	DIBENZO(A,H)ANTHRACENE	1600	ppb	14	ppb
TP-8	3	12/06/99	B70607	DIBENZOFURAN	380	ppb	6200	ppb
TP-8	3	12/06/99	B70607	FLUORANTHENE	20000	ppb	50000	ppb
TP-8	3	12/06/99	B70607	FLUORENE	450	ppb	50000	ppb
TP-8	3	12/06/99	B70607	INDENO(1,2,3-C,D)PYRENE	3900	ppb	3200	ppb
TP-8	3	12/06/99	B70607	PHENANTHRENE	12000	ppb	50000	ppb
TP-8	3	12/06/99	B70607	PYRENE	19000	ppb	50000	ppb
TP-8	3	12/06/99	B70607	TOTAL SVOC TICs	153000	ppb	NA	ppb

NA- Not Applicable

Table 14. Summary of Subsurface Soil Sample Results
Semi-Volatile Organic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance
TP-2	5	12/06/99	B70603	2-METHYLNAPHTHALENE	110000	ppb	36400
TP-1	7-8	12/06/99	B70602	2-METHYLNAPHTHALENE	6400	ppb	36400
TP-1	3-5	12/06/99	B70601	2-METHYLNAPHTHALENE	1500	ppb	36400
TP-3	8-9	12/06/99	B70604	2-METHYLNAPHTHALENE	670	ppb	36400
TP-10	4	12/06/99	B70610	2-METHYLNAPHTHALENE	140	ppb	36400
TP-2	5	12/06/99	B70603	ACENAPHTHENE	170000	ppb	50000
TP-3	8-9	12/06/99	B70604	ACENAPHTHENE	1700	ppb	50000
TP-8	3	12/06/99	B70607	ACENAPHTHENE	270	ppb	50000
TP-8	3	12/06/99	B70607	ACENAPHTHYLENE	540	ppb	41000
TP-3	8-9	12/06/99	B70604	ACENAPHTHYLENE	310	ppb	41000
TP-10	4	12/06/99	B70610	ACENAPHTHYLENE	71.0	ppb	41000
TP-2	5	12/06/99	B70603	ANTHRACENE	510000	ppb	50000
TP-3	8-9	12/06/99	B70604	ANTHRACENE	4700	ppb	50000
TP-8	3	12/06/99	B70607	ANTHRACENE	2000	ppb	50000
TP-10	4	12/06/99	B70610	ANTHRACENE	97.0	ppb	50000
TP-2	5	12/06/99	B70603	BENZO(A)ANTHRACENE	760000	ppb	224
TP-3	8-9	12/06/99	B70604	BENZO(A)ANTHRACENE	10000	ppb	224
TP-8	3	12/06/99	B70607	BENZO(A)ANTHRACENE	7900	ppb	224
TP-5	3	12/06/99	B70606	BENZO(A)ANTHRACENE	630	ppb	224
TP-10	4	12/06/99	B70610	BENZO(A)ANTHRACENE	510	ppb	224
TP-4	5	12/06/99	B70605	BENZO(A)ANTHRACENE	65.0	ppb	224
TP-2	5	12/06/99	B70603	BENZO(A)PYRENE	530000	ppb	61
TP-3	8-9	12/06/99	B70604	BENZO(A)PYRENE	8100	ppb	61
TP-8	3	12/06/99	B70607	BENZO(A)PYRENE	7200	ppb	61
TP-10	4	12/06/99	B70610	BENZO(A)PYRENE	520	ppb	61
TP-5	3	12/06/99	B70606	BENZO(A)PYRENE	260	ppb	61
TP-4	5	12/06/99	B70605	BENZO(A)PYRENE	54.0	ppb	61
TP-2	5	12/06/99	B70603	BENZO(B)FLUORANTHENE	480000	ppb	1100
TP-3	8-9	12/06/99	B70604	BENZO(B)FLUORANTHENE	7000	ppb	1100
TP-8	3	12/06/99	B70607	BENZO(B)FLUORANTHENE	5800	ppb	1100
TP-10	4	12/06/99	B70610	BENZO(B)FLUORANTHENE	690	ppb	1100
TP-5	3	12/06/99	B70606	BENZO(B)FLUORANTHENE	460	ppb	1100
TP-4	5	12/06/99	B70605	BENZO(B)FLUORANTHENE	55.0	ppb	1100
TP-2	5	12/06/99	B70603	BENZO(G,H,I)PERYLENE	280000	ppb	50000
TP-8	3	12/06/99	B70607	BENZO(G,H,I)PERYLENE	4500	ppb	50000
TP-3	8-9	12/06/99	B70604	BENZO(G,H,I)PERYLENE	4200	ppb	50000
TP-10	4	12/06/99	B70610	BENZO(G,H,I)PERYLENE	460	ppb	50000
TP-5	3	12/06/99	B70606	BENZO(G,H,I)PERYLENE	300	ppb	50000
TP-4	5	12/06/99	B70605	BENZO(G,H,I)PERYLENE	43.0	ppb	50000
TP-2	5	12/06/99	B70603	BENZO(K)FLUORANTHENE	470000	ppb	1100
TP-3	8-9	12/06/99	B70604	BENZO(K)FLUORANTHENE	6900	ppb	1100
TP-8	3	12/06/99	B70607	BENZO(K)FLUORANTHENE	5800	ppb	1100
TP-10	4	12/06/99	B70610	BENZO(K)FLUORANTHENE	560	ppb	1100
TP-5	3	12/06/99	B70606	BENZO(K)FLUORANTHENE	220	ppb	1100
TP-4	5	12/06/99	B70605	BENZO(K)FLUORANTHENE	59.0	ppb	1100
TP-10	4	12/06/99	B70610	BIS(2-ETHYLHEXYL)PHTHALATE	440	ppb	50000
TP-2	5	12/06/99	B70603	CARBAZOLE	170000	ppb	NA
TP-3	8-9	12/06/99	B70604	CARBAZOLE	2500	ppb	NA
TP-8	3	12/06/99	B70607	CARBAZOLE	650	ppb	NA
TP-10	4	12/06/99	B70610	CARBAZOLE	55.0	ppb	NA
TP-2	5	12/06/99	B70603	CHRYSENE	710000	ppb	400
TP-3	8-9	12/06/99	B70604	CHRYSENE	11000	ppb	400
TP-8	3	12/06/99	B70607	CHRYSENE	9100	ppb	400
TP-5	3	12/06/99	B70606	CHRYSENE	3100	ppb	400
TP-10	4	12/06/99	B70610	CHRYSENE	920	ppb	400
TP-4	5	12/06/99	B70605	CHRYSENE	72.0	ppb	400
TP-1	3-5	12/06/99	B70601	CHRYSENE	390	ppb	400

Table 14. Summary of Subsurface Soil Sample Results
Semi-Volatile Organic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard Guidance
TP-2	5	12/06/99	B70603	DIBENZO(A,H)ANTHRACENE	100000	ppb	14
TP-8	3	12/06/99	B70607	DIBENZO(A,H)ANTHRACENE	1600	ppb	14
TP-3	8-9	12/06/99	B70604	DIBENZO(A,H)ANTHRACENE	1400	ppb	14
TP-5	3	12/06/99	B70606	DIBENZO(A,H)ANTHRACENE	310	ppb	14
TP-10	4	12/06/99	B70610	DIBENZO(A,H)ANTHRACENE	130	ppb	14
TP-2	5	12/06/99	B70603	DIBENZOFURAN	220000	ppb	6200
TP-3	8-9	12/06/99	B70604	DIBENZOFURAN	1500	ppb	6200
TP-8	3	12/06/99	B70607	DIBENZOFURAN	380	ppb	6200
TP-10	4	12/06/99	B70610	DIBENZOFURAN	86.0	ppb	6200
TP-5	3	12/06/99	B70606	DI-N-OCTYLPHTHALATE	130	ppb	50000
TP-2	5	12/06/99	B70603	FLUORANTHENE	1500000	ppb	50000
TP-3	8-9	12/06/99	B70604	FLUORANTHENE	24000	ppb	50000
TP-8	3	12/06/99	B70607	FLUORANTHENE	20000	ppb	50000
TP-10	4	12/06/99	B70610	FLUORANTHENE	870	ppb	50000
TP-1	3-5	12/06/99	B70601	FLUORANTHENE	500	ppb	50000
TP-4	5	12/06/99	B70605	FLUORANTHENE	130	ppb	50000
TP-2	5	12/06/99	B70603	FLUORENE	360000	ppb	50000
TP-3	8-9	12/06/99	B70604	FLUORENE	2400	ppb	50000
TP-8	3	12/06/99	B70607	FLUORENE	450	ppb	50000
TP-2	5	12/06/99	B70603	INDENO(1,2,3-C,D)PYRENE	280000	ppb	3200
TP-3	8-9	12/06/99	B70604	INDENO(1,2,3-C,D)PYRENE	3900	ppb	3200
TP-8	3	12/06/99	B70607	INDENO(1,2,3-C,D)PYRENE	3900	ppb	3200
TP-10	4	12/06/99	B70610	INDENO(1,2,3-C,D)PYRENE	380	ppb	3200
TP-5	3	12/06/99	B70606	INDENO(1,2,3-C,D)PYRENE	190	ppb	3200
TP-4	5	12/06/99	B70605	INDENO(1,2,3-C,D)PYRENE	35.0	ppb	320
TP-2	5	12/06/99	B70603	NAPHTHALENE	320000	ppb	130
TP-3	8-9	12/06/99	B70604	NAPHTHALENE	2300	ppb	13000
TP-10	4	12/06/99	B70610	NAPHTHALENE	86.0	ppb	13000
TP-2	5	12/06/99	B70603	PHENANTHRENE	1600000	ppb	50000
TP-3	8-9	12/06/99	B70604	PHENANTHRENE	25000	ppb	50000
TP-8	3	12/06/99	B70607	PHENANTHRENE	12000	ppb	50000
TP-1	7-8	12/06/99	B70602	PHENANTHRENE	1500	ppb	50000
TP-5	3	12/06/99	B70606	PHENANTHRENE	1400	ppb	50000
TP-1	3-5	12/06/99	B70601	PHENANTHRENE	1300	ppb	50000
TP-10	4	12/06/99	B70610	PHENANTHRENE	580	ppb	50000
TP-4	5	12/06/99	B70605	PHENANTHRENE	99.0	ppb	50000
MW-2	10-12	02/08/00	B70617	PHENANTHRENE	29.0	ppb	50000
TP-2	5	12/06/99	B70603	PYRENE	960000	ppb	50000
TP-3	8-9	12/06/99	B70604	PYRENE	20000	ppb	50000
TP-8	3	12/06/99	B70607	PYRENE	19000	ppb	50000
TP-10	4	12/06/99	B70610	PYRENE	720	ppb	50000
TP-1	3-5	12/06/99	B70601	PYRENE	670	ppb	50000
TP-5	3	12/06/99	B70606	PYRENE	120	ppb	50000
TP-4	5	12/06/99	B70605	PYRENE	110	ppb	50000
TP-2	5	12/06/99	B70603	TOTAL SVOC TICs	2240000	ppb	NA
TP-1	7-8	12/06/99	B70602	TOTAL SVOC TICs	814000	ppb	NA
TP-1	3-5	12/06/99	B70601	TOTAL SVOC TICs	625000	ppb	NA
TP-8	3	12/06/99	B70607	TOTAL SVOC TICs	153000	ppb	NA
TP-3	8-9	12/06/99	B70604	TOTAL SVOC TICs	63000	ppb	NA
TP-5	3	12/06/99	B70606	TOTAL SVOC TICs	56200	ppb	NA
TP-10	4	12/06/99	B70610	TOTAL SVOC TICs	18300	ppb	NA
TP-4	5	12/06/99	B70605	TOTAL SVOC TICs	1450	ppb	N
MW-2	10-12	02/08/00	B70617	TOTAL SVOC TICs	1360	ppb	

NA- Not Applicable

Table 15. Summary of Subsurface Soil Sample Results
Total Petroleum Hydrocarbons
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-1	8-10	02/08/00	B70618	TOTAL PETROLEUM HYDROCARBONS	1140	ppm	NA	ppm
MW-1	8-10	02/08/00	B70619	TOTAL PETROLEUM HYDROCARBONS	336	ppm	NA	ppm
MW-1	16-18	02/09/00	B70620	TOTAL PETROLEUM HYDROCARBONS	166	ppm	NA	ppm
MW-2	6-8	02/08/00	B70616	TOTAL PETROLEUM HYDROCARBONS	474	ppm	NA	ppm
MW-2	10-12	02/08/00	B70617	TOTAL PETROLEUM HYDROCARBONS	22.3	ppm	NA	ppm

NA- Not Applicable
Samples B70618 and B70619 are field duplicate samples

Table 16. Summary of Subsurface Soil Sample Results
Volatile Organic Compounds Sorted by Depth
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units	Comments
MW-2	10-12	02/08/00	B70617	METHYLENE CHLORIDE	750	ppb	100	ppb	Result is biased high due to laboratory contamination.
MW-2	10-12	02/08/00	B70617	TOTAL VOC TICs	130	ppb	NA	ppb	
TP-1	3-5	12/06/99	B70601	ACETONE	410	ppb	200	ppb	Result is invalid due to laboratory contamination.
TP-1	3-5	12/06/99	B70601	METHYLENE CHLORIDE	1300	ppb	100	ppb	Result is invalid due to laboratory contamination.
TP-1	3-5	12/06/99	B70601	TOTAL VOC TICs	109000	ppb	NA	ppb	
TP-1	7-8	12/06/99	B70602	2-BUTANONE	240	ppb	300	ppb	
TP-1	7-8	12/06/99	B70602	ACETONE	290	ppb	200	ppb	Result is invalid due to laboratory contamination.
TP-1	7-8	12/06/99	B70602	METHYLENE CHLORIDE	1400	ppb	100	ppb	Result is invalid due to laboratory contamination.
TP-1	7-8	12/06/99	B70602	TOTAL VOC TICs	133000	ppb	NA	ppb	
TP-1	7-8	12/06/99	B70602	XYLENE (total)	6300	ppb	1200	ppb	
TP-10	4	12/06/99	B70610	2-BUTANONE	22.0	ppb	300	ppb	
TP-10	4	12/06/99	B70610	ACETONE	100	ppb	200	ppb	
TP-10	4	12/06/99	B70610	METHYLENE CHLORIDE	58.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-10	4	12/06/99	B70610	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-2	5	12/06/99	B70603	METHYLENE CHLORIDE	86.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-2	5	12/06/99	B70603	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-3	8-9	12/06/99	B70604	1,1-DICHLOROETHANE	8.00	ppb	200	ppb	
TP-3	8-9	12/06/99	B70604	ACETONE	98.0	ppb	200	ppb	
TP-3	8-9	12/06/99	B70604	CARBON DISULFIDE	2.00	ppb	2700	ppb	
TP-3	8-9	12/06/99	B70604	METHYLENE CHLORIDE	49.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-3	8-9	12/06/99	B70604	TOLUENE	3.00	ppb	1500	ppb	
TP-3	8-9	12/06/99	B70604	TOTAL 1,2-DICHLOROETHENE	6.00	ppb	NA	ppb	
TP-3	8-9	12/06/99	B70604	TOTAL VOC TICs	237	ppb	NA	ppb	
TP-3	8-9	12/06/99	B70604	TRICHLOROETHENE	28.0	ppb	700	ppb	
TP-4	5	12/06/99	B70605	METHYLENE CHLORIDE	24.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-4	5	12/06/99	B70605	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-5	3	12/06/99	B70606	METHYLENE CHLORIDE	36.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-5	3	12/06/99	B70606	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-8	3	12/06/99	B70607	ACETONE	28.0	ppb	200	ppb	
TP-8	3	12/06/99	B70607	METHYLENE CHLORIDE	62.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-8	3	12/06/99	B70607	TOTAL VOC TICs	ND	ppb	NA	ppb	

ND- Not Detected
NA- Not Applicable

Table 17. Summary of Subsurface Soil Sample Results
Volatile Organic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units	Comments
TP-3	8-9	12/06/99	B70604	1,1-DICHLOROETHANE	8.00	ppb	200	ppb	
TP-1	7-8	12/06/99	B70602	2-BUTANONE	240	ppb	300	ppb	
TP-10	4	12/06/99	B70610	2-BUTANONE	22.0	ppb	300	ppb	
TP-1	3-5	12/06/99	B70601	ACETONE	410	ppb	200	ppb	Result is invalid due to laboratory contamination.
TP-1	7-8	12/06/99	B70602	ACETONE	290	ppb	200	ppb	Result is invalid due to laboratory contamination.
TP-10	4	12/06/99	B70610	ACETONE	100	ppb	200	ppb	
TP-3	8-9	12/06/99	B70604	ACETONE	98.0	ppb	200	ppb	
TP-8	3	12/06/99	B70607	ACETONE	28.0	ppb	200	ppb	
TP-3	8-9	12/06/99	B70604	CARBON DISULFIDE	2.00	ppb	2700	ppb	
TP-1	7-8	12/06/99	B70602	METHYLENE CHLORIDE	1400	ppb	100	ppb	Result is invalid due to laboratory contamination.
TP-1	3-5	12/06/99	B70601	METHYLENE CHLORIDE	1300	ppb	100	ppb	Result is invalid due to laboratory contamination.
MW-2	10-12	02/08/00	B70617	METHYLENE CHLORIDE	750	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-2	5	12/06/99	B70603	METHYLENE CHLORIDE	86.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-8	3	12/06/99	B70607	METHYLENE CHLORIDE	62.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-10	4	12/06/99	B70610	METHYLENE CHLORIDE	58.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-3	8-9	12/06/99	B70604	METHYLENE CHLORIDE	49.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-5	3	12/06/99	B70606	METHYLENE CHLORIDE	36.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-4	5	12/06/99	B70605	METHYLENE CHLORIDE	24.0	ppb	100	ppb	Result is biased high due to laboratory contamination.
TP-3	8-9	12/06/99	B70604	TOLUENE	3.00	ppb	1500	ppb	
TP-3	8-9	12/06/99	B70604	TOTAL 1,2-DICHLOROETHENE	6.00	ppb	NA	ppb	
TP-3	8-9	12/06/99	B70604	TRICHLOROETHENE	28.0	ppb	700	ppb	
TP-1	7-8	12/06/99	B70602	XYLENE (total)	6300	ppb	1200	ppb	
TP-10	4	12/06/99	B70610	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-2	5	12/06/99	B70603	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-4	5	12/06/99	B70605	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-5	3	12/06/99	B70606	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-8	3	12/06/99	B70607	TOTAL VOC TICs	ND	ppb	NA	ppb	
TP-1	7-8	12/06/99	B70602	TOTAL VOC TICs	133000	ppb	NA	ppb	
TP-1	3-5	12/06/99	B70601	TOTAL VOC TICs	109000	ppb	NA	ppb	
TP-3	8-9	12/06/99	B70604	TOTAL VOC TICs	237	ppb	NA	ppb	
MW-2	10-12	02/08/00	B70617	TOTAL VOC TICs	130	ppb	NA	ppb	

ND- Not Detected
NA- Not Applicable

Table 18. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Depth
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance
MW-1	8-10	02/08/00	B70618	ALUMINUM	6140	ppm	Background
MW-1	8-10	02/08/00	B70619	ALUMINUM	3400	ppm	Background
MW-1	8-10	02/08/00	B70618	ARSENIC	7.20	ppm	7.5 or background
MW-1	8-10	02/08/00	B70619	ARSENIC	8.80	ppm	7.5 or background
MW-1	8-10	02/08/00	B70618	BARIUM	43.9	ppm	300 or background
MW-1	8-10	02/08/00	B70619	BARIUM	59.7	ppm	300 or background
MW-1	8-10	02/08/00	B70619	BERYLLIUM	0.15	ppm	0.16 or background
MW-1	8-10	02/08/00	B70618	BERYLLIUM	0.28	ppm	0.16 or background
MW-1	8-10	02/08/00	B70619	CADMIUM	0.65	ppm	10 or background
MW-1	8-10	02/08/00	B70618	CALCIUM	1870	ppm	Background
MW-1	8-10	02/08/00	B70619	CALCIUM	4300	ppm	Background
MW-1	8-10	02/08/00	B70618	CHROMIUM	11.5	ppm	50 or background
MW-1	8-10	02/08/00	B70619	CHROMIUM	19.9	ppm	50 or background
MW-1	8-10	02/08/00	B70618	COBALT	4.60	ppm	30 or background
MW-1	8-10	02/08/00	B70619	COBALT	10.9	ppm	30 or background
MW-1	8-10	02/08/00	B70619	COPPER	113	ppm	25 or background
MW-1	8-10	02/08/00	B70618	COPPER	17.2	ppm	25 or background
MW-1	8-10	02/08/00	B70619	IRON	3400	ppm	2000 or background
MW-1	8-10	02/08/00	B70618	IRON	15900	ppm	2000 or background
MW-1	8-10	02/08/00	B70618	LEAD	12.1	ppm	Background
MW-1	8-10	02/08/00	B70619	LEAD	21.8	ppm	Background
MW-1	8-10	02/08/00	B70619	MAGNESIUM	396	ppm	Background
MW-1	8-10	02/08/00	B70618	MAGNESIUM	2130	ppm	Background
MW-1	8-10	02/08/00	B70618	MANGANESE	85.4	ppm	Backgroun
MW-1	8-10	02/08/00	B70619	MANGANESE	20.4	ppm	Background
MW-1	8-10	02/08/00	B70618	MERCURY	0.09	ppm	0.1
MW-1	8-10	02/08/00	B70619	NICKEL	23.2	ppm	13 or background
MW-1	8-10	02/08/00	B70618	NICKEL	14.5	ppm	13 or background
MW-1	8-10	02/08/00	B70618	POTASSIUM	473	ppm	Background
MW-1	8-10	02/08/00	B70619	POTASSIUM	1000	ppm	Background
MW-1	8-10	02/08/00	B70619	SELENIUM	2.00	ppm	2 or background
MW-1	8-10	02/08/00	B70618	SODIUM	52.3	ppm	Background
MW-1	8-10	02/08/00	B70619	SODIUM	83.6	ppm	Background
MW-1	8-10	02/08/00	B70619	VANADIUM	32.0	ppm	150 or background
MW-1	8-10	02/08/00	B70618	VANADIUM	14.3	ppm	150 or background
MW-1	8-10	02/08/00	B70619	ZINC	62.4	ppm	20 or background
MW-1	8-10	02/08/00	B70618	ZINC	62.9	ppm	20 or background
MW-2	6-8	02/08/00	B70616	ALUMINUM	8100	ppm	Background
MW-2	6-8	02/08/00	B70616	ARSENIC	4.70	ppm	7.5 or background
MW-2	6-8	02/08/00	B70616	BARIUM	47.0	ppm	300 or background
MW-2	6-8	02/08/00	B70616	BERYLLIUM	0.46	ppm	0.16 or background
MW-2	6-8	02/08/00	B70616	CALCIUM	1280	ppm	Background
MW-2	6-8	02/08/00	B70616	CHROMIUM	11.5	ppm	50 or background
MW-2	6-8	02/08/00	B70616	COBALT	7.60	ppm	30 or background
MW-2	6-8	02/08/00	B70616	COPPER	13.7	ppm	25 or background
MW-2	6-8	02/08/00	B70616	IRON	18100	ppm	2000 or background
MW-2	6-8	02/08/00	B70616	LEAD	9.60	ppm	Background
MW-2	6-8	02/08/00	B70616	MAGNESIUM	2640	ppm	Background
MW-2	6-8	02/08/00	B70616	MANGANESE	222	ppm	Backgroun
MW-2	6-8	02/08/00	B70616	NICKEL	20.0	ppm	13 or backgrou
MW-2	6-8	02/08/00	B70616	POTASSIUM	865	ppm	Background
MW-2	6-8	02/08/00	B70616	SELENIUM	1.50	ppm	2 or background
MW-2	6-8	02/08/00	B70616	SODIUM	97.7	ppm	Background
MW-2	6-8	02/08/00	B70616	VANADIUM	13.9	ppm	150 or background

Table 18. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Depth
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance
MW-2	6-8	02/08/00	B70616	ZINC	47.5	ppm	20 or background
TP-1	3-5	12/06/99	B70601	ALUMINUM	6340	ppm	Background
TP-1	3-5	12/06/99	B70601	ARSENIC	9.00	ppm	7.5 or background
TP-1	3-5	12/06/99	B70601	BARIUM	89.5	ppm	300 or background
TP-1	3-5	12/06/99	B70601	BERYLLIUM	0.54	ppm	0.16 or background
TP-1	3-5	12/06/99	B70601	CALCIUM	3150	ppm	Background
TP-1	3-5	12/06/99	B70601	CHROMIUM	9.40	ppm	50 or background
TP-1	3-5	12/06/99	B70601	COBALT	5.80	ppm	30 or background
TP-1	3-5	12/06/99	B70601	COPPER	28.0	ppm	25 or background
TP-1	3-5	12/06/99	B70601	IRON	19300	ppm	2000 or background
TP-1	3-5	12/06/99	B70601	LEAD	29.8	ppm	Background
TP-1	3-5	12/06/99	B70601	MAGNESIUM	2250	ppm	Background
TP-1	3-5	12/06/99	B70601	MANGANESE	108	ppm	Background
TP-1	3-5	12/06/99	B70601	MERCURY	4.00	ppm	0.1
TP-1	3-5	12/06/99	B70601	NICKEL	14.9	ppm	13 or background
TP-1	3-5	12/06/99	B70601	POTASSIUM	930	ppm	Background
TP-1	3-5	12/06/99	B70601	SELENIUM	1.30	ppm	2 or background
TP-1	3-5	12/06/99	B70601	SODIUM	75.4	ppm	Background
TP-1	3-5	12/06/99	B70601	VANADIUM	16.2	ppm	150 or background
TP-1	3-5	12/06/99	B70601	ZINC	139	ppm	20 or background
TP-1	7-8	12/06/99	B70602	ALUMINUM	9120	ppm	Background
TP-1	7-8	12/06/99	B70602	ARSENIC	10.4	ppm	7.5 or background
TP-1	7-8	12/06/99	B70602	BARIUM	29.0	ppm	300 or background
TP-1	7-8	12/06/99	B70602	BERYLLIUM	0.52	ppm	0.16 or background
TP-1	7-8	12/06/99	B70602	CADMIUM	0.56	ppm	10 or background
TP-1	7-8	12/06/99	B70602	CALCIUM	1850	ppm	Background
TP-1	7-8	12/06/99	B70602	CHROMIUM	9.80	ppm	50 or background
TP-1	7-8	12/06/99	B70602	COBALT	5.40	ppm	30 or background
TP-1	7-8	12/06/99	B70602	COPPER	143	ppm	25 or background
TP-1	7-8	12/06/99	B70602	IRON	17700	ppm	2000 or background
TP-1	7-8	12/06/99	B70602	LEAD	9.10	ppm	Background
TP-1	7-8	12/06/99	B70602	MAGNESIUM	2410	ppm	Background
TP-1	7-8	12/06/99	B70602	MANGANESE	87.3	ppm	Background
TP-1	7-8	12/06/99	B70602	NICKEL	17.3	ppm	13 or background
TP-1	7-8	12/06/99	B70602	POTASSIUM	1040	ppm	Background
TP-1	7-8	12/06/99	B70602	SELENIUM	1.60	ppm	2 or background
TP-1	7-8	12/06/99	B70602	SODIUM	67.7	ppm	Background
TP-1	7-8	12/06/99	B70602	VANADIUM	15.7	ppm	150 or background
TP-1	7-8	12/06/99	B70602	ZINC	160	ppm	20 or background
TP-10	4	12/06/99	B70610	ALUMINUM	4400	ppm	Background
TP-10	4	12/06/99	B70610	ANTIMONY	5.70	ppm	Background
TP-10	4	12/06/99	B70610	ARSENIC	12.2	ppm	7.5 or background
TP-10	4	12/06/99	B70610	BARIUM	75.0	ppm	300 or background
TP-10	4	12/06/99	B70610	BERYLLIUM	0.46	ppm	0.16 or background
TP-10	4	12/06/99	B70610	CADMIUM	0.34	ppm	10 or background
TP-10	4	12/06/99	B70610	CALCIUM	31400	ppm	Background
TP-10	4	12/06/99	B70610	CHROMIUM	9.90	ppm	50 or background
TP-10	4	12/06/99	B70610	COBALT	5.90	ppm	30 or background
TP-10	4	12/06/99	B70610	COPPER	132	ppm	25 or background
TP-10	4	12/06/99	B70610	IRON	11400	ppm	2000 or background
TP-10	4	12/06/99	B70610	LEAD	473	ppm	Background
TP-10	4	12/06/99	B70610	MAGNESIUM	17900	ppm	Background
TP-10	4	12/06/99	B70610	MANGANESE	255	ppm	Background
TP-10	4	12/06/99	B70610	MERCURY	1.50	ppm	0.1

Table 18. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Depth
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance
TP-10	4	12/06/99	B70610	NICKEL	14.7	ppm	13 or background
TP-10	4	12/06/99	B70610	POTASSIUM	491	ppm	Background
TP-10	4	12/06/99	B70610	SELENIUM	3.50	ppm	2 or background
TP-10	4	12/06/99	B70610	SODIUM	331	ppm	Background
TP-10	4	12/06/99	B70610	VANADIUM	20.2	ppm	150 or background
TP-10	4	12/06/99	B70610	ZINC	128	ppm	20 or background
TP-2	5	12/06/99	B70603	ALUMINUM	20100	ppm	Background
TP-2	5	12/06/99	B70603	ARSENIC	16.1	ppm	7.5 or background
TP-2	5	12/06/99	B70603	BARIUM	828	ppm	300 or background
TP-2	5	12/06/99	B70603	BERYLLIUM	2.20	ppm	0.16 or background
TP-2	5	12/06/99	B70603	CADMIUM	2.40	ppm	10 or background
TP-2	5	12/06/99	B70603	CALCIUM	85100	ppm	Background
TP-2	5	12/06/99	B70603	CHROMIUM	47.9	ppm	50 or background
TP-2	5	12/06/99	B70603	COBALT	4.10	ppm	30 or background
TP-2	5	12/06/99	B70603	COPPER	45.8	ppm	25 or background
TP-2	5	12/06/99	B70603	IRON	20200	ppm	2000 or background
TP-2	5	12/06/99	B70603	LEAD	467	ppm	Background
TP-2	5	12/06/99	B70603	MAGNESIUM	35800	ppm	Background
TP-2	5	12/06/99	B70603	MANGANESE	3480	ppm	Background
TP-2	5	12/06/99	B70603	MERCURY	1.00	ppm	0.1
TP-2	5	12/06/99	B70603	NICKEL	35.6	ppm	13 or background
TP-2	5	12/06/99	B70603	POTASSIUM	2540	ppm	Backgroun
TP-2	5	12/06/99	B70603	SELENIUM	2.60	ppm	2 or backgroun
TP-2	5	12/06/99	B70603	SILVER	0.24	ppm	Backgroun
TP-2	5	12/06/99	B70603	SODIUM	714	ppm	Background
TP-2	5	12/06/99	B70603	VANADIUM	23.2	ppm	150 or background
TP-2	5	12/06/99	B70603	ZINC	663	ppm	20 or background
TP-3	8-9	12/06/99	B70604	ALUMINUM	7560	ppm	Background
TP-3	8-9	12/06/99	B70604	ARSENIC	4.70	ppm	7.5 or background
TP-3	8-9	12/06/99	B70604	BARIUM	86.1	ppm	300 or background
TP-3	8-9	12/06/99	B70604	BERYLLIUM	0.42	ppm	0.16 or background
TP-3	8-9	12/06/99	B70604	CADMIUM	0.47	ppm	10 or background
TP-3	8-9	12/06/99	B70604	CALCIUM	15400	ppm	Background
TP-3	8-9	12/06/99	B70604	CHROMIUM	11.1	ppm	50 or background
TP-3	8-9	12/06/99	B70604	COBALT	5.50	ppm	30 or background
TP-3	8-9	12/06/99	B70604	COPPER	21.8	ppm	25 or background
TP-3	8-9	12/06/99	B70604	CYANIDE	1.10	ppm	Site specific
TP-3	8-9	12/06/99	B70604	IRON	16700	ppm	2000 or background
TP-3	8-9	12/06/99	B70604	LEAD	47.2	ppm	Background
TP-3	8-9	12/06/99	B70604	MAGNESIUM	5900	ppm	Background
TP-3	8-9	12/06/99	B70604	MANGANESE	346	ppm	Background
TP-3	8-9	12/06/99	B70604	MERCURY	0.12	ppm	0.1
TP-3	8-9	12/06/99	B70604	NICKEL	14.0	ppm	13 or background
TP-3	8-9	12/06/99	B70604	POTASSIUM	1020	ppm	Background
TP-3	8-9	12/06/99	B70604	SELENIUM	1.30	ppm	2 or background
TP-3	8-9	12/06/99	B70604	SODIUM	88.5	ppm	Background
TP-3	8-9	12/06/99	B70604	VANADIUM	15.5	ppm	150 or background
TP-3	8-9	12/06/99	B70604	ZINC	196	ppm	20 or backgrou
TP-4	5	12/06/99	B70605	ALUMINUM	12000	ppm	Backgrou
TP-4	5	12/06/99	B70605	ARSENIC	5.30	ppm	7.5 or background
TP-4	5	12/06/99	B70605	BARIUM	98.8	ppm	300 or background
TP-4	5	12/06/99	B70605	BERYLLIUM	0.69	ppm	0.16 or background
TP-4	5	12/06/99	B70605	CADMIUM	0.31	ppm	10 or background
TP-4	5	12/06/99	B70605	CALCIUM	3880	ppm	Background

Table 18. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Depth
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance
TP-4	5	12/06/99	B70605	CHROMIUM	16.3	ppm	50 or background
TP-4	5	12/06/99	B70605	COBALT	11.5	ppm	30 or background
TP-4	5	12/06/99	B70605	COPPER	13.5	ppm	25 or background
TP-4	5	12/06/99	B70605	IRON	23900	ppm	2000 or background
TP-4	5	12/06/99	B70605	LEAD	14.8	ppm	Background
TP-4	5	12/06/99	B70605	MAGNESIUM	3790	ppm	Background
TP-4	5	12/06/99	B70605	MANGANESE	780	ppm	Background
TP-4	5	12/06/99	B70605	MERCURY	0.03	ppm	0.1
TP-4	5	12/06/99	B70605	NICKEL	22.8	ppm	13 or background
TP-4	5	12/06/99	B70605	POTASSIUM	1170	ppm	Background
TP-4	5	12/06/99	B70605	SELENIUM	0.99	ppm	2 or background
TP-4	5	12/06/99	B70605	SODIUM	56.5	ppm	Background
TP-4	5	12/06/99	B70605	VANADIUM	20.1	ppm	150 or background
TP-4	5	12/06/99	B70605	ZINC	79.4	ppm	20 or background
TP-5	3	12/06/99	B70606	ALUMINUM	22200	ppm	Background
TP-5	3	12/06/99	B70606	ARSENIC	37.7	ppm	7.5 or background
TP-5	3	12/06/99	B70606	BARIUM	41.6	ppm	300 or background
TP-5	3	12/06/99	B70606	BERYLLIUM	0.81	ppm	0.16 or background
TP-5	3	12/06/99	B70606	CADMIUM	1.10	ppm	10 or background
TP-5	3	12/06/99	B70606	CALCIUM	39400	ppm	Background
TP-5	3	12/06/99	B70606	CHROMIUM	49.5	ppm	50 or background
TP-5	3	12/06/99	B70606	COBALT	2.70	ppm	30 or background
TP-5	3	12/06/99	B70606	COPPER	8.10	ppm	25 or background
TP-5	3	12/06/99	B70606	IRON	14200	ppm	2000 or background
TP-5	3	12/06/99	B70606	LEAD	25.9	ppm	Background
TP-5	3	12/06/99	B70606	MAGNESIUM	29900	ppm	Background
TP-5	3	12/06/99	B70606	MANGANESE	100	ppm	Background
TP-5	3	12/06/99	B70606	NICKEL	16.0	ppm	13 or background
TP-5	3	12/06/99	B70606	POTASSIUM	3400	ppm	Background
TP-5	3	12/06/99	B70606	SODIUM	824	ppm	Background
TP-5	3	12/06/99	B70606	VANADIUM	52.6	ppm	150 or background
TP-5	3	12/06/99	B70606	ZINC	54.7	ppm	20 or background
TP-8	3	12/06/99	B70607	ALUMINUM	21400	ppm	Background
TP-8	3	12/06/99	B70607	ARSENIC	113	ppm	7.5 or background
TP-8	3	12/06/99	B70607	BARIUM	28.5	ppm	300 or background
TP-8	3	12/06/99	B70607	BERYLLIUM	1.20	ppm	0.16 or background
TP-8	3	12/06/99	B70607	CADMIUM	1.10	ppm	10 or background
TP-8	3	12/06/99	B70607	CALCIUM	14300	ppm	Background
TP-8	3	12/06/99	B70607	CHROMIUM	59.3	ppm	50 or background
TP-8	3	12/06/99	B70607	COBALT	10.0	ppm	30 or background
TP-8	3	12/06/99	B70607	COPPER	58.5	ppm	25 or background
TP-8	3	12/06/99	B70607	IRON	65500	ppm	2000 or background
TP-8	3	12/06/99	B70607	LEAD	44.0	ppm	Background
TP-8	3	12/06/99	B70607	MAGNESIUM	21200	ppm	Background
TP-8	3	12/06/99	B70607	MANGANESE	1190	ppm	Background
TP-8	3	12/06/99	B70607	MERCURY	0.05	ppm	0.1
TP-8	3	12/06/99	B70607	NICKEL	23.7	ppm	13 or background
TP-8	3	12/06/99	B70607	POTASSIUM	2670	ppm	Background
TP-8	3	12/06/99	B70607	SELENIUM	2.70	ppm	2 or background
TP-8	3	12/06/99	B70607	SODIUM	554	ppm	Background
TP-8	3	12/06/99	B70607	VANADIUM	60.3	ppm	150 or background
TP-8	3	12/06/99	B70607	ZINC	115	ppm	20 or background

Samples B70618 and B70619 are field duplicate samples

Table 19. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
TP-5	3	12/06/99	B70606	ALUMINUM	22200	ppm	Background	ppm
TP-8	3	12/06/99	B70607	ALUMINUM	21400	ppm	Background	ppm
TP-2	5	12/06/99	B70603	ALUMINUM	20100	ppm	Background	ppm
TP-4	5	12/06/99	B70605	ALUMINUM	12000	ppm	Background	ppm
TP-1	7-8	12/06/99	B70602	ALUMINUM	9120	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	ALUMINUM	8100	ppm	Background	ppm
TP-3	8-9	12/06/99	B70604	ALUMINUM	7560	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	ALUMINUM	6340	ppm	Background	ppm
MW-1	8-10	02/08/00	B70618	ALUMINUM	6140	ppm	Background	ppm
TP-10	4	12/06/99	B70610	ALUMINUM	4400	ppm	Background	ppm
MW-1	8-10	02/08/00	B70619	ALUMINUM	3400	ppm	Background	ppm
TP-10	4	12/06/99	B70610	ANTIMONY	5.70	ppm	Background	ppm
TP-8	3	12/06/99	B70607	ARSENIC	113	ppm	7.5 or background	ppm
TP-5	3	12/06/99	B70606	ARSENIC	37.7	ppm	7.5 or background	ppm
TP-2	5	12/06/99	B70603	ARSENIC	16.1	ppm	7.5 or background	ppm
TP-10	4	12/06/99	B70610	ARSENIC	12.2	ppm	7.5 or background	ppm
TP-1	7-8	12/06/99	B70602	ARSENIC	10.4	ppm	7.5 or background	ppm
TP-1	3-5	12/06/99	B70601	ARSENIC	9.00	ppm	7.5 or background	ppm
MW-1	8-10	02/08/00	B70619	ARSENIC	8.80	ppm	7.5 or background	ppm
MW-1	8-10	02/08/00	B70618	ARSENIC	7.20	ppm	7.5 or background	ppm
TP-4	5	12/06/99	B70605	ARSENIC	5.30	ppm	7.5 or background	ppm
MW-2	6-8	02/08/00	B70616	ARSENIC	4.70	ppm	7.5 or background	ppm
TP-3	8-9	12/06/99	B70604	ARSENIC	4.70	ppm	7.5 or background	ppm
TP-2	5	12/06/99	B70603	BARIUM	828	ppm	300 or background	ppm
TP-4	5	12/06/99	B70605	BARIUM	98.8	ppm	300 or background	ppm
TP-1	3-5	12/06/99	B70601	BARIUM	89.5	ppm	300 or background	ppm
TP-3	8-9	12/06/99	B70604	BARIUM	86.1	ppm	300 or background	ppm
TP-10	4	12/06/99	B70610	BARIUM	75.0	ppm	300 or background	ppm
MW-1	8-10	02/08/00	B70619	BARIUM	59.7	ppm	300 or background	ppm
MW-2	6-8	02/08/00	B70616	BARIUM	47.0	ppm	300 or background	ppm
MW-1	8-10	02/08/00	B70618	BARIUM	43.9	ppm	300 or background	ppm
TP-5	3	12/06/99	B70606	BARIUM	41.6	ppm	300 or background	ppm
TP-1	7-8	12/06/99	B70602	BARIUM	29.0	ppm	300 or background	ppm
TP-8	3	12/06/99	B70607	BARIUM	28.5	ppm	300 or background	ppm
TP-2	5	12/06/99	B70603	BERYLLIUM	2.20	ppm	0.16 or background	ppm
TP-8	3	12/06/99	B70607	BERYLLIUM	1.20	ppm	0.16 or background	ppm
TP-5	3	12/06/99	B70606	BERYLLIUM	0.81	ppm	0.16 or background	ppm
TP-4	5	12/06/99	B70605	BERYLLIUM	0.69	ppm	0.16 or background	ppm
TP-1	3-5	12/06/99	B70601	BERYLLIUM	0.54	ppm	0.16 or background	ppm
TP-1	7-8	12/06/99	B70602	BERYLLIUM	0.52	ppm	0.16 or background	ppm
MW-2	6-8	02/08/00	B70616	BERYLLIUM	0.46	ppm	0.16 or background	ppm
TP-10	4	12/06/99	B70610	BERYLLIUM	0.46	ppm	0.16 or background	ppm
TP-3	8-9	12/06/99	B70604	BERYLLIUM	0.42	ppm	0.16 or background	ppm
MW-1	8-10	02/08/00	B70618	BERYLLIUM	0.28	ppm	0.16 or background	ppm
MW-1	8-10	02/08/00	B70619	BERYLLIUM	0.15	ppm	0.16 or background	ppm
TP-2	5	12/06/99	B70603	CADMIUM	2.40	ppm	10 or background	ppm
TP-5	3	12/06/99	B70606	CADMIUM	1.10	ppm	10 or background	ppm
TP-8	3	12/06/99	B70607	CADMIUM	1.10	ppm	10 or background	ppm
MW-1	8-10	02/08/00	B70619	CADMIUM	0.65	ppm	10 or background	ppm
TP-1	7-8	12/06/99	B70602	CADMIUM	0.56	ppm	10 or background	ppm
TP-3	8-9	12/06/99	B70604	CADMIUM	0.47	ppm	10 or background	ppm
TP-10	4	12/06/99	B70610	CADMIUM	0.34	ppm	10 or background	ppm
TP-4	5	12/06/99	B70605	CADMIUM	0.31	ppm	10 or background	ppm
TP-2	5	12/06/99	B70603	CALCIUM	85100	ppm	Background	ppm
TP-5	3	12/06/99	B70606	CALCIUM	39400	ppm	Background	ppm
TP-10	4	12/06/99	B70610	CALCIUM	31400	ppm	Background	ppm
TP-3	8-9	12/06/99	B70604	CALCIUM	15400	ppm	Background	ppm

Table 19. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
TP-8	3	12/06/99	B70607	CALCIUM	14300	ppm	Background	ppm
MW-1	8-10	02/08/00	B70619	CALCIUM	4300	ppm	Background	ppm
TP-4	5	12/06/99	B70605	CALCIUM	3880	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	CALCIUM	3150	ppm	Background	ppm
MW-1	8-10	02/08/00	B70618	CALCIUM	1870	ppm	Background	ppm
TP-1	7-8	12/06/99	B70602	CALCIUM	1850	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	CALCIUM	1280	ppm	Background	ppm
TP-8	3	12/06/99	B70607	CHROMIUM	59.3	ppm	50 or background	ppm
TP-5	3	12/06/99	B70606	CHROMIUM	49.5	ppm	50 or background	ppm
TP-2	5	12/06/99	B70603	CHROMIUM	47.9	ppm	50 or background	ppm
MW-1	8-10	02/08/00	B70619	CHROMIUM	19.9	ppm	50 or background	ppm
TP-4	5	12/06/99	B70605	CHROMIUM	16.3	ppm	50 or background	ppm
MW-1	8-10	02/08/00	B70618	CHROMIUM	11.5	ppm	50 or background	ppm
MW-2	6-8	02/08/00	B70616	CHROMIUM	11.5	ppm	50 or background	ppm
TP-3	8-9	12/06/99	B70604	CHROMIUM	11.1	ppm	50 or background	ppm
TP-10	4	12/06/99	B70610	CHROMIUM	9.90	ppm	50 or background	ppm
TP-1	7-8	12/06/99	B70602	CHROMIUM	9.80	ppm	50 or background	ppm
TP-1	3-5	12/06/99	B70601	CHROMIUM	9.40	ppm	50 or background	ppm
TP-4	5	12/06/99	B70605	COBALT	11.5	ppm	30 or background	ppm
MW-1	8-10	02/08/00	B70619	COBALT	10.9	ppm	30 or background	ppm
TP-8	3	12/06/99	B70607	COBALT	10.0	ppm	30 or background	ppm
MW-2	6-8	02/08/00	B70616	COBALT	7.60	ppm	30 or background	ppm
TP-10	4	12/06/99	B70610	COBALT	5.90	ppm	30 or background	ppm
TP-1	3-5	12/06/99	B70601	COBALT	5.80	ppm	30 or background	ppm
TP-3	8-9	12/06/99	B70604	COBALT	5.50	ppm	30 or background	ppm
TP-1	7-8	12/06/99	B70602	COBALT	5.40	ppm	30 or background	ppm
MW-1	8-10	02/08/00	B70618	COBALT	4.60	ppm	30 or background	ppm
TP-2	5	12/06/99	B70603	COBALT	4.10	ppm	30 or background	ppm
TP-5	3	12/06/99	B70606	COBALT	2.70	ppm	30 or background	ppm
TP-1	7-8	12/06/99	B70602	COPPER	143	ppm	25 or background	ppm
TP-10	4	12/06/99	B70610	COPPER	132	ppm	25 or background	ppm
TP-8	3	12/06/99	B70607	COPPER	58.5	ppm	25 or background	ppm
MW-1	8-10	02/08/00	B70619	COPPER	113	ppm	25 or background	ppm
TP-2	5	12/06/99	B70603	COPPER	45.8	ppm	25 or background	ppm
TP-1	3-5	12/06/99	B70601	COPPER	28.0	ppm	25 or background	ppm
TP-3	8-9	12/06/99	B70604	COPPER	21.8	ppm	25 or background	ppm
MW-1	8-10	02/08/00	B70618	COPPER	17.2	ppm	25 or background	ppm
MW-2	6-8	02/08/00	B70616	COPPER	13.7	ppm	25 or background	ppm
TP-4	5	12/06/99	B70605	COPPER	13.5	ppm	25 or background	ppm
TP-5	3	12/06/99	B70606	COPPER	8.10	ppm	25 or background	ppm
TP-3	8-9	12/06/99	B70604	CYANIDE	1.10	ppm	Site specific	ppm
TP-8	3	12/06/99	B70607	IRON	65500	ppm	2000 or background	ppm
TP-4	5	12/06/99	B70605	IRON	23900	ppm	2000 or background	ppm
TP-2	5	12/06/99	B70603	IRON	20200	ppm	2000 or background	ppm
TP-1	3-5	12/06/99	B70601	IRON	19300	ppm	2000 or background	ppm
MW-2	6-8	02/08/00	B70616	IRON	18100	ppm	2000 or background	ppm
TP-1	7-8	12/06/99	B70602	IRON	17700	ppm	2000 or background	ppm
TP-3	8-9	12/06/99	B70604	IRON	16700	ppm	2000 or background	ppm
MW-1	8-10	02/08/00	B70618	IRON	15900	ppm	2000 or background	ppm
TP-5	3	12/06/99	B70606	IRON	14200	ppm	2000 or background	ppm
TP-10	4	12/06/99	B70610	IRON	11400	ppm	2000 or background	ppm
MW-1	8-10	02/08/00	B70619	IRON	3400	ppm	2000 or background	ppm
TP-10	4	12/06/99	B70610	LEAD	473	ppm	Background	ppm
TP-2	5	12/06/99	B70603	LEAD	467	ppm	Background	ppm
TP-3	8-9	12/06/99	B70604	LEAD	47.2	ppm	Background	ppm
TP-8	3	12/06/99	B70607	LEAD	44.0	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	LEAD	29.8	ppm	Background	ppm

Table 19. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
TP-5	3	12/06/99	B70606	LEAD	25.9	ppm	Background	ppm
MW-1	8-10	02/08/00	B70619	LEAD	21.8	ppm	Background	ppm
TP-4	5	12/06/99	B70605	LEAD	14.8	ppm	Background	ppm
MW-1	8-10	02/08/00	B70618	LEAD	12.1	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	LEAD	9.60	ppm	Background	ppm
TP-1	7-8	12/06/99	B70602	LEAD	9.10	ppm	Background	ppm
TP-2	5	12/06/99	B70603	MAGNESIUM	35800	ppm	Background	ppm
TP-5	3	12/06/99	B70606	MAGNESIUM	29900	ppm	Background	ppm
TP-8	3	12/06/99	B70607	MAGNESIUM	21200	ppm	Background	ppm
TP-10	4	12/06/99	B70610	MAGNESIUM	17900	ppm	Background	ppm
TP-3	8-9	12/06/99	B70604	MAGNESIUM	5900	ppm	Background	ppm
TP-4	5	12/06/99	B70605	MAGNESIUM	3790	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	MAGNESIUM	2640	ppm	Background	ppm
TP-1	7-8	12/06/99	B70602	MAGNESIUM	2410	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	MAGNESIUM	2250	ppm	Background	ppm
MW-1	8-10	02/08/00	B70618	MAGNESIUM	2130	ppm	Background	ppm
MW-1	8-10	02/08/00	B70619	MAGNESIUM	396	ppm	Background	ppm
TP-2	5	12/06/99	B70603	MANGANESE	3480	ppm	Background	ppm
TP-8	3	12/06/99	B70607	MANGANESE	1190	ppm	Background	ppm
TP-4	5	12/06/99	B70605	MANGANESE	780	ppm	Background	ppm
TP-3	8-9	12/06/99	B70604	MANGANESE	346	ppm	Background	ppm
TP-10	4	12/06/99	B70610	MANGANESE	255	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	MANGANESE	222	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	MANGANESE	108	ppm	Background	ppm
TP-5	3	12/06/99	B70606	MANGANESE	100	ppm	Background	ppm
TP-1	7-8	12/06/99	B70602	MANGANESE	87.3	ppm	Background	ppm
MW-1	8-10	02/08/00	B70618	MANGANESE	85.4	ppm	Background	ppm
MW-1	8-10	02/08/00	B70619	MANGANESE	20.4	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	MERCURY	4.00	ppm	0.1	ppm
TP-10	4	12/06/99	B70610	MERCURY	1.50	ppm	0.1	ppm
TP-2	5	12/06/99	B70603	MERCURY	1.00	ppm	0.1	ppm
TP-3	8-9	12/06/99	B70604	MERCURY	0.12	ppm	0.1	ppm
MW-1	8-10	02/08/00	B70618	MERCURY	0.09	ppm	0.1	ppm
TP-8	3	12/06/99	B70607	MERCURY	0.05	ppm	0.1	ppm
TP-4	5	12/06/99	B70605	MERCURY	0.03	ppm	0.1	ppm
TP-2	5	12/06/99	B70603	NICKEL	35.6	ppm	13 or background	ppm
TP-8	3	12/06/99	B70607	NICKEL	23.7	ppm	13 or background	ppm
MW-1	8-10	02/08/00	B70619	NICKEL	23.2	ppm	13 or background	ppm
TP-4	5	12/06/99	B70605	NICKEL	22.8	ppm	13 or background	ppm
MW-2	6-8	02/08/00	B70616	NICKEL	20.0	ppm	13 or background	ppm
TP-1	7-8	12/06/99	B70602	NICKEL	17.3	ppm	13 or background	ppm
TP-5	3	12/06/99	B70606	NICKEL	16.0	ppm	13 or background	ppm
TP-1	3-5	12/06/99	B70601	NICKEL	14.9	ppm	13 or background	ppm
TP-10	4	12/06/99	B70610	NICKEL	14.7	ppm	13 or background	ppm
MW-1	8-10	02/08/00	B70618	NICKEL	14.5	ppm	13 or background	ppm
TP-3	8-9	12/06/99	B70604	NICKEL	14.0	ppm	13 or background	ppm
TP-5	3	12/06/99	B70606	POTASSIUM	3400	ppm	Background	ppm
TP-8	3	12/06/99	B70607	POTASSIUM	2670	ppm	Background	ppm
TP-2	5	12/06/99	B70603	POTASSIUM	2540	ppm	Background	ppm
TP-4	5	12/06/99	B70605	POTASSIUM	1170	ppm	Background	ppm
TP-1	7-8	12/06/99	B70602	POTASSIUM	1040	ppm	Background	ppm
TP-3	8-9	12/06/99	B70604	POTASSIUM	1020	ppm	Background	pp
MW-1	8-10	02/08/00	B70619	POTASSIUM	1000	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	POTASSIUM	930	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	POTASSIUM	865	ppm	Background	ppm
TP-10	4	12/06/99	B70610	POTASSIUM	491	ppm	Background	ppm
MW-1	8-10	02/08/00	B70618	POTASSIUM	473	ppm	Background	ppm

Table 19. Summary of Subsurface Soil Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/Guidance	Units
TP-10	4	12/06/99	B70610	SELENIUM	3.50	ppm	2 or background	ppm
TP-8	3	12/06/99	B70607	SELENIUM	2.70	ppm	2 or background	ppm
TP-2	5	12/06/99	B70603	SELENIUM	2.60	ppm	2 or background	ppm
MW-1	8-10	02/08/00	B70619	SELENIUM	2.00	ppm	2 or background	ppm
TP-1	7-8	12/06/99	B70602	SELENIUM	1.60	ppm	2 or background	ppm
MW-2	6-8	02/08/00	B70616	SELENIUM	1.50	ppm	2 or background	ppm
TP-1	3-5	12/06/99	B70601	SELENIUM	1.30	ppm	2 or background	ppm
TP-3	8-9	12/06/99	B70604	SELENIUM	1.30	ppm	2 or background	ppm
TP-4	5	12/06/99	B70605	SELENIUM	0.99	ppm	2 or background	ppm
TP-2	5	12/06/99	B70603	SILVER	0.24	ppm	Background	ppm
TP-5	3	12/06/99	B70606	SODIUM	824	ppm	Background	ppm
TP-2	5	12/06/99	B70603	SODIUM	714	ppm	Background	ppm
TP-8	3	12/06/99	B70607	SODIUM	554	ppm	Background	ppm
TP-10	4	12/06/99	B70610	SODIUM	331	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	SODIUM	97.7	ppm	Background	ppm
TP-3	8-9	12/06/99	B70604	SODIUM	88.5	ppm	Background	ppm
MW-1	8-10	02/08/00	B70619	SODIUM	83.6	ppm	Background	ppm
TP-1	3-5	12/06/99	B70601	SODIUM	75.4	ppm	Background	ppm
TP-1	7-8	12/06/99	B70602	SODIUM	67.7	ppm	Background	ppm
TP-4	5	12/06/99	B70605	SODIUM	56.5	ppm	Background	ppm
MW-1	8-10	02/08/00	B70618	SODIUM	52.3	ppm	Background	ppm
MW-2	6-8	02/08/00	B70616	VANADIUM	13.9	ppm	150 or background	ppm
TP-8	3	12/06/99	B70607	VANADIUM	60.3	ppm	150 or background	ppm
TP-5	3	12/06/99	B70606	VANADIUM	52.6	ppm	150 or background	ppm
MW-1	8-10	02/08/00	B70619	VANADIUM	32.0	ppm	150 or background	ppm
TP-2	5	12/06/99	B70603	VANADIUM	23.2	ppm	150 or background	ppm
TP-10	4	12/06/99	B70610	VANADIUM	20.2	ppm	150 or background	ppm
TP-4	5	12/06/99	B70605	VANADIUM	20.1	ppm	150 or background	ppm
TP-1	3-5	12/06/99	B70601	VANADIUM	16.2	ppm	150 or background	ppm
TP-1	7-8	12/06/99	B70602	VANADIUM	15.7	ppm	150 or background	ppm
TP-3	8-9	12/06/99	B70604	VANADIUM	15.5	ppm	150 or background	ppm
MW-1	8-10	02/08/00	B70618	VANADIUM	14.3	ppm	150 or background	ppm
TP-2	5	12/06/99	B70603	ZINC	663	ppm	20 or background	ppm
TP-3	8-9	12/06/99	B70604	ZINC	196	ppm	20 or background	ppm
TP-1	7-8	12/06/99	B70602	ZINC	160	ppm	20 or background	ppm
TP-1	3-5	12/06/99	B70601	ZINC	139	ppm	20 or background	ppm
TP-10	4	12/06/99	B70610	ZINC	128	ppm	20 or background	ppm
TP-8	3	12/06/99	B70607	ZINC	115	ppm	20 or background	ppm
TP-4	5	12/06/99	B70605	ZINC	79.4	ppm	20 or background	ppm
MW-1	8-10	02/08/00	B70618	ZINC	62.9	ppm	20 or background	ppm
MW-1	8-10	02/08/00	B70619	ZINC	62.4	ppm	20 or background	ppm
TP-5	3	12/06/99	B70606	ZINC	54.7	ppm	20 or background	ppm
MW-2	6-8	02/08/00	B70616	ZINC	47.5	ppm	20 or background	ppm

Samples B70618 and B70619 are field duplicate samples

Table 20. Summary of Subsurface Soil Sample Results
Pesticides and PCBs
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
TP-1	3-5	12/06/99	B70601	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb
TP-1	7-8	12/06/99	B70602	ALDRIN	2.60	ppb	41	ppb
TP-2	5	12/06/99	B70603	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb
TP-3	8-9	12/06/99	B70604	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb
TP-4	5	12/06/99	B70605	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb
TP-5	3	12/06/99	B70606	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb
TP-8	3	12/06/99	B70607	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb
TP-10	4	12/06/99	B70610	ALL PESTICIDES/PCBs	ND	ppb	NA	ppb

ND- Not Detected
NA- Not Applicable

Table 21. Summary of Subsurface Soil Sample Results
Toxicity Characteristic Leachate Procedure
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Depth (ft)	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
TP-1	3-5	12/06/99	B70601	BARIUM	910	ppb	100000	ppb
TP-1	3-5	12/06/99	B70601	LEAD	57.2	ppb	5000	ppb
TP-1	3-5	12/06/99	B70601	All TCLP HERBICIDES	ND	ppb	NA	ppb
TP-1	3-5	12/06/99	B70601	All TCLP SVOCs	ND	ppb	NA	ppb
TP-1	3-5	12/06/99	B70601	All TCLP VOCs	ND	ppb	NA	ppb
TP-1	3-5	12/06/99	B70601	ALL TCLP PESTICIDES/PCBs	ND	ppb	NA	ppb
TP-1	7-8	12/06/99	B70602	BARIUM	381	ppb	100000	ppb
TP-1	7-8	12/06/99	B70602	LEAD	62.0	ppb	5000	ppb
TP-1	7-8	12/06/99	B70602	MERCURY	0.18	ppb	200.0	ppb
TP-1	7-8	12/06/99	B70602	2-BUTANONE	11.0	ppb	200000	ppb
TP-1	7-8	12/06/99	B70602	BENZENE	97.0	ppb	500	ppb
TP-1	7-8	12/06/99	B70602	All TCLP HERBICIDES	ND	ppb	NA	ppb
TP-1	7-8	12/06/99	B70602	All TCLP SVOCs	ND	ppb	NA	ppb
TP-1	7-8	12/06/99	B70602	ALL TCLP PESTICIDES/PCBs	ND	ppb	NA	ppb

ND- Not Detected
NA- Not Applicable

Table 22. Summary of Groundwater Sample Results
Semi-Volatile Organic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-2	02/23/00	B70624	4-METHYLPHENOL	0.80	ppb	1S	ppb
MW-2	02/23/00	B70624	ACENAPHTHENE	0.60	ppb	20G	ppb
MW-2	02/23/00	B70624	CARBAZOLE	0.90	ppb	NA	ppb
MW-2	02/23/00	B70624	DIBENZOFURAN	0.60	ppb	NA	ppb
MW-2	02/23/00	B70624	DI-N-OCTYLPHTHALATE	0.80	ppb	50S	ppb
MW-2	02/23/00	B70624	FLUORENE	0.80	ppb	50G	ppb
MW-2	02/23/00	B70624	NAPHTHALENE	1.00	ppb	10G	ppb
MW-1	02/23/00	B70623	PHENOL	7.00	ppb	1S	ppb
MW-1	02/23/00	B70623	TOTAL SVOC TICs	1250	ppb	NA	ppb
MW-2	02/23/00	B70624	TOTAL SVOC TICs	125	ppb	NA	ppb
MW-3	02/23/00	B70622	TOTAL SVOC TICs	67	ppb	NA	ppb
MW-3	02/23/00	B70622	ALL TCL SVOCs	ND	ppb	NA	ppb

ND- Not Detected
NA- Not Applicable
S- 6 NYCRR Part 703 groundwater standard.
G- TOGS 1.1.1 groundwater guidance value.
TCL- Target Compound List

Table 23. Summary of Groundwater Sample Results
Total Petroleum Hydrocarbons
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-1	02/23/00	B70623	TOTAL PETROLEUM HYDROCARBONS	3.70	ppm	NA	ppb
MW-2	02/23/00	B70624	TOTAL PETROLEUM HYDROCARBONS	ND	ppm	NA	ppb
MW-3	02/23/00	B70622	TOTAL PETROLEUM HYDROCARBONS	ND	ppm	NA	ppb

ND- Not Detected
NA- Not Applicable

Table 24. Summary of Groundwater Sample Results
Volatile Organic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units	Comments
MW-1	02/23/00	B70623	1,1,2-TRICHLOROETHANE	2.00	ppb	1S	ppb	
MW-2	02/23/00	B70624	1,1-DICHLOROETHANE	13.0	ppb	5S	ppb	
MW-1	02/23/00	B70623	1,1-DICHLOROETHANE	7.00	ppb	5S	ppb	
MW-1	02/23/00	B70623	ACETONE	28.0	ppb	50G	ppb	
MW-2	02/23/00	B70624	ACETONE	14.0	ppb	50G	ppb	
MW-1	02/23/00	B70623	BENZENE	95.0	ppb	1S	ppb	
MW-1	02/23/00	B70623	ETHYL BENZENE	49.0	ppb	5S	ppb	
QA/QC	02/23/00	Trip Blank	METHYLENE CHLORIDE	9.00	ppb	NA	ppb	
MW-1	02/23/00	B70623	METHYLENE CHLORIDE	8.00	ppb	5S	ppb	Result is invalid due to laboratory contamination.
MW-2	02/23/00	B70624	METHYLENE CHLORIDE	8.00	ppb	5S	ppb	Result is invalid due to laboratory contamination.
MW-3	02/23/00	B70622	METHYLENE CHLORIDE	8.00	ppb	5S	ppb	Result is invalid due to laboratory contamination.
MW-1	02/23/00	B70623	TOLUENE	4.00	ppb	5S	ppb	
MW-1	02/23/00	B70623	XYLENE (total)	190	ppb	5S	ppb	
MW-1	02/23/00	B70623	TOTAL VOC TICs	650	ppb	NA	ppb	
MW-2	02/23/00	B70624	TOTAL VOC TICs	ND	ppb	NA	ppb	
MW-3	02/23/00	B70622	TOTAL VOC TICs	ND	ppb	NA	ppb	

ND- Not Detected
NA- Not Applicable
S- 6 NYCRR Part 703 groundwater standard.
G- TOGS 1.1.1 groundwater guidance value.

Table 25. Summary of Groundwater Sample Results
Inorganic Compounds Sorted by Location
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-1	02/23/00	B70623	ALUMINUM	7380	ppb	NA	ppb
MW-1	02/23/00	B70623	ARSENIC	7.60	ppb	25S	ppb
MW-1	02/23/00	B70623	BARIUM	202	ppb	1000S	ppb
MW-1	02/23/00	B70623	BERYLLIUM	0.68	ppb	3G	ppb
MW-1	02/23/00	B70623	CALCIUM	212000	ppb	NA	ppb
MW-1	02/23/00	B70623	CHROMIUM	10.0	ppb	50S	ppb
MW-1	02/23/00	B70623	COBALT	6.30	ppb	NA	ppb
MW-1	02/23/00	B70623	COPPER	15.2	ppb	200S	ppb
MW-1	02/23/00	B70623	IRON	21700	ppb	300S	ppb
MW-1	02/23/00	B70623	LEAD	11.1	ppb	25S	ppb
MW-1	02/23/00	B70623	MAGNESIUM	76200	ppb	35000G	ppb
MW-1	02/23/00	B70623	MANGANESE	1130	ppb	300S	ppb
MW-1	02/23/00	B70623	NICKEL	19.4	ppb	100S	ppb
MW-1	02/23/00	B70623	POTASSIUM	5090	ppb	NA	ppb
MW-1	02/23/00	B70623	SODIUM	23600	ppb	20000S	ppb
MW-1	02/23/00	B70623	VANADIUM	12.0	ppb	NA	ppb
MW-1	02/23/00	B70623	ZINC	149	ppb	2000G	ppb
MW-2	02/23/00	B70624	ALUMINUM	4210	ppb	NA	ppb
MW-2	02/23/00	B70624	ARSENIC	17.0	ppb	25S	ppb
MW-2	02/23/00	B70624	BARIUM	246	ppb	1000S	ppb
MW-2	02/23/00	B70624	BERYLLIUM	0.44	ppb	3G	ppb
MW-2	02/23/00	B70624	CADMIUM	0.87	ppb	5S	ppb
MW-2	02/23/00	B70624	CALCIUM	158000	ppb	NA	ppb
MW-2	02/23/00	B70624	CHROMIUM	7.60	ppb	50S	ppb
MW-2	02/23/00	B70624	COBALT	4.40	ppb	NA	ppb
MW-2	02/23/00	B70624	COPPER	18.4	ppb	200S	ppb
MW-2	02/23/00	B70624	IRON	18700	ppb	300S	ppb
MW-2	02/23/00	B70624	LEAD	15.9	ppb	25S	ppb
MW-2	02/23/00	B70624	MAGNESIUM	50500	ppb	35000G	ppb
MW-2	02/23/00	B70624	MANGANESE	1730	ppb	300S	ppb
MW-2	02/23/00	B70624	NICKEL	13.1	ppb	100S	ppb
MW-2	02/23/00	B70624	POTASSIUM	6480	ppb	NA	ppb
MW-2	02/23/00	B70624	SODIUM	10800	ppb	20000S	ppb
MW-2	02/23/00	B70624	VANADIUM	8.50	ppb	NA	ppb
MW-2	02/23/00	B70624	ZINC	263	ppb	2000G	ppb
MW-3	02/23/00	B70622	ALUMINUM	4010	ppb	NA	ppb
MW-3	02/23/00	B70622	ARSENIC	6.90	ppb	25S	ppb
MW-3	02/23/00	B70622	BARIUM	99.3	ppb	1000S	ppb
MW-3	02/23/00	B70622	BERYLLIUM	0.40	ppb	3G	ppb
MW-3	02/23/00	B70622	CADMIUM	0.46	ppb	5S	ppb
MW-3	02/23/00	B70622	CALCIUM	137000	ppb	NA	ppb
MW-3	02/23/00	B70622	CHROMIUM	6.20	ppb	50S	ppb
MW-3	02/23/00	B70622	COBALT	3.50	ppb	NA	ppb
MW-3	02/23/00	B70622	COPPER	30.4	ppb	200S	ppb
MW-3	02/23/00	B70622	IRON	9360	ppb	300S	ppb
MW-3	02/23/00	B70622	LEAD	62.4	ppb	25S	ppb
MW-3	02/23/00	B70622	MAGNESIUM	49600	ppb	35000G	ppb
MW-3	02/23/00	B70622	MANGANESE	181	ppb	300S	ppb
MW-3	02/23/00	B70622	MERCURY	0.23	ppb	0.7S	ppb
MW-3	02/23/00	B70622	NICKEL	10.7	ppb	100S	ppb
MW-3	02/23/00	B70622	POTASSIUM	10700	ppb	NA	ppb
MW-3	02/23/00	B70622	SODIUM	152000	ppb	20000S	ppb

Table 25. Summary of Groundwater Sample Results
Inorganic Compounds Sorted by Location
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-3	02/23/00	B70622	VANADIUM	7.20	ppb	NA	ppb
MW-3	02/23/00	B70622	ZINC	274	ppb	2000G	ppb

NA- Not Applicable
S- 6 NYCRR Part 703 groundwater standard.
G- TOGS 1.1.1 groundwater guidance value.

Table 20: Summary of Groundwater Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-1	02/23/00	B70623	ALUMINUM	7380	ppb	NA	ppb
MW-2	02/23/00	B70624	ALUMINUM	4210	ppb	NA	ppb
MW-3	02/23/00	B70622	ALUMINUM	4010	ppb	NA	ppb
MW-2	02/23/00	B70624	ARSENIC	17.0	ppb	25S	ppb
MW-1	02/23/00	B70623	ARSENIC	7.60	ppb	25S	ppb
MW-3	02/23/00	B70622	ARSENIC	6.90	ppb	25S	ppb
MW-2	02/23/00	B70624	BARIUM	246	ppb	1000S	ppb
MW-1	02/23/00	B70623	BARIUM	202	ppb	1000S	ppb
MW-3	02/23/00	B70622	BARIUM	99.3	ppb	1000S	ppb
MW-1	02/23/00	B70623	BERYLLIUM	0.68	ppb	3G	ppb
MW-2	02/23/00	B70624	BERYLLIUM	0.44	ppb	3G	ppb
MW-3	02/23/00	B70622	BERYLLIUM	0.40	ppb	3G	ppb
MW-2	02/23/00	B70624	CADMIUM	0.87	ppb	5S	ppb
MW-3	02/23/00	B70622	CADMIUM	0.46	ppb	5S	ppb
MW-1	02/23/00	B70623	CALCIUM	212000	ppb	NA	ppb
MW-2	02/23/00	B70624	CALCIUM	158000	ppb	NA	ppb
MW-3	02/23/00	B70622	CALCIUM	137000	ppb	NA	ppb
MW-1	02/23/00	B70623	CHROMIUM	10.0	ppb	50S	ppb
MW-2	02/23/00	B70624	CHROMIUM	7.60	ppb	50S	ppb
MW-3	02/23/00	B70622	CHROMIUM	6.20	ppb	50S	ppb
MW-1	02/23/00	B70623	COBALT	6.30	ppb	NA	ppb
MW-2	02/23/00	B70624	COBALT	4.40	ppb	NA	ppb
MW-3	02/23/00	B70622	COBALT	3.50	ppb	NA	ppb
MW-3	02/23/00	B70622	COPPER	30.4	ppb	200S	ppb
MW-2	02/23/00	B70624	COPPER	18.4	ppb	200S	ppb
MW-1	02/23/00	B70623	COPPER	15.2	ppb	200S	ppb
MW-1	02/23/00	B70623	IRON	21700	ppb	300S	ppb
MW-2	02/23/00	B70624	IRON	18700	ppb	300S	ppb
MW-3	02/23/00	B70622	IRON	9360	ppb	300S	ppb
MW-3	02/23/00	B70622	LEAD	62.4	ppb	25S	ppb
MW-2	02/23/00	B70624	LEAD	15.9	ppb	25S	ppb
MW-1	02/23/00	B70623	LEAD	11.1	ppb	25S	ppb
MW-1	02/23/00	B70623	MAGNESIUM	76200	ppb	35000G	ppb
MW-2	02/23/00	B70624	MAGNESIUM	50500	ppb	35000G	ppb
MW-3	02/23/00	B70622	MAGNESIUM	49600	ppb	35000G	ppb
MW-2	02/23/00	B70624	MANGANESE	1730	ppb	300S	ppb
MW-1	02/23/00	B70623	MANGANESE	1130	ppb	300S	ppb
MW-3	02/23/00	B70622	MANGANESE	181	ppb	300S	ppb
MW-3	02/23/00	B70622	MERCURY	0.23	ppb	0.7S	ppb
MW-1	02/23/00	B70623	NICKEL	19.4	ppb	100S	ppb
MW-2	02/23/00	B70624	NICKEL	13.1	ppb	100S	ppb
MW-3	02/23/00	B70622	NICKEL	10.7	ppb	100S	ppb
MW-3	02/23/00	B70622	POTASSIUM	10700	ppb	NA	ppb
MW-2	02/23/00	B70624	POTASSIUM	6480	ppb	NA	ppb
MW-1	02/23/00	B70623	POTASSIUM	5090	ppb	NA	ppb
MW-3	02/23/00	B70622	SODIUM	152000	ppb	20000S	ppb
MW-1	02/23/00	B70623	SODIUM	23600	ppb	20000S	ppb
MW-2	02/23/00	B70624	SODIUM	10800	ppb	20000S	ppb
MW-1	02/23/00	B70623	VANADIUM	12.0	ppb	NA	ppb
MW-2	02/23/00	B70624	VANADIUM	8.50	ppb	NA	ppb
MW-3	02/23/00	B70622	VANADIUM	7.20	ppb	NA	ppb
MW-3	02/23/00	B70622	ZINC	274	ppb	2000G	ppb

Table 26. Summary of Groundwater Sample Results
Inorganic Compounds Sorted by Compound
Former Vacuum Oil Company
1999-2000 Site Invesigation

Location Id.	Sample Date	Sample Number	Compound	Concentration	Units	Standard/ Guidance	Units
MW-2	02/23/00	B70624	ZINC	263	ppb	2000G	ppb
MW-1	02/23/00	B70623	ZINC	149	ppb	2000G	ppb

NA- Not Applicable
S- 6 NYCRR Part 703 groundwater standard.
G- TOGS 1.1.1 groundwater guidance value.

APPENDIX A

1999-2000 SITE INVESTIGATION

TEST PIT LOGS

SOIL BORING LOGS

WELL INSTALLATION LOGS

WELL DEVELOPMENT LOGS

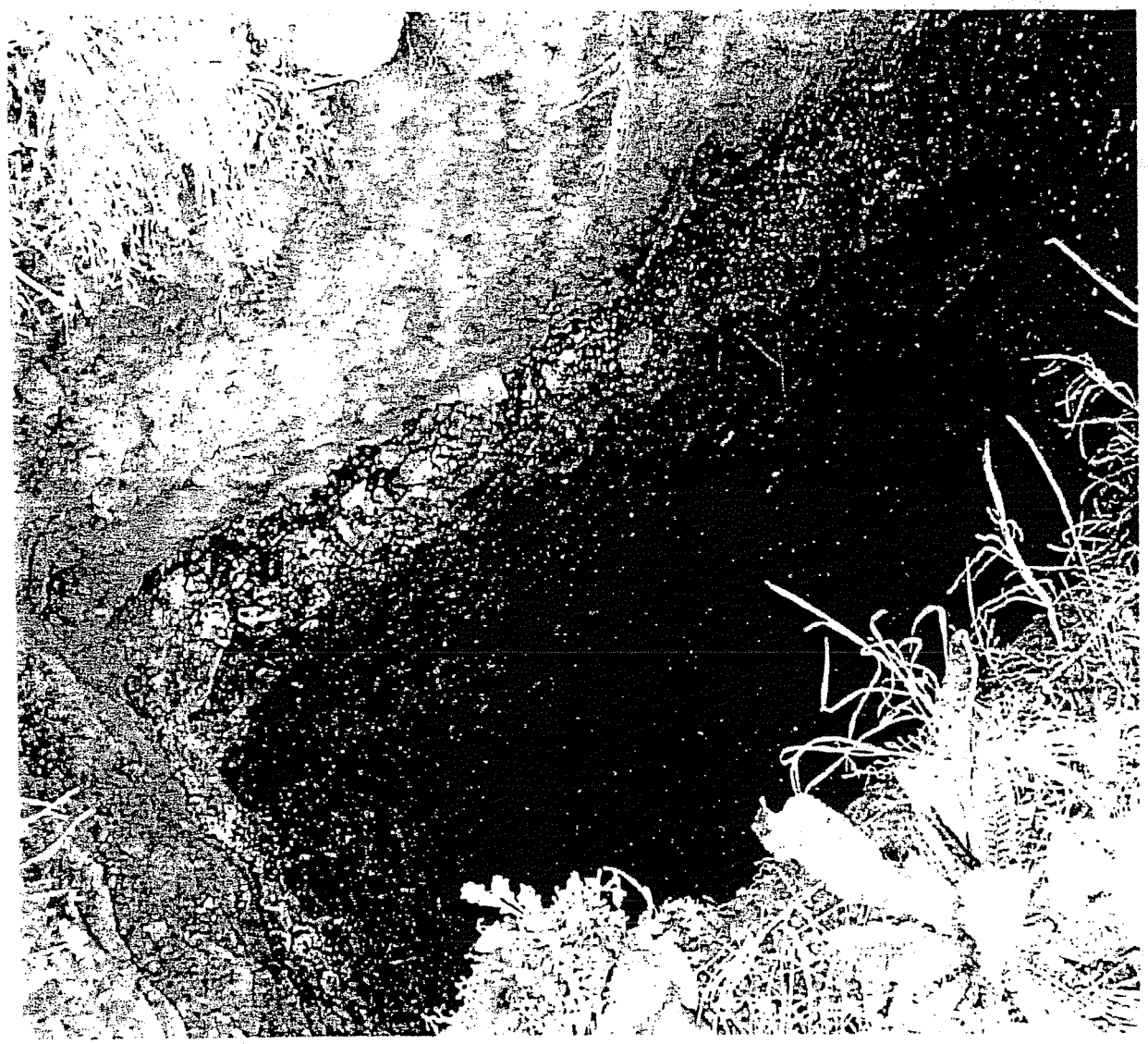
GROUNDWATER SAMPLING FIELD PARAMETER MEASUREMENTS

Test Pit Log

Site No:	828089P			Test Pit No: TP-1
Project Name:	Former Vacuum Oil Company			Sheet 1 of 1
Contractor:	SLC	Geologist:	Jennifer League	By: JL Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999	
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999	

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-	0	0'-1': 3" Topsoil;9" Brn sand, little gravel, l.clay, l.silt, moist (fill)
	0	1': Brn. silty sand, moist (fill)
-2-	0	2.5'-3.5': slag & brick fill w/sand, moist
-4-	14	3.5'-4.7': Blk. silt and f/c sand, l.gravel, l.clay, moist, petroleum odor (ML/fill)
		4.7'-5': Lt. grey 3" layer
-6-	50 (5'-7.7')	5'-8.5': Blk. silt, s.f.sand, s.clay, tr.gravel, wet (ML/fill)
	200 at 7.7'	
-8-	6	8.5': Lt. grey silt and clay
	0	9': l.f/c sand, wet (ML) not much staining present; bottom of pit
-10-		
-12-		

Comments:	Samples Collected:
Excavation Dimensions 9.7'Lx2'Wx9'D	B70601 (3-5') B70602 (7-8')



Test Pit TP-1

Test Pit Log

Site No:	828089P			Test Pit No: TP-2
Project Name:	Former Vacuum Oil Company			Sheet 1 of 1
Contractor:	SLC	Geologist:	Jennifer League	By: JL Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999	
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999	

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-	0	0'-2.8': 3" topsoil, Dk. brn sand, brick, tr.slag, tr. tile, moist
-2-	0	2.8'-4.5': Roofing shingles
-4-	0	4.5'-5': Brn. flc sand, s.slag, moist (fill) At 5', encountered concrete slab that excavator could not penetrate.
-6-		
-8-		
-10-		
-12-		

Comments: Excavation Dimensions 8'Lx4'Wx5'D	**Samples Collected:** B70603 (5')

Test Pit TP-2

Test Pit Log

Site No:	828089P			Test Pit No: TP-3
Project Name:	Former Vacuum Oil Company			Sheet 1 of 1
Contractor:	SLC	Geologist:	Jennifer League	By: JL Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999	
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999	

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-	0	Dk. drn f/m sand, l.gravel, l.silt, tr. roots, moist (fill)
-2-	0	Brn. f.sand and silt, some clay, tr. brick, moist (fill)
-4-	0	4'-8.5': Brn silt, some clay, l.f. sand, tr. gravel, moist (ML)
-6-		
-8-	0	8.5': Grey silt and clay, l.f.sand, moist (ML); bottom of excavation
-10-		
-12-		

Comments:	**Samples Collected:**
Excavation Dimensions 11'Lx3'Wx8.5'D	B70604 (8-9')

Test Pit TP-3

Test Pit TP-4

Test Pit Log

Site No:	828089P			Test Pit No: TP-5
Project Name:	Former Vacuum Oil Company			Sheet 1 of 1
Contractor:	SLC	Geologist:	Jennifer League	By: JL Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999	
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999	

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-	0	0'-1': 3" topsoil; Dk. brn f/c sand, ~~s.~~silt, l.gravel, tr.slag, tr.brick, tr.roots, moist (fill)
-2-	0	1'-5': Blk f/m sand, tr.silt, tr.gravel, moist (fill- material has appearance of ground coal)
-4-		
-6-	0	5'-6.2': Brn. silt and clay, l.f. sand, tr.gravel, moist (ML) 6.2': Bottom of excavation
-8-		
-10-		
-12-		

Comments:	**Samples Collected:**
Excavation Dimensions 10'Lx3'Wx6.2'D	B70606 (3')

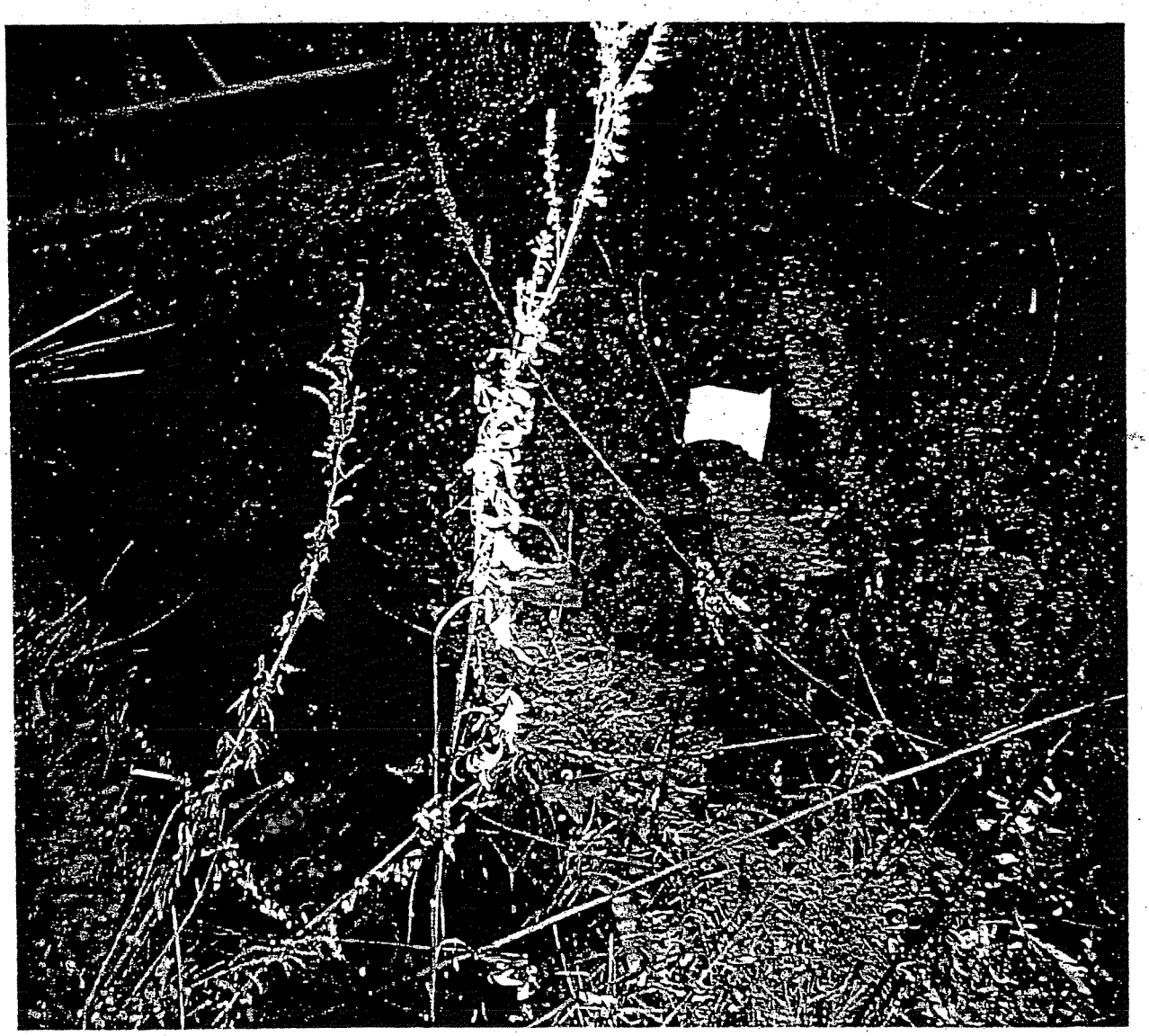
Test Pit TP-5

Test Pit Log

Site No:	828089P			Test Pit No: TP-6
Project Name:	Former Vacuum Oil Company			Sheet 1 of 1
Contractor:	SLC	Geologist:	Jennifer League	By: JL Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999	
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999	

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-	0	0'-1.3': Grey/dk. grey gravel, l.f/c sand, moist (fill)
	0	1.3'-1.7': Dk. brn f/c sand, l.gravel, moist (fill)
-2-	0	1.7'-2.5': Brn. f/c sand and silt, l. clay, tr.gravel, tr.brick (fill)
	0	2.5'-3.2': Dk. brn f/c sand and silt, l.gravel, tr.glass (SM/fill)
-4-	0	3.2'-4.2': Dk. brn to Lt. grey f/c sand (ash-like), l.gravel, tr.silt, tr.glass, saturated (fill)
		4.2': Bottom of excavation; groundwater encountered
-6-		
-8-		
-10-		
-12-		

Comments:	**Samples Collected:**
Excavation Dimensions 7'Lx2'Wx4.2'D	No samples collected



Test Pit TP-6

Test Pit Log

Site No:	828089P			Test Pit No: TP-7
Project Name:	Former Vacuum Oil Company			Sheet 1 of 1
Contractor:	SLC	Geologist:	Jennifer League	By: JL Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999	
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999	

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-		5" Topsoil
	0	Dk. brn f/m sand, l.silt, l.gravel, tr.roots, moist (SM)
-2-		
	0	Brn. grey (mottled) clay and silt, f/c sand, tr.gravel, moist (CL)
-4-		4.3': Bottom of Excavation
-6-		
-8-		
-10-		
-12-		

Comments:	**Samples Collected:**
Excavation Dimensions 7'Lx2'Wx4.3'D	No samples collected

Test Pit TP-7

Test Pit Log

Site No:	828089P			Test Pit No: TP-8
Project Name:	Former Vacuum Oil Company			Sheet 1 of 1
Contractor:	SLC	Geologist:	Jennifer League	By: JL Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999	
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999	

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-		5" Topsoil
	0	0.5'-3': Dk. brn/blk. fine to coarse sand, l.gravel, moist grading to saturated (fill)
-2-		this is a coal-like material similar to what was in TP-5
	0	3' Grey silt and clay, l.f/c sand, saturated
-4-		3.1': Bottom of Excavation, groundwater encountered
-6-		
-8-		
-10-		
-12-		

Comments:	**Samples Collected:**
Excavation Dimensions 8'Lx2'Wx3.1'D	B70607 (3')

Test Pit Log

Site No:	828089P			Test Pit No:	TP-9
Project Name:	Former Vacuum Oil Company			Sheet 1 of	1
Contractor:	SLC	Geologist:	Jennifer League	By: JL	Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999		
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999		

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-		3" Topsoil
-2-	0	0.25'-5': Lt. brn silt and f.sand, l.clay, tr.gravel, tr.roots, moist (ML)
-4-		
-6-	0	5'-5.8': Brn. grey clay and silt, tr.gravel, moist (CL) 5.8': Bottom of excavation; groundwater trickling into excavation
-8-		
-10-		
-12-		

Comments: Excavation Dimensions 6.5'Lx2'Wx5.8'D	**Samples Collected:** No samples collected

Test Pit TP-9

Test Pit Log

Site No:	828089P			Test Pit No:	TP-10
Project Name:	Former Vacuum Oil Company.			Sheet 1 of	1
Contractor:	SLC	Geologist:	Jennifer League	By: JL	Date:12/06/99
Operator:	Ken Kuhn	Date Started:	6-Dec-1999		
Equipment:	Komatsu 35R	Date Completed:	6-Dec-1999		

DEPTH (FT.)	PID (PPM)	SAMPLE DESCRIPTION
-0-	0	0'-1': Dk. brn f/c sand, s.silt, l.gravel, moist (fill)
	0	1'-2': Grey silt, s.f.sand, l.clay, l.gravel, moist (fill-ML)
-2-	0	2'-3.7': Blk. gravel, s.f/c sand, l.silt, tr.brick, l.clay, wet grades to saturated with increasing depth (fill)
-4-		3.7': Bottom of Excavation, groundwater encountered, slight sheen
-6-		
-8-		
-10-		
-12-		

Comments:	Samples Collected:
Excavation Dimensions 8'Lx2'Wx3.7'D	No samples collected

Test Pit TP-10

Boring Log

Site No: 828089P Project Name:Former Vacuum Oil Company	Well/Boring No: MW-1 Sheet 1 of 1 By: JL Date: 2/08/00

Drilling Contractor:	MAXIM Technologies Inc.			Borehole Completion Depth: 16.5'
Driller:	Ron Brown	Geologist:	Jennifer League	Borehole Diameter: 4.25"
Drill Rig:	CME 850	Drilling Method:	HSA	Ground Surface El.:
Sample Spoon I.D.:	2" SS	Drive Hammer Wt.:	140	
Date Started:	02/08/00	Date Completed:	02/09/00	

DEPTH (FT.)	SAMPLE NO.	SAMPLING INTERVAL	PID SCREEN (PPM)	RECOVERY (in)	BLOWS	SAMPLE DESCRIPTION
-0-	1	0-2	3	13	3 5 7 4	Brn stiff silt and f/c sand, l.gravel, tr.brick, tr.cinders, tr.clay, moist (fill)
-2-	2	2-4	3	13	20 38 50/5	7" Brn. hard silt s.f/c sand, tr.gravel, tr.clay, tr.brick, moist (fill) 6" Brn/grey v.dense gravel and concrete, l.brick, dry (fill)
-4-	3	4-6	88	22	9 5 3 4	11" Dk. brn. loose f/c sand, gravel, l.silt, tr.clay, wet (fill) petroleum odor 11" Blk/grey stiff silt, s.f/m sand, l.clay, wet (ML) petroleum odor
-6-	4	6-8	189	21	3 3 4 3	Blk. stiff silt, f.sand, tr.clay, wet (ML) Strong petroleum odor and black petroleum product throughout sample
-8-	5	8-10	340	21	3 4 9 9	19" Blk./grey stiff silt and clay, s.f.sand, tr.wood, wet (ML/CL) strong petroleum odor 2" Grey stiff silt and clay, hr.f. sand, wet (CL)
-10-	6	10-12	25 (top) 95 (bot.)	22	4 6 6 10	Grey/blk. stiff silt and clay, tr. f/c sand, tr.roots, wet (ML) Petroleum odor w/black stains
-12-	7	12-14	470	22	20 19 10 10	Grey v.stiff silt, s.clay, tr. f.sand, wet (ML) Petroleum odor
-14-	8	14-16	12	18	WH 1 1 1	Grey v.soft silt, s.f/m sand, s.clay, wet (ML) Petroleum odor w/black stains
-16-	9	16-16.5	350	22	1 50/1	Top 16" assumed collapse; Brn. v.dense sand, s.gravel, wet (SM); Refusal at 16.5'
-18-						

Remarks

Boring Log

Site No: 828089P Project Name:Former Vacuum Oil Company	Well/Boring No: MW-2 Sheet 1 of 1 By: JL Date: 2/08/00

Drilling Contractor:	MAXIM Technologies Inc.		
Driller:	Ron Brown	Geologist: Jennifer League	Borehole Completion Depth: 15.5'
Drill Rig:	CME 850	Drilling Method: HSA	Borehole Diameter: 4.25"
Sample Spoon I.D.:	2" SS	Drive Hammer Wt.: 140	Ground Surface El.:
Date Started:	02/08/00	Date Completed: 02/08/00	

DEPTH (FT.)	SAMPLE NO.	SAMPLING INTERVAL	PID SCREEN (PPM)	RECOVERY (in)	BLOWS	SAMPLE DESCRIPTION
-0- -2- -4-						Augered directly to concrete slab Concrete slab encountered at 4.5' Augers were able to penetrate slab Slab was about 1' thick, began split spoon sampling at 6'
-6-	1	6-8	98	18	6 12 9 7	Grey v.stiff silt and clay, l.f.sand, moist (ML) petroleum odor
-8-	2	8-10	200	14	2 4 4 7	Grey stiff silt and clay, l.f.sand, wet (ML) petroleum odor
-10-	3	10-12	38 (top) 2 (bot.)	22	2 4 5 7	Grey stiff silt and clay, l.f.sand, wet (ML) petroleum odor at top of sample
-12-	4	12-14	5	24	2 3 3 3	Grey m.stiff silt and clay, l.f.sand, wet (ML) grades to sat at 20" into sample
-14-	5	14-15.5	NA	6	32 34 5/5	3" Grey/brn hard silt & clay, l.f/c sand, wet (ML) 3"Brn v.densegravel and f/c sand, sat (GM); Refusal at 15.5'
-16-						

Remarks
NA - Not Available

Boring Log

Site No: 828089P Project Name:Former Vacuum Oil Company	Well/Boring No: MW-3 Sheet 1 of 1 By: JL Date: 2/07/00

Drilling Contractor:	MAXIM Technologies Inc.			Borehole Completion Depth: 6'
Driller:	Ron Brown	Geologist:	Jennifer League	Borehole Diameter: 4.25"
Drill Rig:	CME 850	Drilling Method:	HSA	Ground Surface El::
Sample Spoon I.D.:	2" SS	Drive Hammer Wt.:	140	
Date Started:	02/07/00	Date Completed:	02/07/00	

DEPTH (FT.)	SAMPLE NO.	SAMPLING INTERVAL	PID SCREEN (PPM)	RECOVERY (in)	BLOWS	SAMPLE DESCRIPTION
-0-	1	0-2	0	6	2 5 12 8	Dk. brn v.stiff silt and f/c sand, l.gravel, tr.brick, moist (fill)
-2-	2	2-4	0	3	4 3 3 3	Dk. brn med.stiff silt and f/c sand, l.gravel, wet (fill)
-4-	3	4-6	0	0	WH WH 2 2	Refusal at 6'. Only water recovered
-6-	4	6-8				
-8-	5	8-10				
-10-	6	10-12				
-12-						

Remarks

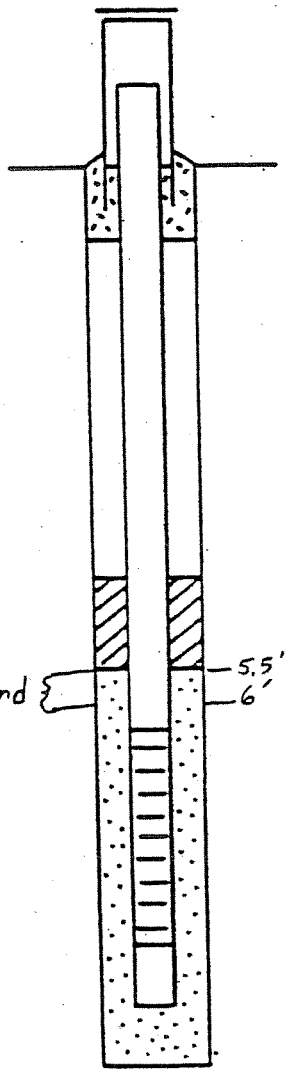
Site Vacuum Oil Company 828089P Well No. MW-1

Total Depth 16.5' Surface Elev. ____ Top Riser Elev. 517.81

Water Levels (Depth, Date, Time) ____ Date Installed 2/09/2000

Riser:	Dia. 2"	Material PVC	Length 8'			
Screen:	Dia. 2"	Material PVC	Length 10'	Slot Size 0.01		
Prot. Csg:	Dia. ____	Material ____	Length ____			

SCHEMATIC



2.3' Prot. Csg stickup

2.1' Riser stickup

Ground Surface

____ Bottom Surface Seal

Surface Seal Type Concrete

Grout Type Portland Cement and Bentonite

Seal Type Bentonite

3.5' Top Seal

5.5' Top Sand Pack

6.5' Top Screen

Sand Pack Type/Size - No. 1 Choke Sand - 00

16.5' Bottom Screen

____ Bottom Sump/Wellpoint

16.5' Total Depth of Boring

Comments ____

Driller Ron Brown

Geologist Jennifer League

Engineer Frank Sowers

Technical Person ____

DEC Inspector Bob Long

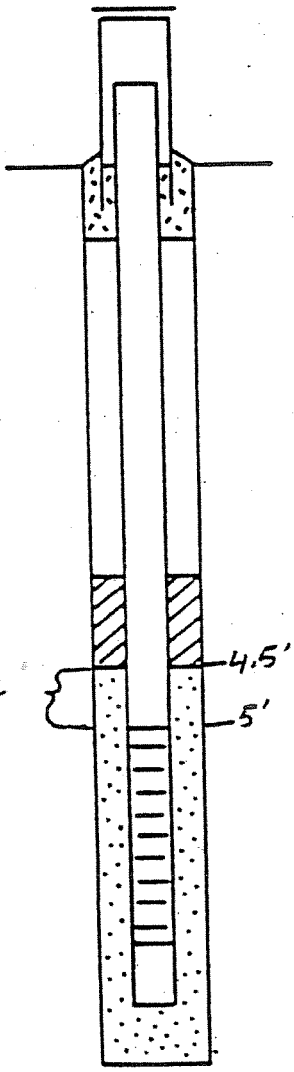
Site Vacuum Oil Company Well No. [illegible]

Total Depth 15.5' Surface Elev. _____ Top Riser Elev. 514.88

Water Levels (Depth, Date, Time) _____ Date Installed 2/08/2000

Riser: Dia. 2" Material PVC Length ~5.5'
Screen: Dia. 2" Material PVC Length 10' Slot Size 0.01
Prot. Csg: Dia. ____ Material _____ Length ____

SCHEMATIC



2.3' Prot. Csg stickup

2.1' Riser stickup

Ground Surface

Surface Seal Type Concrete

____ Bottom Surface Seal

Grout Type Portland Cement and Bentonite

Seal Type Bentonite

3' Top Seal

4.5' Top Sand Pack

0.5' Choke Sand

5' Top Screen

Sand Pack Type/Size No. 1 Choke Sand - 00

15 Bottom Screen

____ Bottom Sump/Wellpoint

15.5 Total Depth of Boring

Comments _____

Driller Ron Brown
Geologist Jennifer League
Engineer Frank Sowers
Technical Person _____

DEC Inspector Bob Long

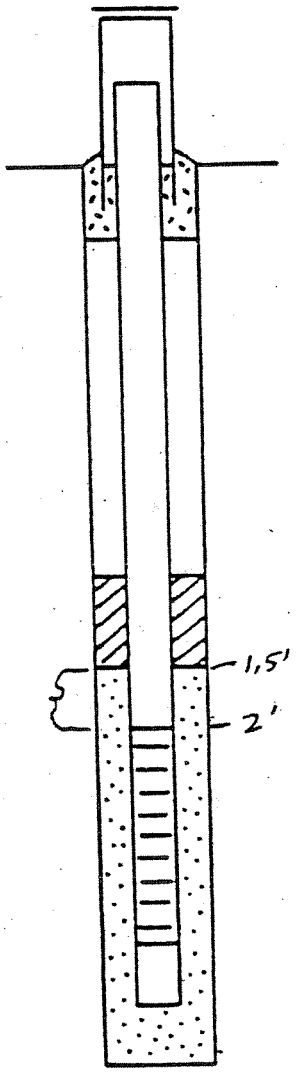
Site Vacuum Oil Company

Total Depth 6' Surface Elev. _____ Top Riser Elev. 511.95

Water Levels (Depth, Date, Time) _____ Date Installed 2/07/2000

Riser: Dia. 2" Material PVC Length 3.8'
Screen: Dia. 2" Material PVC Length 4' Slot Size 0.01
Prot. Csg: Dia. _____ Material _____ Length _____

SCHEMATIC



2.3' Prot. Csg stickup

1.8' Riser stickup

Ground Surface

_____ Bottom Surface Seal

Surface Seal Type Concrete

Grout Type Portland Cement and Bentonite

Seal Type Bentonite

1' Top Seal

1.5' Top Sand Pack

0.5' Choke Sand

2' Top Screen

Sand Pack Type/Size No 1 Choke Sand - 001

6' Bottom Screen

_____ Bottom Sump/Wellpoint

6' Total Depth of Boring

Comments _____

Driller Ron Brown
Geologist Jennifer League
Engineer Frank Sowers
Technical Person _____

DEC Inspector Bob Long

WELL DEVELOPMENT LOG

Former Vacuum Oil Company
Site #828089P

Well Id.	Method	Depth to Water (ft.)	Depth of Well (ft.)	Well Diameter (inches I.D.)	Gallons per Foot of Depth	Volume of One Column of Water (gal.)	Volume of 10 Columns of Water (gal.)	Volume of Water Actually Removed (gal.)	Field Parameters				
									Cumulative Volume (gal)	Temperature (F)	Conductivity (ms/cm)	pH	Turbidity (NTU)
MW-1	Bailer	9.7	18	2	0.163	1.35	13.53	9 gal. on 2/10/00 + 5 gal. on 2/11/00 = 14 gal.	5 8 11 14	46 45.9 43 39.8	1 1.04 0.69 0.88	7.41 7.25 7.53 7.51	>100 >100 >100 >100
MW-2	Bailer	4.25	15	2	0.163	1.75	17.52	15 gal. on 2/09/00 + 6 gallons on 2/10/00 + = 21 gal.	13 15 16 17 18 19 20 21	50 48.5 45.1 44.2 44.1 44.6 42.4 44.6	0.70 0.71 0.62 0.61 0.68 0.67 0.65 0.70	7.76 7.50 7.81 7.73 7.63 7.45 7.41 7.34	NA NA >100 >100 >100 >100 >100 >100
MW-3	Bailer	5	6	2	0.163	0.16	1.63	1 gal. on 2/09/00 + 0.5 gal. on 2/10/00 + 0.25 gal. on 2/11/00 = 1.75 gal.	1 1.5	52.5 NA	1.46 NA	6.7 NA	NA 22.8

Water Sampling Field Parameters
Former Vacuum Oil Company
1999-2000 Site Investigation

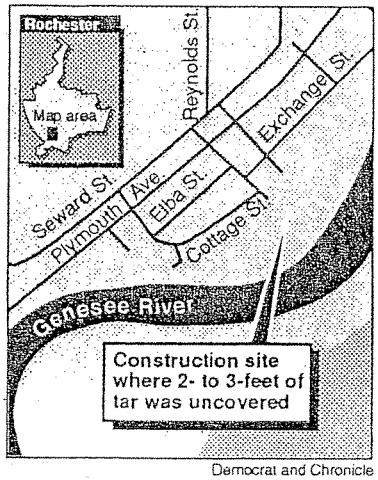
Location Id.	Date	Temperature (F)	Conductivity (ms/cm)	pH	Turbidity (NTU)	Well Headspace PID Reading (ppm)
MW-1	02/23/00	53	1.56	7.07	700	400
MW-2	02/23/00	52.3	1.1	7.27	365	1.5
MW-3	02/23/00	49	0.98	7.49	Water was black. Turbidity was not measured	0.5

Appendix M

1989 Rochester Democrat and Chronicle News Article on the Petroleum Sludge Pits

Tar pits along Genesee River found to contain toxic metals

State DEC recommends designating area as hazardous



Democrat and Chronicle

By Sherrie Negrea
Democrat and Chronicle

Cyclists, joggers and pedestrians using a trail built along the Genesee River by the city of Rochester may be passing by a potentially hazardous waste site that contains toxic levels of arsenic and lead.

Officials from the regional office of the state Department of Environmental Conservation have recommended designating the area, which is centered around two tar pits adjacent to the river's west bank, as an inactive hazardous waste site for further evaluation and cleanup.

"There could be other areas we're not aware of," said Michael Khalil, who is in charge of the state superfund program at the DEC's Avon office. "That's why you need an investigation of the site."

Although the toxic metals do not pose a public health threat, the bureaucratic process that will determine the extent of the contamination and who will clean up the site could affect housing development proposed in the city's South River Corridor Plan, a $110 million project designed to spur investment south of downtown.

The tar pits are located within a general area designated for about 600 housing units to be built over a 10-year period across the river from the University of Rochester. The contaminated area is also about 1,000 feet away from a site where 14 housing units are being built near the intersection of Utica Place and Cottage Street.

TURN TO PAGE 6B

Pits contain toxic metals

FROM PAGE 1B

Larry Stid, the city's director of planning, said the housing project will not be affected by the contamination because the units are elevated from the area by a steep 50-foot hill. He also believes that the hazardous material will not delay development of additional housing in the area because construction is not scheduled for several years.

"It might create a little more paperwork but I don't think it will delay the schedule." he said.

The tar pits were discovered by a city bulldozer operator who was clearing land for a portion of the $70,000 riverfront trail last June. City officials had walked through the site but had not conducted extensive environmental testing along the proposed trail.

"We had no reason to believe there was any contamination," said Edward Doherty, commissioner of environmental services.

The city, however, was aware that a former oil refinery called Vacuum Oil had operated on some nearby property between 1866 and 1933, Stid said. City officials did soil testing before building the Utica-Cottage housing units, but by a 20- by 20-foot barbed wire fence. Mayor Thomas P. Ryan Jr. formally opened the 3.4-mile trail to the public on Sept. 7.

"Obviously, we wouldn't have built the trail where there were hazardous materials," Doherty said. "We routed it around it safely."

The Monroe County Health Department, which was notified about the problem, determined that the contaminated area posed no threat to people who use the path, according to health officials.

Instead of having the area designated a suspected hazardous waste site, the city is offering to conduct testing on land its owns near the river trail, Doherty said. The tar pits are actually located on state-owned land.

"We would simply prefer that the state clean it up," said Doherty, who plans to meet with DEC officials next week. "Putting it on the hazardous waste registry does nothing."

Doherty noted that other hazardous waste sites in the city, such as the Fire Academy, have been tied up in lengthy bureaucratic delays once they go on the registry. There are 13 designated hazardous waste sites in the city and 64 in Monroe County, according to a DEC report.

The DEC, meanwhile, is at-

Pits contain toxic metals

FROM PAGE 1B

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The city, however, was aware that a former oil refinery called Vacuum Oil had operated on some nearby property between 1866 and 1933, Stid said. City officials did soil testing before building the Utica-Cottage housing units, but did not think such precautions were needed for paving a trail over an old rail bed, Stid said.

After the tar pits were found, however, the city conducted testing which detected eight toxic metals in the tar, including high levels of arsenic and lead, said Mark Gregor, an environmental analyst with the city.

With construction begun on the trail, the city then decided to reroute the pathway around the hazardous area, which was enclosed by a 20- by 20-foot barbed wire fence. Mayor Thomas P. Ryan Jr. formally opened the 3.4-mile trail to the public on Sept. 7.

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Doherty noted that other hazardous waste sites in the city, such as the Fire Academy, have been tied up in lengthy bureaucratic delays once they go on the registry. There are 13 designated hazardous waste sites in the city and 64 in Monroe County, according to a DEC report.

The DEC, meanwhile, is attempting to locate companies that may be responsible for disposal of the contaminated waste. Khalil said he suspects the metals may be part of a tank bottom of the oil refinery, which eventually was bought out by Mobil Oil Corp.

He said DEC has contacted Mobil but said the company does not know anything about the site.

Democrat and Chronicle reporter Steve Orr contributed to this report.

Appendix N

April 2001 NYSDEC Fact Sheet on Investigation Report Release

New York State Department of Environmental Conservation

FACT SHEET

April 2001

Investigation Report Released for Former Vacuum Oil Site

City of Rochester, Monroe County

The New York State Department of Environmental Conservation (DEC), in conjunction with the New York State Department of Health (DOH) and the Monroe County Health Department (MCHD), want to inform you about activities at the former Vacuum Oil property located along the western bank of the Genesee River between Flint Street and Serenity Circle (across from the University of Rochester) in Rochester (see map). DEC is providing this fact sheet to update the public on site environmental activities and explain how to get more information.

History of the Vacuum Oil Site:

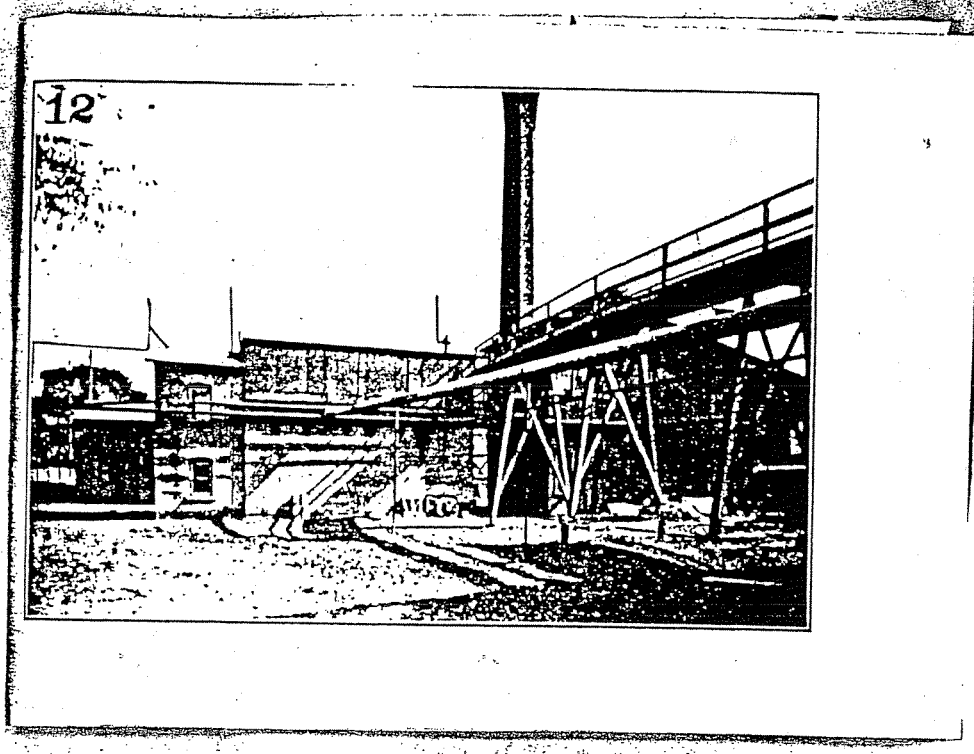
The former Vacuum Oil Company (the predecessor of Mobil Oil) operated as an oil refinery on the western bank of the Genesee River from c1866 to c1936. The Vacuum Oil facility consisted of several process and storage buildings, a rail yard, a tank farm area, and several pipelines. Reports from 1887 indicated that there were 135 tanks and six boilers at the refinery, and that the facility refined over 4 million gallons of crude oil per year. Many of the refinery structures were reportedly demolished in place. Building and tank foundations are still visible throughout the site.

Since 1936, portions of the site have been used for a variety of commercial purposes. Owners included a paper company, two tool and die companies, a printing company, a university, a scrap bailing company, a junkyard, and government agencies.

In 1989, the City of Rochester performed a limited environmental investigation on an approximately 11-acre portion of the former Vacuum Oil facility. The 1989 investigation, which focused on the northern section of the facility, did not identify any contaminants at levels above New York State standards and guidance values. In September 1992, the DEC removed approximately 400 to 500 tons of petroleum sludge located in the former rail yard area at the southeastern portion of the property near what is currently the Genesee River bike trail. The site is currently under multiple ownership and many of the properties are either vacant or underutilized.

The Investigation:

From 1999-2001, the DEC performed an environmental investigation on a 24-acre portion of the former Vacuum Oil facility to gather information on the types and locations of contamination at the site. The southern section of the Vacuum Oil facility was the focus of this investigation because it was not part of the 1989 investigation, it was accessible to the public, and the discovery of the petroleum sludge in 1992 indicated that additional contamination may be present in this area. The



This figure shows a typical Vacuum Oil lubricating still and its condenser. At the left of the condenser is a small brick building known as a "running house." There the still man separates the distillates as they come from the condenser, using an hydrometer to determine the quality of the distillates and to turn the stream from one tank to another as varying grades of distillates are reached. This distillation secures as near fractional distillation as is practicable, leaving a sweet and unburned residual oil instead of tar.

F I G U R E 2

A typical Vacuum Oil still