PRELIMINARY SITE ASSESSMENT

REMINGTON RAND PLANT
CITY OF ELMIRA
CHEMUNG COUNTY, NY

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July 1988

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7/14/88

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EXECUTIVE SUMMARY

This report describes the results of a preliminary site assessment of the Remington Rand plant site in Elmira, New York (Figure 1). This study is based on a review of readily available information and visual reconnaissance of the property from public areas.

The approximately 83-acre site straddles the Elmira-Southport corporate boundary. The southern part comprises essentially a parking lot and athletic field; the middle part consists of industrial buildings within a chainlink fence; and the northern part is occupied by the Southside High School.

Parts of the property have been used for industrial manufacturing since as early as 1887, including P.W. Payne & Sons for manufacture and assembly of industrial steam engines, Morrow Corporation for rear assemblies for the Overland and Willys-Knight automobile, Remington Rand for typewriters and related office equipment, and American LaFrance for fire-fighting equipment. Plant operations at the site consisted of machine shops, foundry, forge shop, plating operations, metal blackening, heat treatment, pickling/painting, tumbling, and washing. After Remington Rand vacated the plant in 1972, it was subdivided. In 1977, the northern portion was purchased by the Elmira School District, and the southern part by ATL which was later acquired by Figgie International. The Southside High School and athletic fields were constructed on the northern portion after demolition of the plant structures in the late 1970s.

Aerial photographs dating back to 1938 indicate disturbed areas along the eastern and southwestern portions of the site, which may have been used for disposal of waste products from plant operations. These areas are currently grass-covered or paved parking areas. Other areas where the ground may have been affected by plant operations include drainage pits, settling ponds, coal pits, and plating operation areas. Liquid wastes may also have been discharged into a ditch leading to now Coldbrook Creek east of the plant site.

The plant site is located on glacial outwash aquifer deposits that may extend to about 100 feet in thickness. Ground water is anticipated to flow eastward. The Elmira Water Board supplies the water for the area around the plant site. Community wells are located less than a mile upgradient of the plant site. Site soils are anticipated to be permeable permitting relatively rapid infiltration where not covered by parking areas or

structures. Site runoff enters either Elmira storm drains or flows to Coldbrook Creek and then to the Chemung River. No designated wetlands or sensitive habitats are known to occur within a mile radius of the site. No air quality problems have been reported in the site vicinity.

ELM/000452

PRELIMINARY SITE ASSESSMENT

REMINGTON RAND PLANT SITE
CITY OF ELMIRA
CHEMUNG COUNTY, NY

1.0 INTRODUCTION

This report comprises a Preliminary Site Assessment (PSA) of the Remington Rand plant site in the city of Elmira, Chemung County, New York (Figure 1).

This PSA has been performed by Dames & Moore on behalf of Unisys Corporation which inherited the assets and liabilities of Sperry Rand, a former owner and operator of the plant site [1].* The objectives of the PSA were to outline, to the extent practical using the available information, the nature and extent of storage, usage, or disposal areas for potential hazardous material, environmental migration pathways, and human or environmental exposure points, by performing a literature review.

The literature review included the collection and evaluation of historical data, including air photographs, information from state and local government agency files, published literature, and other sources. No field work was performed other than a brief visit to view the site surface conditions from the adjacent public areas.

The information collected is summarized in the sections which follow in terms of:

- Background and History
- Regional Features
- Waste Materials
- Hydrogeology
- Surface Water
- Health and Environmental Considerations

Appendix A contains a chronological summary of events associated with the Remington Rand plant site. Chemical analyses of three liquid waste streams performed in 1952 by the State Department of Health are provided in Appendix B [2]. Appendix C

* Refer to list of references that follows the figures.

provides information on waste components that may have been generated at the plant site based on laboratory analyses performed, and the types of raw materials and production processes used at the former Remington Rand plant.

2.0 BACKGROUND AND HISTORY

This section summarizes the information collected on the background and history of the Remington Rand plant site. The following subsections discuss:

- Site Location
- History
- Remington Rand Operational History
- Current Site Conditions

2.1 SITE LOCATION

The Remington Rand plant site is located on South Main Street, approximately a half mile south of the intersection of this street with Pennsylvania Avenue, on the south side of the Chemung River in the city of Elmira, Chemung County, New York (Figure 1).

The extent of the property considered in this report comprises about 83 acres as shown in Figure 2 [3]. The irregular-shaped site is over a mile long in a north-south direction but only about 1,000 feet at its widest east-west point. The northern quarter of the plant site falls in the city of Elmira; the southern three-quarters are located in the adjacent town of Southport. South Main Street runs along much of the plant site to the west; to the east, the site is bordered by the Consolidated Rail Corporation, formerly the Erie-Lackawanna Railroad.

2.2 HISTORY

The plant site has had a history of industrial use spanning over a century. The periods and nature of use are described in the following sections and summarized in Appendix A.

2.2.1 1882-1909 B.W. Payne & Sons

In 1882, 20 acres of land were donated on South Main Street by John Arnot to encourage business development in Elmira, and the Payne Engine and Boiler Works was established in about 1887, having moved from Corning [4,5]. B.W. Payne and later his sons, Benjamin N. and David W. Payne, employed several hundred men, producing high-speed steam engines for direct connection to dynamos and for belting purposes. The plant was idled by a strike of machinists that began in 1904 and lasted more than 2 years. As a result, the Payne Company sold its holding and closed the plant [4,5]. The location of the Payne Engine and Boiler Works and configuration of the buildings are shown on Figure 3. South of the plant, a stream originated on the west side of South Main Street and passed in a west to east direction through the area, later to become part of the Remington Rand plant site which was still largely undeveloped, roughly bisecting it [6].

2.2.2 1909-1935 Morrow Manufacturing Company

Alexander Morrow, inventor of the Morrow Coaster Brake, left the Eclipse Bicycle Company to establish his own business on LaFrance Street in Elmira in 1905 where he manufactured drillchucks, machine parts, and a line of tools for the machine trade. In 1909 he moved to the idle plant of the B.W. Payne & Sons engine works, and before long constructed a new factory. In 1913, the plant consisted of an office building, machine shop, horse barn, and foundry [7]. At about that time, John North Willys, an ex-Elmiran who headed the Willys-Overland Company of Toledo, Ohio, became interested in the Morrow Company. Soon the Morrow plant was making transmissions, universal joints, gears, bolts, and nuts for the Overland and Willys-Knight cars, and producing 5,000 ball bearings each day. Assets and liabilities of the Morrow Manufacturing Company were turned over to the Willys-Morrow Company in 1916 in mergers, but local management was unchanged [5].

Following the mergers, there were substantial British contracts for machine parts to be used for airplane construction. The U.S. government ordered 5,000 OX-5 Curtiss training plane motors. The Morrow plant also manufactured and shipped more than 2 million shell adapters, thousands of 75 mm gun carriage parts, practically all the machine parts for the Curtiss Airplane Company, and all screw machine parts for the Sunbeam airplane engine for Britain. More orders came in for Liberty-S and Liberty-12 engines. OX-5 motors, used in the JN-4 training planes were shipped in February 1919. At wartime peak, weekly payroll at the Morrow factory reached $170,000; there were 6,000 employees [5].

In 1920, when many of the employees who had been in World War I service had returned after the Armistice, employment at the Morrow factory was about 3,000 [5]. At this time, the plant was producing the rear system of Willys cars. During 1920, a drop forge and case hardening department were added as well as an office building. However, in the recession of 1922, the plant laid off 600 and put 400 workers on a 3-day week [5].

By 1921, the plant had been significantly expanded from the Payne Engine and Boiler Works (Figures 3 and 4). The addition of a drop forge on the southern part of the property resulted in a general reshaping of the topography. The stream shown on Figure 3 and on the 1895 USGS topographic map had been filled in and a pond created south of the power plant [6]. A new culvert was excavated under the railroad for discharge of the pond water, and the old limestone block culvert was abandoned; the channel having been filled by roughly 15 to 20 feet of fill. Only the top of the headwall remains exposed today based on a reconnaissance of the railroad tracks. Railroad spurs were also added within the factory complex (Figure 4).

The various operations performed at the plant are indicated by the usage of the buildings as noted on Figure 4. Activities at the plant apparently included machinery, heat treating, pickling, annealing, carbonizing, and hardening (Figure 4).

The Depression caused a large layoff at the Morrow plant in 1929 [8]. It was still Elmira's largest industry with a payroll of nearly $3 million annually. But the Morrow plant faded early in 1934 when court action restricted the operations of the Willys-Overland Company in Toledo, which was in receivership [5].

2.2.3 1935-1937 Elmira Precision Tool Company

The beginnings of the Rand operations were in 1935 when Elmira Industries, Inc., seeking to bring Chemung County out of the Depression, bought the idle Willys-Morrow plant for $300,000 [9]. By February 1936, renovations were completed, and the Elmira Precision Tool Company began making typewriter parts on a contract from Remington Rand. The next year, the plant was offered free to Remington Rand which took over in name and rechristened the plant the "E" division of Remington Rand [9].

2.2.4 1937-1972 Remington Rand

For many years, the huge Remington Rand plant produced every typewriter and every adding machine sold by Remington Rand in the United States [9]. Elmira claimed itself "The Typewriter Capital of the World" [9]. The products were standard and portable typewriters and adding machines, plus electrics starting in 1948, and beginning in 1953, components for Univac, the electronic computer [9,50].

Made-in-Elmira typewriters were sold throughout the world [9]. The keyboards and segments were in a dozen languages--Russian, French, Japanese, Spanish, Italian, Portugese, and Thai. The foreign machines included those with right-to-left, bottom-to-top operation for the Arabic-Yiddish languages [9].

When production was at the peak, a day shift of about 5,600 started work at 7 a.m.; a medium-size night shift of about 850 started at 4 p.m., and a much smaller group handled a third, night shift [9]. The total work force included about 200 supervisors. In each group of 100 employees, the ratio generally was 60 male to 40 female employees [9].

In 1941, Remington Rand announced that the Elmira plant had started production of high explosive anti-aircraft shells [10]. However, only fuses for the shells were reportedly produced [51]. In 1942, the 300,000-square-foot "N" plant was built on the south side of the Rand property by the Defense Plant Corp. at a cost of $4 million [11] for construction of the Norden bomb sight and related war equipment (Figure 5). Initially, Remington Rand operated the plant as subcontractor for Carl L. Norden, Inc. However, the Navy took over the plant on November 29, 1943 to expedite production of the bomb sights. The plant continued in operation until 1944, when the Norden contract for bomb sights was completed [53]. The Elmira plant also reportedly assembled pistols and manufactured ammunition boxes during the war.

After the war, in the fall of 1946, Remington Rand bought the "N" plant and subsequently moved part of the plant operations there. In the 1948-50 period, the plant was booming with production of the new standard typewriter and electric typewriters [9]. The mid-1950s saw an expansion of the electronic components production, with parts supplied for Univac and electronic calculators [50].

In 1955, Remington Rand and Sperry Corporation merged into the Sperry-Rand Corporation. The Elmira plant was one of 22 in the United States, and there were 24 Rand plants abroad [9]. By 1960, employment at the plant had declined to 4,500 and in 1961 came the word that Rand's portable typewriter manufacturing operations were moved to Japan and Europe. At that time, the annual payroll at the plant was $18.2 million.

When the portable typewriter production was moved out in 1961, more than 1,000 local employees were laid off [9]. Sperry-Rand Corporation added about $1 million in equipment in 1963 in a streamlining program to make the plant competitive with foreign production. The plant underwent an extensive redesigning and modernization program [52]. Machinery in the plant had been relocated to achieve a "straight-flow" operation; raw material in one end and finished product out the other. Previously, manufacture had been done at two different ends with assembly in the middle. There was essentially a complete relocation of all machines. The old, north section of the plant had been almost completely evacuated [52]. During the renovation, a new heat treatment furnace was installed. After a strike in 1969, the company spent nearly $100,000 in a consolidation move when part of the old Elmira property was razed. But employment gradually went downhill and in 1970, the manufacture of electronic desk calculators and electro-mechanical calculators was discontinued. About one-fourth of the work force was laid off in 1970 and about 1,300 in 1971, leaving 690 employees who lost their jobs in 1972 when remaining production was shifted to Canada [9].

The various plant operations performed during 1967 are presented on Figure 6. Operations included plating, tumbling, metal blackening, heat treatment, pickling, painting, and washing. Locations of the various operations within the buildings are reported to have changed from the initial start up of the plant. Plating may have been originally performed in the building 49 area (Figure 8) [21]. The extensive reorganization in 1963 and consolidation in 1969 necessitated changing locations of plant operations; however, basic plant operations are anticipated to have been about the same throughout the history of operations by Remington Rand.

Construction of the "N" plant resulted in some additional topographic changes, as noted by the changed shape of the spring-fed pond (Figures 13 and 14). Remington Rand also added five water wells to service the water requirements of the plant. Some of the wells produced up to 1,000 gpm (Figure 6).

2.2.5 1971-Present Northern Half of Plant Site

In 1971, the northern 5.5 acres were sold to Marine Midland Bank. Sperry Rand sold the remaining plant property in 1973 to the Chemung County Industrial Development Agency. Late in 1973, Westinghouse Electric Corporation purchased a 10.4-acre parcel south of the City of Elmira-Town of Southport line (Figure 2) as part of a $10 million expansion of Westinghouse's color television tube facility in Horseheads. The portion of the plant purchased was probably used for warehousing [34]. The purchase was financed by $1 million in industrial revenue bonds issued through the Chemung County Industrial Development Agency (IDA) [9].

In 1977, the school district purchased the northern part of the plant and soon demolished the remaining plant structures north of the "N" plant and constructed the Southside High School (Figure 7). No reports were made of any unusual odors or other conditions during demolition or excavation for construction of the new school at the site [49].

2.2.6 1973-Present Southern Half of Plant Site

In 1980, American LaFrance (ALF), a division of A.T.O. Properties, Inc. acquired the "N" plant for manufacture of fire engines and related apparatus [15]. American LaFrance remodeled the factory and lowered the floor by about 5 feet to provide sufficient clearance for fire trucks [16]. No unusual conditions were reported in removal of the wooden floor and excavation of the soils during remodeling [16].

Since 1980, three of the supply wells, producing 45 to 53°F water were alternately used for non-contact cooling of air conditioners [16]. The used water was discharged to the pond. The wells were also pumped to depress the water table to keep seepage out of the below-grade machinery pit. City water was reportedly used in the process operations and for drinking.

ALF ceased manufacturing at the "N" plant in 1985 after which most of the contents were auctioned and moved out [16]. ALF is currently part of Figgie International of Richmond, Virginia which continues to monitor and maintain the empty buildings with a small onsite security staff.

2.3 OPERATIONAL HISTORY

No information was readily available on the storage, use, or disposal of hazardous materials prior to ownership by Remington Rand. However, it is likely that Payne & Sons and Morrow Manufacturing Company were using industrial materials such as oils, spirits, solvents, and possibly plating solutions prior to 1935.

In 1936, the year before Remington Rand took over the plant, the Elmira Precision Tool Company manufactured typewriter parts [9]. With the establishment of Remington Rand in 1937, the line of products apparently expanded to include complete manufacture from raw material to finished product of typewriters and adding machines and later electric and electronic equipment [9]. In 1967, Lancy Laboratories reported plant operations included cyanide heat treating and metal finishing involving cleaning, tumbling, pickling, plating, stripping, metal blackening, and conversion coating treatments [17]. Since the products generated by the plant were similar through the 35 years of operation, the plant operations were most likely similar, although technological improvements were likely incorporated. Due to expansion of facilities at the plant and later demolitioning of older buildings and smaller work forces, locations of various operations were likely changed over the operating history of the plant. Documentation of these locations changes was not found in the readily available literature.

During World War II, in addition to the manufacture of office equipment, a Remington Rand executive announced a contract with the Department of Defense for manufacture of high-explosive, anti-aircraft shells at both the Elmira and Ilion plants [10]. However, local sources only remember producing fuses for the bombs [49]. In 1942, the new building, the "N" Plant, was completed for another government contract, manufacture of the Norden Bomb Sight [9]. The information was readily available concerning waste management practices for these operations. A local resident, however, recalls as a youth scavenging the "dump area" behind the plant for explosive powders to make homemade explosives [49].

In the spring of 1952, the State Department of Health sampled wastes being discharged by the plant to surface water. Four samples were taken from various waste streams at the plant prior to discharge to surface water by the District Sanitary Engineer for the Health Department. The receiving stream entered Miller Creek (now Coldwater Creek) and then flowed about 3/4 mile to the Chemung River [2]. Results of these tests were formally transmitted to the Remington Rand plant in the spring of 1953 [2]. The Health Department informed Remington Rand that toxic wastes were being discharged [2]. Test results indicated the presence of chromium and cyanide as well as others (Appendix B).

In 1952, Remington Rand purchased the McInerney farm site near Seeley Creek about 0.5 mile south of the plant site. The farm site was apparently used for disposal of waste from the plant between the 1940s and 1967 [19].

In January 1954, a large fish kill resulting from cyanide contamination occurred on the Chemung River [20]. Investigations performed by the Conservation Department resulted in Remington Rand being attributed to the source of the contamination. The plant later acknowledged that the contents of a nickel plating machine containing cyanide in solution had been discharged on January 9 down a drain which led into Miller Creek. Disposal of all concentrated cyanide and metal solutions was supposed to be taken to a dump area. The disposal was contrary to plant orders according to the plant manager [20].

In the fall of 1958, an industrial survey form was completed by the Department of Health for the plant [21]. At this time, the plant was manufacturing and assembling office machines at the rate of about 1,000 typewriters and 150 adding machines per day. The plant employed between 4,500 and 5,800 personnel working two to three shifts per day and 5 days per week. Typical raw materials and quantities used at this time are listed on Table 1. There were three waste discharge outlet points during this period of operation (Figure 8). All three reportedly carried plating and oil waste [21]. Two of the waste streams had oil skimmers. Discharge of waste streams was to an "inlet ditch" leading to a swampy area on the east side of the railroad, and then to Miller Creek [2,17].

In mid-1958, work began by state agencies on the Chemung River Basin to provide data for enforcement of Article 12 of the Public Health Law. In late 1964, the work was completed and in early 1965 the CCHD received the final Section [22]. Shortly afterwards, a concerned citizen complained of pollution in Miller Creek and the Health Department responded by noting that an informal meeting with Remington Rand would soon be held [22].

On September 21, 1965, the CCHD took samples of Miller Creek about 25 feet below the point where the waste ditch enters the creek, to determine the effects of the plant's waste on the stream [23]. On November 12, 1965, Sperry Rand Corporation was notified of the results of the sampling [23,24] as follows.

1. Elevated concentration of zinc
2. Elevated concentration of cyanide

3. pH of one sample marginally beyond the acceptable range
4. Observation of an oil slick and gassing sludge deposits

As a result of these alleged violations, Sperry Rand Corporation was targeted by the State Health Department as a polluter in Chemung County in violation of Article 12 of the Public Works Law [25]. A case summary was prepared by the CCHD describing the discharge to the stream [23]. The report also noted that concentrated solution of plating wastes were reportedly collected and disposed of on a dump site owned by the company.

In 1965, a newspaper article stated that after 29 years "the Remington office Machine E Division Plant had ceased dumping treated industrial waste into Miller Creek" [16]. The plant manager said "the waste, primarily chromates used for plating materials, is now being stored in barrels pending conclusions of negotiations with the city for using the city sewage system." The manager stated that "the company stopped discharging chromate waste into the stream in early November (1965) and had been in contact with a company in Binghamton (NY) that reclaims it." The only waste being discharged by Remington according to the manager, was possibly a small amount of chromate contained in runoff water (rinse) and water used for cooling plating tanks.

In early 1966 after the newspaper article, the CCHD made visual observations that while the plant had stopped dumping chromate water into the stream, there was very little change in the appearance of the stream [26]. Consequently, Sperry Rand was scheduled for an enforcement hearing on February 17, 1967 [27]. CCHD recommended to the New York State Department of Environmental Conservation (NYSDEC) that the company be required to [26]:

- Perform engineering studies and report by September 1966
- Submit final plan by March 1967
- Start construction by June 1967
- Pollution abated by December 1967

In August 1966, Sperry Rand responded to the CCHD concerning the November 1965 violations [28]. The plant had thoroughly reviewed their processes and facilities connected with the drainage system carrying waste to Miller Creek. The company documented repairs and changes that were made in the system including [28]:

1. All plating tanks containing zinc, cyanide, chromate, etc. when requiring disposal, were pumped to barrels for disposition.

2. All tanks containing paint sludges, strippers, and other contaminates were pumped into barrels for disposition.

3. All cutting oils, both water soluble and petroleum base, when requiring a change were pumped from the machine to a portable tank which was then emptied into a tank truck for disposition.

In March 1967, Sperry Rand failed to meet the schedule set up at the enforcement hearing for supplying final plans for abatement for the stream pollution in Miller Creek [29]. Sperry Rand informed CCHD that Lancy Laboratories had been retained to perform an engineering survey of the waste treatment problem [30]. Thus began a long succession of delays in construction and threats of legal action by the state. The treatment plant was finally operative the end of April 1971 [31,73] and operated until the plant closed in 1972. The Town of Southport landfill, which is believed to have received the sludge from the treatment plant, was probably closed during 1973.

Lancy Laboratories completed the engineering study in July 1967 [17]. The report summarized the activities and identified the source and quantity of waste being generated by the plant at that time (Tables 2 and 3).

> "The Office Machines Division of the Sperry Rand Corporation employs approximately 2,200 employees. The plant operates 16 hours per day, 5 days per week, producing office machines, principally typewriters. The manufacturing operations involved for typewriter production include both mechanical and metal finishing operations. Included in the latter category are cleaning, tumbling, pickling, heat treating, buffing, polishing, plating, stripping, metal blackening, and conversion coating treatments."

> "The process water used for the wet process treatments above is pumped from five company wells having combined pumping capacity of 2,760 gallons per minute (gpm). Of this total, however, only 250 gpm are used for metal finishing operations. For sanitary purposes, approximately 52,000 gallons per day (gpd) are purchased from the city of Elmira. The division is partly situated in both Elmira

and Southport, the Elmira city line roughly splitting the property in two equal parts. Sanitary wastes from the entire plant are discharged to the city of Elmira sanitary sewer system."

"Industrial wastes are generated in cyanide heat treating and in metal finishing operations such as cleaning, tumbling, pickling, plating, stripping, metal blackening, and conversion coating treatments. [Table 3] lists all the various process solutions used in these operations, as well as their volumes and their dumping frequency."

"Without treatment, these metal finishing and heat treating operations would produce an effluent containing cyanide, hexavalent chromium, trivalent chromium, iron, copper, and nickel and would be high in soil and suspended solids. In addition, the pH of the effluent water would vary from high to low, coincident with the dumping of alkaline or acidic process solutions."

Lancy Laboratories proposed that an in-plant waste treatment system be installed for the chemical waste treatment of the industrial wastes generated at the plant prior to discharge to the Chemung River by way of Millers Creek at the existing storm sewer.

Sludge generated from the waste treatment facility was originally proposed to go to the company-owned landfill [32], but in early 1968, the town of Southport was reported to be willing to accept the 750 cubic feet per month of treated sludge from the plant at their trash and rubbish landfill [33]. No information on the disposal of the sludge was readily available from the literature. The CCHD preferred this to disposal on company property [33]. The Town of Southport landfill was probably closed in 1973 [73]. According to Lancy Laboratories, the type and quantity of sludge resulting from chemical waste treatment would be as follows:

1. Neutralized Wire Pickle Sludge - 250 cubic feet per month
2. Sludge Bed Filters - 400 cubic feet per month
3. Tumbling Sludge Settling Ponds - 100 cubic feet per month

There was no literature readily available that provided information on the final disposal of the sludge, but is assumed that since the County Health Department preferred disposal at the Town of Southport landfill, that this was the place of final disposal.

The Remington Rand plant shut down operations in 1972 and sold the plant properties in 1973 [9]. Westinghouse Electric purchased part of the facility in 1973 for use as warehouse space [34]. In 1975, the CCHD investigated an oil film on Coldbrook Creek (formerly Miller Creek) [35]. The investigation showed that oil from a transformer being moved at the warehouse had been emptied by a contractor. The oil had flowed into Coldbrook Creek via a storm drain at the plant. Westinghouse personnel stopped the contractor when it was noticed by an employee. CCHD took samples of the oil and water from the creek [32]. No testing results were available concerning these samples. Analyses would most likely have included tests for detection of PCBs.

No information was readily available concerning the waste management practices employed by American LaFrance from 1980 to 1985. However, it is possible that their operations used hazardous materials, generated hazardous waste, and may have included plating operation.

2.4 CURRENT SITE CONDITIONS

The site is bounded by a vacant parcel owned by the City of Elmira City School District to the south, residential housing to the west and north, and Consolidated Rail Corporation to the east [54]. The present owners of the 82.96-acre property are City of Elmira City School District and Figgie International Inc. of Richmond, Virginia [55].

In terms of current usage and conditions, the site can be divided into three (Figure 2): the southern part comprising essentially a parking lot and athletic field; the middle part consisting of industrial buildings within a chainlink fence; and the northern part occupied by the Southside High School.

Near the southern boundary, the property is thinly vegetated with overgrown brush. This area extends across to both east and west boundaries. A large concrete box culvert that formerly transmitted water under the railroad exists in this area along the eastern boundary; the drainage swales are filled in. Northward, the overgrown area thins into a grass athletic field, no longer in use. A partly paved parking lot occupies the western part of the area.

The industrial area which dominates the center portion of the property is enclosed by a fence on all sides and is attended by security guards. The buildings are constructed of brick, with glass windows extending upwards to intersect the metal roofs. The buildings in the eastern portion of the area appear vacant and poorly maintained with broken windows, no doors, and in a state of collapse. The large building on the western portion is in better condition and appears to be in use. The parking lots, driveway, and lawns surrounding the buildings show no signs of being maintained. Near the northern border of the industrial area with the high school is a large detention basin which appears to be an outlet for storm drainage pipes for the plant. The water detained in this basin, outlets by a small channel flowing eastwards through a large concrete culvert under the railroad to intersect with Coldbrook Creek, the outlet stream from Miller Pond.

The high school with its parking lots, athletic fields, and academic buildings dominates the remaining portion of the site.

3.0 REGIONAL FEATURES

This section summarizes the physiography, climate, land use, demography, natural resources, and water usage of the region in which the Remington Rand plant site falls.

3.1 PHYSIOGRAPHY

Chemung County comprises part of the southwestern plateau section of New York, located in the northern glaciated part of the Allegheny Plateau Physiographic Province, a mature eroded plateau dissected by streams and rivers during pre-glacial, glacial, and post-glacial times [36]. The region is characterized by flat-topped hills and ridges with long slopes.

The Elmira-Horseheads-Big Flats region constitutes a triangular valley system separated by a 9-square-mile bedrock hill, known as Harris Hill, which has a national reputation as a sail plane and gliding center (Figure 9) [37]. The northern reach of the triangular valley system between Big Flats and Horseheads is drained in a westerly direction by Sing Sing Creek. The eastern reach from Horseheads to Elmira is drained in a southerly direction by Newtown Creek. These creeks, in fairly wide valleys ranging in most places from 1.5 to 2.5 miles, discharge into the Chemung River which flows from Big Flats to Elmira through a narrow bedrock gorge only 0.25 mile wide in places.

The rounded U-shaped profiles of the larger valleys suggest that they were formed primarily by erosion from thick tongues of glacial ice that once occupied the valleys [36]. Slopes of the valley walls, although smooth for the most part, are steep. The uniform elevation and the almost level to gently sloping relief of the hilltops reflect the nearly horizontal character of the underlying shale and sandstone bedrock. In Chemung County, the highlands surrounding the large valleys range in elevation from 1,500 to 1,800 feet National Geodetic Vertical Datum (NGVD). Elevations of the valley floors range from 775 to 900 feet NGVD for a typical relief of approximately 900 feet.

Prior to glacial times, principal drainage in the region was directed to the north, the reverse of the present situation [36]. For example, it is believed that the Chemung River once flowed from Big Flats northward into the Seneca Lake Valley. However, during glacial times as a tongue of ice progressed southward down the Seneca Valley, the river's course was diverted eastward toward Horseheads from where it took a southerly course through the valley now occupied by Newtown Creek. Ice continued to advance down the Newtown Creek valley into the Elmira area, and down the Seneca Lake valley into the Big Flats area, and eventually obscured the Chemung River in the southern reaches of the watershed. With the flow of water toward Horseheads restricted, the Chemung River was diverted across the uplands southwest of Elmira where the water carved the gorge that forms its present course. Newtown Creek established its position in the north-south valley as a main tributary to the Chemung River.

The Chemung River presently originates in Steuben County near Bath, New York, and flows southeast through Corning, Big Flats, and Elmira. From Elmira, the Chemung River continues southeast into the Susquehanna River approximately 2 miles south of Athens in Bradford County, Pennsylvania.

The plant site is situated on the broad glacial valley of the Chemung River, about 1 mile southwest of the confluence of this river with Newtown Creek.

3.2 CLIMATE

The climate in the region is humid-continental [36,38]. The summers are pleasantly warm, although in the peak summer months it is not uncommon for temperatures to reach above 90°F in the lower valleys. The winters are relatively long and quite cold with the lowest temperatures ranging between -1° and -15°F. The mean annual temperature is 49°F. Snow generally covers the ground from about mid-December to early March. Seasonal snowfall in the main river valleys is among the lightest in New York. Wind direction is variable but generally comes either from the Great Lakes to the northwest or from the south-southwest. Annual precipitation is about 34 inches in Elmira. A month-by-month summary of temperature and precipitation data recorded in Elmira is as follows [36]:

Temperature and Precipitation

Month	Temperature °F Average Daily Maximum	Temperature °F Average Daily Minimum	Precipitation (inches) Average Total	Precipitation (inches) Snow Average Monthly Total
January	35	19	1.8	9
February	36	18	2.0	10
March	44	25	2.8	9
April	57	36	3.1	2
May	70	46	3.8	0
June	80	44	3.4	0
July	84	59	3.5	0
August	82	57	3.8	0
September	74	50	2.7	0
October	63	40	2.8	(1)
November	49	32	2.5	3
December	37	22	2.1	8
Year	60	39	34.3	41

(1) Trace

3.3 LAND USE

In 1981, the USGS in cooperation with the New York State Department of Health compiled a land use map for the Elmira, Horseheads and Big Flats area of Chemung County [37]. Land use was divided into eight categories: (1) industrial and extractive, (2) commercial and services, (3) transportation, (4) farmland, (5) forestland, (6) residential, (7) open public land, and (8) water and wetlands (Figure 9).

The city of Elmira, village of Horseheads, and village of Elmira Heights all contain relatively large areas of open public land. Residential, industrial, and commercial areas have expanded at the expense of agricultural land. Residential and commercial areas occupy more than half of the valley floor; industrial and extractive operations occupy approximately 6 percent of the valley area. The major industrial centers are located in the village of Horseheads and the city of Elmira. Major industries include food processing, glass production, metal fabrication, and manufacture of electrical equipment.

Most of the major industries are situated along the western and southern sides of the intersecting Chemung River and Newtown Creek valleys. Industrial and commercial warehouse operations are located in a former army depot in the village of Horseheads. The center of the valley region in the vicinity of Elmira Heights comprises mostly residential with some commercial land. The new Chemung Correctional Facility is under construction in the town of Southport.

Major transportation facilities, including two railroads, an interstate highway, and an airport, have helped Elmira and Horseheads maintain significant urban communities. There are no major tracts of forestland within the valley portions of the region.

3.4 DEMOGRAPHY

In 1980, the total population of Chemung County was 97,656 [39,40]. Of this total, 95,213 were native born and 2,443 were foreign born. Approximately 69-1/2 percent of persons over 25 years old completed high school. Of the total population, 74,027 persons were 16 years of age or older and eligible to work. The portion of this number considered as the labor force was 42,876 persons; the remaining 31,151 were considered non-labor persons. Those not considered in the labor force include students, housewives, retired workers, seasonal workers who were not looking for work, inmates of institutions, disabled persons, and persons doing incidental unpaid family work (less than 15 hours/week). Of the workers in the labor force, approximately:

- 9.5 percent work in the city of Elmira central business district
- 38.4 percent work in the remainder of the city of Elmira
- 34.3 percent work in the remainder of Chemung County
- 11.3 percent work outside of Chemung County
- 6.5 percent did not report where they work

The distribution of occupations among those employed in 1980 were divided as follows:

- 22.5 percent managerial and professional specialty occupations
- 29.7 percent technical, sales, and administrative support occupations
- 14.5 percent service occupations
- 1.6 percent farming, forestry, and fishing occupations
- 12.0 percent precision production, craft, and repairs occupations
- 19.6 percent operators, fabricators, and laborers

Per capita income in 1984 was $9,443. Mean family income is dependent on the numbers of workers in the family. Estimates for 1979 were:

Number of Workers in Family	Mean Family Income
0	$10,196
1	$17,586
2	$23,306
3 or more	$31,624

Since the 1970s, the towns of Elmira and Horseheads have been in a period of economic recession. With the shutdown of Remington Rand, Ann Page Foods, American Bridge, and other companies, many jobs have been lost. Over the period between April 1980 and December 1984, the population decreased in Chemung County by 1.2 percent. The economic outlook for the region is somewhat improving with the establishment of the Toshiba-Westinghouse joint venture, the reopening of Thatcher Glass Company, and construction of the new state prison in the town of Southport.

3.5 NATURAL RESOURCES

The natural resource which is the most critical to the Elmira area is the ground water aquifer underlying the valley (Figure 10). It is estimated that the Elmira-Horseheads-Big Flats area obtains 18.4 million gallons per day (mgd) from the Newtown Creek aquifer. The volume of ground water storage in the aquifer has been estimated at 33 billion gallons [41]. Typical yields from wells in the valley are between 50 and 500 gallons per minute (gpm) (Figure 11). Well yields as high as 500 gpm to greater than 1,000 gpm have been obtained in some areas of the valley. Long-term well yields are of concern because present pumpage of 18.4 mgd is approximately equal to estimated annual recharge of 18 mgd (37).

Sand and gravel are excavated in large quantities from a pit on the east side of Newtown Creek, about 2,500 feet north of E. Franklin Street. The primary use of this sand and gravel is in the construction of roads and highways. Other small sand and gravel operators are opened up for short periods to supply local needs.

3.6 WATER USAGE AND WATER DISTRIBUTION

Public water supplies in the region are provided by the Elmira Water Board (EWB) which services the city of Elmira, the village of Elmira Heights, and parts of the town of Horseheads [42]. The extent of the EWB water distribution system is illustrated in Figure 12.

The EWB relies on supplies from three district sources: the Hoffman Creek Reservoir, the Chemung River, and ground water wells [42].

The Hoffman Creek Reservoir is located approximately 1 mile north of the filtration plant south of West Hill Road in the city of Elmira. The reservoir impounds water from a drainage area of approximately 5 square miles. It was originally constructed in 1870 and was re-excavated in 1930 and 1939. The earthen dam reservoir is the only substantial water supply impoundment in the region, having a storage capacity of 150 million gallons. From this reservoir, water flows to a coagulation basin where it is treated with chlorine for sanitation, and alum to coagulate and settle out impurities. The treated water then flows through rapid sand filters located in the filtration plant south of West Hill Road and then into a Low Service Reservoir. Since 1941, a small amount of ammonia has been added to the water leaving the plant to neutralize the taste of residual chlorine. The water is then lifted 104 feet and sprayed into a High Service Reservoir (Distribution Reservoir). In addition to the High Service and Low Service storage reservoirs, the EWB system also includes four additional storage reservoirs, which combined with the Low and High Service Reservoirs, have a storage capacity of nearly 14 million gallons. The storage capacities of these smaller reservoirs are summarized below [42]:

Name of Reservoir	Elevation (ft mean sea level)	Capacity (MG)
Distribution (High Service)	1,045	5.0
Low Service	944	3.5
Westside	1,032	0.5
Eastside	1,035	1.5
Southside	1,040	1.4
J.M. Caird	1,025	2.0
		13.9

A second source of water for the EWB system is the Chemung River. The drainage area of the Chemung River basin for the portion upstream of the filtration plant intake located in Elmira is approximately 2,050 square miles. Water from the Chemung River is drawn into the system by two intake structures located in the river west of the Walnut Street bridge. From these intake structures, the water flows through double gravity pipelines into stilling wells located under the pumping station at the corner of Winsor Avenue and Hoffman Street. Water is pumped through a 24-inch line to the coagulation basin at the Filtration Plant Complex. At the present time, there are three pumping units in the Winsor Avenue Station: one 8 mgd unit installed in 1934, one 12 mgd unit installed in 1942, and one 9 mgd unit installed in 1962 [42].

The third source of water for the EWB distribution system, is a network of five ground water supply wells. The first well developed by the EWB for supply purposes is located on the east side of Sullivan Street, south of Thurston Street. The well, drilled in 1960 and 98 feet deep, is gravel-walled with a 32-foot shutter screen, and is capable of producing 3 mgd. The screen was placed between the elevations of 759 and 789 feet NGVD in stratified layers of sand, silty sand, and sandy gravel. In 1963, a zeolite softening plant was added at the Sullivan Street site to reduce the hardness of the water produced by the well to 150 mg/liter. An additional 3-mgd well was constructed at the Sullivan Street well site in 1968 which is now alternated with the first well and, in emergency situations, may be used in combination with the first well to produce 6 mgd without softening [42].

The second well site to be developed by the EWB was required when the Ann Page food processing plant moved to Chemung County. A 1-mgd capacity well was completed in December 1962 at the north end of Kentucky Avenue in the town of Horseheads, which pumped directly into the 24-inch main servicing the plant. The well is 18 inches in diameter, 64 feet deep, with a 10-foot-long stainless steel screen. The screen was placed between the elevations of 845 and 855 feet NGVD in a zone of well-graded gravel with minor fines. In 1980, the Kentucky Avenue well was found to be contaminated with levels of trichloroethylene (TCE) which exceeded recommended drinking water standards. Later in 1980, the Kentucky Avenue well was taken out of service by the EWB [42].

The reduced water capacity, due to the removal of the Kentucky Avenue well from the system, has been supplemented through increased use of filtered surface water from the Chemung River and increased pumping during peak demand periods from the Sullivan Street wells. The primary demand for the Kentucky Avenue well was based on the needs of the Ann Page food processing plant. The shutdown of this plant in the 1970s reduced the immediate demand on the Kentucky Avenue well. The existing water supply and distribution system is adequate under present conditions; however, given the potential for reopening of operations at the food processing plant, and increases in the regional population, water-supply sources may have to be expanded in the future [42].

Also servicing the city of Elmira with water are two 1-mgd capacity wells located on the south side of the Chemung River near West Hudson and South Hoffman Streets. These wells are the only sources of community water on the south side of the river. All of the EWB well installations are equipped to provide chlorination and fluoridation.

The following table presents a summary of the approximate average supply and usage of water in the EWB system for the years 1985 and 1986 [43,44].

SUMMARY OF ELMIRA WATER BOARD SUPPLIES AND USAGE
1985 Statistics

Source	Capacity (mgd)	Usage (mgd)	Percent of Total Usage
Chemung River	12	5.34	56.2
Hoffman Creek Reservoir	2	0.02	0.2
Sullivan Street wells	6	2.76	29.0
Hudson Street wells	2	1.39	14.6
Kentucky Avenue wells	1	0	0
Totals	23	9.51	100

1986 Statistics

Source	Capacity (mgd)	Usage (mgd)	Percent of Total Usage
Chemung River	12	5.19	54.1
Hoffman Creek Reservoir	2	0.02	0.2
Sullivan Street wells	6	2.88	30.0
Hudson Street wells	2	1.50	15.7
Kentucky Avenue wells	1	0	0
Totals	23	9.59	100

In the village of Horseheads, four wells have been completed to date which tap the Newtown Creek aquifer. These wells are referred to as Horseheads Well Nos. 1, 2, 3, and 4. Wells 1 and 2 are pumped 24 hours a day at rates of 1.2 and 1.4 mgd, respectively. Average use for the village of Horseheads is about 2 to 3 mgd. Well No. 3, located at the northern end of the industrial park in Horseheads, was closed due to a high iron bacteria content in 1967. Well No. 4, located about 400 feet east of Knispel Construction Company along Newtown Creek, became contaminated with benzene and is under investigation by the New York State Department of Environmental Conservation (NYSDEC).

Average per capita residential water use is estimated to be 65 gallons per day (gpd) [45]. Water is distributed to most residential areas via 4- to 12-inch water mains. Some residences, primarily in the Elmira Heights-Horseheads area, still rely on individual domestic wells for their water supply. As a result of TCE contamination of some domestic wells, water mains have been extended and new water services installed along Lenox Avenue, Rockwell Avenue, California Avenue, Mulberry Street, Lake Road, and Old Corning Road.

In addition to the water supply and distribution system described above, some of the major industries are supplied by their own individual wells. As previously mentioned in Section 2.3 above, Remington Rand process water used for the wet process treatments was pumped from five company wells having a combined pumping capacity of 2,760 gallons per minute (mgd) (Figure 6) [17]. These supply wells were later used by American LaFrance for cooling purposes [16].

Sewage treatment for the region is handled by Chemung County District No. 1 located on Lake Road.

A 48-inch trunk sewer line brings sewage water into the treatment plant at a design flow rate of 4.8 mgd. Preliminary treatment of the sewage consists of comminution (grinding), screening, and grit removal (sedimentation basin). Preliminary treatment is followed by primary sedimentation. Water is then treated by primary and secondary trickling filters, followed by secondary sedimentation. As a final step, the water is chlorinated prior to discharge into Newtown Creek. The discharge from the treatment plant is piped 3 miles to a location on Newtown Creek 1/4 mile upstream of the confluence with the Chemung River. The sludge retained during the sedimentation processes is handled through a two-stage anaerobic digestor, then air dried on sand drying beds. The dried sludge is stored onsite and is periodically transferred to the solid waste landfill in Lowman, in the southeast part of Chemung County.

4.0 WASTE MATERIALS

The purpose of this section is to summarize the nature and extent of possible waste areas present at the plant site and characterize the probable nature of the waste components to the extent practicable using the available information. The history of operations conducted at the plant site was described earlier in Section 2.3. Little information was readily available covering the periods prior to, and after Remington Rand ownership, although hazardous materials were doubtless used and waste products generated during these periods also.

4.1 WASTE DISPOSAL

During the period of operation by Remington Rand plant, from 1937 to 1972, the primary products produced were typewriters and office machines [9]. In 1967, the production involved both mechanical and metal finishing operations. Included in the latter category were cleaning, tumbling, pickling, heat treating, buffing, polishing, plating, stripping, metal blackening, and conversion coating treatment [17]. Tables 1, 2, and 3 provide a list of raw materials used and waste products produced in the production operations. During WWII, the plant also produced primers for high explosive anti-aircraft shells, Norden bomb sights, and related war articles [9,10,11]. Disposal of waste products reportedly involved both land disposal and discharge to surface water [2,18,46]. The products generated at the Remington Rand plant were similar throughout its 35-year history. The waste products are also anticipated to be similar as are the methods of operation, although technological changes are anticipated to have occurred.

4.1.1 Land Disposal

As early as 1938, aerial photography indicates surface disturbed areas were present (Figure 13). One area is north of the pond and power plant on the east side of the site, and another on the south side. By 1955, the "N" plant and a parking area had been constructed over the southern area, and a disturbed area existed along the railroad tracks on the southeastern part of the plant site (Figure 14). The disturbed area north of the pond was significantly enlarged by this time (Figure 14). These areas may have been disposal areas for plant waste products. By 1976, the southern disturbed area appeared to be well vegetated, indicating non-use for an extended period (Figure 15). The area north of the power plant appears to have been used for a laydown or staging area at this time.

Fly ash, and bottom ash from the power plant may be present in these plant areas. Based on the information available, disposal of wastes on the plant site may be presumed to have occurred until sometime after 1965.

4.1.2 Disposal to Surface Waters

During the same period as land disposal was occurring, liquid wastes were being discharged to surface waters (Figure 8). The results of chemical analyses of surface water performed in 1952 are also provided in Appendix B [2]. The discharged waters were noted to have excessive chromium. Based on sampling performed in 1965, the discharge stream was recorded to have elevated amounts of zinc and cyanide [28]. The pH of one of the three samples taken was recorded at 9.6, which was above the 9.5 discharge limit. Observations by the Chemung County Health Department of the stream channel, about 25 feet below the point where the waste ditch enters the main stream, indicated an oil film and gassing sludge deposits [23].

The storm drain system, as recorded in the 1967 Lancy Laboratory report [17], collected waste products from various parts of the plant (Figure 17). Prior to the installation of the treatment facility, untreated wastes were collected and discharged to the drainage ditch [22]. The 1958 Industrial Report states that at that time plating waste, cooling water, blowdown water from the boiler, and drainage from the plating and oil storage room in Building 49 were all discharged directly to the drainage ditch. Cutting oils were also most likely discharged as three oil skimmers were included in the discharge system (Figure 8). By comparing the department number shown on Figure 17 with those listed in Table 3, the locations of various plant operations can be determined. The location of the plating operation and related operations where heavy metal and cyanide solutions were used were located in Department 19. Reduced copies of selected Lancy Laboratory drawings are provided in Appendix D. These drawings show the equipment layout and type of solutions used in various operations.

The information available relates to post-WWII plant operations. The basic operations most likely did not change significantly over the period of operation; however, the location of the various departments within the plant most likely changed when the assembly lines were relocated in 1963 [52]. The 36-inch storm line shown on Figure 8 most likely transported the wastes to the discharge channel in the early pre-WWII years. The size of the line in comparison with the culverts noted in the 1958 Industrial Report indicates the 36-inch line would be of sufficient size to transport all of the plant waste streams. Plating operations were most likely originally in building 49 and were probably in use prior to 1937 when Remington Rand acquired the site.

Considering the types of materials being transported, the pipes would most likely experience sludge buildup. This was confirmed by a letter from Remington Rand after the company had cleaned the lines and blocked off or rerouted others [28].

4.1.3 Subsurface Disposal

In addition to the surface water discharge, there was also apparently direct discharge to the subsurface. A drainage pit was noted to be in existence near the wire-pickling operation in building 44 when Lancy Laboratories performed the study in 1967 (Figure 17). Lancy proposed adding a sump into which sodium hydroxide (NaOH) could be added to control the pH when the sulfuric acid (H_2SO_4) for pickling was dumped. The drainage pit had an overflow to the storm drain leading to Miller Creek.

Details of the construction of the tumbling sludge settling ponds located east of the plating area department 19 were not readily available (Figure 17). If these areas are unlined, infiltration of liquid wastes may have occurred. Also, there may be more than one location of these ponds. The Lancy Laboratory drawings show the post-WWII location, but the pre-WWII location is unknown. The 1938 photograph does not indicate the presence of the ponds except the natural spring-fed pond.

A french drain was noted around the sludge filters located between the northwest corner of Building 66 and the settling ponds. The drain and filters may be part of the Lancy Laboratory addition for a treatment system; however, only details for the settling tank were noted on the drawings. The sludge filters may have been in operation prior to the treatment facility. A four-inch collection line was installed with the french drain and most likely directed the flow to the storm drain system (Appendix D).

4.2 MCINERNEY FARM SITE

The McInerney farm site, located about 0.5 mile south of the plant, was purchased in 1952. In 1987, during construction of the Chemung Correctional Facility, buried drums and contaminated soils were encountered in excavations. One of the drums encountered bore the name *Rand Corporation* [58].

Three areas of disposal have been observed to exist at the McInerney farm site:

- North of Seeley Creek
- On the south side of Seeley Creek
- Within the Chemung Correctional Facility construction area

Available laboratory test results on material removed from four pits inside the prison construction area have indicated the presence of relatively low levels of some volatile organic compounds such as ethylbenzene, toluene, xylene, and several semivolatile organic compounds in some of the samples tested. These compounds are common components of oils and paint wastes. In a few samples, EP toxicity tests have released the presence of a number of heavy metals (As, Hg, Se, Ba, and Cr) and some PCBs at very low levels, generally below 1 ppm. Laboratory test results of the soils and waste material encountered are summarized in Table 4. Waste products similar to those encountered at the farm site may be anticipated to occur at the plant site if land disposal occurred in the plant area [58].

4.3 OTHER OPERATIONS ON RAND PROPERTY

In 1941, the Elmira plant of Remington Rand was fulfilling a contract with the Navy for primers for high explosive anti-aircraft shells [10]. Very little information was available on the extent of this operation, or in what part of the plant it was performed. Explosive powder and waste products may have been disposed of in the area now occupied by the parking lot on the south side of the "N" plant, and the recreation area south of the plant [49,57].

The "N" plant was operated until November, 1943 by the Rand Corporation. In 1943, the Navy took over operation of the plant until production ended in October, 1944

[53]. No readily available information was encountered on waste products associated with this operation.

The plant site has, since the 1880s, been used for industrial purposes, primarily forging and milling steel products. In 1975, during ownership by Westinghouse, a spill occurred from a transformer containing oil. Waste oils and associated solvents would have been used in the various other plant operations by P.W. Payne Brothers Company and the Willys-Morrow Company. Waste products could have been disposed of in the plant area by the previous companies.

Figure 18 indicates the approximate locations used for the storage, handling, or disposal of potential hazardous materials or waste products based on the available information reviewed.

4.4 WASTE COMPONENT CHARACTERISTICS AND BEHAVIOR

The waste components listed in Tables 1, 2, and 3, and identified in the samples of soil and waste collected from the Chemung Correctional Facility trenches, are described in terms of their characteristics and behavior in Appendix C. This information was adapted and compiled from:

Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd Ed., by Marshall Sittig, Nlyes Publication, 1985.

Dangerous Properties of Industrial Materials, 6th Ed., by N.I. Sox, Van Nostrand Reinhold, 1984.

The Condensed Chemical Dictionary, 10th Ed., by G.G. Hawley, Van Nostrand Reinhold, 1981.

5.0 HYDROGEOLOGY

The hydrogeologic characterization presented in this section includes a description of the bedrock geology, soils, and the ground water based on a compilation of information available in the literature.

5.1 REGIONAL GEOLOGY

As mentioned in Section 3.1, physiographically, Chemung County is characterized as a mature, eroded plateau which has been carved out and reformed through stream erosion and glacial action. As a result of this glacial action and erosion by streams, the regional geology is typified by bedrock overlain by thin unconsolidated deposits in the uplands and thick unconsolidated deposits in the valleys. Within the unconsolidated material in the valleys, glacial deposits are generally overlain by more recent alluvial deposits. The discussion that follows will begin with the bedrock and work stratigraphically upwards through the younger deposits.

Figure 19 shows typical profiles of the valleys in the Elmira area. Sections D-D' and E-E' are anticipated to be representative of the geological stratigraphy near the Remington Rand plant site.

5.1.1 Bedrock

During the Devonian Period, approximately 350 million years ago, shallow seas covered much of New York State, leaving deposits of marine sands, silts, clays, and reefs. Through geologic time, these sediments became consolidated into the rocks that are now called sandstone, siltstone, shale, and limestone. Bedrock exposed in outcrops or underlying the surficial deposits in Chemung County can be divided into two groups [36]. The older group, called the Portage Formation, consists of beds of gray flaggy shale, alternating with beds of thin, hard, fine-grained sandstone. The younger group, called the Chemung Formation, overlies the Portage Formation and is represented by two members: the Cayuta Shale at the bottom, which consists of about 600 feet of alternating layers of soft, gray shale and siltstone, and thin-bedded, fine-grained gray sandstone; and the Wellsburg sandstone at the top, which consists of 400 to 800 feet of interbedded shale, siltstone, and fine-grained flaggy sandstone. Depth to bedrock in the Elmira-Horseheads area generally ranges from zero in the highlands to about 400 feet in the deeper part of the valleys where the rocks have been scoured by glacial ice [36].

Structurally, the main feature of the bedrock in the region is a gentle dip to the south of about one degree from the horizontal. Superimposed on this monocline is a series of broad open folds (anticlines and synclines) that trend approximately east-west and are spaced about 5 to 10 miles apart. A joint pattern can be found parallel to and perpendicular to this trend [36]. The rock units exposed on the sides of the valleys and uplands were most likely subjected to more stress as a result of the "plucking" action of glaciers trying to dislodge the rock. Therefore, more open joints and subsequent weathering may have taken place which would increase the shallow permeability.

Previous studies indicate that the bedrock in the Horseheads area is at least down to about elevation 600 NGVD, and that the bedrock surface may contain undulations or bowl-shaped depressions [42]. In the Elmira Heights-Horseheads area, thick glacial deposits are present and bedrock may be as much as 500 feet below ground surface (approximate elevation 400 feet NGVD) [42].

5.1.2 Glacial Deposits

During Pleistocene time, a continental ice sheet covered the region [36]. The ice sheet was most likely preceded by the movement of tongues of ice down the major valleys. As these lobes of ice moved, they deepened and broadened the valleys. Eventually, the ice sheet associated with these lobes of ice completely covered the uplands as well as the valleys. Because the ice was thicker and moved faster in the valleys, it caused greater erosion of the bedrock in the valleys than on the uplands.

The materials eroded by the moving ice were transported and deposited in an almost continuous layer over the area as an unsorted mixture of clay, silt, sand, gravel, and boulders [36]. These materials, termed glacial till, were later compressed by the weight of successive ice sheets.

The uplands were also covered by a continuous mantle of glacial till. The till ranges in thickness from almost nothing on some hilltops to significant depths on some of the lower slopes. Glacial activity was much less on the uplands due to the thinner ice sheet and slower movement of ice. Consequently, since the character of till is largely determined by the underlying bedrock, the glacial till deposited on the uplands was principally derived from local shale, siltstone, and fine-grained sandstone. The upland till has a silty texture and contains many fragments of local rock [36].

In the valleys where glaciation was more active, the till contains material that may not be locally derived. In the Elmira area, this "erratic" material is limestone transported from the north. The till deposits have an irregular, undulating surface [36].

When melting in summer exceeded growth in winter, the ice sheet ceased to advance. The recession was most rapid on the uplands where the ice was thinner. The valleys were most likely still chocked with lobes and blocks of stagnant ice. As the ice melted, the material it had picked up was transported by melt water into other parts of the valley. The melt waters flowing from the ice front were heavily laden with rock debris from the ice. As the volume of water became less, the ability of the streams to transport material diminished and this resulted in deposition of sand and gravels in the stream channels. These deposits are generally known as outwash. Extensive areas of outwash are found throughout the stream valleys [36].

Prior to the last advance of ice over the Chemung County area in Wisconsinan time (10,000 to 12,000 years ago), the drainage of the area was to the north [36]. As the ice advanced southward, the drainage of the streams was blocked and glacial lakes were formed. Within these lakes, horizontal layers of clay, silt, and fine sand were deposited by slow moving waters. These deposits are known as lacustrine deposits. Glacial Lake Newberry, which included the Seneca and Cayuga Lake basins, discharged waters southward through the valley at Horseheads. Remnants of the lacustrine sediments can be found locally in the valley near Elmira and Horseheads (Figure 20). The gorge in which the Chemung River flows today southwest of Elmira, was the result of ice blocking the pre-glacial drainage path from Big Flats to Horseheads.

As the ice continued to advance southward, the melt waters cut channels in the lacustrine deposits and later filled them with younger outwash sand and gravel [36].

Interspersed with the glacial deposits, particularly near the bases of steep slopes, are deposits of material called "colluvium." Colluvium is a general term applied to loose and incoherent deposits of rock fragments derived from the in-place weathering of geologic materials (rock, till, alluvium) and brought to their present position chiefly by gravity [36]. Some of this colluvium was deposited in the Pleistocene epoch; some in the Recent epoch.

5.1.3 Post-Glacial and Modern Alluvial Deposits

Just as icemelt waters deposited unconsolidated sediments during the Pleistocene epoch, the modern day streams are dropping sediment loads into their channels and onto adjacent floodplains. The grain sizes of these modern alluvial sediments are dependent upon the river's capacity to transport and deposit its sediment load. The sediments range from coarse sands and gravels to very fine sand and silt, and in most places are moderately well to well sorted. In a few places along the sides of the major valleys, tributaries have brought sediment into the valley forming "Alluvial Fans."

5.1.4 Soil Development

The surface soils are developed as a result of climate, plant and animal life, parent material, topography, and time. These soils are important from the standpoint of infiltration and runoff and the effect on recharge of the ground water aquifer.

The type and texture of surface soils in the region are a reflection of their underlying materials. The extent to which a soil profile is developed is determined, to a large degree, by slope, vegetation, and depth to the water table. Generally speaking, the natural soils in the area of the plant site can be categorized into two soil associations (Figure 21) [36]:

- The Howard-Chenango association which consists of deep, well-drained to somewhat excessively-drained, gravelly, and channery soils. The soils are located on glacial outwash terraces and old alluvial fans that have nearly level to gently sloping topography.

- The Tioga-Unadillo-Howard association consists of deep well-drained to somewhat excessively-drained soils on floodplains, and silty and gravelly soils on adjacent terraces. The soils are located on nearly level to gently sloping topography.

5.2 REMINGTON RAND PLANT SITE

The Remington Rand plant site general stratigraphy consists of fill and relatively thin alluvial soils largely affected by site development, overlying thick glacial deposits on bedrock [37]. The glacial deposits consist of outwash sands and gravels, lacustrine silts, and glacial till. The glacial till, if encountered, would typically form a basal unit overlying bedrock. Lacustrine deposits could be encountered within the outwash sands and gravels. Variations may occur both horizontally and vertically throughout the outwash deposits.

5.2.1 Bedrock

There is currently no site-specific information available for the plant site relating to bedrock. Based on the available literature, the bedrock consists of the Upper Devonian Portage Formation. The formation reportedly has few outcrops in the vicinity of the plant site [36], generally being covered by glacial deposits in the valleys. The Enfield Member is the only member represented in the site region. It consists of beds of gray, flaggy shale alternating with beds of thin, hard, fine-grained sandstone.

The valley walls and bedrock on the uplands flanking the valley are formed by the Chenango Formation. The Chenango Formation has two members. The lower Cayuta shale consists of alternating layers of soft, gray shale and siltstone, and thin-bedded, fine-grained, gray sandstone. The Upper Wellsburg sandstone consists of interbedded shale, siltstone, and fine-grained flaggy sandstone. Both formations consist of similar rock units, thus requiring careful examination to differentiate.

In the Southport-Elmira area, bedrock is estimated to have a relatively flat surface (Figure 19, Section E-E') at approximate elevation 780 NGVD feet at west side of valley (about 70 to 100 feet below ground surface).

5.2.2 Glacial Till

Glacial till consists of dense, unstratified heterogeneous mixture of clay, silt, sand, and gravel. Literature indicates the material is well graded, ranging from gravel to silt and clay. The material typically has a low permeability due to its dense nature. From the literature, if the till is present, it may be of limited thickness and would be expected to be encountered directly overlying the bedrock.

5.2.3 Outwash Deposits

The available literature indicate outwash deposits to be present beneath the entire plant site. The outwash deposits consist of sands and gravels, generally with small amounts of silt. Although the outwash has been classified as a single unit, there are many localized variations, especially in the sand and gravel content. The deposits vary in consistency from medium to very compact, with occasional loose areas. The outwash deposits may have a thickness in excess of 100 feet [42] and generally extend up to within a few feet of the ground surface.

5.2.4 Lacustrine Deposits

The lacustrine deposits consist of silt and fine sands. These sediments are generally loose to dense and may contain gravel along the edges of the deposit. Due to the fine-grained and dense nature of the deposit, the permeability is anticipated to be low and the unit would be expected to act as an aquitard. The presence of this unit may cause local variations in the flow of ground water.

5.2.5 Alluvial Deposits

The most recent deposits of these sediments are encountered along the floodplains of the present day stream courses, such as Coldbrook Creek. Older deposits of alluvium also form the surficial layer on higher terrace levels. The alluvial deposits may be limited in thickness (less than several feet) and may not be present at all locations.

5.2.6 Surface Soils

Three soil series are present in the vicinity of the plant site [36]: Alluvial land, Howard silt loam, and Unadillo silt loam (Figure 21). Man-made fill may also be encountered expected to be present.

The Alluvial land consists of unconsolidated alluvium that is frequently changed as a result of stream overflow. The soils have a considerable range of textures within short distances. Some areas may be gravelly and others silty. Drainage ranges from good to very poor. These soils occupy the area in the stream bed of Coldbrook Creek.

The Howard series consists of deep, well-drained medium and moderately coarse textured soils that develop in stratified outwash deposits.

The Unadillo series consists of deep, nearly level, well-drained silty soils. These soils, developed in deposits of silts and very fine sands on stream terraces. The Howard and Unadillo series occupied the southern part of the site prior to construction of the plant.

The entire plant area and part of the recreation field are all classified man-made soils, indicating the original Unadillo and Howard series have been disturbed by the action of men.

5.3 GROUND WATER

Three sources of ground water exist in the region [36]: outwash deposits in the Chemung River valley, glacial till on the uplands, and bedrock.

The upland wells in till are marginal producers, and the rock wells are suitable for single family usage. The wells in till are shallow and large in diameter and may produce 100 gpd [36]. Water is transmitted through permeable sand seams within the till. Bedrock wells on the uplands may produce 8 gpm and are suitable for single family use [36]. The productivity of the well is dependent on the fractures in the rock that are encountered. Bedrock in the valleys has not been developed as an aquifer due to the quantity of water available from the overlying outwash deposits.

The outwash sand and gravel is the principal aquifer with well yields capable of 1,000 gpm [37]. The aquifer is generally considered to be under water table conditions. Localized non-water table conditions may be present due to lower permeability lacustrine zones or aquitards in the outwash deposits.

The stratigraphy, areal extent, and character of the outwash sand and gravel have previously been discussed in this section. Saturated thickness of the aquifer ranges from 10 to 100 feet but is generally from 15 to 40 feet thick (Figure 9). Depth to ground water typically varies from 5 to 20 feet [42].

The ground water flow for the region is primarily to the southeast along the Chemung River Valley (Figure 23). However, in the vicinity of the plant site, the general direction of ground water flow is anticipated to be to the east (Figure 23). Local variations may occur due to the presence of less permeable soils and recharge from the uplands.

Recharge to the outwash aquifer occurs primarily by infiltration of precipitation directly into the aquifer [37]. On the oversteepened hillsides adjacent to the aquifer boundary, the upland soils developed from bedrock or till have moderate permeability and precipitation is unable to infiltrate in significant amounts. The water flows overland into the valley, as surface runoff, and infiltration occurs through the Unadillo silt loam. This soil is derived from the permeable stratified sand and gravel deposits and is, itself, permeable with a loose, porous, well-drained subsoil. Figure 24 shows the distribution of the infiltration capacity of surface soils throughout the site region.

A less significant amount of recharge to the outwash aquifer is derived from the bedrock adjacent to and beneath the aquifer. The water that infiltrates the soils on the uplands flows through the bedrock and till toward the valleys and recharges the outwash sand and gravel aquifer. Influence of recharge from bedrock and till may be evidenced by higher ground water levels at the edges of the valleys.

The geometry of the aquifer is defined by two surfaces: the base of the outwash aquifer and the water table. An average water table condition varying from 5 to 20 feet in depth below ground surface is shown in Figure 19 to represent the potentiometric surface [37].

Seasonal fluctuation of the water table in the aquifer is reported to be 8 to 12 feet. Water levels are highest and gradients steepest during the spring when recharge from precipitation and snowmelt is significant, and water loss from evapotranspiration is low. Water levels and hydraulic gradients typically begin to drop during summer and autumn in response to pumping when the aquifer also drains to streams and evapotranspiration diminishes recharge.

6.0 SURFACE WATER

This section summarizes the information available on surface water in terms of:

- Surface water bodies
- Sediments
- Surface drainage
- Flood potential

6.1 SURFACE WATER BODIES

Three streams and two ponds are of significance in considering surface water and drainage conditions. The streams are Coldbrook Creek, which was formerly known as Miller Creek; the Chemung River; and the drainageway from the onsite pond to Coldbrook Creek. A field sketch (Figure 8) drawn in 1958 indicates a swampy area where the drainageway enters Coldbrook Creek, although the current topographic map (Figure 1) does not show this area [21]. The two surface bodies are Miller Pond, east of the plant area, and the onsite pond south of the power plant.

The onsite pond is reportedly spring fed. Water flows eastward from the pond approximately 500 feet to the railroad culvert and then eastward toward Coldbrook Creek. Coldbrook Creek starts at Miller Pond and flows southward toward the Chemung River. The surface water from the plant site enters Coldbrook Creek about 2,000 feet south of Miller Pond.

Coldbrook Creek is a Class D stream, and the Chemung River is Class C. The drainageway from the pond to Coldbrook Creek is reportedly intermittent, being dependent on precipitation [46].

6.2 SEDIMENTS

Stream beds are anticipated to consist of silts and fine-grained sediments. The banks of the streams are also anticipated to consist of silt and fine-grained soil.

6.3 DRAINAGE

Natural surface drainage has been altered significantly by construction at the site. Drainage would either be to storm drains or flow eastward toward the railroad tracks.

Runoff from the disposal areas has a comparatively short distance to travel before reaching the surface water of the pond or drainage ditch, although the highly permeable nature of the natural surface soils and fill may tend to limit the amount of net runoff reaching the stream.

6.4 FLOOD POTENTIAL

Literature reports that the Elmira area has been subjected to severe flooding. The flood potential of the surface waterways in the Elmira-Horseheads area was illustrated and well documented during the flooding which occurred in June 1972, in response to the occurrence of Tropical Storm Agnes in which 7.5 inches of rainfall fell over the valley within a 5-day period. The city of Elmira sustained the most extensive flooding of any populated area in a flood zone of New York State. A maximum discharge rate of about 4,000 cfs was recorded at the Newtown Creek gauging station. This value was influenced by backwater from the Chemung River; a peak measurement of 5,200 cfs was estimated upstream at the East Franklin Street bridge in Horseheads. The discharge rate of Newtown Creek during Tropical Storm Agnes was equal to 1.08 times the rate associated with a 100-year flood [42].

The plant area lies above the 500-year flood zone. Coldbrook Creek (previously discussed), however, may be affected in the lower portion when the Chemung River floods [47].

7.0 HEALTH AND ENVIRONMENTAL CONSIDERATIONS

The possible disposal areas and potential contaminated areas are well vegetated or used as parking areas having asphalt or stone covering. There are no signs of distressed vegetation as observed from nearby public areas. The areas have unrestricted access, and on the northern portion of the site, a possible former plating area forms part of the Southside High School playing fields. The more recent plating area (1967) located on the west side of the property underlies the high school building and grassed area by the South Main Street entrance.

Surface water drainage is toward Coldbrook Creek or into Elmira storm drains. The flow from both will eventually enter the Chemung River.

Prevailing wind direction is from the northwest and south-southwest. There have been no reported air quality complaints received by the Chemung Health Department in relation to the plant site.

The plant site is underlain by glacial outwash that may exceed 100 feet in thickness. The outwash is considered an aquifer being used for domestic, industrial, and municipal water supplies. The area around the plant is serviced by the Elmira Water Board. Five wells are located on the plant site that were used for plant operations. Ground water is expected to flow in an easterly direction beneath the site. Community wells are located about 1 mile upgradient, to the north, of the site.

TABLE 1

RAW MATERIALS USED AT THE REMINGTON RAND PLANT IN 1958*

Nickel anodes	3,000 lbs per month
Steel	1,000,000 lbs per month
Sodium cyanide	6,000 lbs per month
Zinc	500 lbs per month
Copper anodes	300 lbs per month
Chromic acid and powder	40 lbs and 15 gallons per week
Cutting oils	10,000 gallons per month
Paint	5,330 gallons per month
Solid alkali cleaner (Oakite)	22,000 lbs per month
Liquid cleaners (Nistripper)	2,200 gallons per month

Production: 1,000 typewriters per day
150 adding machines

*From 1958 Industrial Survey Report prepared by Department of Health [21].

7/14/88

TABLE 2

INDUSTRIAL WASTE PRODUCED AT THE REMINGTON RAND PLANT IN 1967*

1. Solvent-oil sludges resulting from the periodic cleaning of vapor degreasers
2. Solvent emulsions resulting from the power washing machine cleaners and rust preventives
3. Soluble coolants resulting from coolants from mechanical operations
4. Oil wastes resulting from rust preventive oil dips
5. Paint wastes from water wash paint spray booths
6. Phenolic wastes from organic paint strippers
7. Rinse water after cyanide plating
8. Rinse waters after cyanide heat treating and cyanide nickel stripping
9. Rinse waters after chromium plating
10. Rinse waters after nickel plating
11. Rinse waters following cyanide flux removal
12. Rinse waters after sulfuric acid wire pickling
13. Solid cyanide wastes from heat treating
14. Cyanide wastes from filter back flushing
15. Nickel wastes from filter back flushing
16. Cyanide wastes from spent cyanide nickel stripping baths
17. Spent acid and alkali process solutions and sludges resulting from their intermixing
18. Acid and alkali rinse waters following nontoxic treatment process
19. Soaps and solids containing wastes from tumbling operations
20. Soaps and solids containing wastes from tumbling operations

*From 1967 report prepared by Lancy Laboratories [17].

TABLE 3

PLANT OPERATION AND WASTE PRODUCTS IN 1967*

Remington Office Machines Division
Sperry Rand Corporation

Elmira, New York

I. PLATING AREA (DEPARTMENT 19)

1. Stevens Automatic Plater

	Process Treatment	Tank Vol. (gal.)	Dumping Frequency
(a)	Alkaline electroclean	930	Weekly
(b)	Alkaline electroclean	800	Weekly
(c)	Hydrochloric acid dip	350	Once every 3 weeks
(d)	Water displacing dip (solvent emulsion)	475	Not dumped (Water layer removed)

2. Nickel Rack Strip (McDermid SR) 100 gallons once every 2 weeks

3.	**Chromium Plating Line**		
(a)	Alkaline cleaner	250	Weekly
(b)	Hydrochloric acid dip	190	Once every 2 weeks
(c)	Chromium rack strip	190	Once every 3 months
4.	**Aluminum Conditioning**		
(a)	Alkaline etch	50	Once every year
(b)	Chromate desmutter (Oakite 34)	5	Once every 6 weeks
5.	**Barrel Nickel Plating Line**		
(a)	Alkaline clean	350	Weekly
(b)	Hydrochloric acid dip	190	Weekly
6.	**Basket Nickel Plating Line**		
(a)	Alkaline electroclean	180	Weekly
(b)	Alkaline clean	180	Weekly
(c)	Hydrochloric acid dip (double tank)	80	Weekly
7.	**Pickle Line (Adjacent to Basket Nickel Line)**		
(a)	Alkaline cleaner	220	Weekly
(b)	Inhibited hydrochloric acid dip	75 gal	Monthly
8.	**Steel Blackening Line**		
(a)	Alkaline cleaner (two tanks)	650	Weekly
(b)	Hydrochloric acid dip	350	Weekly
(c)	Acidic burr removal Rosheen Fe	350	Once every 6 months
(d)	Neutralize	350	Weekly
(e)	Hot chromic acid rinse	350	Once every 2 months

7/14/88

TABLE 3 (Continued)

II.	HEAT TREATMENT (DEPARTMENT 16)			
	(a)	Alkaline clean (three thanks)	270	Weekly
	(b)	Hydrochloric acid dip (two tanks)	180	Once every 2 weeks
III.	WIRE PICKLING			
	(a)	Sulfuric acid pickle (10 percent H_2SO_4)	3,800	Once every 2 months
	(b)	Lime neutralize	1,500	Once every 2 months
IV.	PAINT AREA (DEPARTMENT 25)			
	1.	Phosphate Washer		
	(a)	Alkaline clean	650	Once every 2 weeks.
	(b)	Iron phosphate	650	Once every 6 months
	(c)	Rust preventive	650	Not dumped
	2.	Alkaline Rack Strip	5,700	Not dumped (sludge removed from tank bottom once a year)
	3.	Alkaline Work Strip	390	Same as above
	4.	Cold Paint Strip (Phoenix)	190	Once every 6 months
V.	FLUX REMOVAL AREA (DEPARTMENT 40)			
	1.	Cyanide cleaner	290	Daily

POWER WASHING MACHINES

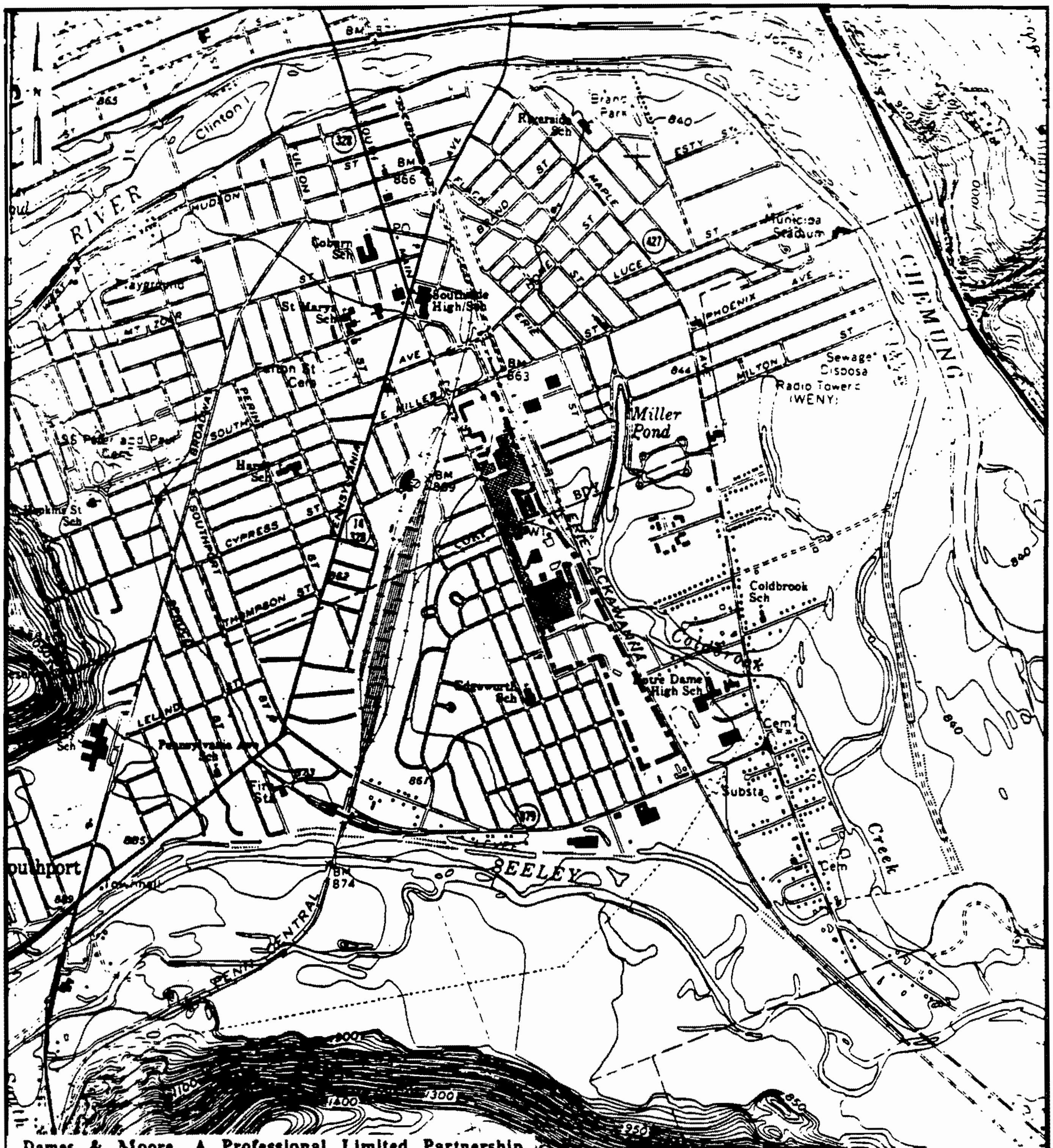
Location and Washer Identification	Type of Compound	Volume (gal.)	Anticipated Dumping Frequency and Disposition
Department 1 Cincinnati Washer (wash, rust preventive,dry)	Phosphate cleaner (Pennsalt Fosbond #25)	500	Once every 2 months (Sanitary sewer via tumbling sludge settling ponds)
Department 12 Simplicity Vibra Washer (wash, rinse, infra dry)	Alkaline cleaner (Peqco Kleen 174)	650 200	Weekly (Sanitary sewer via tumbling sludge settling ponds)
Department 5 Cincinnati Washer (wash, rust preventive, dry)	Phosphate Clean (Pennsalt Fosbond #25)	500	Once every 2 months (Sanitary sewer via tumbling sludge settling ponds
	Solvent emulsion rust preventive (Sunoco)	300	Once every 2 months (Waste oil hauler)

TABLE 3 (Continued)

Department 27 Detroit Products Co. Power Washer (wash, rust preventive, dry)	Phosphate cleaner (Pennsalt Fosbond #25)	350	Once every 2 months (Sanitary sewer via tumbling sludge settling ponds)
	Solvent emulsion rust preventive (Sunoco)	160	Once every 2 months (Waste oil hauler)

*From 1967 report by Lancy Laboratories [17].

ELM/000507



LEGEND:

Remington Rand Plant Site

NEW YORK

QUADRANGLE LOCATION

0 2000 4000

SCALE IN FEET

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

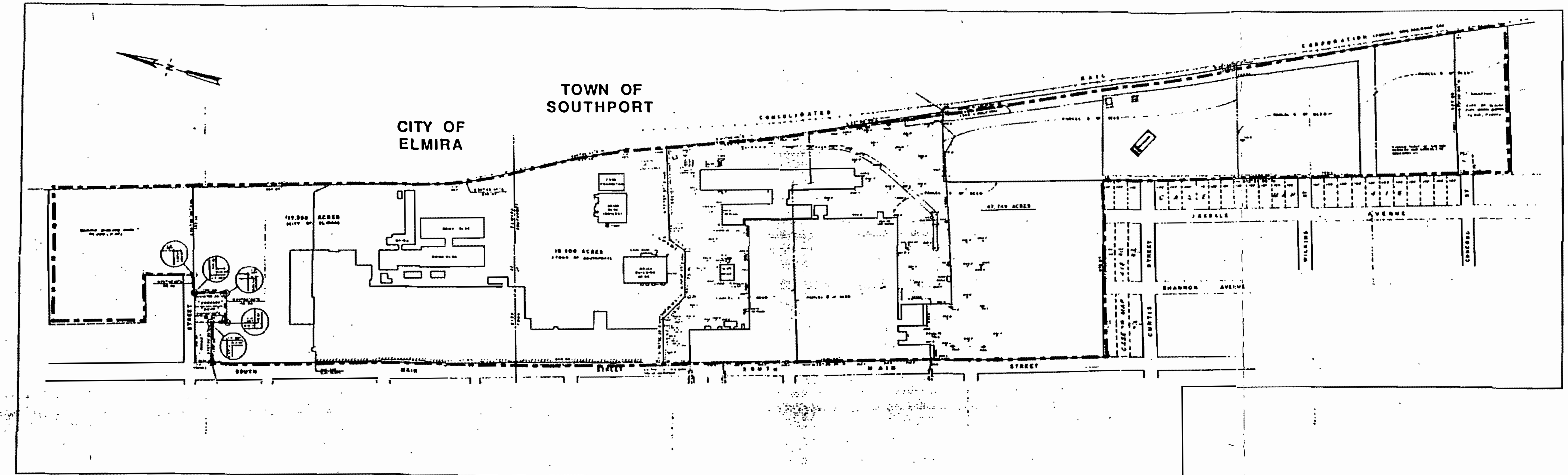
FIGURE 1

SITE LOCATION

BASE MAP SOURCE: USGS 7 /12 minute topographic quadrangle map Elmira, New York-Pennsylvania, 1969.

Job No. 15783-005

ELM/000509



ELM/000510

REFERENCES:
- 1977 Weiler Associates Drawing Entitled: Map of Lands Being Conveyed From Chemung County Industrial Development Agency to Elmira City School District
- 1980 Weiler Associates Drawing Entitled: Boundary of Lands Being Conveyed To A.T.O. Properties,Inc.

LEGEND:
-·- Remington Rand Plant Site

0 400 800
APPROXIMATE SCALE IN FEET

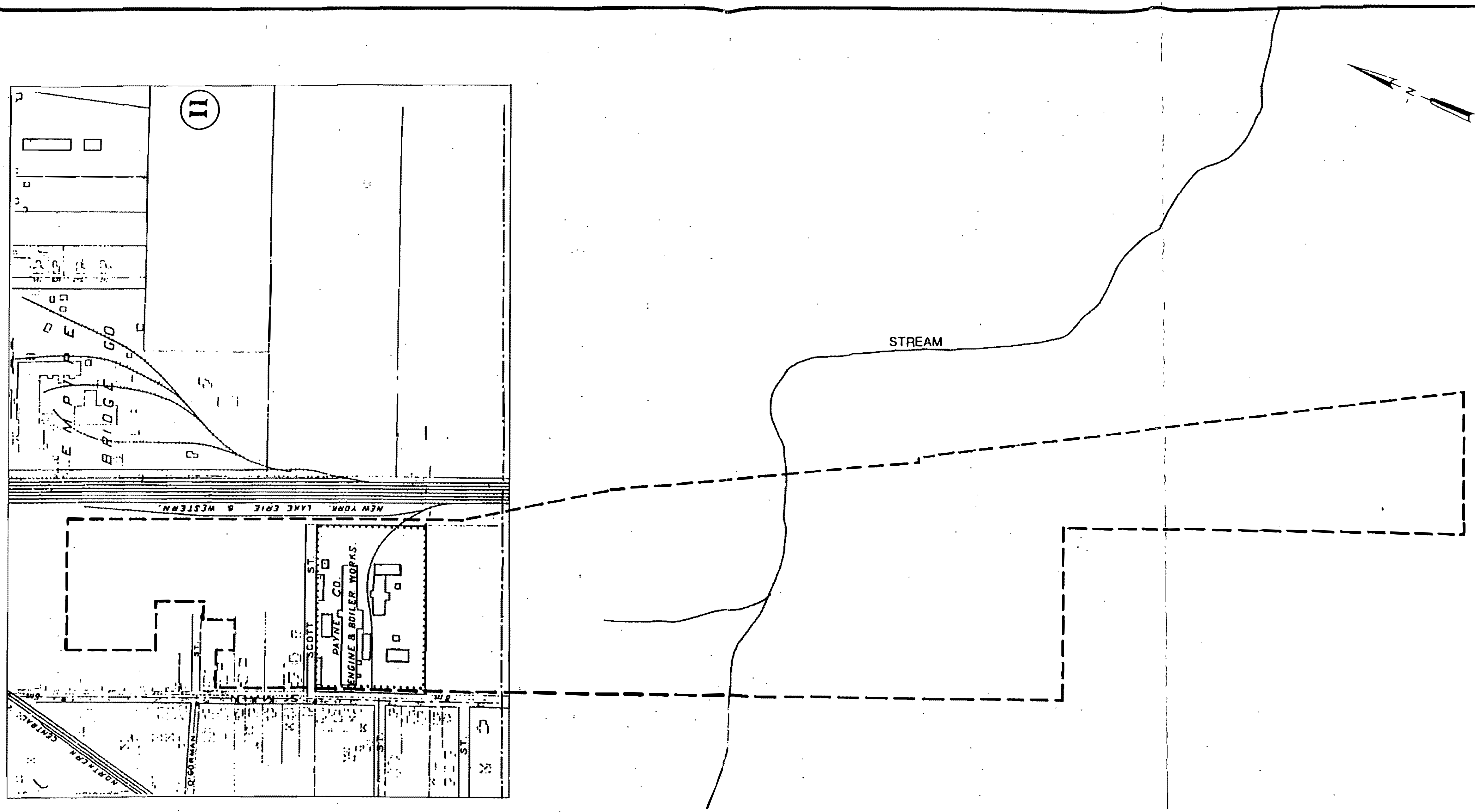
REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 2

SITE BOUNDARY

Job No. 15783-005

Dames & Moore, A Professional Limited Partnership



ELM/000512

LEGEND:
- — — Remington Rand Plant Site
- ········ Payne & Sons Engine & Boiler Works

0 400 800
APPROXIMATE SCALE IN FEET

REFERENCES:
- 1904 plot plan from Sanford Business Atlas, City of Elmira, New York
- Stream location from USGS15' topographic map

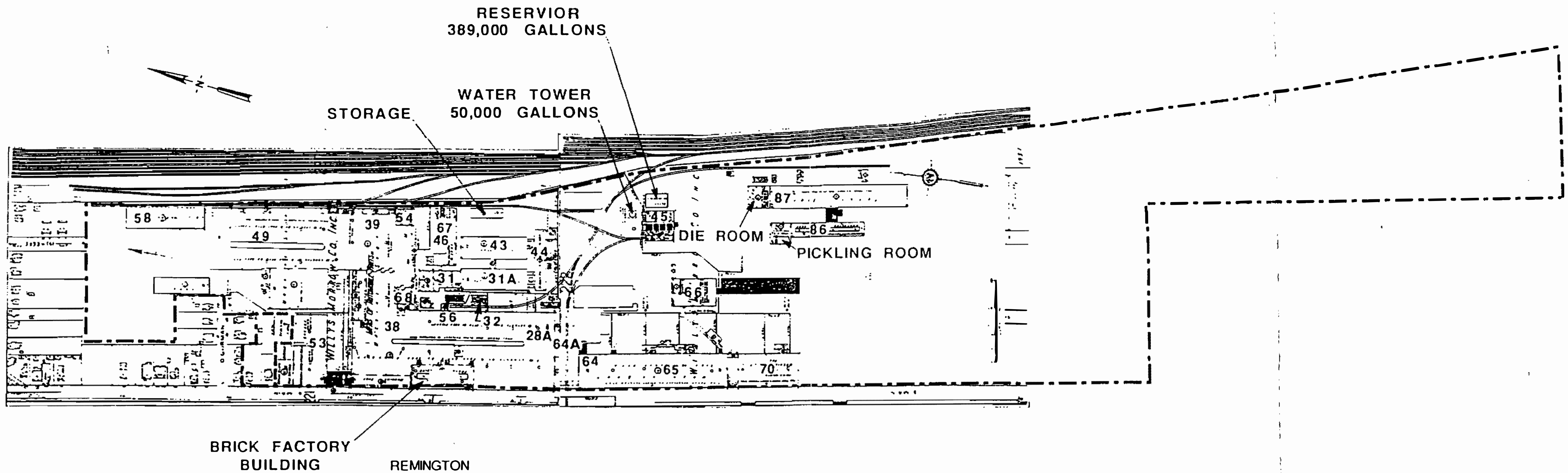
REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 3

B.W. PAYNE AND SONS-1904

Job No. 15783-005

Dames & Moore, A Professional Limited Partnership



REMINGTON RAND BUILDING NUMBER	PLANT OPERATION
31	Tool Hardening
31A	Carbonizing Furnaces
32	Electrical Building
28A, 28, 38, & 64A	Machine Shop, Factory Building
43	Heat Treating
44	Blower Room and Cooling Shed
45	Engine Room
46 & 67	Sand Blasting
37, 49	Machine Shop
53	Garage, Recreation Hall and Cafeteria
54	Oil Handling
56	Machine Shop
58	Steel Storage
64, 65, & 70	Machine Shop
66	Storage
68	Locker Room
86	Pickling Room, Annealing and Trim Shop
87	Forge Shop and Die Room

LEGEND:

—·— Remington Rand Plant Site

– – – – Willys Morrow Company Site (where different from Remington Rand Site)

0 400 800
APPROXIMATE SCALE IN FEET

REFERENCE:
1931 plot plan from Sanford Business Atlas, City of Elmira, New York

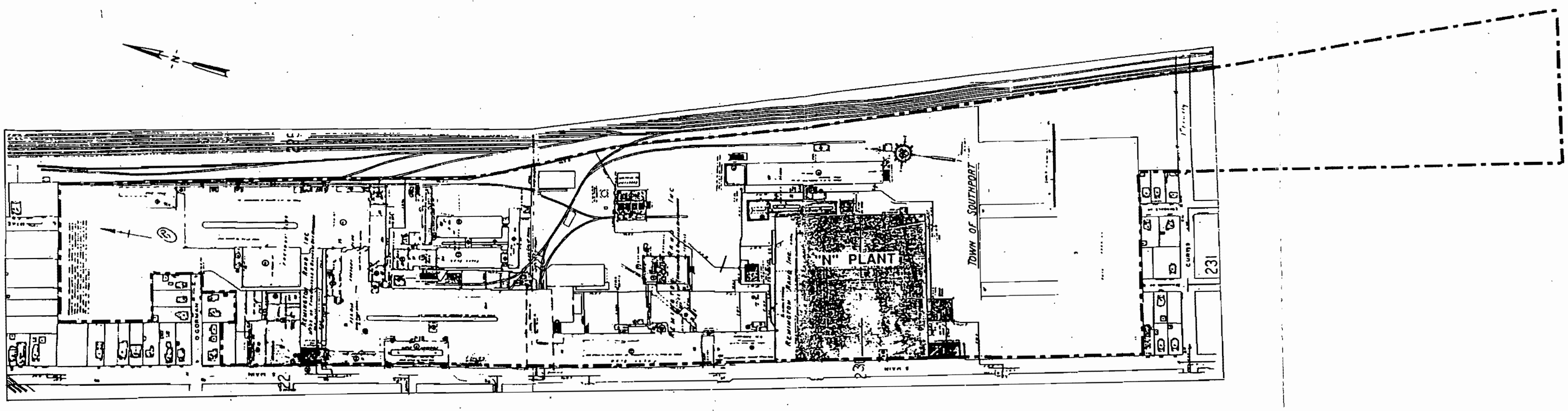
ELM/000513

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 4

WILLYS MORROW COMPANY 1931

Dames & Moore, A Professional Limited Partnership | Job No. 15783-005



LEGEND:
Remington Rand Plant Site

0 400 800
APPROXIMATE
SCALE IN FEET

REFERENCE:
• 1934 plot plan updated to 1950 from Sanford Business Atlas, City of Elmira, New York

ELM/000514

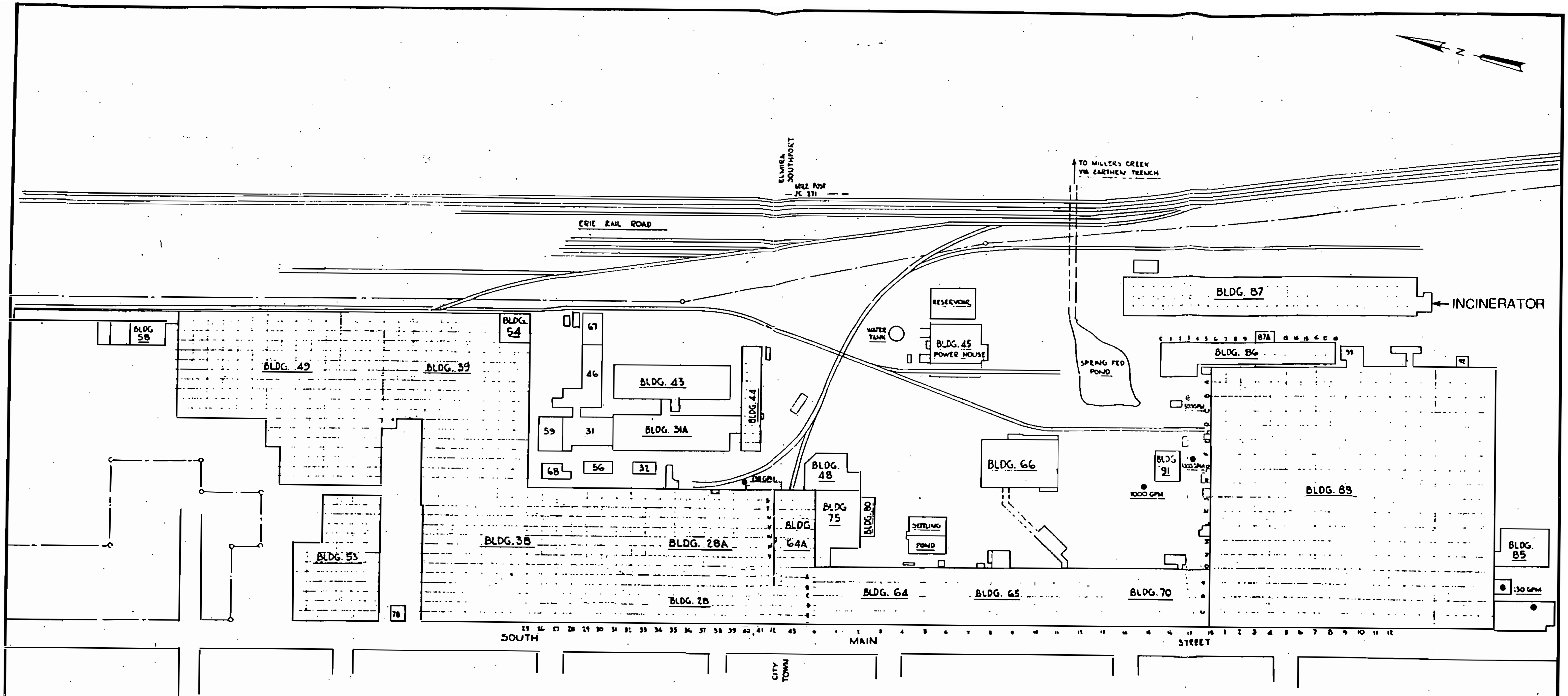
REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 5

1950 REMINGTON RAND PLANT

Job No. 15783-005

Dames & Moore, A Professional Limited Partnership



BUILDING NUMBER	PLANT OPERATION
28	Power Washing (Wash, Rust Preventive, Dry)
28A	Power Washing (Wash, Rinse, Infra dry)
38	Power Washing (Wash, Rust Preventive, Dry)
44	Wire Pickling
46 & 67	Maintenance Department
53	Cafeteria and Recreation Room
58	Steel Storage
64	Heat Treatment
65	Plating, Tumbling, Metal Blackening
66	Shipping Department
70	Converting to Cafeteria
88	Painting (Northeast Corner of Building)

LEGEND:
• Water Well Location and Yield

0 200 400
SCALE IN FEET

REFERENCE:
Lancy Laboratories Drawing ROE 2

ELM/000515

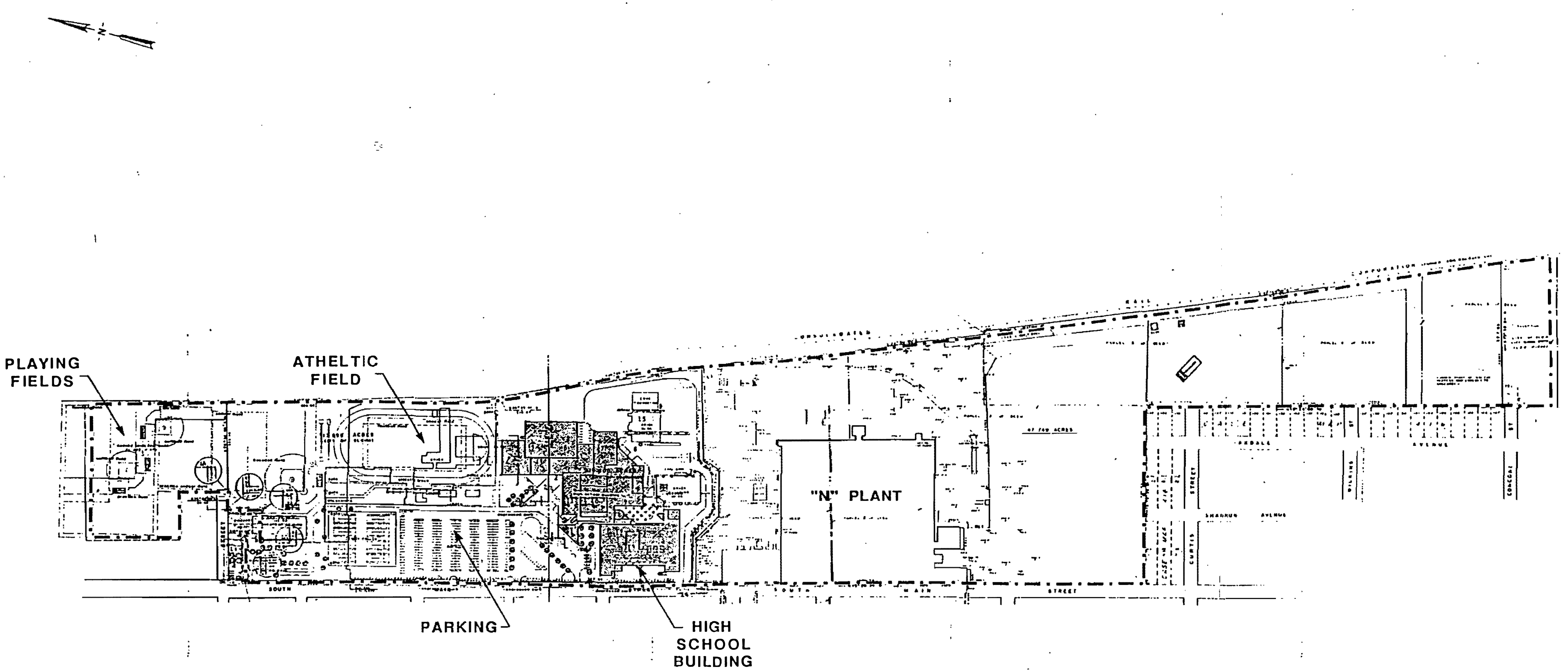
REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 6

1967 PLANT LAYOUT

Job No. 15783-005

Dames & Moore, A Professional Limited Partnership



LEGEND:
Remington Rand Plant Site

0 400 800
APPROXIMATE SCALE IN FEET

REFERENCES:
- Boundary survey map by Weiler Associates, 1980
- City School District, City of Elmira, New York, Plan of Southside Community Recreation Center and Educational Facility

ELM/000516

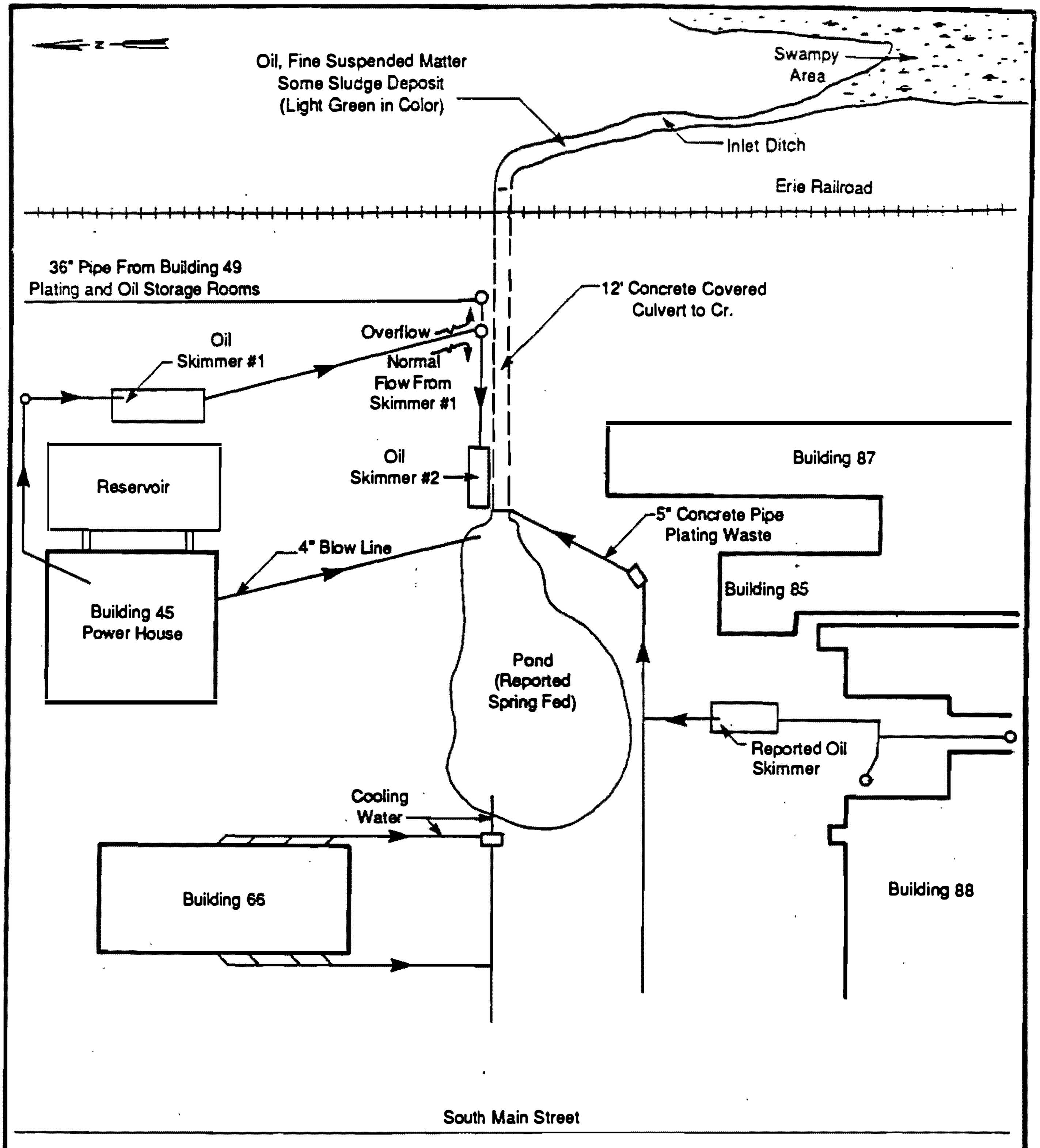
REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 7

CURRENT SITE CONDITIONS

Job No. 15783-005

Dames & Moore, A Professional Limited Partnership



NOT TO SCALE

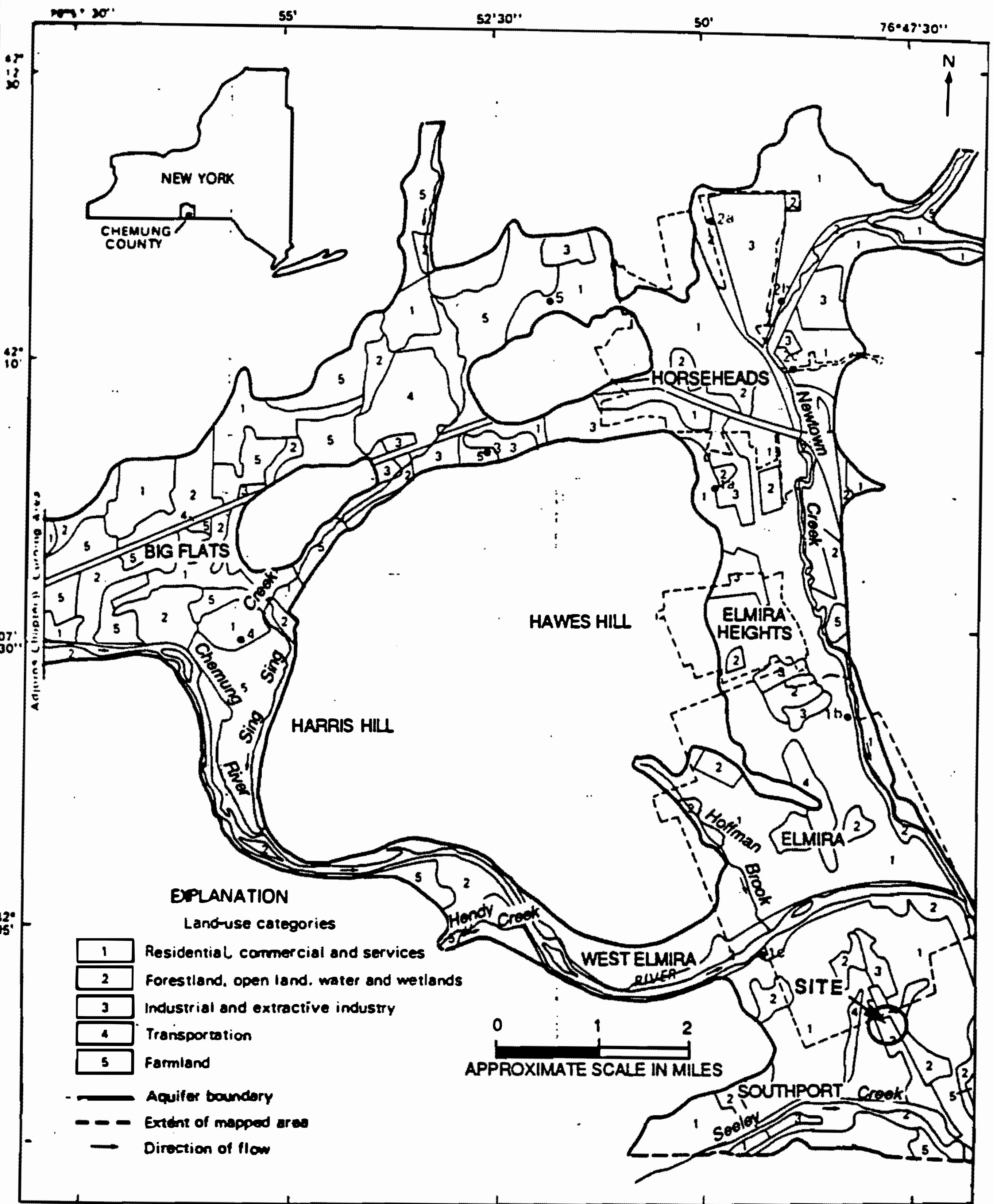
ELM/000517

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

REFERENCE: Schematic of waste streams redrafted from 1958 Industrial Survey Report.

FIGURE 8
1958 SCHEMATIC OF PLANT
WASTE STREAMS

Dames & Moore, A Professional Limited Partnership | Job No. 15783-005



Base from U.S. Geological Survey, 1978

Modified from Miller and others, 1982

BASE MAP SOURCE: Atlas of 11 Selected Aquifers in New York; USGS Open File Report 82-553.

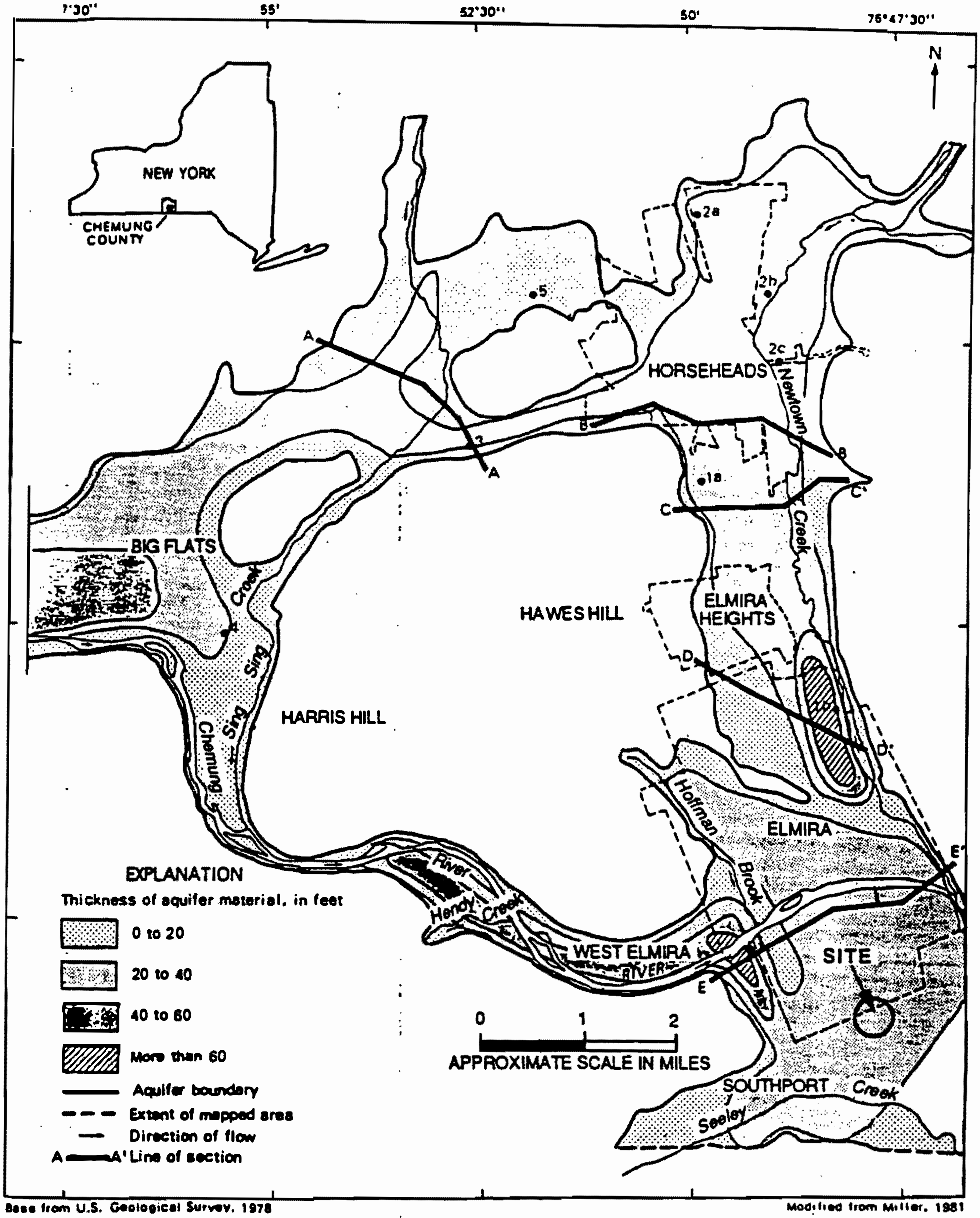
DAMES & MOORE, A Professional Limited Partnership

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 9
LAND USE
ELMIRA-HORSEHEADS-BIG FLATS AREA

Job No. 15783-005

ELM/000518



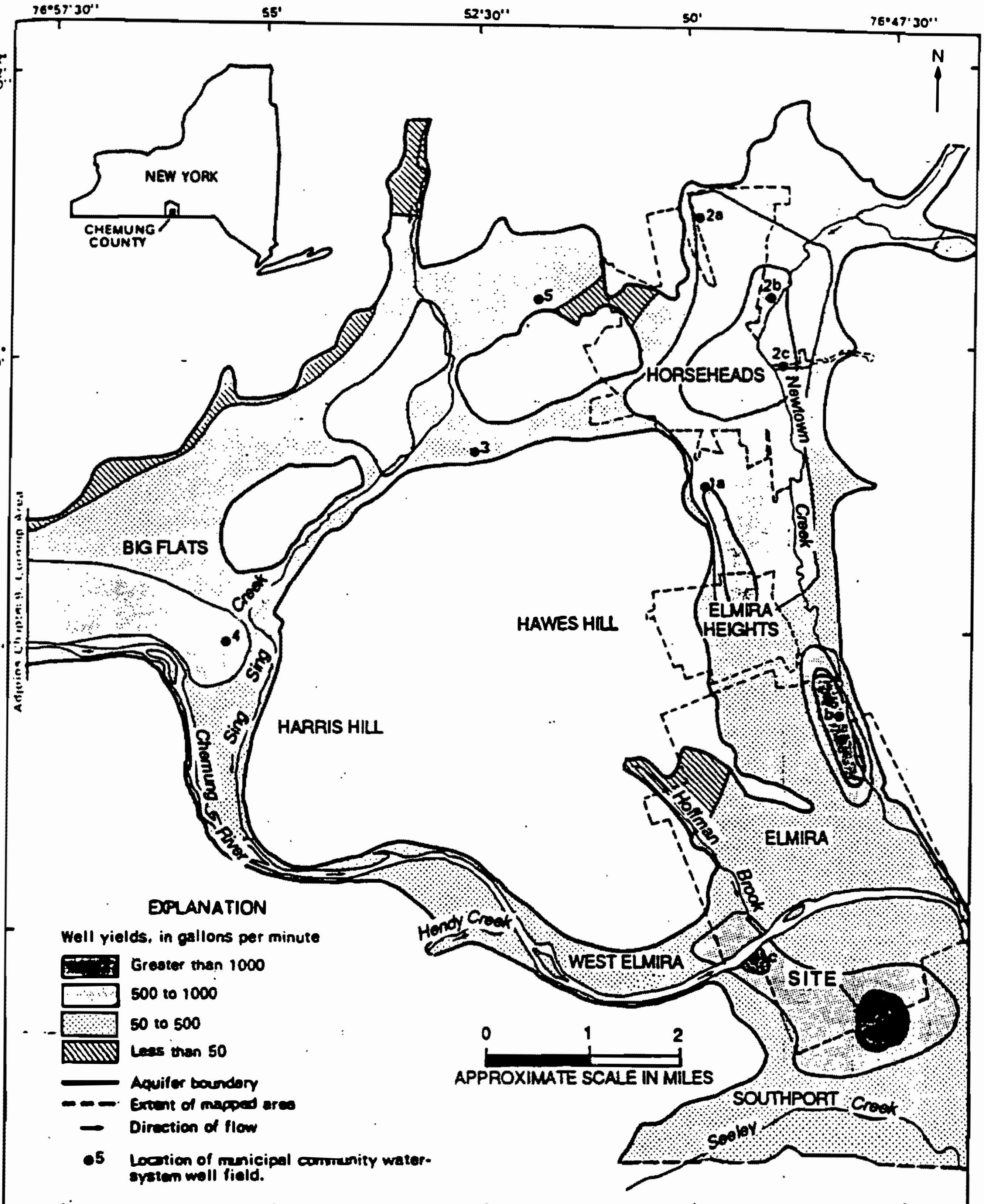
BASE MAP SOURCE: Atlas of 11 Selected Aquifers in New York; USGS Open File Report 82-553.

DAMES & MOORE, A Professional Limited Partnership

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 10
AQUIFER THICKNESS
ELMIRA-HORSEHEADS-BIG FLATS AREA

Job No. 15783-005



BASE MAP SOURCE: Atlas of 11
Selected Aquifers in New York;
USGS Open File Report 82-553.

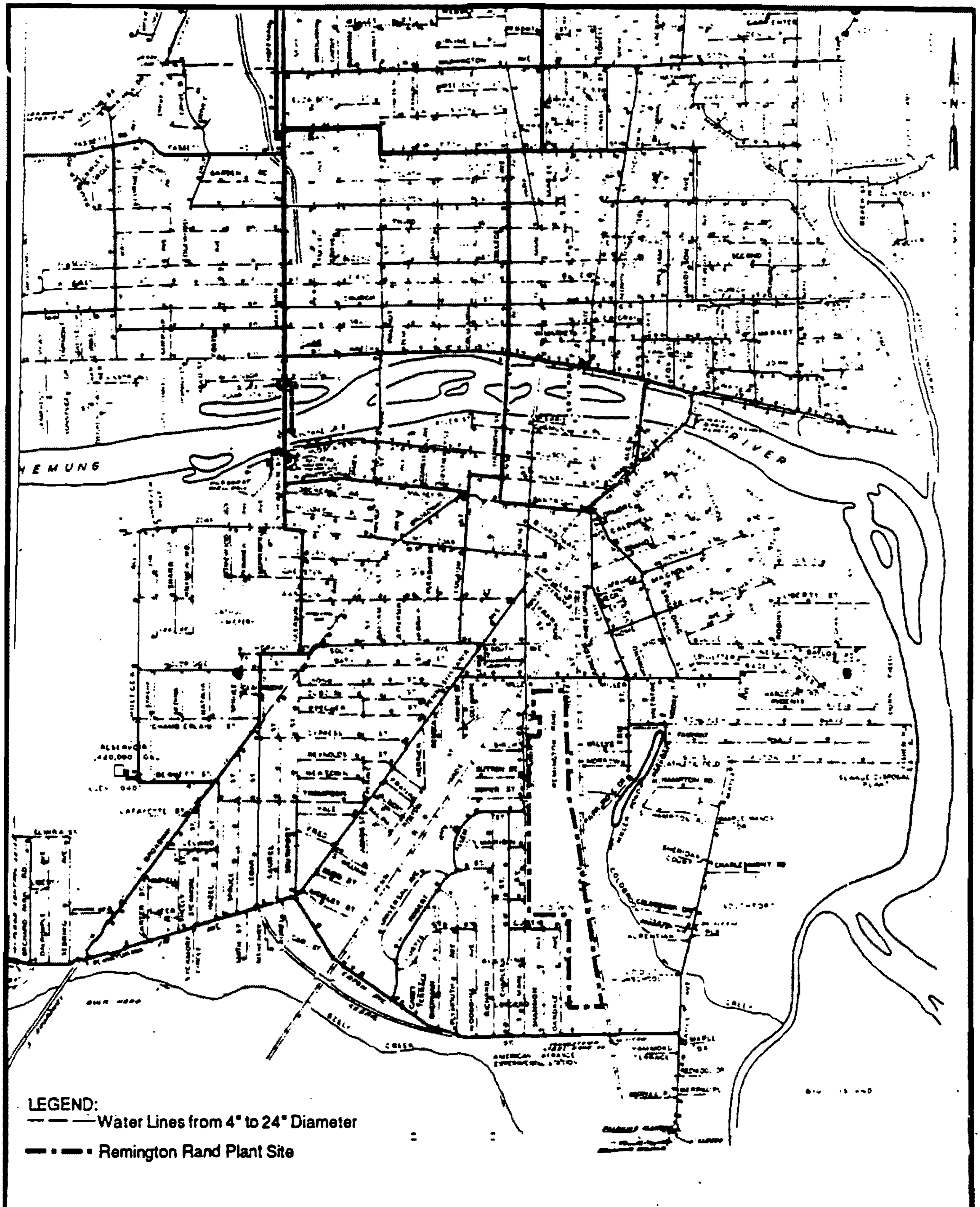
DAMES & MOORE, A Professional Limited Partnership

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 11
WELL YIELDS
ELMIRA-HORSEHEADS-BIG FLATS AREA

Job No. 15783-005

ELM/000520



BASE MAP SOURCE: Elmira Water Board map of water distribution of Elmira, New York, revised 1976.

0 1500
SCALE IN FEET

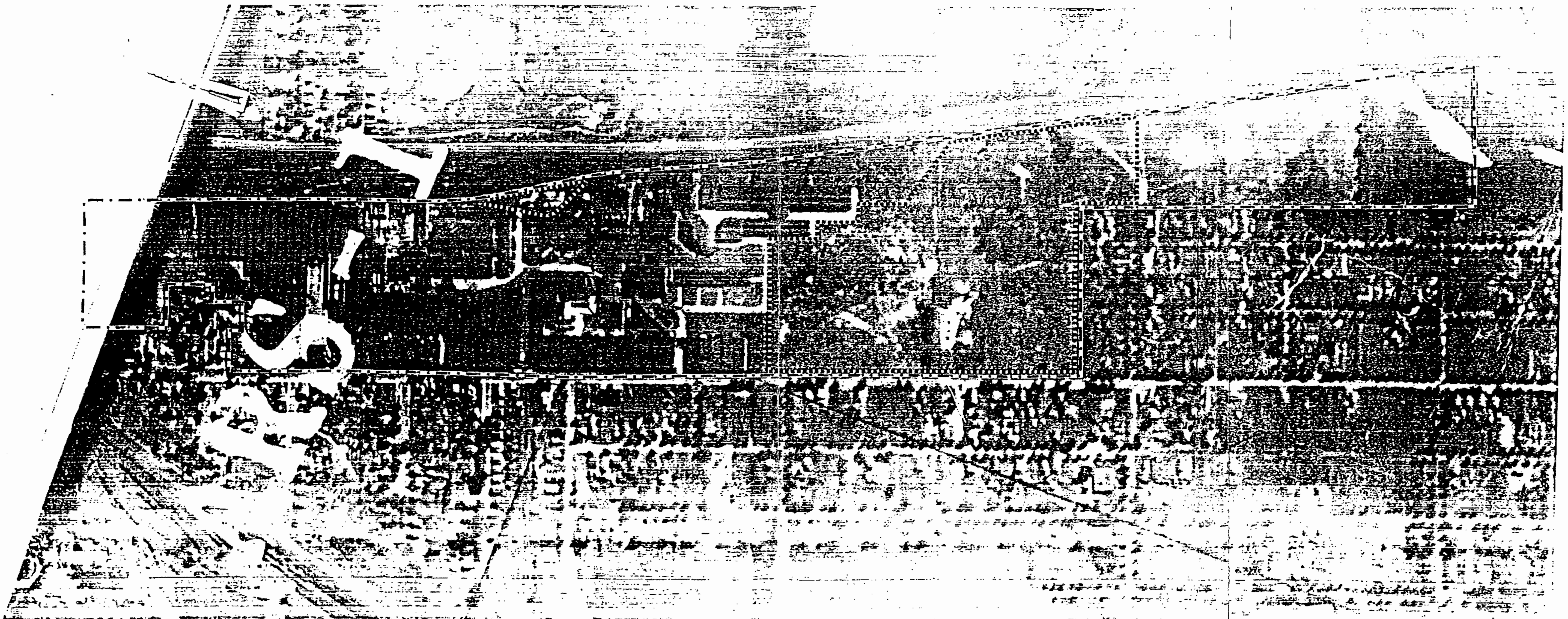
DAMES & MOORE, A Professional Limited Partnership

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 12
ELMIRA WATER BOARD
DISTRIBUTION SYSTEM

Job No. 15783-005

ELM/000521



LEGEND:

- — · — Remington Rand Plant Site
- ········ Possible Disposal Area

0 400 800
SCALE IN FEET

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

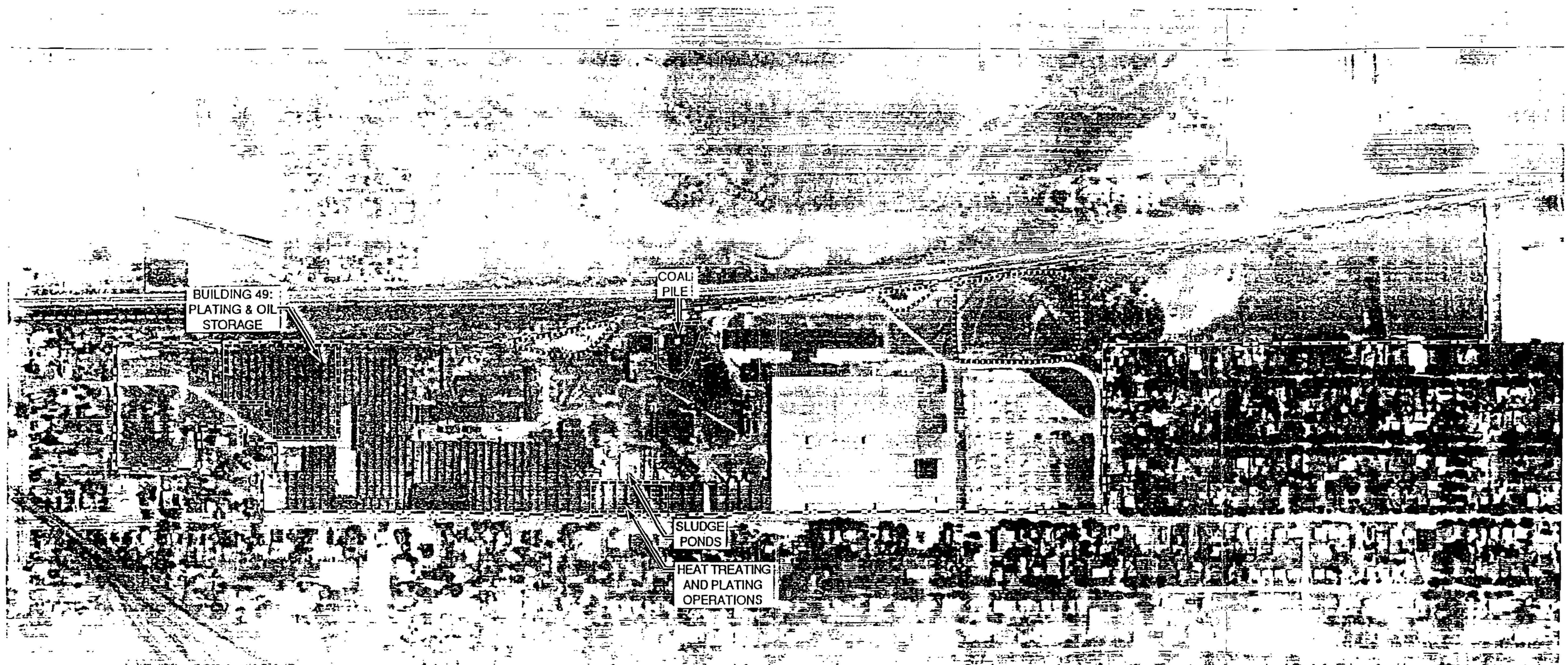
FIGURE 13

ELM/000522

1938 AERIAL PHOTOGRAPHY

Job No. 15783-005

Dames & Moore, A Professional Limited Partnership

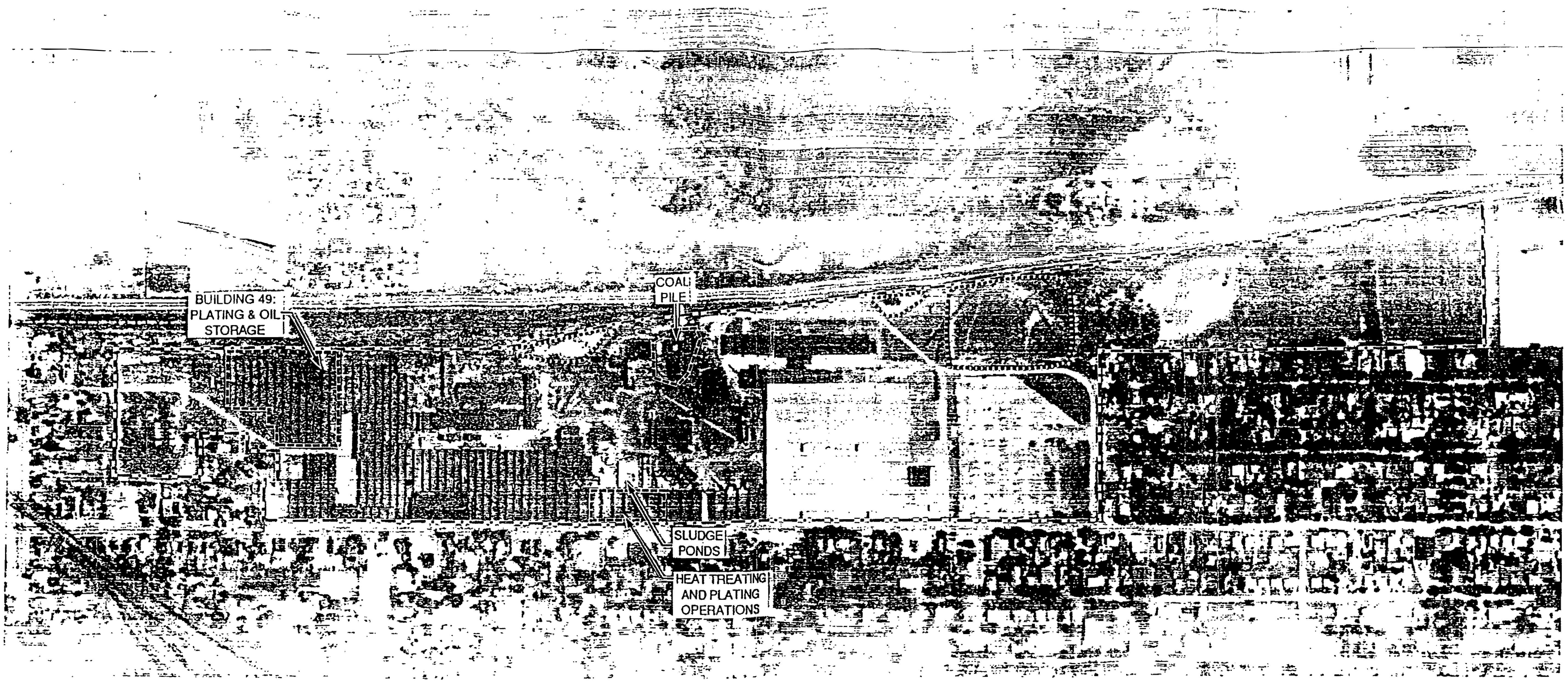


----- Possible Source of Contamination

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 15

ELM/000524

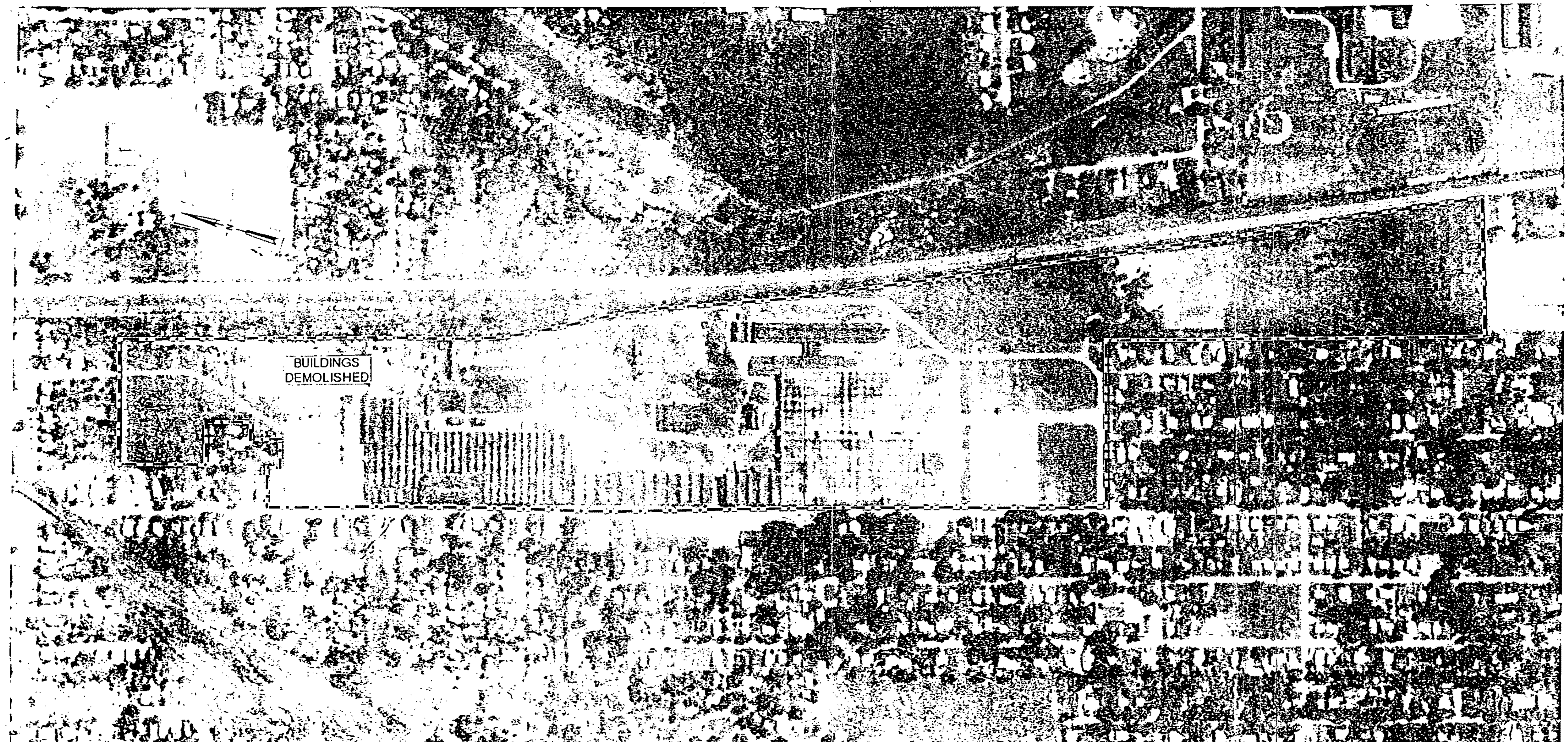


------ Possible Source of Contamination

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 15

ELM/000524



LEGEND:
— · — Remington Rand Plant Site

REFERENCE: 1976 USDA Aerial Photography.

0 400 800
SCALE IN FEET

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

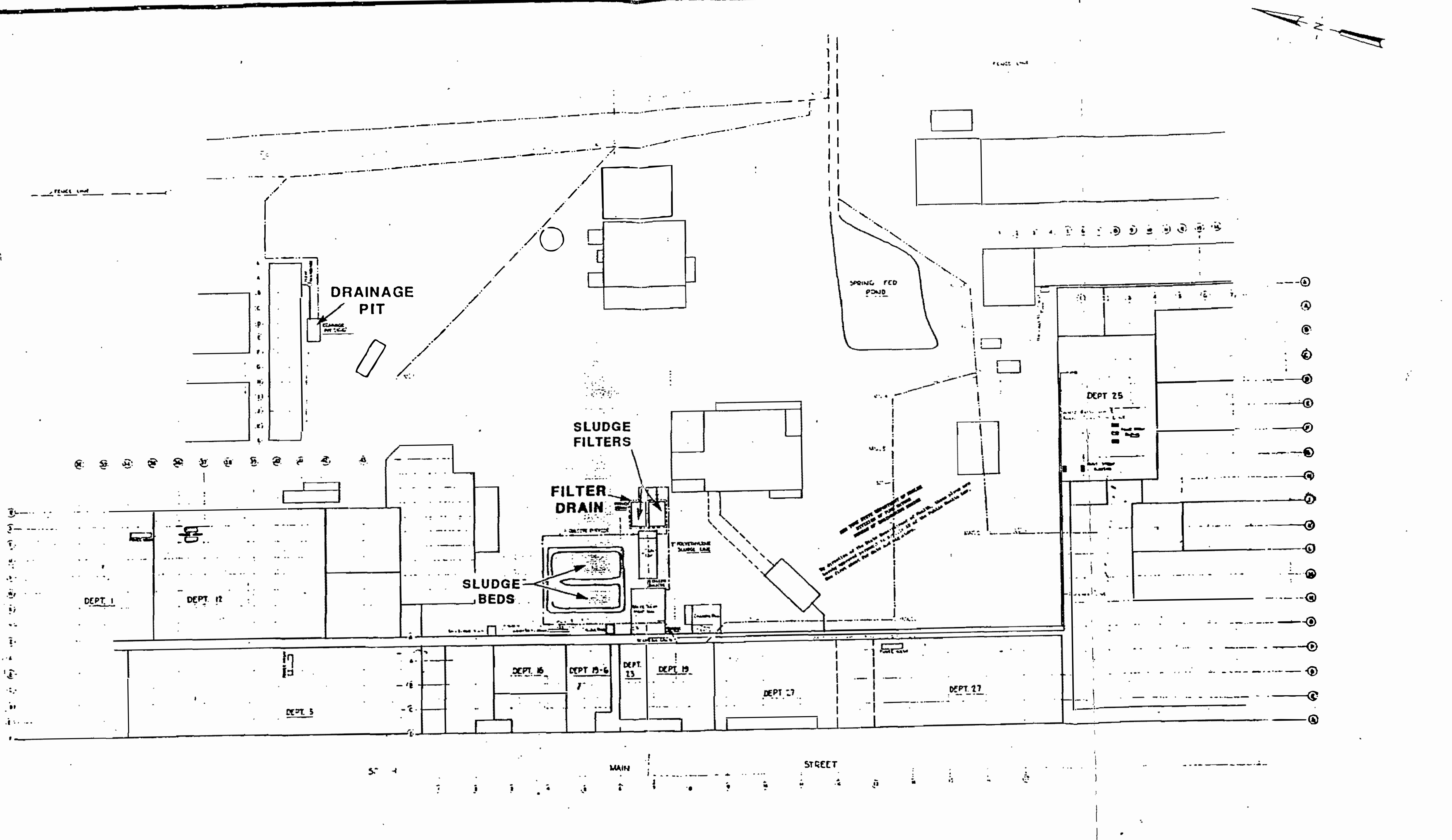
FIGURE 16

1976 AERIAL PHOTOGRAPHY

Job No. 15783-005

ELM/000525

Dames & Moore, A Professional Limited Partnership



ELM/000526

NOTE: See Table 3 for description of work activities at various waste producing departments.

0 122 244

SCALE IN FEET (APPROXIMATE)

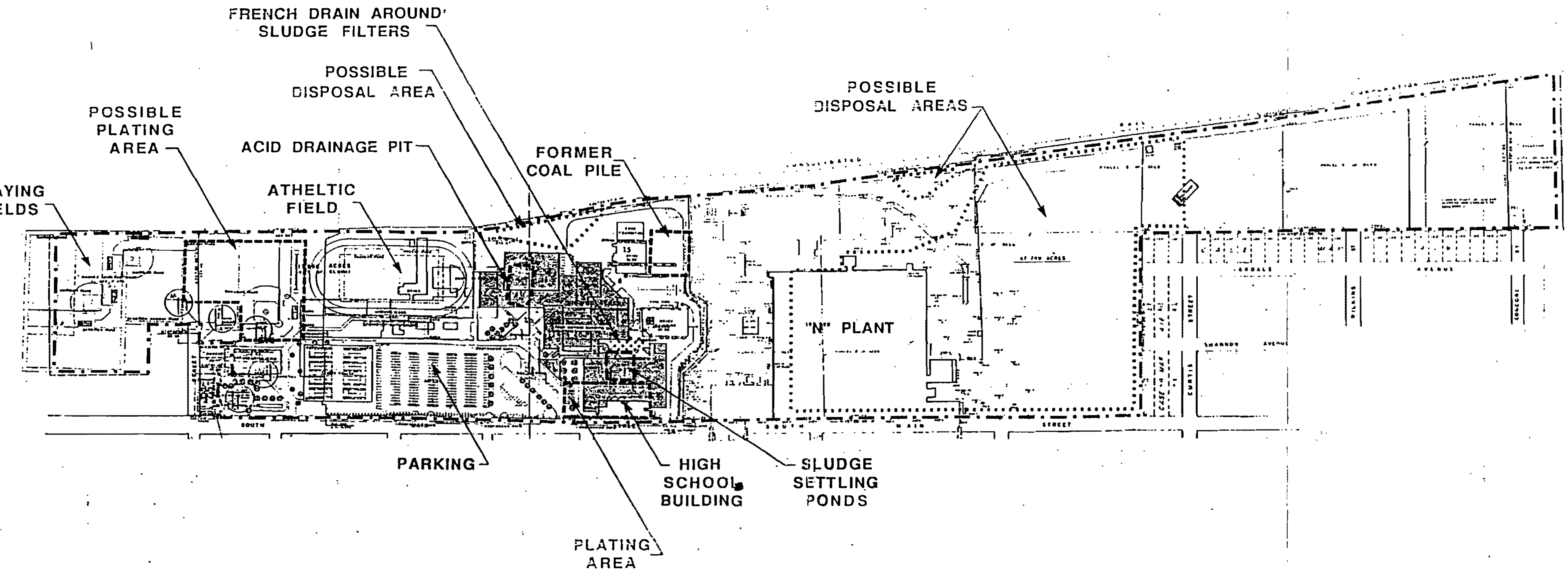
REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 17

PLANT OPERATIONS-1967

Dames & Moore, A Professional Limited Partnership

Job No. 15783-005



LEGEND:
- Remington Rand Plant Site
- Possible Disposal Area
- Possible Source of Contamination

ELM/000511

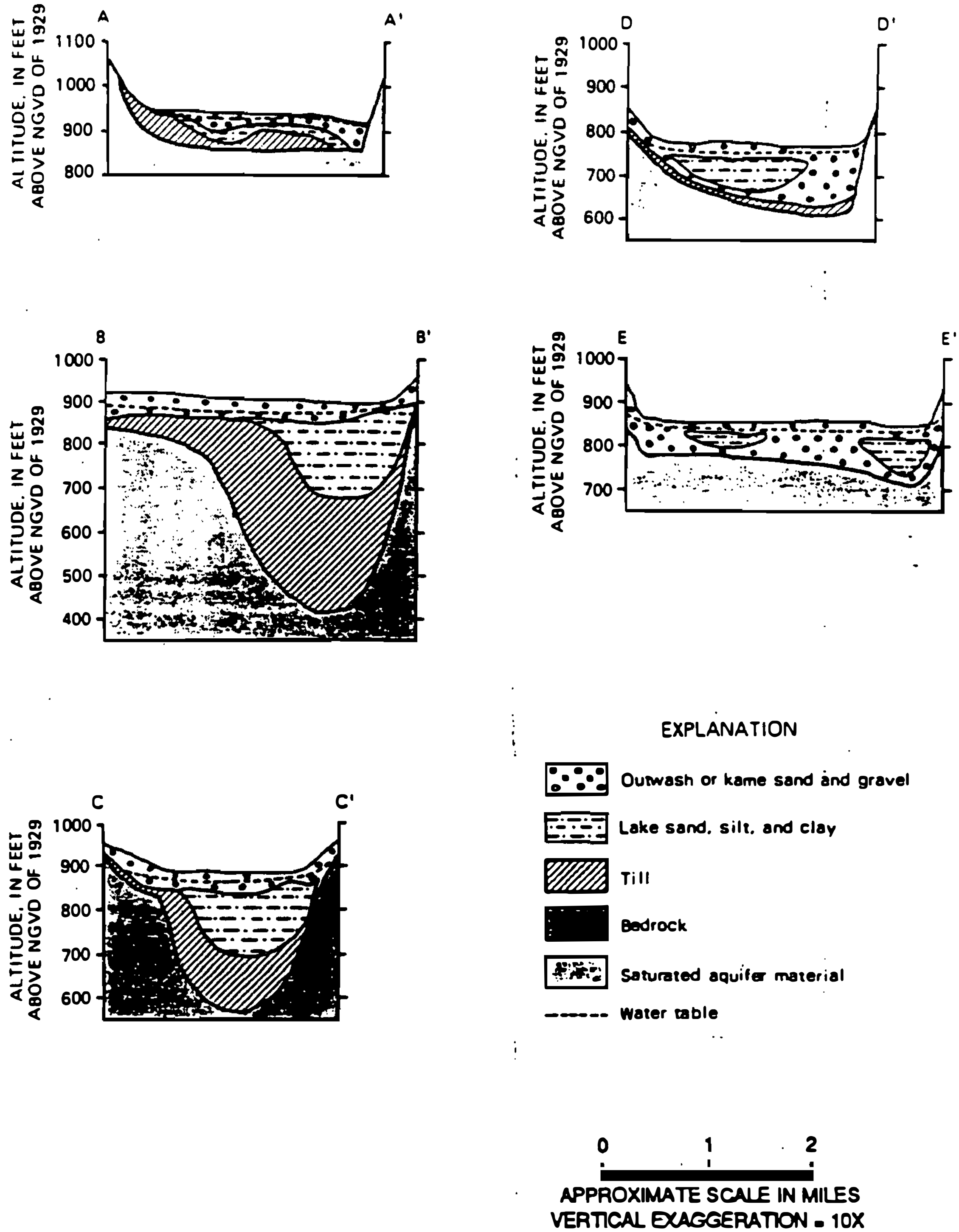
REMINGTON RAND PLANT SITE
UNISYS CORPORATION

REFERENCES:
• 1977 Weiler Associates Drawing Entitled: Map of Lands Being Conveyed From Chemung County Industrial Development

400 800
APPROXIMATE SCALE IN FEET

FIGURE 18
POSSIBLE AREA OF DISPOSAL AND CONTAMINATION

Professional Limited Partnership



Modified from Miller and others, 1982

NOTE: Locations of sections shown on Figure 20.

SOURCE: Atlas of 11 Selected Aquifers in New York; USGS Open File Report 82-553.

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REMINGTON RAND PLANT SITE
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FIGURE 19

TYPICAL VALLEY SECTIONS

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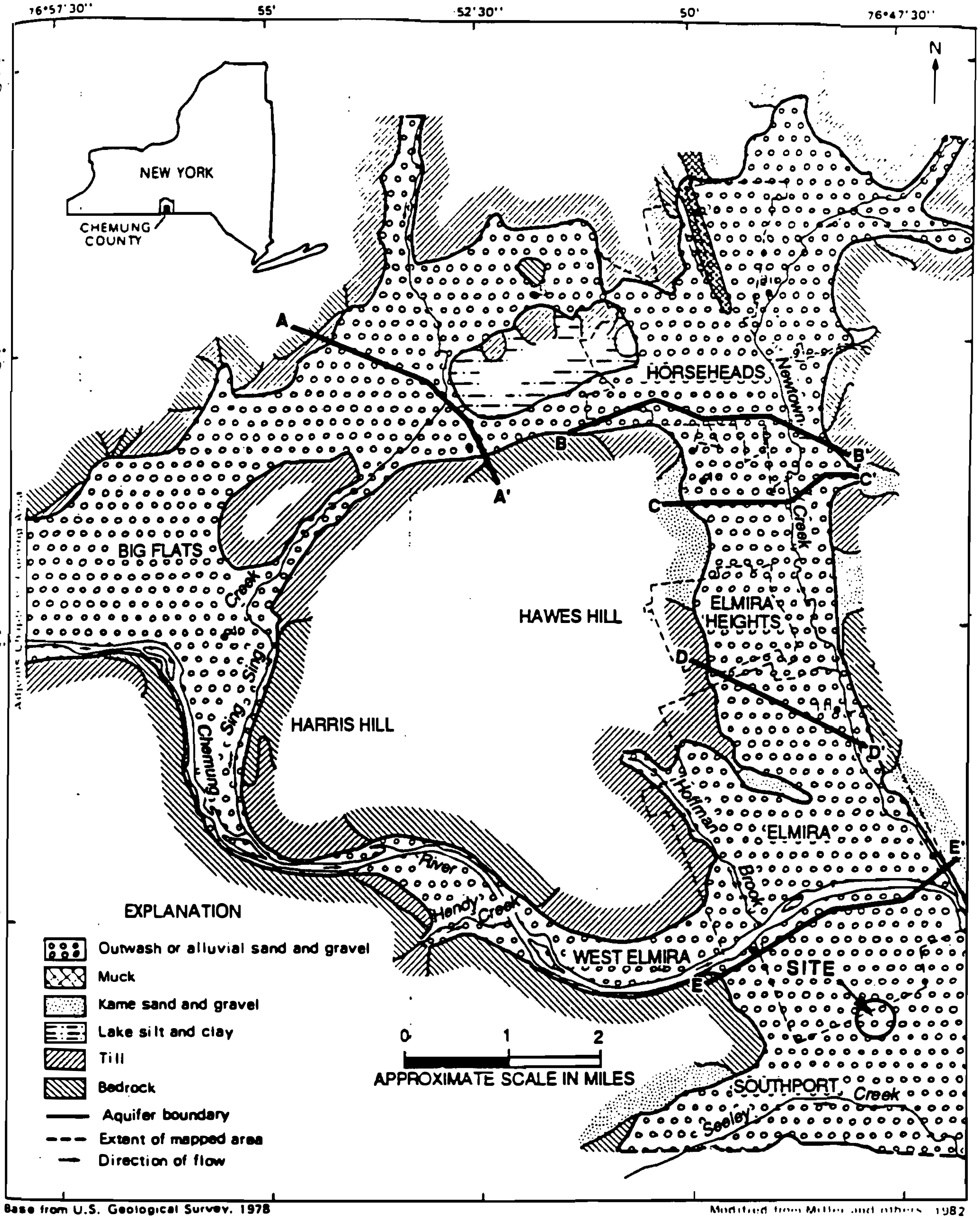

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FIGURE 20
GLACIAL DEPOSITS
ELMIRA-HORSEHEADS-BIG FLATS AREA

Job No. 15783-005

BASE MAP SOURCE: Atlas of 11 Selected Aquifers in New York; USGS Open File Report 82-553.

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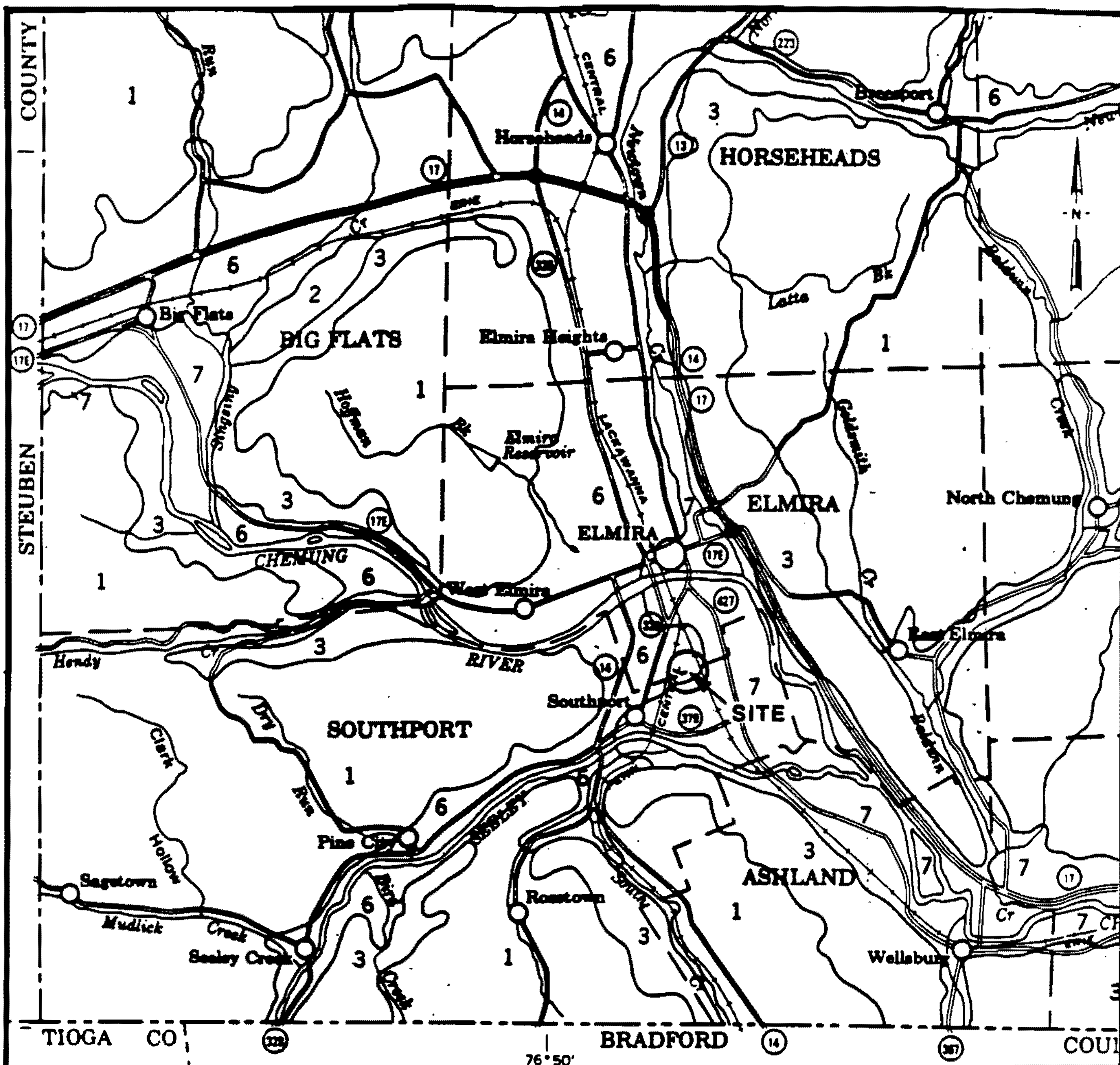

SOIL ASSOCIATIONS

1 Lordstown-Volusio-Mardin association: Gently sloping to steep, moderately deep, well-drained soils and deep, somewhat poorly drained and moderately well drained soils that have a fragipan; on uplands

2 Volusio-Lordstown association: Gently sloping to steep, deep, somewhat poorly drained soils that have a fragipan and well-drained, moderately deep soils; on uplands

3 Lordstown-Arnot association: Steep and very steep, moderately deep and shallow, well drained to moderately well drained soils; on uplands

4 Valois-Lansing association: Gently sloping to steep, deep, well-drained soils; on valley slopes and adjacent uplands

5 Hudson-Howard association: Nearly level to steep, deep, moderately well drained to somewhat excessively drained soils; on glacial lake plains and glacial outwash terraces and kames

6 Howard-Chenango association: Nearly level to gently sloping, deep, well-drained to somewhat excessively drained, gravelly and channery soils; on glacial outwash terraces and old alluvial fans

7 Tioga-Unadilla-Howard association: Nearly level to gently sloping, deep, well-drained to somewhat excessively drained soils on flood plains and silty and gravelly soils on adjacent terraces

0 2 4

SCALE IN MILES

BASE MAP SOURCE: Soil Survey of Chemung County, New York; U.S. Department of Agriculture, Soil Conservation Service, September 1973.

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FIGURE 21
GENERAL SOIL MAP
ELMIRA-HORSEHEADS-BIG FLATS AREA

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LEGEND:
- - - REMINGTON RAND PLANT SITE

UnA Unadillo Silt Loam

Ma Man-made Soil (DISTURBED)

Ho Howard Silt Loam

Ab Alluvial Land

0 2000
SCALE IN FEET

BASE MAP SOURCE: Soil Survey of Chemung County, New York; U.S. Department of Agriculture, Soil Conservation Service, September 1973.

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 22

SITE SOILS MAP

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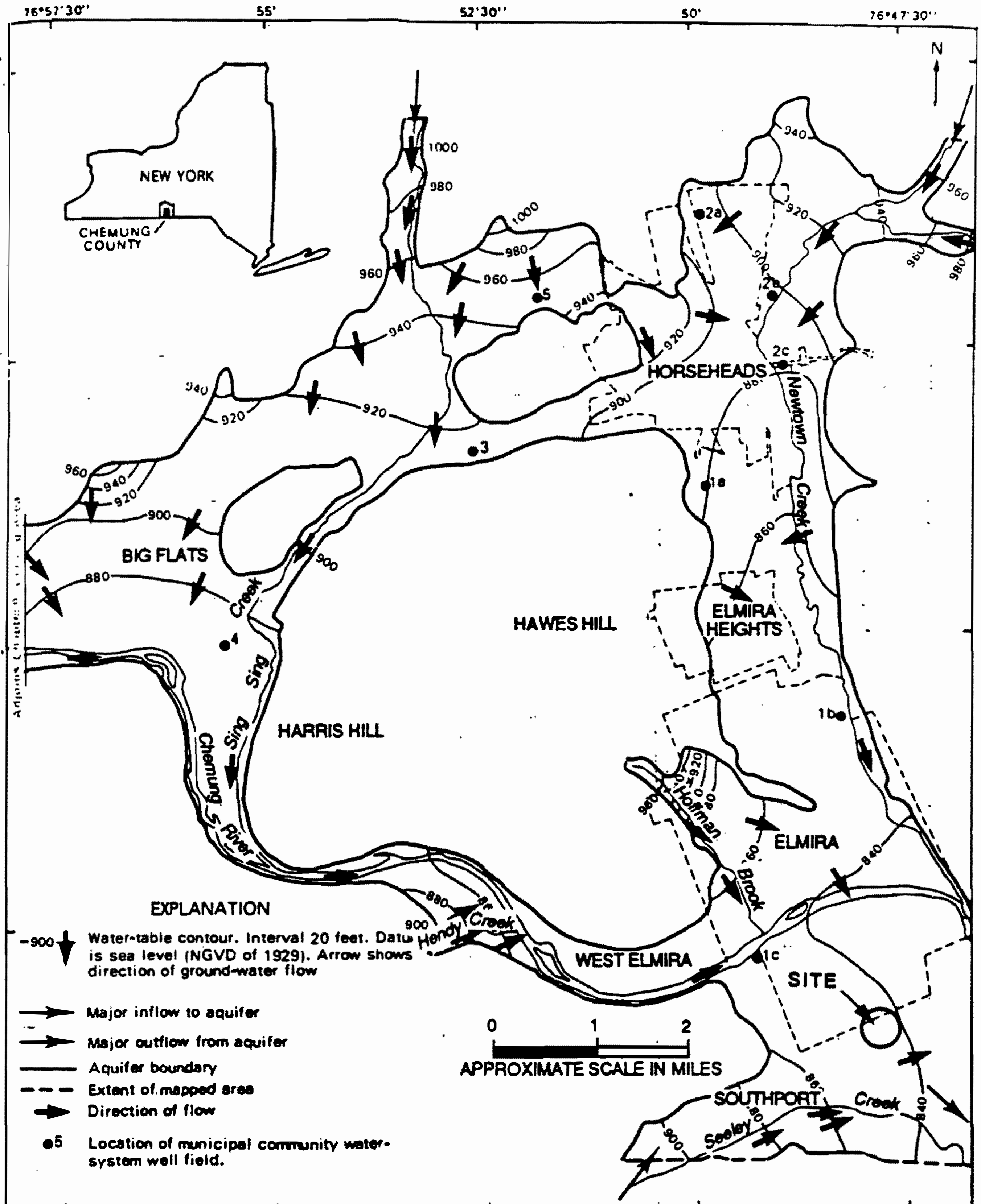

REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 23
GROUND WATER MOVEMENT
ELMIRA-HORSEHEADS-BIG FLATS AREA

Job No. 15783-005

BASE MAP SOURCE: Atlas of 11 Selected Aquifers in New York; USGS Open File Report 82-553.

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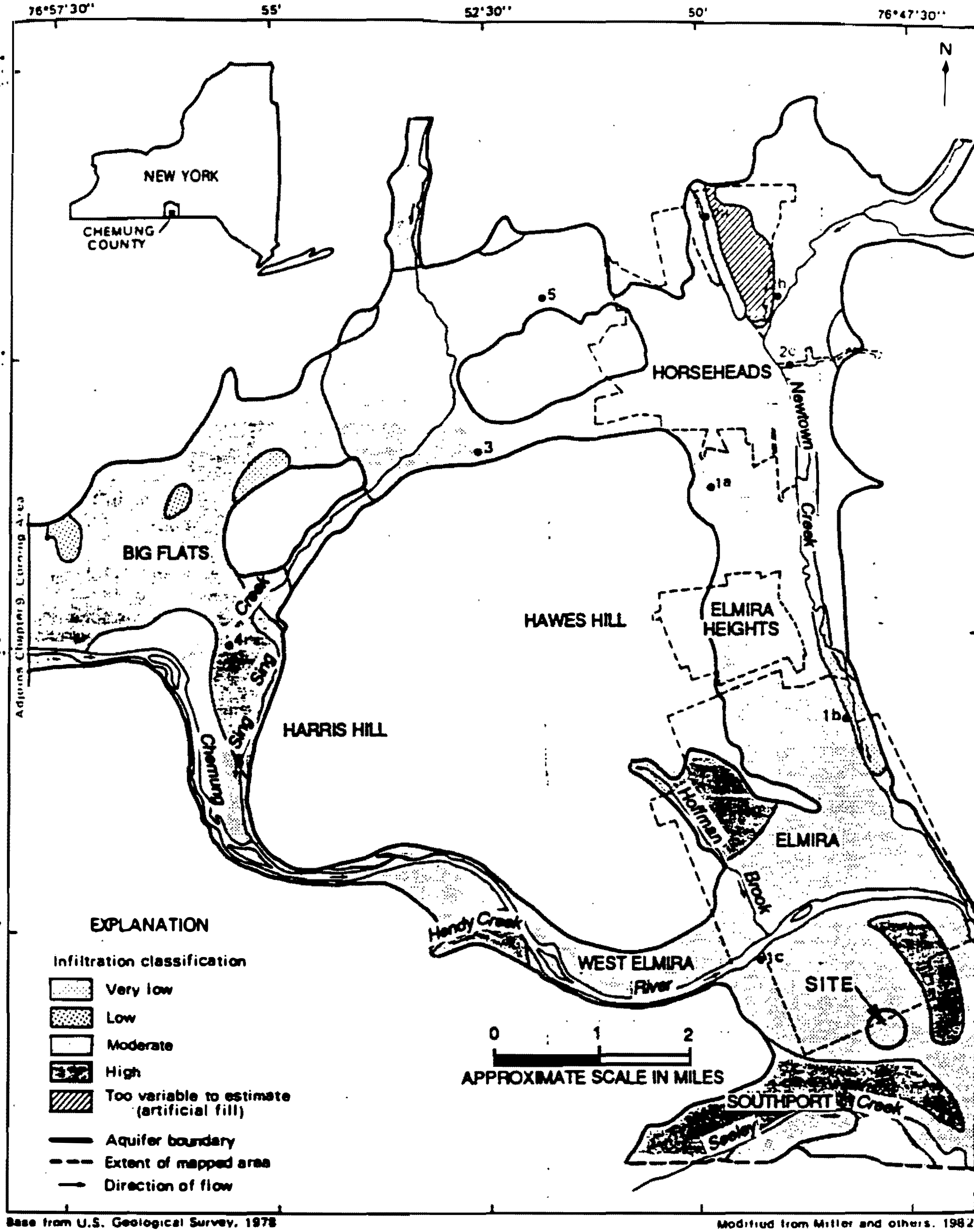

BASE MAP SOURCE: Atlas of 11 Selected Aquifers in New York; USGS Open File Report 82-553.

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REMINGTON RAND PLANT SITE
UNISYS CORPORATION

FIGURE 24
SOIL PERMEABILITY
ELMIRA-HORSEHEADS-BIG FLATS AREA

Job No. 15783-005

ELM/000533

REFERENCE LIST

Reference Number	
1	Title search conducted by Dames & Moore.
2	Letter from Chemung County Health Department to Remington Rand, dated March 24, 1953.
3	Appraisal of Sperry Rand Corp. plant by Pomeroy Appraisal Associates, August 25, 1972, made for Louis J. Mustico.
4	Newspaper articles (Star Gazette), dated October 5, 1969.
5	Chemung County 1890-1975, Chemung County Historical Society, p. 70-71.
6	USGS topographical map of site, 1895, reprinted 1944, 15' quad sheet.
7	Newspaper article (Star Gazette), dated June 24, 1933.
8	Deleted
9	Chemung County 1890-1975, Chemung County Historical Society, p. 319-320.
10	Newspaper article (Star Gazette), dated July 31, 1961.
11	Newspaper article (Sunday Telegram), January 27, 1957.
12	Newspaper article (Star Gazette), undated copy, on file.
13	Deleted
14	Deleted
15	Chemung County 1890-1975, Chemung County Historical Society, p. 285-288.
16	Communication between American LaFrance and Dames & Moore.
17	Final Engineering Report and Description of Proposed Waste Treatment Installation by Lancy Laboratories, Inc., dated July 3, 1967.
18	Newspaper article (Star Gazette) undated copy on file with Chemung County Health Department.
19	NYSDEC publication, Inactive Hazardous Waste Disposal Sites in New York State, volume 8, dated December 1987.
20	Conservation Department Stream Pollution Report, dated January 20, 1954.

REFERENCE LIST (Continued)

Reference Number

21 NYS Department of Health, Water Pollution Control Section, Industrial Survey Report, dated October 15, 1958.

22 Letter from concerned citizen to Water Pollution Control Section and State Health Department dated November 9, 1964 and reply to County Health Department dated April 1, 1965.

23 Chemung County Health Department Case Summary of Chemung River Drainage Basin, dated December 3, 1965.

24 Letter from Remington Office Machine Corp. to Chemung County Health Department, dated December 19, 1965.

25 Letters from NYS Department of Health of Chemung County Health Department, dated November 22, 1965.

26 Memorandum from County Health Department to Water Pollution Control, dated January 10, 1966.

27 NYS Department of Health, notice of enforcement hearing, undated.

28 Letter from Remington Office Machines to Chemung County Health Department, dated August 15, 1966.

29 Memorandum from Chemung County Health Department to Rochester Regional Office, dated March 23, 1967.

30 Letter from Remington Office Machines to Chemung County Health Department, dated March 23, 1967.

31 Letter from Chemung County Health Department to Remington Office Machines, dated April 9, 1971.

32 Letter from Lancy Laboratories, Inc. to Chemung County Health Department, dated November 13, 1967.

33 Letter from Chemung County Health Department to Lancy Laboratories, dated January 16, 1968.

34 Letter from Westinghouse Electric, dated February 27, 1974.

35 Chemung County Health Department field report, dated November 11, 1975.

Reference Number	
36	Soil Survey of Chemung County, New York, U.S. Department of Agriculture Soil Conservation Service, issued September 1973.
37	T.S. Miller, 1982. Elmira-Horseheads-Big Flats Area. Atlas of Eleven Selected Aquifers in New York, U.S. Geological Survey Water Resources Investigations, Open File Report 82-553.
38	J.P. Hood and others, 1964. Water Resources Data New York Water Year 1983, volume 3 - Western New York. U.S. Geological Survey Water Data Report NY 83-3 (with supplemental data for 1984).
39	U.S. Bureau of the Census, 1980. Census of Population and Housing, Elmira, NY, Report 146.
40	Rand McNally, 1986. Commercial Atlas and Marketing Guide. Rand McNally & Co., New York, 117 edition.
41	R.D. McNish, A.D. Randall, and J.F. H. Ku, 1969. Water Availability in Urban Areas of Susquehanna River Basin - A Preliminary Appraisal. new York State Water Resources Commission Report of Investigations RI-7, 24 p.
42	Kentucky Avenue Wellfield Site Remedial Investigation and Feasibility Study performed by Dames & Moore, August 1986.
43	Elmira Water Board, 1985 Annual Report.
44	Elmira Water Board, 1986 Annual Report.
45	Hazen and Sawyer Engineers and Woodward Clyde, Sherard & Associates, April 1969. Report on Comprehensive Water Supply Study for Chemung County, New York, State of New York Department of Health CPWS-1.
46	Letter from Chemung County Health Department to Remington Office Machines, dated November 1, 1966.
47	National Flood Insurance Program, Town of Southport, New York, Chemung County, Panel 30 of 40, May 1, 1980.
48	Personal communication between Dames & Moore and construction worker employed by contractor of high school.
49	Memo from Chemung County Health Department to Region 8 NYSDEC, dated October 1, 1987.

Reference Number	
50	Newspaper article, dated September 10, 1954.
51	Personal communication between former Remington employee and Dames & Moore.
52	Newspaper article, dated February 14, 1963.
53	Newspaper article, dated August 1, 1982.
54	U.S. Department of the Interior, USGS 7.5 minute series topographic map; Elmira quadrangle, 1969.
55	Dames & Moore title research 1988.
56	Deleted
57	Field sketch with Potential Disposal Areas noted, dated September 29, 1987 on file with NYSDEC Region 8.
58	Preliminary Site Assessment, McInerney Farm Site, Dames & Moore, March 1988.
59	Air photograph dated 1938, on file with the U.S. Department of Agriculture, agricultural Stabilization and Conservation Service, Horseheads Office.
60	U.S. Department of Agricultural Stabilization and Conservation Service, 1955 aerial photography.
61	U.S. Department of Agricultural Stabilization and Conservation Service, 1964 aerial photography.
62	U.S. Department of Agricultural Stabilization and Conservation Service, 1976 aerial photography.
63	Memorandum from Chemung County Health Department to Municipal and Industrial Waste Section State Health Department, dated August 31, 1966.
64	Letter from Department of Health to Sperry Rand, dated July 24, 1987.
65	Letter from Lancy Laboratories, Inc. to Chemung County Health Department, dated November 13, 1967.
66	Letter from Chemung County Health Department to DIVISION of Pure Water-Industrial Parks Division, dated February 9, 1968.

Reference
Number

67 Letter from Sperry Rand to Department of Health, dated March 28, 1968.

68 Letter from Chemung County Health Department to Sperry Rand, dated May 23, 1968.

69 Facility Field Inspection Form, dated September 1, 1970.

70 Letter from Town of Southport to NYSDEC, dated August 17, 1979.

71 NY S Office of General Services, Public Information Office, dated July 17, 1987.

72 Field notes dated July 22, 1987 on file, Region 8 NYSDEC.

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