PHASE I REMEDIAL INVESTIGATION REPORT

LOCKHEED MARTIN TACTICAL DEFENSE SYSTEMS DIVISION
(Former Unisys Corp. Site)

Great Neck, New York
NYSDEC Site No.130045

Prepared for:
New York State
Department of Environmental Conservation

On behalf of:
Lockheed Martin Tactical Defense Systems Division of
Lockheed Martin Tactical Systems, Inc.

DECEMBER 1996

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1.0 INTRODUCTION

The Lockheed Martin Tactical Defense Systems Division of Lockheed Martin Tactical Systems, Inc. (Lockheed Martin) facility, located in Great Neck, New York, has been placed on the New York State Department of Environmental Conservation (NYSDEC) Inactive Hazardous Waste Disposal Site List. The facility is classified as a Class 2 site and was given the ID Number 130045. On December 13, 1991, Unisys Corporation (Unisys), the owner of the Lockheed Martin facility at the time, entered into an Administrative Order on Consent with the NYSDEC. The Consent Order required certain deliverables including a Remedial Investigation/Feasibility Study (RI/FS) and Interim Remedial Measures (IRMs).

This document represents the latest version of the RI report which includes a summary of the site's operational history, past investigation results (prior to NYSDEC involvement), and Phase I RI results. The RI activities were performed as proposed in the RI/FS Work Plan dated September 30, 1993. The scope of work was slightly modified due to changing field conditions and based upon information collected during the course of the RI. All RI/FS Work Plan modifications were proposed to the NYSDEC and approved. The RI/FS Work Plan also included the Health and Safety Plan (HASP), Community Participation Plan (CPP), and Sampling and Analysis Plan (SAP). The SAP is a stand alone document that details procedures to assure the quality, quantity and validity of data collected during the RI.

Due to the size (over 94 acres) and complexity of the site, the RI/FS will be conducted as two operable units (OU). OU-I includes the portion of the site property presently owned by Lockheed Martin (i.e., 94 acres of land as described in Section 2.0). OU-II includes areas off of the site. This document represents the Phase I RI results for both OUs. The purpose of the Phase I RI was to characterize on- and off-site subsurface conditions, locate and investigate potential source areas, and determine potential exposure pathways and receptors. The focus of the next phase of work (i.e., the FS and Risk Assessment) will be on OU-I.

The off-site RI/FS for OU-II will consist of additional studies to further characterize off-site environmental conditions and will be conducted after NYSDEC reviews and comments on this report. After the off-site activities are completed and approved by the NYSDEC, an FS for Operable Unit II will be conducted. The purpose of the FS will be to evaluate methods to prevent, minimize, or eliminate the release of hazardous substances from the site and to minimize the risk to human health and the environment. Data collected during the RI/FS and operation of the existing IRM will be evaluated along with proven technologies for the Final Remediation Design. The remaining OU-II work will commence after the completion of the RI/FS for OU-1.

1.1 Interim Remedial Measures

The purpose of the IRM is to minimize the risk to the environment and public health during the performance of RI/FS activities and prior to NYSDEC's Record of Decision (ROD). IRM activities at this site consist of both groundwater and soil remediation. Performance of the groundwater remediation IRM is discussed in the IRM Operable Unit I Work Plan dated January 27, 1993. Performance of the soil remediation IRM is discussed in the IRM Operable Unit II Work Plan dated December 10, 1993.

Both remediation systems have been in operation since shortly after the Work Plans were approved by the NYSDEC. Results of the remedial activities are reported to the NYSDEC on a monthly basis. The groundwater treatment system has recovered and treated over 840 million gallons of water to date. The soil-vapor extraction and treatment system has recovered and treated approximately 35,000 lbs of volatile organic compounds (VOCs).

2.0 BACKGROUND

2.1 Site History

The Lockheed Martin property consists of several large buildings on 94 acres of land located at the intersection of Marcus Avenue and Lakeville Road between the Village of Lake Success and the Town of North Hempstead in Nassau County, New York (Figure 2-1). The property has a main manufacturing building, and six smaller buildings located immediately south of the main building, which total approximately 1.5 million square feet. Three small drainage basins are located in the southwest corner of the property adjacent to Lakeville Road. The drainage basins collect snow melt and rain runoff from the roof and parking lots. The majority of the remaining property is used for parking.

Currently, the site is only used for engineering activities and, until recently, the site was an active manufacturing facility which has been in operation since shortly after it was constructed in 1941. The facility was originally designed and built by the United States Government and was operated under contract by the Sperry Gyroscope Company, a division of Sperry Rand Company, from 1941 until 1951. In 1951, the government sold the property to Sperry and in 1986 Sperry merged with Burroughs Corporation to form Unisys Corporation. Unisys Corporation sold the facility to Loral Corporation in 1995, who subsequently sold the facility to Lockheed Martin in 1996. Originally, the property included an additional 55 acres with a large manufacturing building immediately to the east of the present property. However, this building was demolished, the property was sold to a developer in the 1970s, and the present day Triad Business Park was constructed.

At present, the Lockheed Martin facility houses administration offices and engineering departments. In the past, the facility has been used to manufacture a wide range of defense-related products. Manufacturing processes used in the past included a foundry, etching, degreasing, plating, painting, machining and assembly. Chemicals used during manufacturing at the plant included halogenated and non-halogenated hydrocarbon solvents, cutting oil, paints, and fuel oils.

In the past, unused solvents and waste solvents were reportedly delivered to the site, stored, transported on-site, and removed in 55-gallon drums. Currently, all process chemicals are stored in the chemical storage area and are handled per Resource Conservation and Recovery Act (RCRA) requirements. Unisys performed a search of corporate archives and little or no written record of wastes generated in the past, as well as historical waste handling practices, were available. The above summary of historical waste handling practices is primarily based upon interviews of former employees.

Groundwater had been used for non-contact cooling purposes since the facility was constructed. The non-contact cooling system consisted of three extraction wells (EW-1, 2 and 3), piping and chillers in the main building, and four diffusion wells (DW-5, 6, 7 and 8). The extraction and diffusion wells are located to the north and south of the main manufacturing building, respectively. When operational, approximately 1,000 gallons per minute (gpm) was pumped from the extraction wells, used for non-contact cooling in the plant, and drained into the aquifer through the diffusion wells. The non-contact cooling system is no longer in use. The groundwater IRM, which was initiated in 1993, uses the existing system to remove, treat, and re-inject groundwater. The groundwater is no longer used for cooling purposes. In addition, the soil vapor extraction (SVE) system was installed in 1994 to address source area remediation for volatile organic contamination in the area of the five former dry wells.

2.2 Site Geology

The Lockheed Martin site and surrounding area is underlain by unconsolidated surficial deposits and Precambrian Age bedrock. Based upon boring logs and geologic publications of the surrounding area, the unconsolidated deposits are approximately 700 feet thick and lie unconformably upon the bedrock. The unconsolidated deposits are comprised of the following formations (from youngest to oldest); Upper Pleistocene glacial deposits, Late Cretaceous Magothy Formation and the Late Cretaceous Raritan Formation (see Figure 2-2).

The glacial deposits are comprised of stratified, fine to coarse sands and gravels interbedded with silts and thin clay lenses. Based upon boring logs, glacial deposits at this site are approximately 150 feet thick. The glacial deposits lie unconformably over the Magothy Formation, which is composed primarily of fine to coarse sand with silt and clay lenses and is believed to be approximately 250 feet thick. This formation coarsens with depth and lies unconformably upon the Raritan Formation.

The Raritan Formation is composed of two members, the Upper Clay Member and the Lloyd Sand. The Upper Clay Member consists predominantly of light to dark clay with some silt and is approximately 200 feet thick in the study area. The Lloyd Sand is approximately 190 feet thick and is composed of light colored sand and gravel with, in some locations, a clayey matrix. The Lloyd Sand lies unconformably upon the Precambrian bedrock which generally consists of gneiss and biotite schist. The Bedrock, Magothy and Raritan Formations gently slope (50 ft/mile) to the southeast.

2.3 Regional and Site-Specific Hydrogeology

The sands and gravels of the unconsolidated deposits have a much greater potential for yielding large quantities of water to wells than the underlying crystalline bedrock. The sands and gravels of the Upper Glacial aquifer and the Magothy Formation contain substantial pore space between grains and can store and transmit large quantities of water. At some locations within Long Island, New York, the Magothy is confined by a clay layer that separates the Glacial and Magothy sediments, however, this condition does not exist at the site and the contact between the two units is not sharply defined. In the vicinity of the Lockheed Martin site, these two aquifers are directly connected and can be thought of as a single unconfined to semi-confined hydrogeologic unit.

The Magothy Aquifer is the principal aquifer underlying Long Island and it is Long Island's main source of water for public supply wells. Large users near the site include: Manhasset Lakeville Water District, Garden City Park Water District and Jamaica Water Supply Company. The reported yield during the pumping tests of 90 wells completed in the Magothy, in the vicinity of North Hempstead, ranged between 300 gpm to 1,543 gpm, with an average of 1,000 gpm.

In general, the hydraulic conductivity (K) of the Upper Glacial aquifer is greater than the K of the underlying Magothy Formation. The hydraulic conductivities for the Glacial and Magothy Formations have been estimated at 270 ft/day horizontally, 27 ft/day vertically, and 50 ft/day horizontally, 1.4 ft/day vertically, respectively (Franke and Cohen, 1972). Published data suggests that the regional groundwater flow direction is to the west or northwest (Doriski, 1987). Work completed by Roux Associates in 1990 and Leggette, Brashears & Graham, Inc. (LBG) in 1991 indicate that aquifer characteristics at the project location are within published ranges. The Roux work is presented in Appendix K of the Site Assessment Report dated January 13, 1992.

The Magothy Formation is underlain by the Raritan Clay Unit. This unit is considered an aquitard due to its extremely low vertical and horizontal hydraulic conductivities. Based upon permeability tests performed during previous investigations and published data, average horizontal and vertical conductivity values of the clay unit are extremely low. The Raritan Clay is considered an impermeable unit.

The Lloyd Sand is confined by the Raritan Clay and has a groundwater flow direction to the southwest. The Lloyd flow direction is in contrast with the northwesterly flow direction of the Magothy indicating that the two units are not hydraulically connected. The Lloyd, to a lesser extent than the Magothy, is used as an aquifer in the Nassau/Queens County area. Large users of the aquifer in the vicinity of the site include Jamaica Water Supply Company and Manhasset Lakeville Water District. The horizontal hydraulic conductivity of the Lloyd is estimated at 40 ft/day and the vertical is 7 ft/day (Franke and Cohen, 1972). Based upon published data, yields during pumping tests of wells completed in the Lloyd ranged between 510 gpm and 1,610 gpm.

2.4 Previous Investigations

This section contains a summary of the results of groundwater and soil investigations performed prior to Phase I RI activities between 1988 and 1992 (prior to NYSDEC involvement). In summary, the following investigative activities have taken place in the past:

- 29 monitoring wells were installed and groundwater samples were collected on 5 occasions.
- 32 borings were drilled and soil samples were collected and analyzed for various parameters.
- Two recovery wells were installed.
- A pumping test was conducted on EW-2.
- Two groundwater models were constructed.
- Downhole geophysical (gamma and spontaneous potential) logging was performed on the monitoring wells.
- A soil-vapor extraction pilot test was performed in the reclamation room area.
- A soil-gas survey was performed in the reclamation room area.

2.4.1 Groundwater Investigation

Prior to Phase I RI activities, 29 monitoring wells and 2 recovery wells (RW-1 and RW-2), ranging from 90 to 395 feet below grade (ft bg) were installed on the site. The finished depth of each well is referenced by a well number and two letters. The letters signify the presumed aquifer and the relative depth within the aquifer. The two aquifers which have been screened are designated as "M" for the Magothy Aquifer and "G" for the Glacial Aquifer. The relative depths within the aquifers are denoted as U for upper, I for intermediate, and L for lower. For example, Well 12MI refers to well cluster 12 completed in the Magothy Aquifer with the screen set in the intermediate portion of the formation. In addition, three extraction wells (EW-1, 2 and 3) and four diffusion wells (DW-5, 6, 7 and 8) were installed in the 1940s and 1950s. These wells have all been completed in the Glacial/Magothy Aquifer system. The four possible monitoring well designations are summarized below:

Designation	**GU**	**GL**	**MI**	**ML**
Depth (ft)	90 to 115	125 to 185	210 to 250	300 to 400

The monitoring wells have been sampled for VOCs on at least six occasions, and metals and PCBs/pesticides on one occasion. Results of the groundwater sampling are summarized as follows:

- The most commonly detected parameters include tetrachloroethylene (PCE) and its degradation products, trichloroethylene (TCE) and 1,2-dichloroethene (1,2-DCE).
- In general, VOCs have been detected in all wells sampled and concentrations have decreased between the 1991 and September 1994 sampling rounds.

A well search was performed by reviewing Nassau County Department of Health (NCDOH) and Nassau County Department of Public Works (NCDPW) well records for wells located within a 1.5-mile radius of the site. The NCDOH records include well construction specifications, operational history and groundwater quality and are summarized in the RI/FS Work Plan. The 37 wells located within a 1.5-mile radius of the site consist of monitoring, industrial, and municipal wells. No domestic wells were reported to be within this area. All wells are reported to be completed in the Magothy/Glacial Aquifer system with the exception of Wells N1802, N1958 and N1618 which are completed in the Lloyd Aquifer.

NCDOH and NCDPW water-quality records date back to the mid-1970s, and the data are included in the RI/FS Work Plan. The NCDOH and NCDPW water-quality records are summarized as follows.

- VOCs were detected in off-site wells located downgradient, upgradient and cross gradient of the Lockheed Martin site.
- Commonly detected VOCs included: 1,2-DCE, TCE, and PCE.

2.4.2 Soils Investigation

Prior soil investigation activities included the drilling of 32 borings, performance of a soil-gas survey, and performance of a soil-vapor extraction pilot test. The majority of this work was performed in the vicinity of the reclamation room and the former dry wells as summarized in the RI/FS Work Plan. Results of the soil investigations in the vicinity of the reclamation room are summarized as follows:

- Total VOC concentrations of soil samples collected in the vicinity of the reclamation room ranged from not detected to 2,200 parts per million (ppm). The most commonly detected VOCs were PCE, TCE and 1,2-DCE.
- PCBs in concentrations ranging from 0.89 to 3.06 ppm were detected in three of the four samples analyzed for PCBs. These samples were collected from depths ranging between 12 and 80 feet in soil-vapor borings (SVB) 17 and 18.
- Pesticides ranging in concentrations from 0.048 to 0.088 ppm were detected in two of the four samples analyzed for pesticides. These samples were collected from depths ranging between 12 and 80 feet in SVB-17 and 18.
- Semi-volatile organic compounds (Semi-VOCs) ranging in concentrations from 1.14 to 6.27 ppm were detected in two of the four samples analyzed for semi-VOCs. These samples were collected from depths ranging between 12 and 80 feet in SVB-17.
- VOCs are confined to an area of approximately 180 feet in diameter in the unsaturated soils from approximately the bottom of the dry wells to the water table (approximately 100 ft bg) in the vicinity of the reclamation area.

2.4.3 Soil-Gas Survey

In September of 1989, a shallow soil-gas survey was performed in the vicinity of the southeast corner of the main manufacturing building. During the survey, a total of 43 soil-gas samples were collected from 18 sample locations. Results of the soil-gas survey indicated that 1,2-DCE was not detected in any of the samples, however, PCE and TCE were detected in concentrations ranging from 0.08 to 780 parts per billion by volume (ppbv). A report summarizing the results of the soil-gas survey is presented in Appendix I of the Site Assessment Report (Unisys, 1992).

2.4.4 Soil-Vapor Extraction Pilot Test

In 1991, a soil-vapor extraction pilot test was conducted using VW-1 as an extraction point. The test was conducted for a period of 72 hours at an extraction rate of approximately 400 cubic feet per minute (cfm). Results of vapor samples taken during the test indicated that a significant quantity of chlorinated hydrocarbons were being removed from the subsurface. It was concluded that vapor extraction is an effective means of removing VOCs from the subsurface. A more detailed discussion of the results of the vapor-extraction test is contained in the IRM Operable Unit II Work Plan (Unisys, 1992).

2.4.5 Drainage Basin Sampling

Previous environmental studies of the drainage basins have consisted of two samples (type unknown) collected by NCDOH in 1978 and one sediment sample collected by Geraghty and Miller (G&M) in 1988. The exact sample locations are not known, however, the NCDOH samples were reported to be collected in the southwest corner of the east basin and the southwest corner of the center basin.

NCDOH samples were analyzed for 1,1,1-trichloroethane (1,1,1-TCA), carbon tetrachloride, bromo-dichloromethane, chloroform, PCE and TCE. TCE was detected in concentrations ranging from 10 to 18 parts per billion (ppb) and PCE was detected at 7 ppb. The Unisys samples were analyzed for VOCs, TPH and metals including: copper, lead, nickel, and chromium and results are summarized below:

Sample I.D.	Cr	Cu	Pb	Ni	TPH	TVOC
Basin sediment	45 ppb	617 ppb	150 ppb	41 ppb	391 ppm	ND

ND Not detected.

3.0 REMEDIAL INVESTIGATION OBJECTIVES

The main objective of the RI was to define the nature and extent of organic and inorganic constituents both on and off-site. To obtain this objective, the investigation focused on the following media: soil, groundwater, surface water, air, and biota. The investigation itself consisted of the following scope of work:

- Background information review.
- Soil-gas survey.
- Installation of soil borings and soil sampling.
- Installation and sampling of on- and off-site monitoring wells.
- Downhole geophysical surveys.
- Off-site water quality and well survey.
- Lloyd Well N1802 investigation.
- Drainage basin investigation.
- Groundwater flow model.
- Meteorological data collection.

The Scope of Work is described in detail in the RI/FS Work Plan and the SAP which are dated September 1993 and which were approved by the NYSDEC in October 1993. All of the above tasks were conducted in accordance with the approved plans with the exceptions noted below. These modifications were reviewed and approved by the NYSDEC prior to being implemented.

- The monitoring wells were drilled using a mud-rotary method as opposed to a water-rotary method.
- Well Clusters 13, 14 and 16 were dropped from the program due to their distance from the site per the NYSDEC project manager's request.
- Groundwater samples were collected during drilling of the on-site deep monitoring wells every 50 feet in between existing and proposed well screen intervals within the same cluster.
- Soil samples were collected during drilling of the off-site monitoring wells at the discretion of the supervising geologist.

In addition to the above items, Unisys voluntarily installed 14 additional monitoring wells at seven different on-site locations across the northern portion of the site. These well clusters, which consist of two wells each, are numbered 23 through 29 and were installed outside the scope of the RI/FS Work Plan. Although analytical data from these wells have not been validated, the data have been included in the RI/FS report so that those who wish to, can consider it. Other tasks conducted outside the scope of the RI/FS Work Plan but included in this report, include a subsurface VOC emissions survey and a recovery well pumping test.

4.0 SOILS INVESTIGATION

The purpose of the soils investigation was to identify all on-site areas that might have been impacted by past site activities and which may in turn be impacting groundwater. The soils investigation included a soil-gas survey and the collection of soil samples from the former dry wells, during the installation of the on-site monitoring wells, and from the Long Island Lighting Company (LILCO) substation. The property on which the LILCO substation is located was formerly owned by Unisys; however, the equipment was always owned and operated by LILCO. All of the above activities were conducted in accordance with the approved RI/FS Work Plan and SAP.

4.1 Soil-Gas Survey

Soil-gas surveys were conducted at one off-site and five on-site locations. The sampling locations and analytical results are presented on Figures 4-1 through 4-4. Actual analytical reports are contained in Appendix A. All of the samples were analyzed for VOCs. The sampling locations, rationale, and analytical methods are fully described in the RI/FS Work Plan and SAP.

The results for soil-gas grid Nos. 1, 2 and 5 are shown on Figures 4-1 and 4-2. VOCs were not detectable at any of the sampled locations. The results for grid No. 3 are shown on Figure 4-3. TCE was detected at two locations near the northeastern corner of the former foundry building at 3 micrograms per liter (ug/L) and 6 ug/L, respectively. PCE was detected at four points in grid No. 4 between 1 ug/L and 2 ug/L. PCE, TCE and 1,2 DCE were detected at several points in grid No. 6 (Figure 4-4). This grid was located in the vicinity of the former dry wells where previous sampling results have shown elevated levels of VOCs. This area is suspected to be the main source of VOCs to the groundwater on site and is currently undergoing interim remedial measures by soil-vapor extraction (Section 1.1). Total VOC concentrations at this location ranged from 1 ug/L to 3,300 ug/L.

4.2 Dry Well Soil Borings

Five soil borings, B-15 through B-19, were drilled at the location of each of the five former dry wells located near the southeast corner of the main manufacturing building (Figure 4-5). The purpose of these borings was to collect soil samples for analysis to confirm if residual materials related to former waste handling practices exist at these locations.

During drilling of the borings, continuous split-spoon samples were collected from grade to approximately 20 ft bg. Two samples from each boring were selected, based on field screening with a photoionization detector (PID), for analysis of the parameters specified in the RI/FS Work Plan. A geologic log for each boring is included in Appendix B. A summary of the analytical results is presented on Tables 4-1 through 4-3. The validated analytical data, including a complete list of analytes and detection limits, are included in Appendix C. It should be noted that many of the concentrations reported on the summary tables are followed by "J" qualifiers indicating they were estimated values. This occurs because the compound was either detected below the practical quantitation limit (PQL) or other data criteria issues were identified during data validation.

As shown on the summary tables, VOCs, mainly PCE and TCE, were detected in all of the soil boring samples. The highest concentrations were detected in samples from B-17, B-18 and B-19 and ranged between 2,300 milligrams per kilogram (mg/Kg) and 18,000 mg/Kg. Various semi-VOCs were also detected in all of the analyzed samples, although at much lower concentrations. The highest semi-VOC concentration detected was 210 mg/Kg of Di-n-butylphthalate in the 6 to 8-feet sample from B-18. However, this compound was also detected in the laboratory method blank and, as a result, the reported concentration may not be truly representative of the sample concentration.

In addition to VOCs and semi-VOCs, the samples were analyzed for pesticides, PCBs and inorganics (metals and cyanide). Low levels of some pesticides, less than 1 mg/Kg, were detected in at least one sample from each boring with the exception of B-17. PCBs were detected in samples from B-15, B-18 and B-19 at concentrations ranging from less than 1 mg/Kg to 3.9 mg/Kg (Table 4-2).

The inorganic results are presented on Table 4-3. Unlike the organic parameters, all of the inorganic parameters, with the exception of cyanide, are naturally-occurring elements. As a result, their detection alone is not indicative of an impact from site activities. To determine if any of the detected concentrations on Table 4-3 could be considered elevated, the results from the five borings (ten samples total) were compared to each other and to published, naturally-occurring concentration ranges for uncontaminated soils in the eastern United States and New York State (Shacklette, 1971). In comparison to these ranges, many of the reported concentrations were within the average range. However, relative to each other, some of the reported concentrations appear to be elevated as indicated on Table 4-3.

As shown on Table 4-3, the greatest number of compounds with elevated concentrations, and the highest concentrations, were detected in the 6 to 8-foot sample from B-18 followed by the same sample interval from B-19. The sample descriptions contained on the geologic logs in Appendix B, show that these samples consisted of a very moist, black, silty material (sludge) with a strong odor.

4.3 Monitoring Well Split-Spoon Samples

During the drilling of the on-site deep monitoring wells 2ML, 3ML, 5ML, 7ML and 8ML, split-spoon soil samples were collected at the intervals specified in the RI/FS Work Plan. The purpose of the sampling was to determine if impacted soils were present on-site other than in the immediate vicinity of the former dry wells. One sample from each borehole was selected for analysis of VOCs based on field screening with a PID. The PID readings and a geologic description of each sample are included on the geologic logs in Appendix B. The analytical results are summarized on Table 4-1. The validated analytical data, including the complete list of analytes and detection limits, are included in Appendix C. As shown on Table 4-1, VOCs were not detected in any of the split-spoon samples.

4.4 LILCO Substation Soil Borings

The LILCO electrical substation is located south of the Lockheed Martin facility on the corner of Lakeville Road and Union Turnpike (Figure 4-6). This property was formerly owned by Unisys and, as a result, the NYSDEC requested that soil samples be collected as part of the RI. However, the substation equipment was never owned, operated, or maintained by Unisys and subsequent owners. Due to the presence of extensive underground utilities and high voltage lines, the number of sampling locations was limited to four and only hand digging was allowed. The sample locations are shown on Figure 4-6. The samples were analyzed for VOCs, semi-VOCs, and PCBs in accordance with the RI/FS Work Plan. The analytical results are summarized on Table 4-1 and the validated analytical data, including the complete analyte list and detection limits, are included in Appendix C.

As shown on Table 4-1, the only VOCs detected were acetone and 2-butanone in sample No. 21A at 0.160 mg/Kg and 0.030 mg/Kg, respectively. However, acetone was detected in the laboratory method blank and, as a result, the reported concentration (0.160 mg/Kg) may be higher than the actual sample concentration. Semi-VOCs were detected in all four samples at concentrations ranging from 0.02 mg/Kg to 3.2 mg/Kg with the highest concentrations detected in sample No. 2A. Many of the reported semi-VOC concentrations are estimated values because they were either detected below the PQL or other data criteria issues were identified during the validation process. Additionally, many of the semi-VOCs detected were different from those detected in samples collected on site from the former dry wells. PCBs were not detected in any of these samples, with the exception of No. 21A which contained 0.39 mg/Kg of Aroclor-1260.

4.5 Summary of Results

1. The soil-gas survey detected VOCs at three of the six survey locations (grid Nos. 3, 4 and 6). The detections at grid Nos. 3 and 4 were relatively low and not indicative of significant impact. The results for grid No. 6 (the dry well area) were elevated as expected and were consistent with previous analytical results from this area which showed elevated levels of TCE, PCE, and 1,2 DCE.

2. Analysis of soil samples from the dry well soil borings confirmed the presence of elevated levels of VOCs in that area and indicated that elevated levels of some metals may also be present. TCE and PCE were detected in all of the samples with the highest concentrations in samples from B-18. In addition, low levels of semi-VOCs and trace concentrations of pesticides and PCBs were detected.

3. VOCs were not detected in any of the monitoring well split-spoon samples.

4. VOCs were also generally not detected in the LILCO substation samples, however, low levels of semi-VOCs were detected in all four samples and PCBs were detected in one sample at 0.39 mg/Kg.

These results indicate that the only area of VOC-impacted soil is in the vicinity of the former dry wells, where soil-vapor extraction and groundwater recovery and treatment systems are already in place as part of the IRM. The primary VOCs of concern, PCE, TCE, and 1,2 DCE, were not detected in any of the LILCO samples and the semi-VOCs that were detected were not consistent with those found on-site. As a result, it does not appear that the compounds detected on the LILCO property are related to Lockheed Martin activity.

5.0 GROUNDWATER INVESTIGATION

The main objectives of the groundwater investigation were to define the hydraulic characteristics of the site and to define the vertical and horizontal extent of groundwater impacts. The investigation included the testing and repair of Lloyd Well No. N1802, the installation and sampling of on-site and off-site monitoring wells, a review of existing off-site well records and water quality, water-level monitoring, aquifer testing, and groundwater flow modeling. All of the above activities were conducted in accordance with the approved RI/FS Work Plan and SAP.

5.1 Lloyd Well No. N1802 - Investigation and Repair

Lloyd Well No. N1802 is located on the corner of Lakeville Road and Union Turnpike and is owned and operated by the Manhasset Lakeville Water District. Routine testing of this well detected the presence of VOCs and although the water was being treated with granular activated carbon (GAC) prior to distribution, the NYSDEC requested that this well be investigated as part of the RI. Unisys tested the well and discovered the following:

- The driller's well construction summary indicates that the 20-inch outer casing does not penetrate the 150 foot bg clay aquitard.
- Down-hole television inspection of N-1802's did not indicate that the inner casing and screen of the well was damaged.
- An abrupt change in slope of the temperature gradient located at approximately 224 feet bg indicated a possible point of water flow.
- The gamma log indicated a clay layer was present between 410 and 482 feet bg.
- Presence of wave distortions on the full wave form sonic log indicated possible gravel or sand pack materials with a high percentage of void areas between 226 and 415 feet bg.
- A head differential of approximately 22 feet was observed between the upper and lower portions of the well following the inflation of a packer.
- The upper unscreened interval of the well (which was isolated from the lower portion of the well with a packer) recovered 1.62 feet in 10 minutes after initial well-bore evacuation.

Based on the above, the contamination was attributed to a hole in the well casing. Upon determining the problem, the well was repaired. Complete details of the testing and repair of Lloyd Well No. N1802 are included as Appendix D. The well was first brought back on line on July 19, 1996 and no post-repair groundwater analytical data are available. The Manhasset

Lakeville Water District has indicted that the well will be sampled for VOCs on July 26, 1996. The analytical results will be forwarded to the NYSDEC when they become available.

5.2 Monitoring Well Installations

To aid in the collection of groundwater data, the existing on-site monitoring well network was expanded by the installation of five wells in the Lower Magothy Aquifer: 2ML, 3ML, 5ML, 7ML and 8ML. In addition, eight monitoring wells were installed off-site at four different locations in the Lower Glacial and Magothy Aquifers. These clusters are numbered 15, 17, 18 and 22. Groundwater samples were collected during the installation of these wells, via the hydropunch method, at 50-foot intervals in between existing and proposed well screen settings. The samples were analyzed for VOCs and the results are discussed in Section 5.4. All of these wells were installed as described in the RI/FS Work Plan with the exception of the modifications noted in Section 3.0. After installation, all of the wells were surveyed by a licensed surveyor for relative locations and top-of-casing elevations. Figure 5-1 is a generalized well construction diagram; well construction details for all on and off-site monitoring wells are summarized on Table 5-1. In addition to these wells, Unisys voluntarily installed 14 additional monitoring wells at seven different locations along the northern portion of the site for the purpose of obtaining data for the groundwater flow model. These well clusters are numbered 23 through 29 and were installed by the hollow-stem auger method. Geologic logs for all of the monitoring wells are included in Appendix B and the well locations are shown on Figure 5-2.

5.3 Downhole Geophysical Logs

During the installation of the ML (Magothy Lower) and MI (Magothy Intermediate) monitoring wells, downhole geophysical surveys were conducted using the gamma radiation technique. These surveys were conducted to obtain information on the stratigraphy of underlying sediments, supplement the lithology data collected during drilling and aid in placement of the well screens. These data were also used in conjunction with published information (Krulikas, 1983) to create the geologic cross sections presented on Plate 5-1.

In general, the geophysical data show that site hydrogeology is consistent with regional hydrogeologic information (Swarzenski, 1963). Most noticeable from the data on Plate 5-1 is that very little of the glacial formation contains groundwater. The maximum thickness of saturated glacial material is approximately 70 feet near the northeast portion of the site. Groundwater occurrence beneath the site is mainly in the underlying Magothy Formation. Also noticeable is the presence of a clay layer on the east-west cross-section A-A'. The clay occurs at an elevation of approximately 20 feet above sea level, which is just below the water table. However, based on the north-south section B-B', this clay is not continuous across the entire site. As a result, there does not appear to be a clear confining layer between the Upper Glacial and Magothy Aquifers beneath this site, which is consistent with previously obtained site-specific information. Also consistent with published information is the presence of the Raritan Clay, the confining unit between the bottom of the Magothy and the Lloyd Aquifers. As shown on Plate 5-1 in section B-B', the Raritan Clay was encountered during the drilling of Wells 17ML and 2ML between 290 and 330 feet below sea level. The presence of this clay was verified through visual observations, as noted on the geologic logs in Appendix B, and the geophysical logging as shown on Plate 5-1.

5.4 Groundwater Sampling and Water Quality Results

As part of the RI, groundwater samples were collected from all on-site and off-site monitoring wells in accordance with the RI/FS Work Plan and SAP. The well locations are shown on Figure 5-2. In addition, groundwater samples were collected during drilling of the ML wells, via the hydropunch method, from formation intervals between existing and proposed well screen settings. The purpose of the sampling was to characterize and determine the vertical and horizontal extent of groundwater impact. The hydropunch samples and the samples from Well Clusters 23 through 29 were analyzed for VOCs. Samples from the remaining on and off-site monitoring wells were analyzed for VOCs, semi-VOCs, pesticides, PCBs and inorganics. Summaries of the detected compounds are presented on Plate 5-2 and Tables 5-2, 5-3, 5-4, and 5-4A. Validated and non-validated laboratory data, including a complete list of analytes and detection limits, are included in Appendices E and F.

Based on the results of the VOC analyses (Plate 5-2 and Table 5-4A), at least one, if not all three of the primary compounds of concern, 1,2-DCE, PCE, and TCE, were detected in all of the samples. The detected concentrations of the individual compounds ranged from 0.8 ug/L to 11,000 ug/L with the highest concentrations detected in wells located just north of the administration building. With respect to the vertical distribution, the highest concentrations were detected in the GL and MI wells which are screened between 130 and 250 ft bg in the mid to upper portions of the Magothy Aquifer. These depths correspond to elevations ranging from 10 feet above sea level to 100 feet below sea level. At depths of greater than 250 ft bg, VOC concentrations were generally lower, decreasing with depth. This pattern was most noticeable when the hydropunch data (Table 5-2) are compared with that of the respective monitoring wells, and in the data from Well Clusters 1, 2 and 5 which have more than two wells screened at multiple depths.

In addition to the primary compounds of concern, other detected VOCs include 1,1,1-TCA and its degradation product, 1,1-dichloroethene (1,1-DCE) and Freon 113. These compounds were mostly detected in samples from wells located in the northeast quadrant of the site at concentrations ranging from 0.8 ug/L to 120 ug/L. There were also isolated detections of acetone, 2-butanone, carbon disulfide and chloroform. These compounds were mainly detected at relatively low concentrations and did not exhibit any clear trend or pattern.

Table 5-3 is a summary of detected semi-VOCs and pesticides; PCBs were not detected in any of the groundwater samples. Semi-VOCs were detected in nine samples with the majority of detections ranging between 0.6 ug/L and 1 ug/L for three of the four compounds detected. Many of the reported concentrations are estimated values because they were either detected below the PQL or other data criteria issues were identified during the validation process. One compound, phenol, was detected in samples from 1ML and 15GL at 45 ug/L and 2,100 ug/L, respectively. Well 15GL is located upgradient of the site on the south side of Union Turnpike. Well 1ML is located downgradient, on-site along the northern property line just off of Marcus Avenue. Due to the distance and lack of phenol detections between these two wells, its occurrence at these two locations is not believed to be related. The sample from 15GL was also the only one in which a pesticide was detected. Heptachlor was detected in this sample below the PQL of 0.05 ug/L at an estimated value of 0.034 ug/L.

The results of the inorganic analyses, which include metals and cyanide, are presented on Table 5-4. As shown, beryllium, cyanide, silver and thallium were not detected in any of the groundwater samples. The remaining metals were randomly detected in all of the samples and, as stated previously, are naturally occurring in the formation sediments. As a result, their detection alone is not indicative of an impact. Many of the detected concentrations were less than 1 mg/L with the exception of the more common elements such as calcium, iron, magnesium, manganese, potassium and sodium. The inorganic results do not show any clear vertical or horizontal trends that would indicate the detected concentrations are the result of something other than a naturally-occurring source.

5.5 Off-Site Well Survey and Water Quality Review

As part of the RI, a well survey and data review was conducted for off-site domestic, industrial, and municipal wells. The purpose of the survey was to identify potential sensitive receptors and define off-site water quality. The survey included a complete review of water-quality results and well records from the NCDOH, NCDPW and the NYSDEC.

The results of the survey were used to prepare Plate 5-3 which shows the locations of all off-site wells found within a 1.5-mile radius of the site and the most recent available analytical results for PCE, TCE and 1,2-DCE. As a result of the survey, it was also determined that no private domestic water-supply wells are present within the 1.5-mile radius.

A private water system is defined in the Article as any system which is used to provide drinking water other than that obtained from a public system. The Article also provides that plans for realty subdivisions or other land developments, which would be located in areas served by a public water system, would only be approved bv the NCDOH if such plans called for a connection to the public water system. In effect, no person, company or other private entity can legally install a well for the purpose of providing drinking water in the vicinity of the Lockheed Martin site as the area is served by a public water system.

As shown on Plate 5-3, PCE, TCE, and 1,2-DCE have been detected over the last several years in off-site wells located downgradient as well as upgradient and sidegradient of the Lockheed Martin site. The highest concentrations were detected in wells located within a 0.5 miles north of the site. Concentrations in wells located between a 0.5 and 1.5 miles of the site, in all directions, were significantly lower and, in most areas, not detectable. A few exceptions to the pattern are Wells N5603, N11659, N3672, N3673, and N15 which are located approximately 1.5 miles south and southeast of the site. These wells contained elevated levels of PCE and no TCE or 1,2-DCE. The distance and location of these wells from the Lockheed Martin site and the absence of TCE and 1,2-DCE indicate that there are other sources of PCE in the area.

5.6 Water-Level Elevations and On-Site Groundwater Flow

As part of the RI/FS, water-level elevations were obtained from all of the on-site and off-site monitoring wells so that the direction of groundwater flow across the site could be determined. Figures 5-3, 5-4 and 5-5 are groundwater contour maps for November 22, 1994 for the GL, MI and ML wells, respectively. As shown, the direction of groundwater flow in all three zones across the site is north-northwest with a slight shift to the northeast between the site and the Northern State Parkway. This northeasterly shift may be due to pumping influence from off-site Wells N3905 and N4243 which are located just north of the Northern State Parkway. These wells are public supply wells owned by the Manhasset Lakeville Water District. Water from the wells is currently treated at the wellhead to eliminate VOCs prior to entering the distribution system.

In general, water-level elevations in the GL wells were slightly higher than those in the deeper MI wells. Elevations in the GL and MI wells were also higher than those in the deepest ML wells. These data suggest that a downward vertical groundwater gradient exists in the Upper Glacial and Magothy Aquifers beneath this site.

5.7 Pumping Test

As part of the RI field activities, pumping tests were conducted to evaluate the hydrogeologic characteristics of the strata underlying the site. The main objective of the pumping test program was to determine the radius of influence of each individual pumping well at a time when only the tested well was on-line. The response of individual monitoring wells to pumping was evaluated in order to determine aquifer parameters, including transmissivity (T) and storativity (s) which were used in the groundwater modeling effort.

5.7.1 Pumping Test Methodology

Prior to conducting the pumping tests, data loggers and transducers were installed on approximately 20 monitoring wells. Data loggers used during this investigation included in-situ model SE-2000, In-Situ Well Sentinels, Slope Indicator recorders, and Instrument Northwest data loggers. The data loggers were programmed to collect water levels at 10-minute intervals until such time that the data logger's memory was full. Date and time for all of the loggers, as well as the geologist's watch, were synchronized prior to installation. After the loggers were set up and at least one day of antecedent water-level data was collected, the pumping test commenced. The general procedures for conducting the pumping tests were as follows:

- All wells were taken off-line for at least 4 hours.
- The well furthest from the most recent pumping well was brought on-line at a pumping rate of approximately 500 gpm,
- After at least 12 hours at 500 gpm, the flow rate was increased to 1,000 gpm.
- After at least 12 hours at 1,000 gpm, the pumping well was taken off-line for at least 4 hours before the next well was tested.

After the four pumping wells were tested, the transducers were removed from the monitoring wells and the data loggers were down loaded to a computer. The water-level data files were imported into a graphing software package (Grapher^{TM}) and hydrographs for each pumping well were constructed (see Appendix G). Each pumping well hydrograph is a compilation of several hydrographs prepared from data collected from individual monitoring wells adjacent to the pumping well. The hydrographs contain data collected over the entire multiple-well pumping test program including the time before, during, and after the individual pumping well was on-line. A second hydrograph for each pumping well was prepared from data collected during the period the individual pumping well was on-line.

5.7.2 Pumping Test Analysis

Due to the erratic daily changes in water levels, determining drawdown from long-term hydrographs has proven to be difficult if not impossible. On the other hand, drawdown effects resulting from pumpage are evident on the pumping period hydrographs. As shown on the pumping period hydrographs, a rapid response to pumping was recorded in monitoring wells within the vicinity of the pumping well. In addition, the adjacent monitoring wells recovered relatively rapidly after pumping ceased. In most cases, maximum drawdown in the pumping well and the adjacent monitoring wells occurred within 15 minutes after the pumping started. After the pumping stopped, groundwater levels in most monitoring wells also recovered to pre-pumping levels within approximately 15 minutes.

When a well in a semi-confined aquifer is pumped, some water may be released from elastic storage. Consequently, the area of drawdown or the cone of depression will expand indefinitely or until vertical leakage is equivalent to the well yield. Another important property of a semi-confined aquifer system is that water is released from storage nearly instantaneously. Based upon the nearly instantaneous response of the monitoring wells to pumping, as depicted on the hydrographs, the Magothy/Upper Glacial Aquifer system reacts to pumping stresses in a manner that is consistent with a hydraulically semi-confined aquifer. The semi-confining nature of the aquifer is probably due to the strong vertical anisotropy of the strata and the various clay lenses that were encountered during the gamma logging program.

Aquifer parameters were calculated using the distance drawdown method which is a modification of the Jacob Straight-Line Method. When drawdown is measured at the same time in different wells, the magnitude of the drawdown is found to vary with distance from the pumping well. Drawdown was obtained from the pumping period hydrographs at the time maximum drawdown was observed, or approximately 15 minutes after pumping commenced. Drawdown versus distance hydrographs were prepared by plotting drawdown observed in a monitoring well versus distance of the monitoring well from the pumping well on the y-axis and x-axis, respectively. A best-fit line is then drawn through the data points and extended until it intersects the zero drawdown line.

Using the distance versus drawdown plots, the T and S values are calculated from the following equations.

1.) $$T = \frac{528Q}{s}$$

where,

T = the coefficient of transmissivity, in gpd/ft;
Q = pumping rate, in gpm; and
s = slope of the distance drawdown plot between any log cycle.

2.) $$S = \frac{0.3\,Tt}{r_0^2}$$

where,

S = coefficient of storativity;
t = time since pumping started in days; and
r_o = intercept of extended straight line at zero drawdown in feet.

Calculated storativity and transmissivity values are as follows and the distance versus drawdown graphs are presented in Appendix G.

Pumping well	Flow rate (gpm)	Transmissivity (gpd/ft)	Storativity	Distance to O feet of drawdown (feet)	Distance to 1 foot of drawdown (feet)
RW-1	450	70,000	0.017	420	180
EW-1	980	215,600	0.0017	725	275
EW-2	475 985	209,000 200,030	0.00081 0.00073	1,050 1,100	200 470
EW-3	975	245,143	0.0033	800	280

5.8 Groundwater Model

As part of the RI, an effort was undertaken to evaluate the movement of site related constituents in the groundwater environment and their potential impact on off-site receptors. Analysis of groundwater samples collected on and around the site reveal the existence of several chlorinated solvents, primarily 1,2-DCE, TCE and PCE. Little is known about the quantity of wastes disposed of, the rate of disposal or the time period over which disposal occurred.

Presented below is a brief description of the groundwater flow model.

5.8.1 Objectives

The principal objective of the modeling effort was to predict the movement of dissolved constituents in order to evaluate the effectiveness of a groundwater pump and treat system designed to capture the plume and stem the migration of constituents from the site. Groundwater flow modeling was selected as a means of assessing the potential for dissolved compounds to migrate to receptors.

5.8.2 Conceptual Model

A series of groundwater modeling programs were used in order to evaluate the subsurface hydrogeology and potential transport of the dissolved solvent plume at the Great Neck site. A three-dimensional computer model of the site was constructed using the PC-based Visual MODFLOW^{TM}, Version 1.5 (Waterloo Hydrogeologic, 1996) pre-processor program. The pre-processor framework of the site was imported into the PC-based model MODFLOW^{TM}, Version EM (United States Geological Survey (USGS), 1990) to perform a mathematical finite-difference model to evaluate the resultant potentiometric surfaces and inferred groundwater flow directions. The MODPATH^{TM} Version 1.2 (USGS, 1990) particle tracking post-processing package was used to compute pathlines which indicate the most probable contaminant migration pathway based upon the modeled conditions and time frame. All model results were exported through the Visual MODFLOW post-processor for output.

5.8.3 Model Description

The movement of groundwater in an aquifer can be described by the following partial differential equation:

$$\frac{\partial}{\partial x}\left(Kxx\frac{\partial h}{\partial x}\right)+\frac{\partial}{\partial y}\left(Kyy\frac{\partial h}{\partial y}\right)+\frac{\partial}{\partial z}\left(Kzz\frac{\partial h}{\partial z}\right)-\overline{V}=S_s\frac{\partial h}{\partial t}$$

Where: Kxx, Kyy, and Kzz are hydraulic conductivity's along the x, y, and z coordinate axes (Length, L/Time, T);

h is the potentiometric head (L);

$\overline{V}$ is a volumetric flux per unit volume of groundwater or surface waters into or out of the aquifer (1/T);

S_s is the specific storage of the aquifer (1/L);

and t is time (T)

Analytical solutions of this generalized partial differential equation are typically not possible except in extremely simple cases. For this reason, finite difference approximations or other numerical methods are employed. The MODFLOW model used by H2M uses a block-centered finite-difference approximation to estimate the solution to the general groundwater flow equation.

5.8.4 Hydrogeologic Framework

The physical characteristics (including regional and site-specific hydrogeology) are thoroughly described elsewhere in this document and only a summary is provided herein. The topography of the site is low-lying with shallow slopes. The surface elevation of the site is approximately 130 feet above mean sea level (msl) and is covered by relatively impermeable surfaces such as asphalt parking lots, buildings, etc. Much of the surface water occurring as the result of precipitation is discharged to the storm-water infiltration basins discussed in the RI. However, because the site is a relatively small part of the horizontal model domain, the estimated recharge of 22 inches per year was evenly distributed over the entire model grid.

Based upon data collected during the RI, the site is underlain by approximately 120 feet of unconsolidated sand, gravel, silt , and clay of the Upper Glacial aquifer Only the 10 to 20 feet of the Upper Glacial aquifer is under saturated conditions. There is no significant lithologic changes across the Upper Glacial and Magothy aquifers contact. The Magothy aquifer occurs beneath the Upper Glacial aquifer to a depth of approximately 350 feet below msl. The lithologies encountered within the Magothy aquifer include layers of sand and silt with interbedded lenses of gravel and clay. The clay member of the Raritan formation is found beneath the Magother aquifer and is estimated to be 200-feet thick.

Based upon data in the RI, the groundwater flow direction in the Upper Glacial, Intermediate and Deep Magothy aquifers was to the north with a deflection to the northeast, north of the site. It was thought that this deflection in groundwater flow direction was due to the presence of two public supply wells located north of the site.

An evaluation of the vertical extent of the on-site groundwater contamination indicates that the majority of the contamination is present in the Upper and Intermediate Magothy aquifer; therefore, the model concentrated upon the saturated Magothy aquifer to a depth of approximately 145 feet below msl (approximately 275 feet below ground surface).

5.8.5 Model Construction

This section of Section 5 describes the parameters input into the model. Where possible, actual field data collected from the site as part of the RI were utilized. More general data from published sources were utilized where site-specific data were not available.

Model Grid

The area modeled was a 2.5 mile (north-south direction) by 2.3 mile (east-west) rectangle approximately centered on the Lockheed Facility. Initially, the model was constructed with 60 rows and 70 columns. During the steady-state flow calibration phase of modeling (as discussed later), this model grid was used. Additional rows and grids were added where higher model resolution was required (such as in the area of pumping and injection wells). The final model consisted of 158 rows and 163 columns. In general, the model had a tighter grid spacing in the vicinity of the Lockheed site.

Model Layers

The model consists of six layers (see Table 5-5). Layer 1 was defined to represent the unconfined Upper Glacial aquifer which has a minimal saturated thickness at the site (i.e., 10 to 20 feet thick). The bottom elevation of Layer 1 was selected from the geologic cross section presented in the RI. Layers 2 through 5 were constructed to represent the Magothy aquifer. Layer 2's top and bottom elevations of +20 and -60 feet msl, respectively were selected to represent the approximate screened intervals of wells RW-1 and DW-8. The upper half of the screened interval for RW-2 is also in Layer 2. The top and bottom elevations of -60 and -138 feet msl, respectively of Layer 3 were selected to represent the approximate screened intervals of EW-1, EW-3, EW-3, DW-5, DW-6, and DW-7. Additionally, the bottom half of the screened interval for RW-2 was in this layer. The top and bottom elevations of Layers 4 and 5 (see Table 5-5) were selected to represent the approximate screened interval of various public supply pumping wells present within the model grid. Layer 6 was defined to represent the Raritan Clay member of the Lloyd formation.

Model Hydraulic Boundary Conditions

In order to initiate and calibrate the model, a steady-state flow model with no active pumping wells was first constructed. For each layer, constant head boundary conditions were defined at the peripheries of the model domain to produce potentiometric surfaces which reflected field-measured conditions. The November 22, 1994 potentiometric surface maps for the Upper Glacial, Intermediate Magothy, and Deep Magothy aquifers presented in the RI were used as calibration targets for the steady-state flow model. The resultant model runs for the upper five model layers indicated that the steady-state flow model was well calibrated. Sensitivity analyses indicated that the steady-state flow model was sensitive to changes in the constant head boundary conditions but relatively insensitive to changes in the hydraulic parameters (i.e., hydraulic conductivity, storativity, etc.) input into the model.

Model Hydraulic Parameters and Calibration

The hydraulic parameters including horizontal hydraulic conductivity (K_{xy}), vertical hydraulic conductivity (K_z), storativity (S_s), specific yield (S_y), and porosity used for the different model layers are presented in Table 5-5. The hydraulic parameters for Layer 1 (the Upper Glacial aquifer) were taken from McClymonds and Franke, 1972.

The initial hydraulic parameters for Layer 2 were determined by analyzing the aquifer pumping test data for RW-1 which was pumped at 450 gpm, as reported in the RI. A horizontal to vertical conductivity ratio of 40:1 for the Magothy was assumed. The hydraulic conductivity parameter was adjusted within reasonable values to calibrate the parameters of Layer 2 while RW-1 was pumped within the model at 450 gpm. The 40:1 horizontal to vertical conductivity ratio was maintained. The layer's hydraulic parameters were considered calibrated when the head differences observed during the pumping test in monitoring wells 25GL and 25MI matched the head differences calculated by the model.

The initial hydraulic parameters for Layer 3 were determined by analyzing the results of the aquifer pumping tests conducted for EW-1, EW-2, and EW-3. A horizontal to vertical conductivity ratio of 40:1 for the Magothy was assumed. The hydraulic conductivity parameter was adjusted within reasonable values to calibrate the parameters of Layer 3 while EW-1 was pumped within the model at 985 gpm. The 40:1 horizontal to vertical conductivity ratio was maintained. The layer's hydraulic parameters were considered calibrated when the head differences observed during the pumping test in monitoring wells 28MI, 25MI, 26MI, and 27MI matched the head differences calculated by the model.

The aquifer pumping test data used to calibrate the model for the Upper and Intermediate Magothy was for Layers 2 and 3; therefore, hydraulic parameters from the available literature were used for the Upper Glacial aquifer. Inspection of the geophysical and lithologic logs for the deep Magothy aquifer (Layers 4 and 5) indicate that there were no significant lithologic differences within the Magothy aquifer; therefore, the hydraulic parameters from Layer 3 were used for Layers 4 and 5. Typical hydraulic parameters for low permeable clay were used for Layer 6 (the Raritan clay) of the model.

5.8.6 Groundwater Recovery Scenario

Once the model had been calibrated both under steady-state and pumping conditions, several extraction and injection scenarios were run. Prior to running the model, a series of 10 particles were inserted within each model layer. The final model was constructed to evaluate the optimal extraction/injection well network for establishing hydraulic control in Layers 2 and 3 (the Upper and Intermediate Magothy aquifer). Layers 2 and 3 were targeted for hydraulic control for the following reasons:

1. Based upon the RI data, the majority of the contaminated groundwater is present on site in the Upper Glacial and Upper/Intermediate Magothy aquifers.

2. Typically, the concentrations of contaminants are an order of magnitude lower in the deeper portions of the Magothy aquifer. The contaminants currently present in the deeper layers will degrade by natural attenuation processes assuming that additional source loading of halogenated solvents from higher in the aquifer (i.e., Layers 2 and 3) are interdicted by the treatment system.

3. The injection and extraction wells of the historic non-contact cooling water system were generally screened in Layers 2 and 3 This encouraged the migration/transport of contaminants into these layers.

A total of five extraction wells and five injection wells proved to be the most efficient remediation system. The wells, their screened intervals, and pumping rates are included in Table 5-6. The total pumping rate was 1,800 gpm. The resultant model outputs presenting the simulated potentiometric surface maps and particle tracks for Layers 1, 2, and 3 are included as Figures 5-6, 5-7, and 5-8, respectively. In this scenario, all on-site particles are captured from the highly impacted Layers 2 and 3. The majority of the on-site particles (and by inference, the contamination) in Layer 1 (the Upper Glacial aquifer) are also captured.

5.9 Summary of Groundwater Results

1. The investigation of Lloyd Well N1802 determined that there was a problem with the construction of the well casing and as a result, water from the overlying Magothy Aquifer which contained VOCs was draining into the well. Repairs to the well were made as part of the RI and in cooperation with the Manhasset Lakeville Water District.

2. A total of 27 monitoring wells were installed at various locations on and off-site in the Upper Glacial and Magothy Aquifers. Geologic and geophysical data obtained during the well installations confirmed that site geology and hydrogeology is consistent with regional information and that the Upper Glacial and Magothy Aquifers beneath the site are not separated by a confining layer (Plate 5-1). These data also confirmed the presence of the Raritan Clay beneath the site between 290 and 330 feet below sea level.

3. The groundwater sampling results show that VOCs, primarily PCE, TCE, and 1,2-DCE, were detectable in all of the wells sampled as part of the RI. Concentrations were found to be highest in the north end of the property in wells screened between 130 and 250 ft bg. Four semi-VOCs were randomly detected in nine wells at relatively low concentrations (0.6 to 1 ug/L) with the exception of phenol which was detected in 1ML and 15GL at 45 and 2,100 ug/L, respectively. Well 15GL is located upgradient and off-site, and was the only well in which a pesticide was detected. PCBs were not detected in any of the groundwater samples and the

inorganic results did not exhibit any trends that would be consistent with impact from on-site activities.

4. Results of the off-site well survey indicate that only municipal and industrial wells are located within a 1.5-mile radius of the Lockheed Martin site. No private domestic water-supply wells were located within the area. The results of the water-quality review show that PCE, TCE, and 1,2-DCE are present in groundwater throughout the Great Neck regional area. The distribution of constituents suggests the presence of other sources in the area, particularly south and southeast of the site.

5. The direction of groundwater flow across the site in the Upper Glacial and Magothy Aquifers is north-northwest. A shift to the northeast between the site and the Northern State Parkway may be the result of two pumping wells located north of the parkway. Based on the water-level elevation data for November 22, 1994, there is a downward vertical gradient between the Upper Glacial and Magothy Aquifers.

6. Computer simulation of steady-state groundwater flow conditions indicates that the pumping from on-site wells, as discussed, will capture the majority of groundwater flow from the site area.

6.0 SURFACE-WATER AND SEDIMENT INVESTIGATION (DRAINAGE BASINS)

As part of the RI, surface-water and sediment samples were collected from the three on-site drainage basins to determine if they have been impacted by site activities. The basins receive surface-water runoff from the entire site through a network of on-site storm and roof drains. They are located in the southwestern corner of the site and are shown, along with the sampling locations, on Figure 6-1. The drainage basin samples were collected in accordance with the procedures outlined in the RI/FS Work Plan and all of the sampling locations were surveyed for relative locations by a licensed surveyor.

6.1 Analytical Results

The surface-water and sediment samples were analyzed for VOCs, semi-VOCs, pesticides, PCBs and inorganics. Analytical summaries are presented on Tables 6-1 and 6-2. Validated analytical data including a full list of analytes and detection limits are included in Appendix H.

As shown on Table 6-1, the only organic parameter detected in the water samples was 1,2-DCE which is an estimated value since the compound was detected below the practical quantification limit (PQL). This compound was detected in the samples from the center and west basins at 1 and 2 ug/L, respectively. VOCs, including PCE, TCE, and 1,2-DCE, were detected in the sediment samples from all three basins. The concentrations were relatively low, ranging from 0.001 to 0.016 mg/Kg with most of the detections occurring in samples from the center basin. Semi-VOCs were also detected in sediment samples from all three basins. The detections were evenly distributed between the three basins with concentrations ranging between 0.01 and 60 mg/Kg, the highest of which were detected in samples from the center basin. Many of the reported VOC and semi-VOC concentrations were estimated values because they were either detected below the PQL or other data criteria issues were identified during data validation.

Pesticides and PCBs were also detected in sediment samples from all three basins at relatively low concentrations and, again, most of the reported values were estimates. The highest concentrations detected were 1.4 mg/Kg of the pesticide 4,4-DDD in WB-1 and 4.3 mg/Kg of Aroclor-1254 (PCBs) in CB-3. As with the semi-VOCs, pesticide and PCB detections were relatively evenly distributed between the three basins.

The inorganic results are presented on Table 6-2 and as shown, all of the analyzed parameters were detected in the sediment samples with the exception of beryllium. Many of the detected concentrations were elevated in comparison to some or all of the soil samples collected from the former dry wells as part of the RI and the basin samples collected in 1988 (see Section 2.4.5). While the distribution of elevated concentrations within the basins themselves varied, the distribution between the three basins was fairly even. Fewer inorganic compounds were detected in the water samples and the detected concentrations were several orders of magnitude lower than those detected in the sediment samples. In addition, the compounds detected tended to be present in samples from all three basins at similar concentrations, again indicating an even distribution. The exceptions to this pattern were aluminum and barium which were not detected in all three surface-water samples.

6.2 Summary of Results

The results of the drainage basin sampling showed the presence of low levels of VOCs, semi-VOCs, pesticides and PCBs in the sediment samples. In contrast, the only organic parameter detected in the surface-water samples was 1,2-DCE, at a maximum concentration of 2 ug/L. Many of the inorganic parameters analyzed were detected in both the sediment and surface-water samples with the concentrations and number of detections being greatest in the sediment samples, as expected. Another noticeable pattern is the fairly even distribution of detections and concentrations between the three basins, which is not surprising considering that they are interconnected and receive runoff from the same sources.

These results are not inconsistent with the nature and purpose of the drainage basins which is to collect storm-water runoff from surrounding parking lots, walkways, rooftops and unpaved areas and allow it to drain to the underlying sediments. Many of the compounds detected in the drainage basin samples are leached from the surrounding pervious and impervious surfaces or transported on sediments and deposited in the basins. As runoff collects in the basins, sediments picked up enroute settle to the bottom and become part of a natural filter which removes impurities from the water as it drains through the bottom of the basin. Over time, these impurities concentrate in the bottom sediments as is evident by the results presented above. Studies of drainage basins on Long Island show that the compounds detected in these samples are not uncommon (KU, 1986).

As a result, while the drainage basins appear to have been impacted by site activities, the impact is consistent with the nature and purpose of the basins and does not appear to be a contributing factor to the on-site groundwater problem.

7.0 AIR QUALITY INVESTIGATION

The Air Quality Investigation (AQI) detailed in the RI/FS Work Plan included meteorological data collection and an Air Pathway Analysis (APA). The APA was to be performed using predictive modeling techniques. If predictive modeling indicated the potential for significant impact, then more rigorous techniques such as direct emissions procedures were to be employed. In order to more accurately determine the emissions of VOCs from the site, Unisys opted to perform a subsurface volatile organic emissions test. Therefore, the less rigorous APA was not performed. The purpose of the AQI was to determine the potential for volatilization of contaminants from the subsurface of the site and determine the direction and rate of migration within the air medium.

7.1 Meteorological Data Collection

Per the RI/FS Work Plan, meteorological data has been collected from November 1993 to present. The data was collected using a Precision Meteorological Instruments model number 26700 programmable translator. Meteorological data collected since November 1993 includes inches of rainfall, temperature, wind speed, wind direction, and barometric pressure. Meteorological data sheets are contained in Appendix I.

7.2 Subsurface VOC Emissions

An emission isolation flux chamber was used at the site to directly measure emission rates of VOCs permeating from soils in the vicinity of the reclamation room. The primary document referenced for design, construction, and use of the flux chamber was EPA's Measurement of Gaseous Emission Rates from Land Surfaces Using An Emission Isolation Chamber (EPA/600/8-86/008). This reference was used extensively during the subsurface VOC emissions investigation. Important design parameters for the flux chamber include chamber base area, volume, geometry, sweep air flow rate and sweep air mixing. Each is critical to ensure that the flux chamber operates consistently throughout the sampling effort.

Operation of the flux chamber was described in the Unisys letter to NYSDEC dated October 25, 1994 and is summarized as follows:

- The base of the flux chamber is placed at the sampling location and embedded into the soil 1 to 2 inches.

- Sweep air is introduced into the chamber at a rate of 10 liters/minute. This allows the ambient air to be purged along with any existing VOCs. The chamber was purged of at least five volumes prior to sampling.
- Samples were collected from the chamber by attaching a Summa^{TM} canister equipped with a regulator to the exit line. After the canister was filled, it was then sent to the laboratory for TO14 analysis.

The sampling effort was focused in the vicinity of the reclamation room documented in the RI/FS Work Plan as containing relatively high levels of VOCs. A statistically based random sampling strategy was developed using EPA Users Guide. This was accomplished by dividing the area into grids of equal size. The sampling event occurred over a period of two days during which six flux gate samples and four Quality Assurance/Quality Control (QA/QC) samples were collected. The QC/QA samples included one duplicate sample, one background sample, one sample blank, and one field blank.

Analytical results of the flux gate samples and the QA/QC samples are summarized on Table 7-1 and raw data is contained in Appendix J. The sample locations are presented on Figure 7-1. As shown on Table 7-1, no VOCs, with the exception of 1,2,4 - trimethylbenzene, (1,2,4-TMB), were detected in the flux gate samples. 1,2,4-TMB was detected at a concentration of 0.22 ppbv which is an estimated value since this concentration is below the Method Detection Limit (MDL). MDLs of the other T014 compounds for the six field samples were all less than 0.55 ppbv.

Emission rate calculations are typically determined using a series of equations in the Users Manual. The calculations allow for the conversion of the laboratory results in ppbv into an emission result in grams per meter squared per second. Emission rates are dependent upon, temperature, barometric pressure, molecular weight of the species, and the sweep air flow rate. However, for this sampling event, emission rates were not determined since VOCs were not detected.

7.3 Summary of Air Quality Investigation

Data presented in this report as well as previous investigations indicate that the highest level of VOCs are found in the vicinity of the reclamation room. Furthermore, results of the flux chamber test indicate that VOCs are not being emitted from the subsurface of the site in this area of the site. Contaminant fate screening was evaluated using the EPA Superfund Exposure Assessment Manual (EPA/540/1-88/001). According to the manual, "the atmospheric fate of contaminants must be assessed whenever it is determined that significant gaseous or airborne particulate contaminants are released from the site". Since results of the subsurface VOC emissions test indicate that VOCs are not being released from the site, and the majority of the site is paved or covered by buildings, the assessment of the atmospheric fate of contaminants was not possible and would serve no practical purpose.

8.0 FISH AND WILDLIFE IMPACT ANALYSIS

A preliminary Fish and Wildlife Impact Analysis for the Lockheed Martin Great Neck facility has been performed in order to satisfy NYSDEC requirements as set forth in Step 1 of Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC, 1994). This report identifies if fish and wildlife resources exist which could potentially be affected by site activities. The primary objective is to characterize the area's geographic and biotic features that are ecologically significant via. maps and written documentation. Once the physical features of the area have been described, the importance of these habitats as economic and ecological resources are assessed.

8.1 Identification of Geographic and Biotic Features of the Area

The five predominant covertypes within a two-mile radius of the Lockheed Martin, Great Neck site (aquatic habitats, wetlands, woodlands, open field/landscaped, and heavily developed property) will be described in the following text. Aquatic systems identified in the area are depicted on Figures 8-1 and 8-2, and comprise any river, stream, lake, pond or intermittent body of surface water. A wetland is defined jointly by the Corps of Engineers and U.S. EPA as:

> "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (Army Corps of Engineers, 1987).

A search was performed to identify all wetlands regulated by the NYSDEC within a two-mile radius of the Lockheed Martin facility. The only regulated wetland within this area is Lake Success and land within 100 feet of this delineated wetland (Figure 8-1). Woodlands located in this area are typically comprised of temperate deciduous trees. Open field/landscaped habitats include a wide spectrum of conditions from well manicured golf courses and residential lawns to runoff fields adjacent to major roadways. The last covertype occurring within a two-mile radius is a highly developed, heavily populated land that has been anthropogenically altered from its natural state. Figures 8-1 and 8-2 depict the geographical boundaries of these covertypes. A search was performed by the New York State Natural Heritage Program to identify significant habitats within the general vicinity of the site. Lake Success Parkway Woods and Creedmoor Farm were identified by New York State Natural Heritage Program in their search. Lake Success Parkway Woods is a significant habitat because it is a unique scenic area (Figures 8-1 and 8-2). Creedmoor Farm, a wildlife observation area located at Latitude 40°44'12" Longitude 73°45'5", is close to the Great Neck facility but not within two miles. No rivers within a two-mile radius of the site are classified as wild and scenic. No endangered or threatened species were reported in this area.

The site is located on the border of Nassau County and Queens County, New York. Endangered species listed by NYSDEC as historically present in these counties are the Tiger Salamander, the Piping Plover, the Least Tern and, the Roseate Tern. Threatened species include the Osprey, the Northern Harrier, and the Common Tern. With the exception of the Tiger Salamander, the identified endangered or threatened species are all shorebirds associated with coastal marine habitats. As the site influence of the Lockheed Martin facility does not include any coastal areas, impact upon these receptors is highly improbable. In fact, none of these species (including the Tiger Salamander) have been reported within a 2-mile radius of the site.

Fauna commonly found in the Great Neck area are squirrels, mice, typical insects such as grass hoppers and flies, passerine birds, and perhaps an occasional resident raccoon. Typical flora identified in this area include landscape type grasses, shrubs and trees, undeveloped open fields, and temperate region deciduous woodlands. In general, the area can be characterized as a typical urban region. Furthermore, there are no obviously stressed areas (i.e., exposed waste, stained soils, bare soil where vegetative cover would be expected) which can be related to site activities.

8.2 Description of Value of Fish and Wildlife Resources

Qualitative evaluation of the value of habitat to fauna associated with the Great Neck area indicates that habitats are adequate to support survival and propagation of fish and wildlife in the area. The habitats meet the animal's requirements for food supply and shelter. Diversity and densities of populations are typical of this type of environment.

Great Neck, New York is primarily a commercial and residential community. Activities such as hunting, fishing, and farming are unlikely in this heavily populated area. The community does not depend economically on aesthetics of its natural landscape as is the case with the Grand Canyon, the Shennandoah Valley, and the Everglades. Furthermore, it does not rely on the harvest of species such as trout, salmon, or timber for its economic livelihood. Therefore, the value of fish and wildlife resources to humans is minimal for the Great Neck site.

8.3 Summary of Results

Based on preliminary analysis, activities at the Lockheed Martin site do not appear to be adversely impacting the limited fish and wildlife resources of the area. Nor is a potential for impact present in as much as groundwater is the only affected medium at this site and the groundwater table is approximately 100 feet below grade. There are no endangered or threatened species within a two-mile radius. Flora and fauna typical of the area are in evidence. Lake Success, the only regulated wetland identified, does not appear to be negatively influenced by site activities. Likewise, there is no evidence of site-related impacts on Lake Success Parkway Woods, a significant habitat identified by the NYS Natural Heritage Program. Furthermore, there are no wild and scenic rivers within a two-mile radius of the site.

9.0 CONCLUSIONS

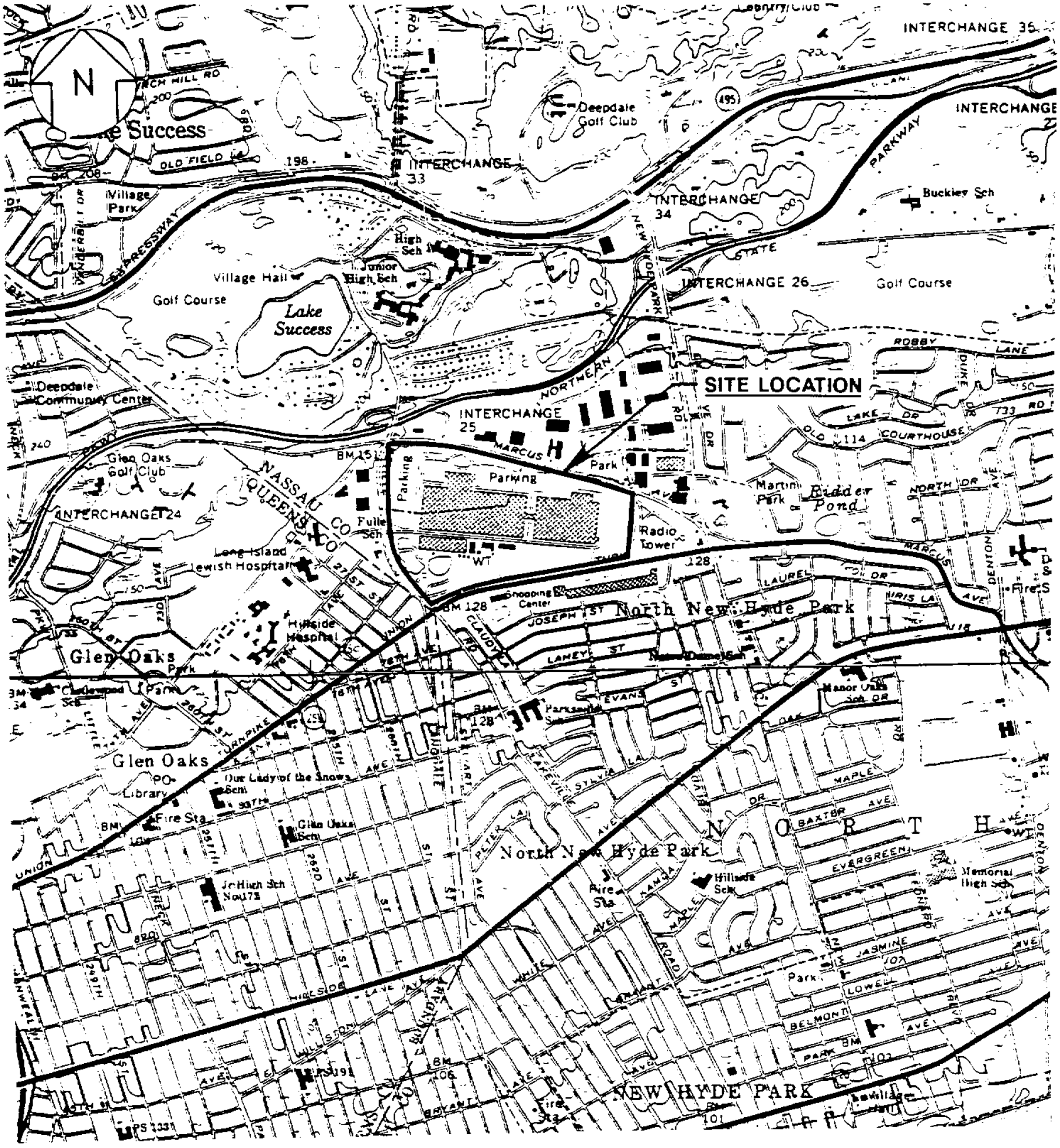
- Results of the soil investigation indicate that the only area impacted is in the vicinity of the former dry wells. Soils in this area are already undergoing remediation by soil-vapor extraction as part of the IRM. The majority of this area is paved or contains structures and the impacted soils are in excess of 4 ft bg. Air emissions testing has shown that volatile organic vapors associated with the VOCs in the soils are not migrating to the surface. As a result, the VOCs detected in soil are not exposed to the atmosphere or on-site personnel and, thus, there is no risk to human health.

- The results of the groundwater investigation show that VOCs are present in all of the wells sampled as part of the RI. However, the minimum depth to groundwater on-site is approximately 75 ft bg, the area is served by a public water system, and the existing groundwater recovery and treatment system will capture and treat the majority of groundwater flowing from the site. In addition, groundwater that is pumped by nearby public supply wells is treated to remove VOCs prior to entering the distribution system. As a result, there are no potential routes of exposure for the VOCs detected in groundwater and, therefore, no risks to human health.

- The results of the surface-water and sediment sampling indicate that surface water in the drainage basins has not been adversely impacted and the compounds detected in the sediments are consistent with the nature of the basins as well as sample results from other drainage basins on Long Island. These sediments are covered by approximately 15 to 20 feet of water at all times and, as a result, are never exposed to the atmosphere or on-site personnel and, thus, are not a risk to human health.

- There are no endangered or threatened species or wild and scenic rivers within a two-mile radius of the site. Site activities do not appear to have adversely impacted the limited fish and wildlife resources of the area or those significant habitats which have been identified within the general vicinity of the site.

FIGURES



SOURCE: USGS QUADRANGLES
SEA CLIFF & LYNBROOK, NY

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SCALE IN FEET

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GREAT NECK, NEW YORK FACILITY

SITE LOCATION MAP

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Professional Ground-Water Consultants
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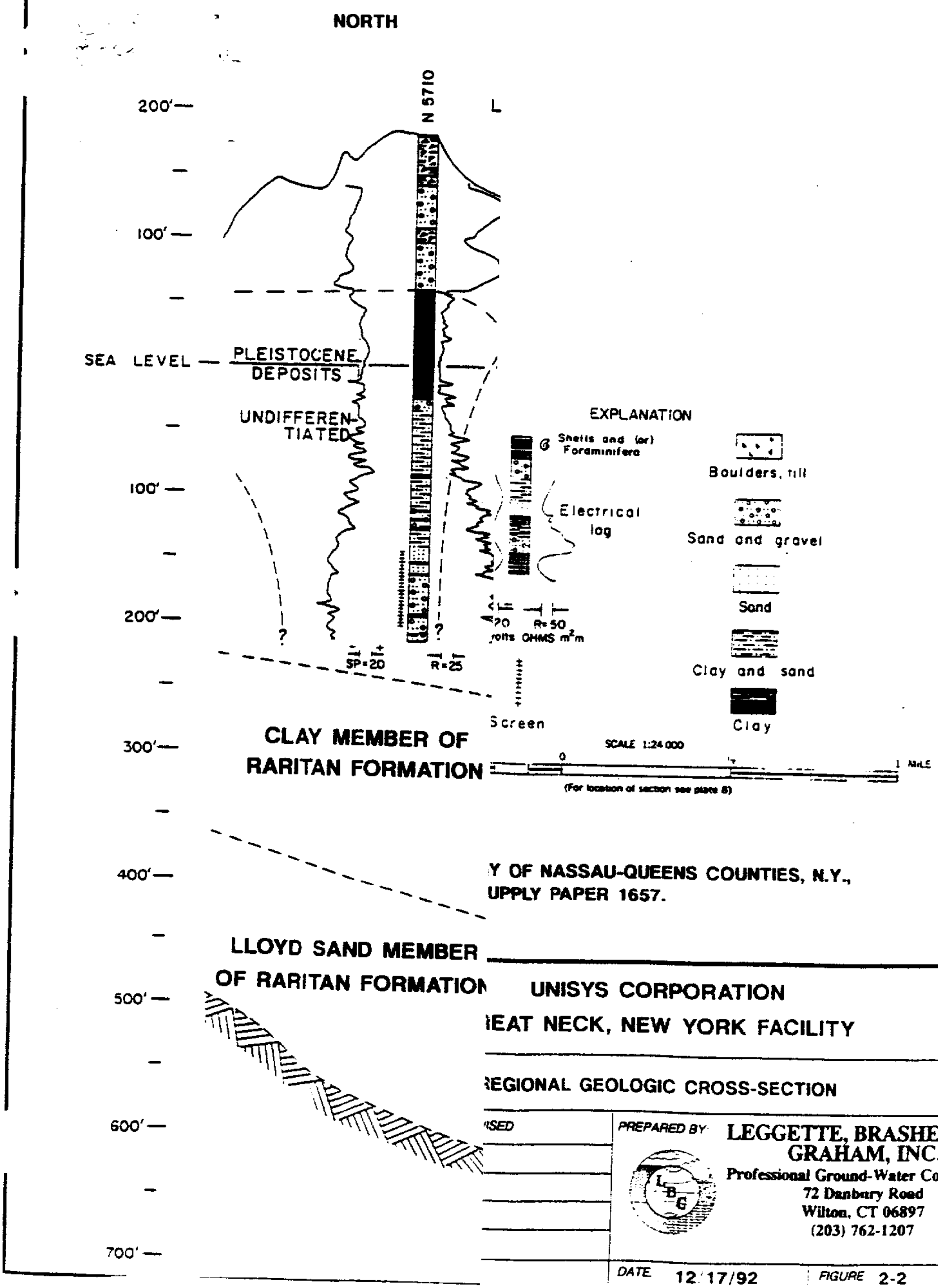
(203) 762-1207

DATE: 12/14/92 FIGURE 2-1



Y OF NASSAU-QUEENS COUNTIES, N.Y.,
UPPLY PAPER 1657.

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EGIONAL GEOLOGIC CROSS-SECTION

ISED

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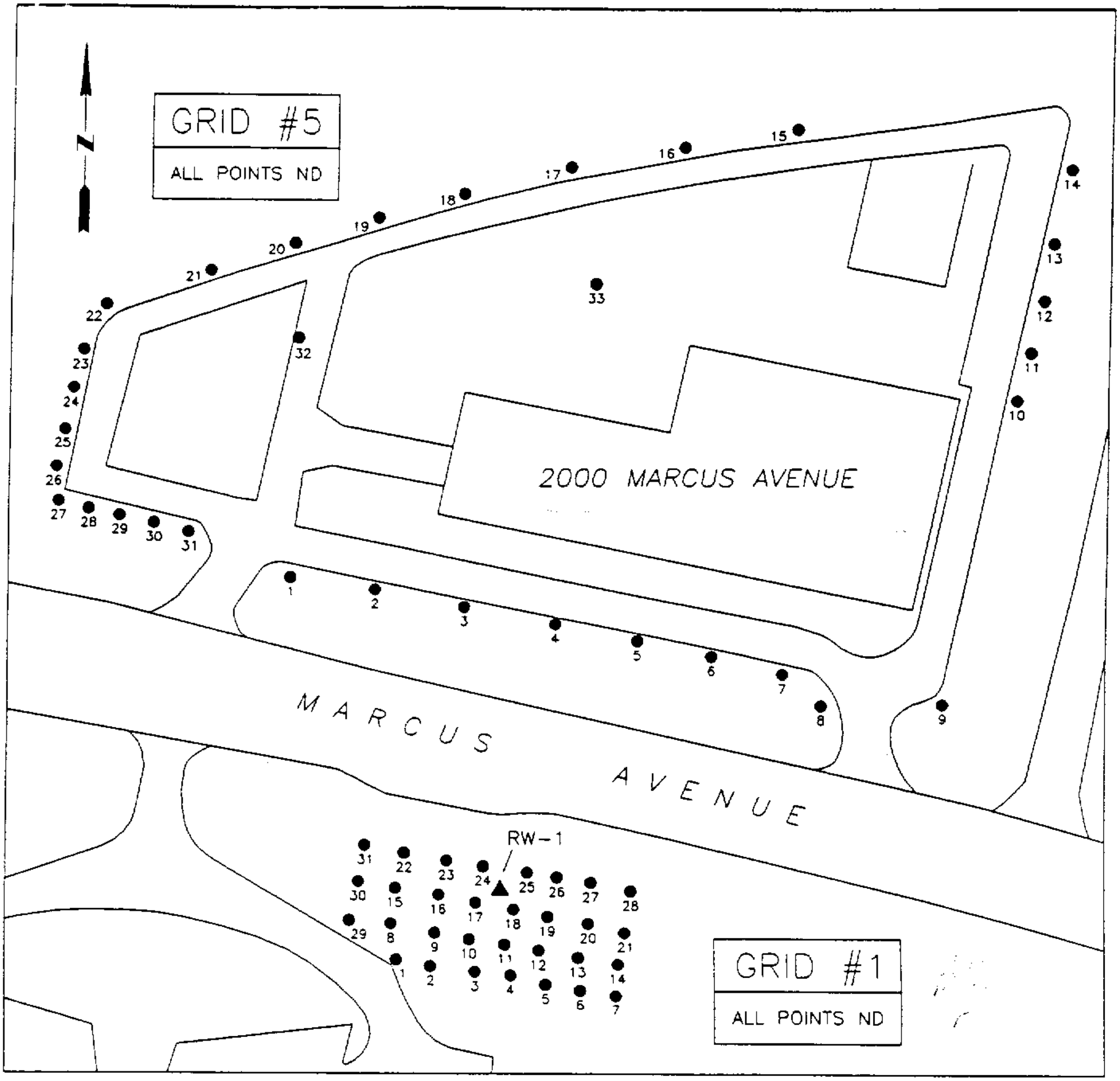
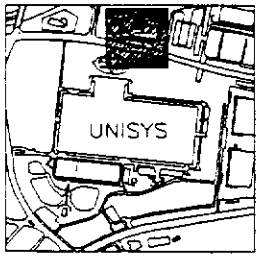
DATE 12/17/92

FIGURE 2-2

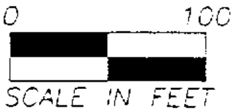


LEGEND

● 1	SOIL GAS SAMPLE POINT AND LOCATION NUMBER
▲	MONITOR WELL LOCATION
ND	NOT DETECTED (LESS THAN 1 ug/l)
ug/l	MICROGRAMS PER LITER



AREA OF ENLARGEMENT



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SOIL-GAS SURVEY GRIDS NO.1 AND NO.5

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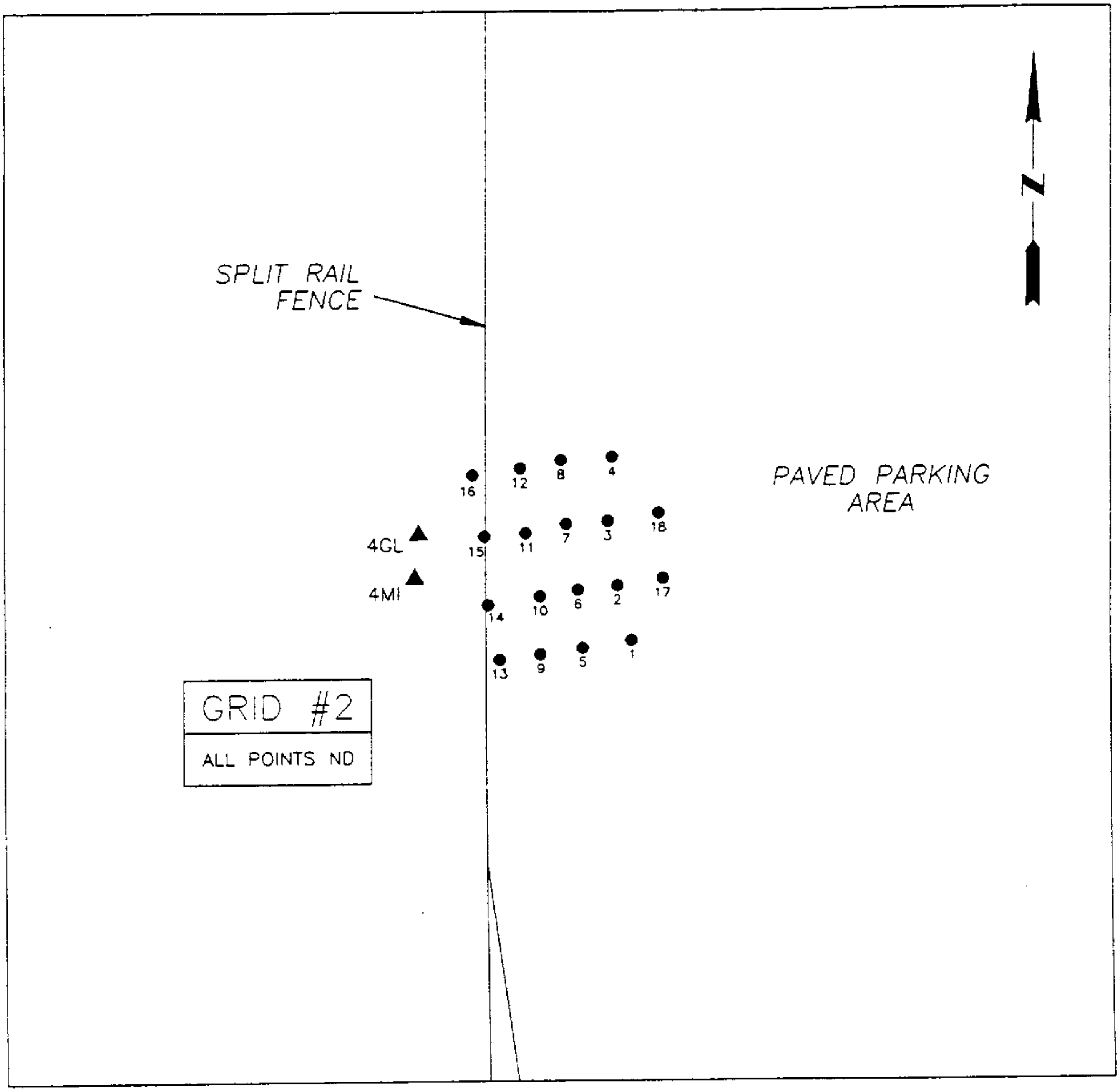
FILENAME: UNIGRD01
DATE: 2/27/95
FIGURE: 4-1



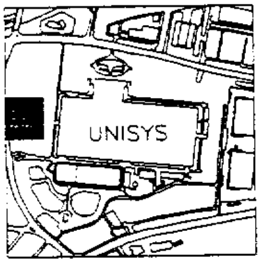
<u>LEGEND</u>

● 1 SOIL GAS SAMPLE POINT AND LOCATION NUMBER

▲ MONITOR WELL LOCATION

ND NOT DETECTED (LESS THAN 1 ug/l)

ug/l MICROGRAMS PER LITER



AREA OF ENLARGEMENT

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SOIL-GAS SURVEY GRID NO.2

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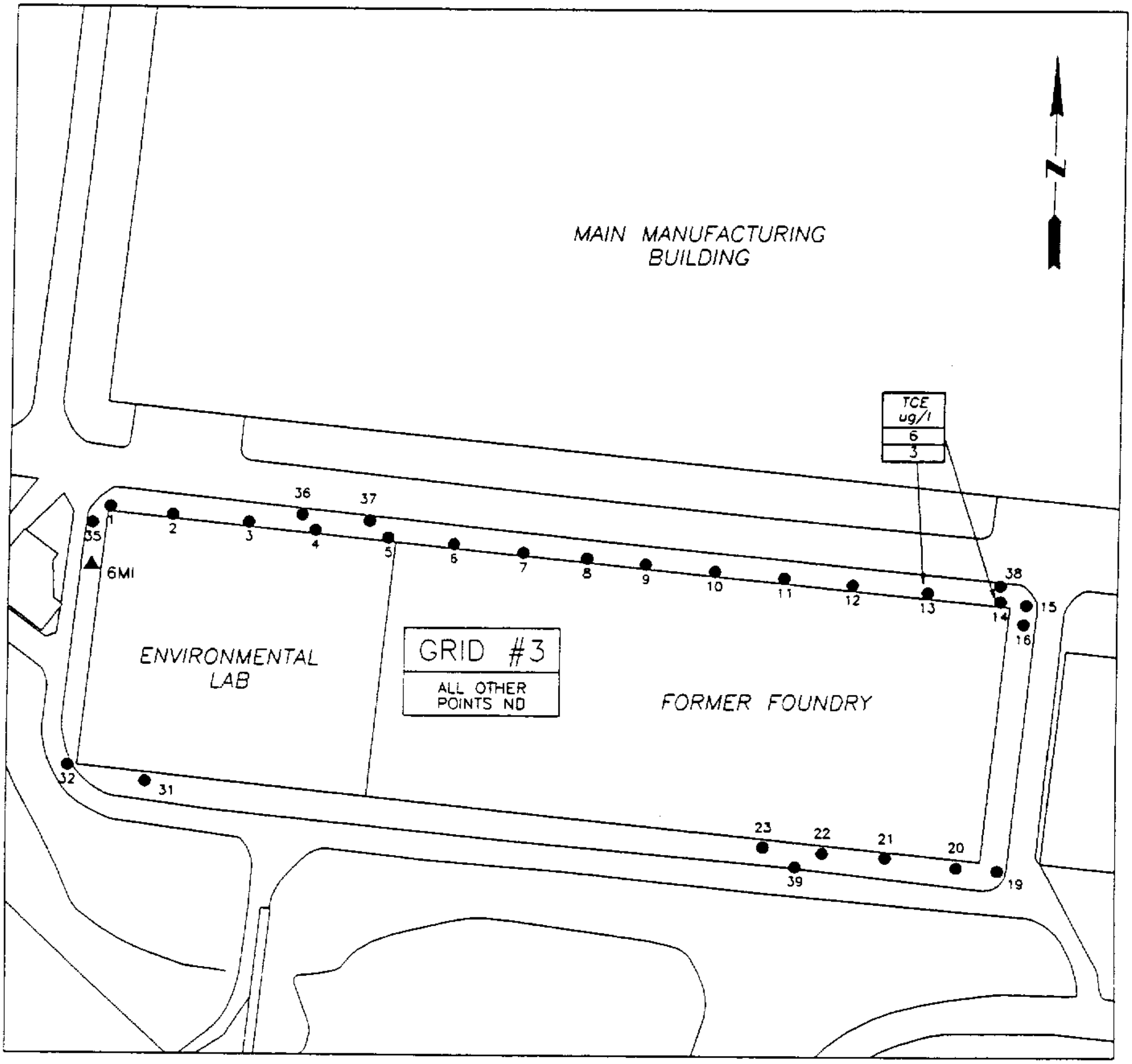
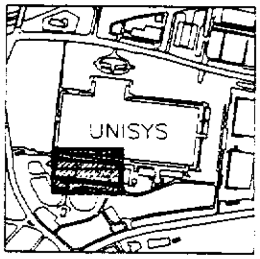
FILENAME: UNIGRDC1 DATE: 2/27/95 FIGURE: 4-2



LEGEND

● 1	SOIL GAS SAMPLE POINT AND LOCATION NUMBER	ND	NOT DETECTED (LESS THAN 1 ug/l)
▲	MONITOR WELL LOCATION	ug/l	MICROGRAMS PER LITER
TCE	TRICHLOROETHENE		



AREA OF ENLARGEMENT

0 120

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SOIL-GAS SURVEY GRID NO.3

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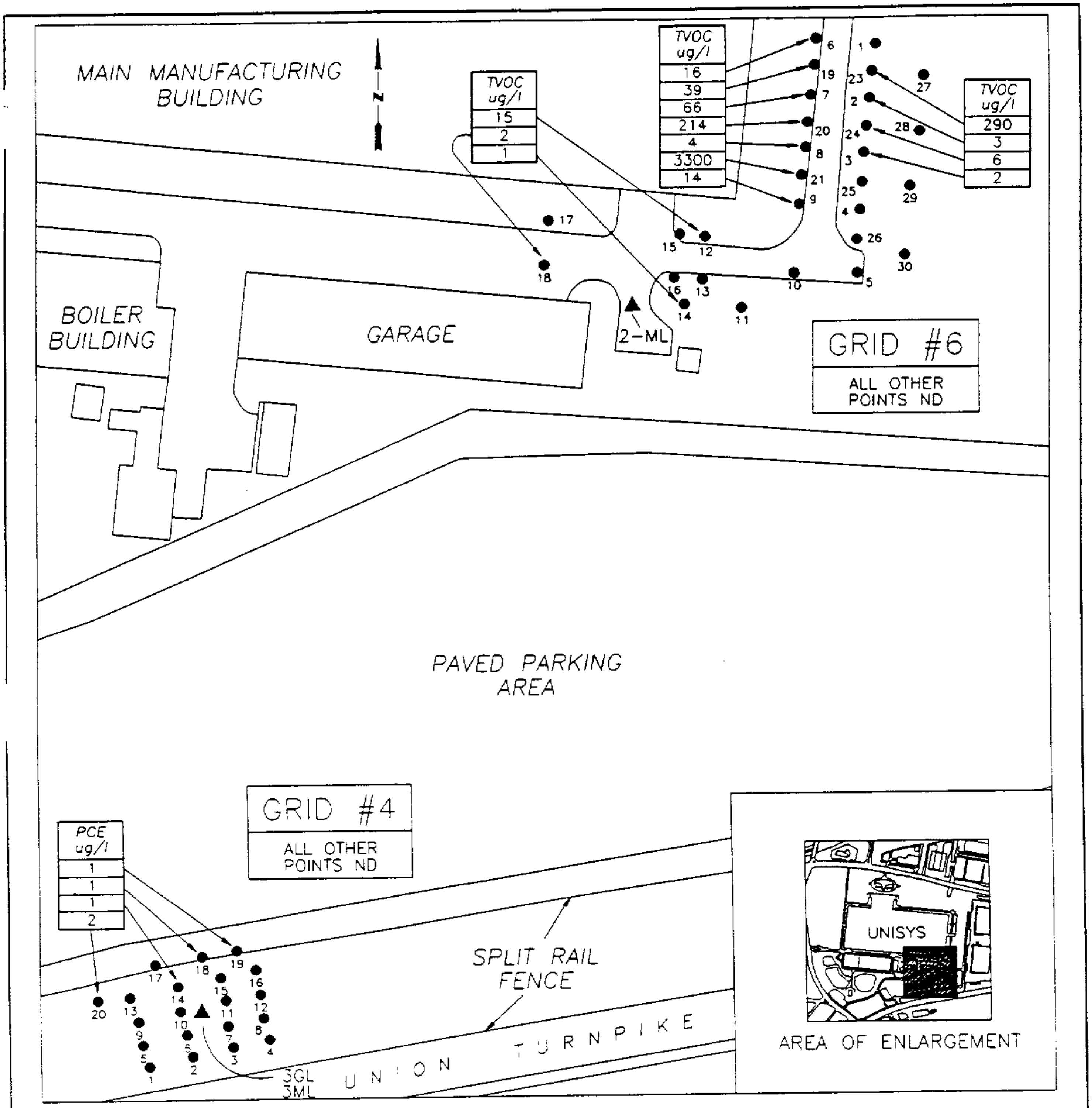
FILENAME: UNIGRD01 DATE: 2/27/95 FIGURE: 4-3



LEGEND

● 1	SOIL GAS SAMPLE POINT AND LOCATION NUMBER
▲	MONITOR WELL LOCATION
TVOC	TOTAL VOLATILE ORGANIC COMPOUNDS (TCE, PCE & 1,2-DCE)
ND	NOT DETECTED (LESS THAN 1 ug/l)
ug/l	MICROGRAMS PER LITER

0 100

SCALE IN FEET

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GREAT NECK, NEW YORK FACILITY

SOIL-GAS SURVEY GRIDS NO.4 AND NO.6

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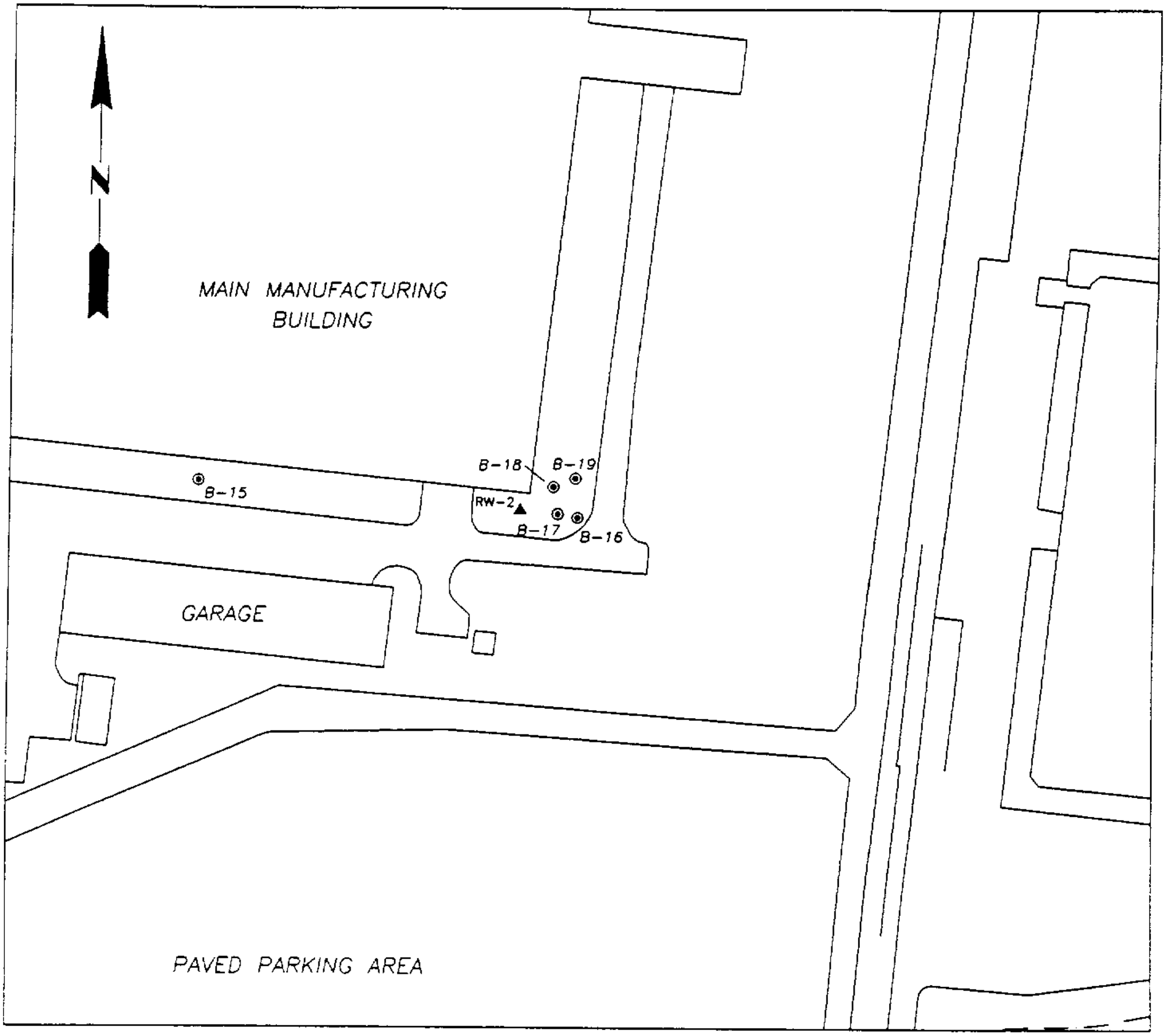
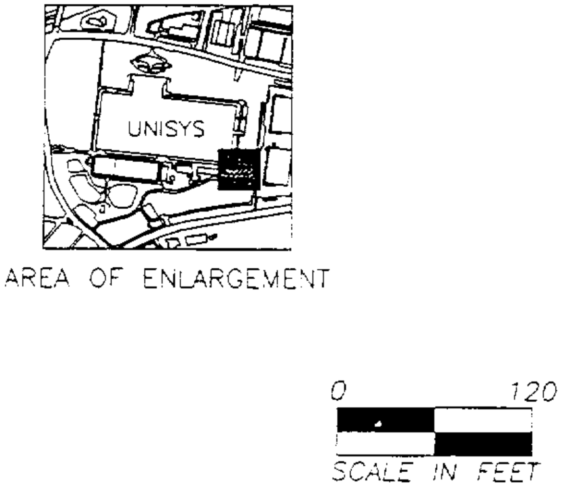
FILENAME: UNIGRD01
DATE: 2/27/95
FIGURE: 4-4



LEGEND

◉ B-15 DRY WELL SOIL BORING

▲ RW-2 RECOVERY WELL



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DRY WELL SOIL BORING LOCATIONS

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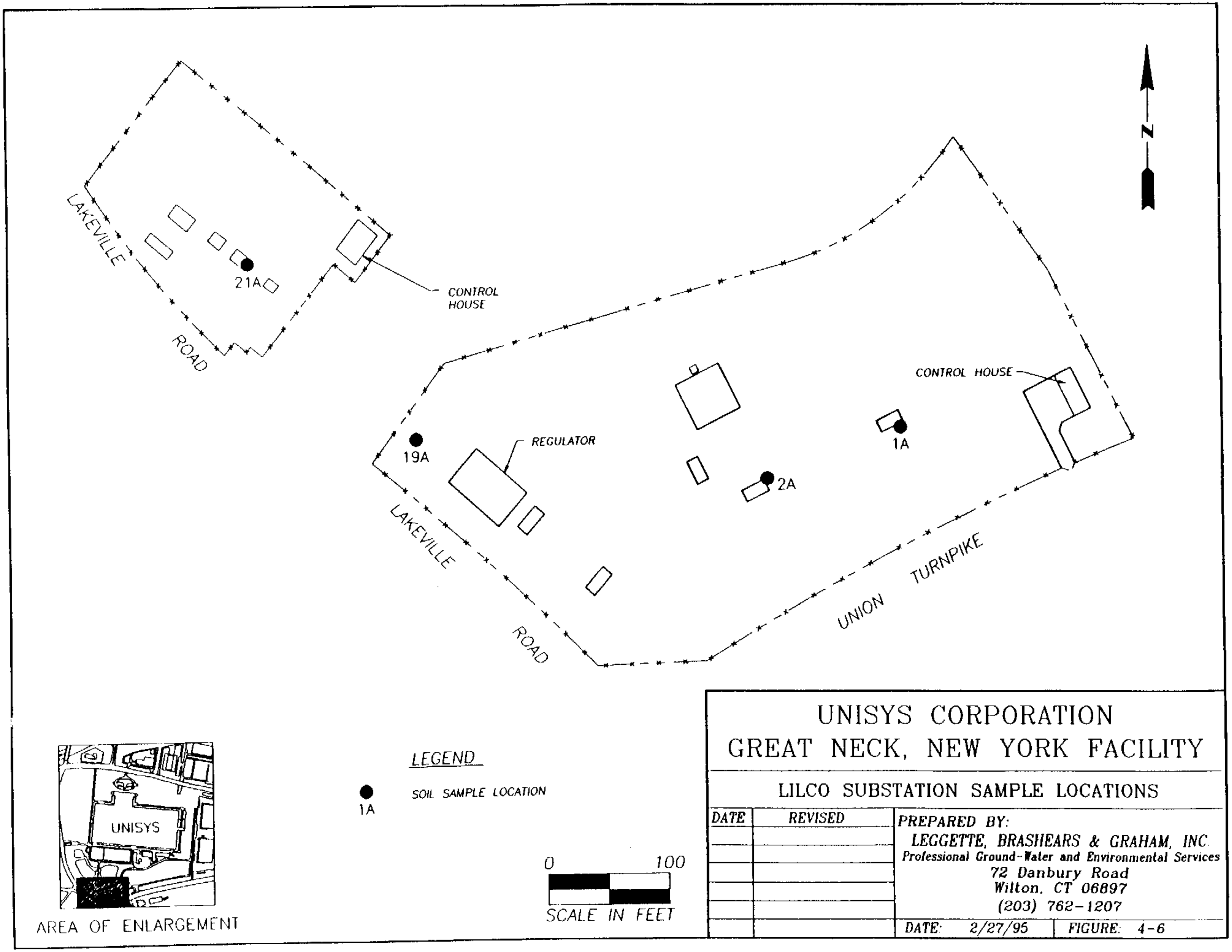
DATE: 2/27/95 FIGURE: 4-5



UNISYS CORPORATION
GREAT NECK, NEW YORK FACILITY

LILCO SUBSTATION SAMPLE LOCATIONS

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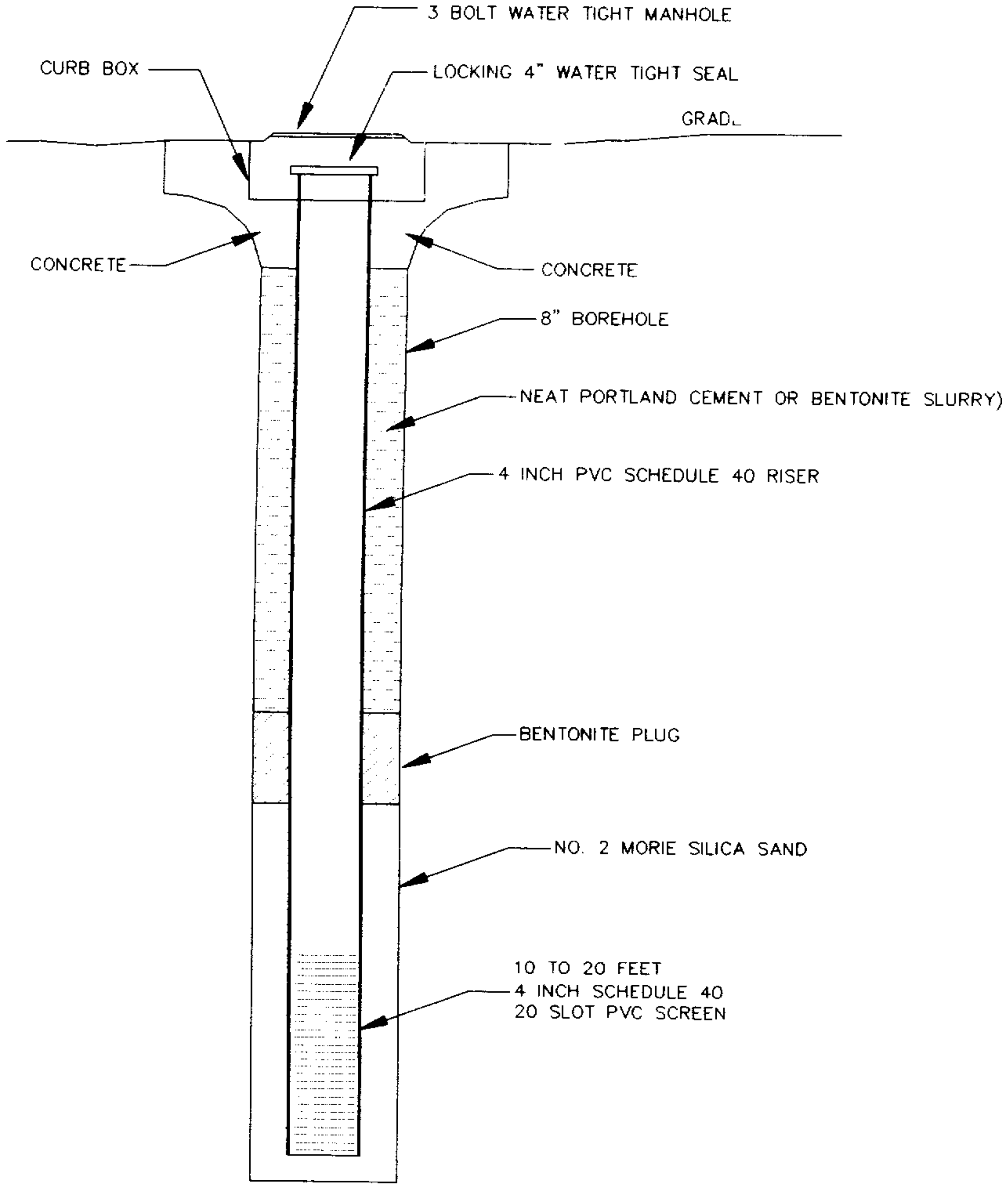
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 2/27/95 *FIGURE:* 4-6

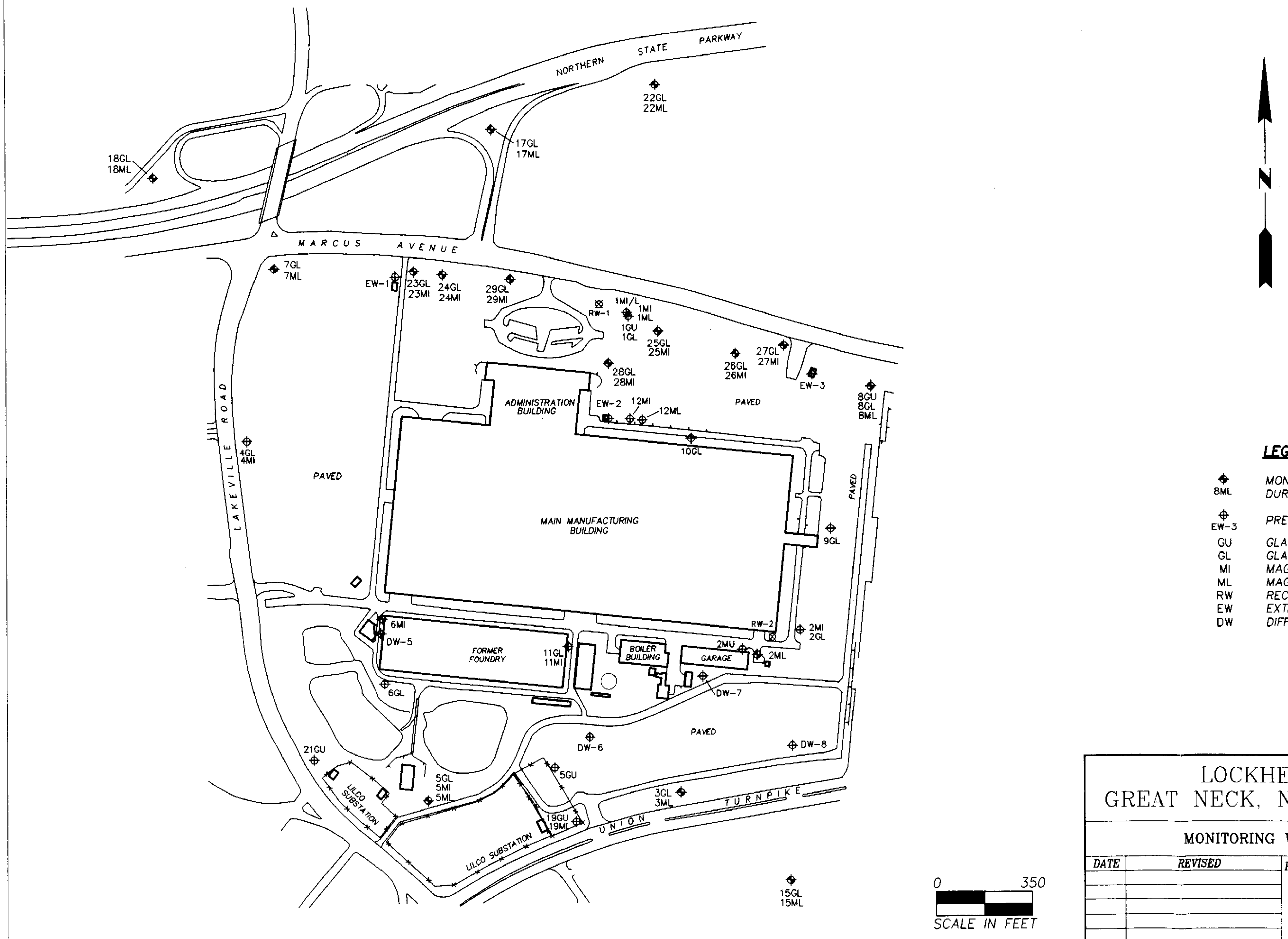


DATE	6/7/95
SCALE	N.T.S.
DRAWN BY:	D.A.P.
CHK. BY:	F.J.F.
PROJ. MGR.:	F.J.F.
PROJ. NO.:	87041
ISSUED:	

LOCKHEED MARTIN
GREAT NECK, NEW YORK
GENERALIZED WELL CONSTRUCTION DIAGRAM

FIGURE
5-1

FILE NAME: C:\CEA\DWGS\87041\87041-09



M:\CADD\LORL\9606\FIG5_2 7-23-96 2:04:02 pm

LEGEND

◈ 8ML	MONITORING WELL INSTALLED DURING PHASE 1 RI ACTIVITIES
⊕ EW-3	PREVIOUSLY INSTALLED WELL
GU	GLACIAL UPPER (90-115 ft bg)
GL	GLACIAL LOWER (125-185 ft bg)
MI	MAGOTHY INTERMEDIATE (210-250 ft bg)
ML	MAGOTHY LOWER (300-400 ft bg)
RW	RECOVERY WELL
EW	EXTRACTION WELL
DW	DIFFUSION WELL

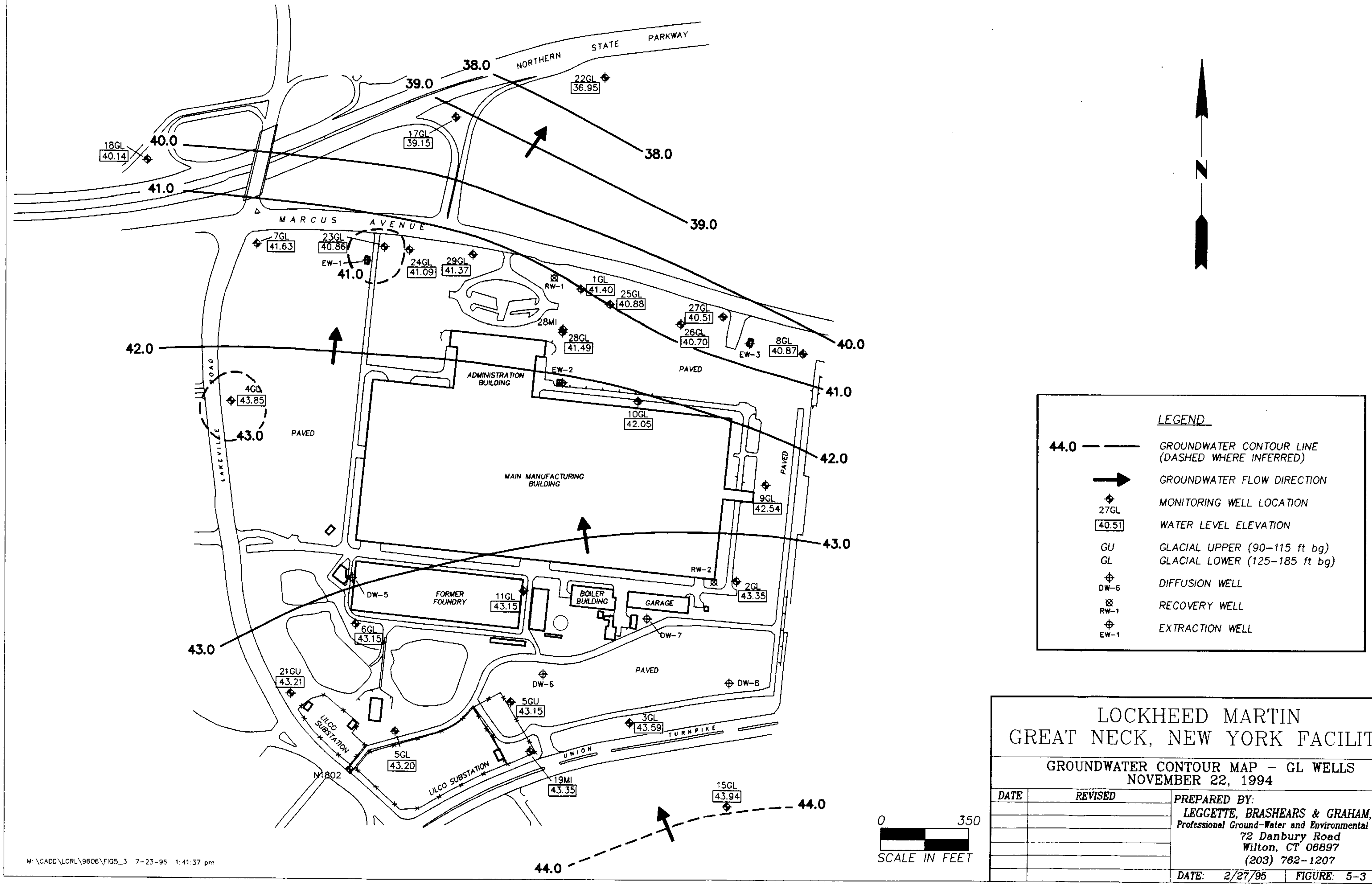
LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY

MONITORING WELL LOCATION MAP

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Services
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 2/27/95 FIGURE: 5-2



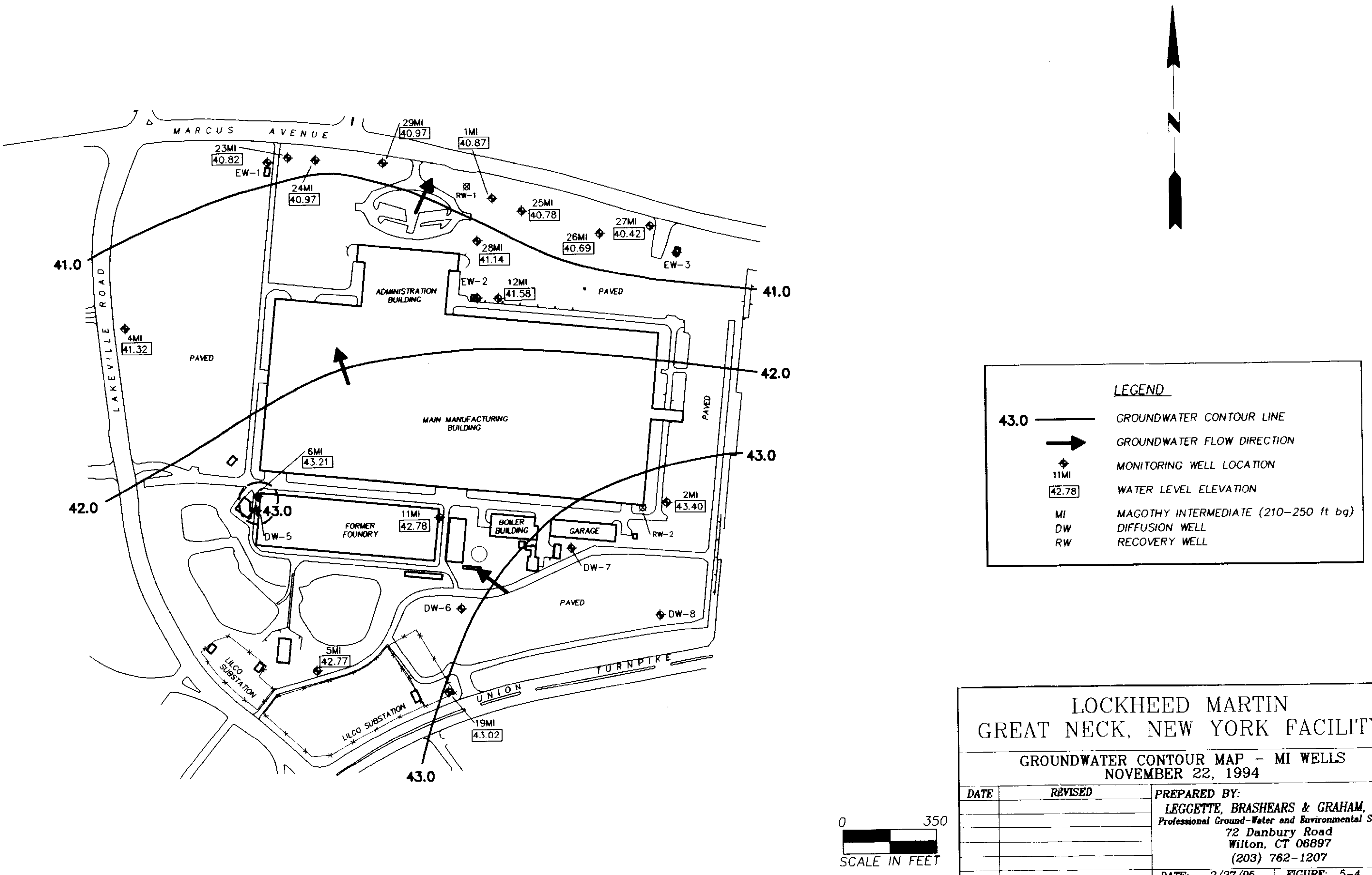
LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY

GROUNDWATER CONTOUR MAP – GL WELLS
NOVEMBER 22, 1994

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Services
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 2/27/95 FIGURE: 5-3



LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY

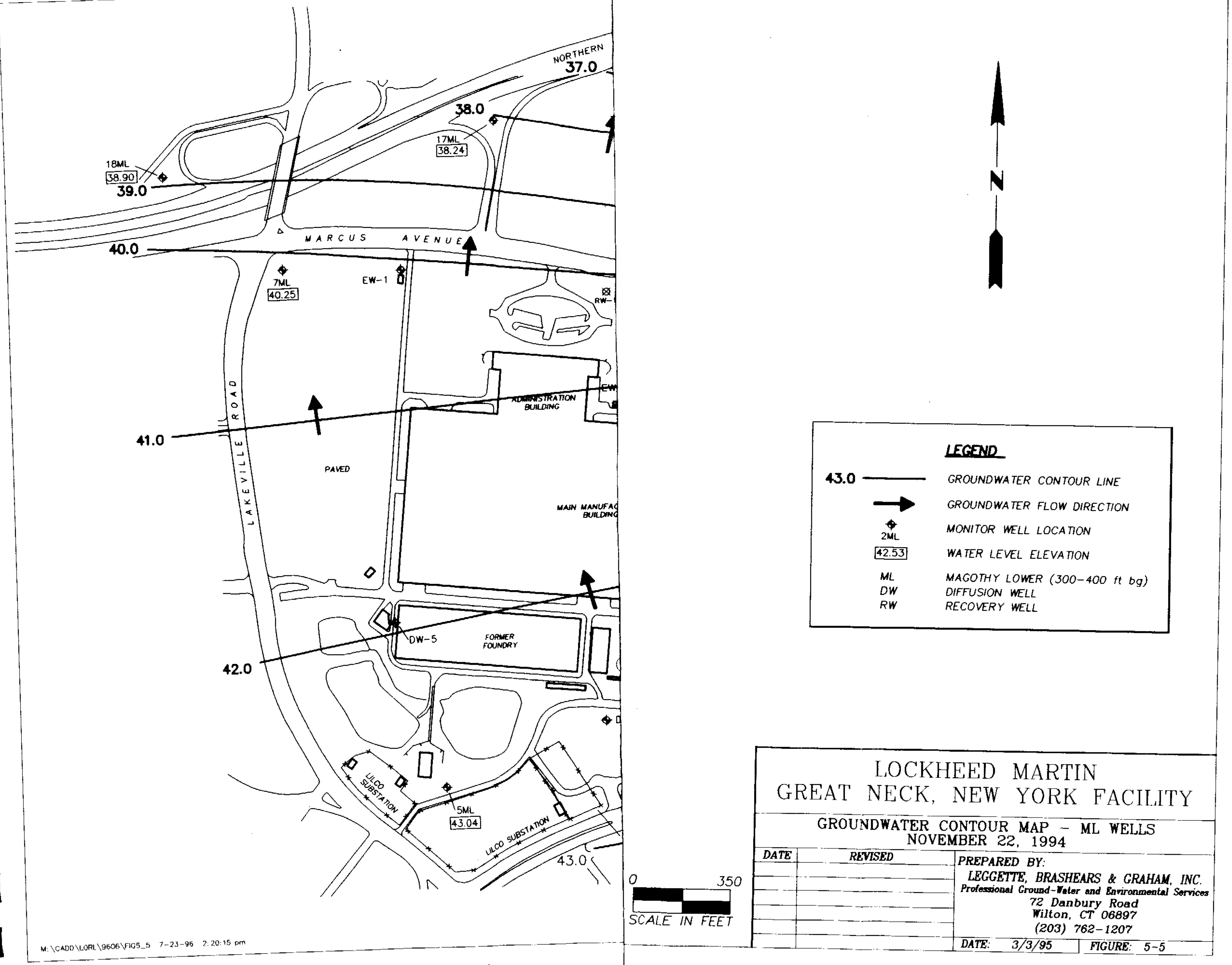
GROUNDWATER CONTOUR MAP – MI WELLS
NOVEMBER 22, 1994

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Services
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 2/27/95 FIGURE: 5-4

M:\CADD\LORL\9606\FIG5_4 7-23-96 2:17:59 pm



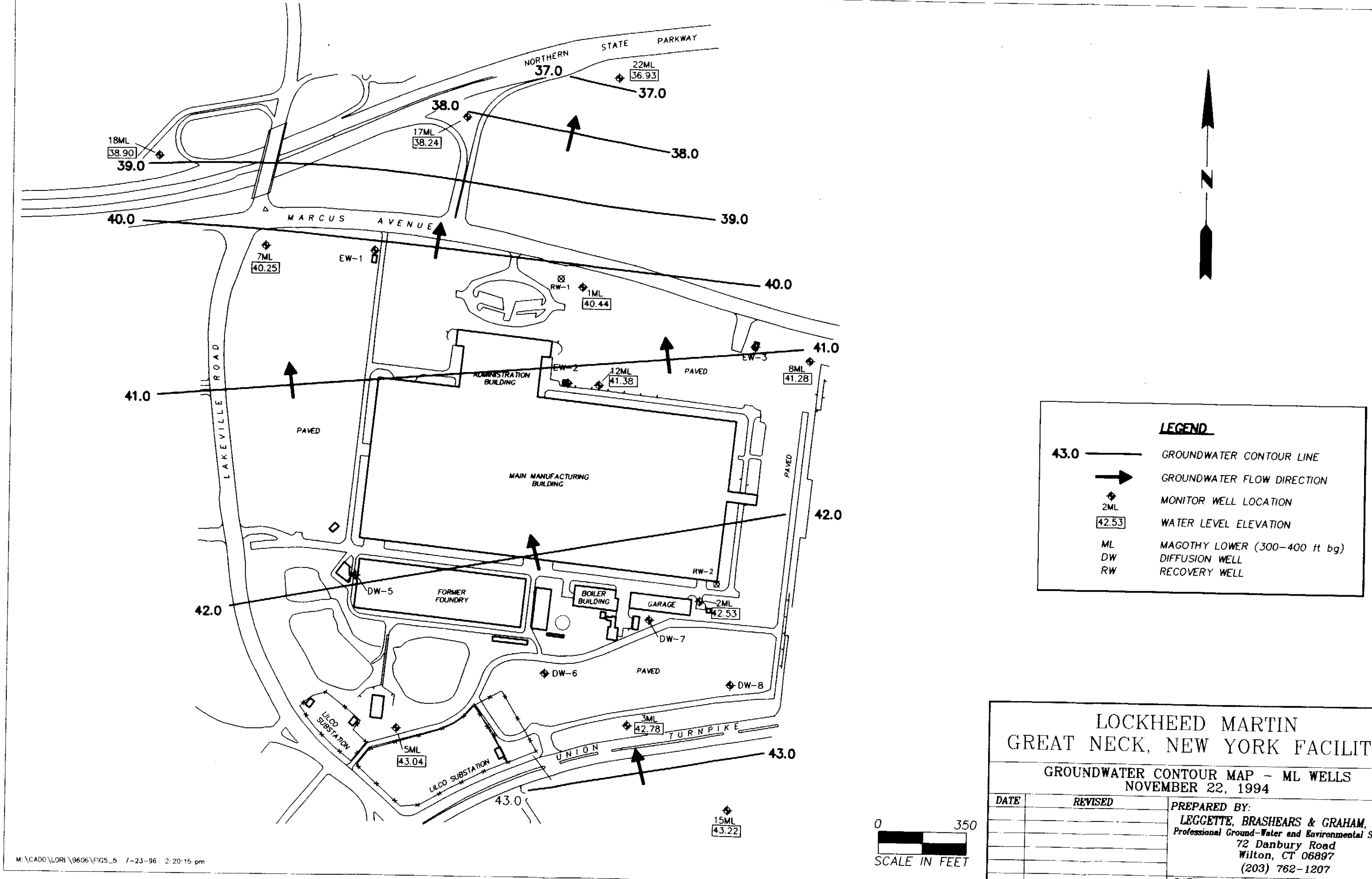
LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY

GROUNDWATER CONTOUR MAP – ML WELLS
NOVEMBER 22, 1994

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Services
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 3/3/95 FIGURE: 5-5



LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY

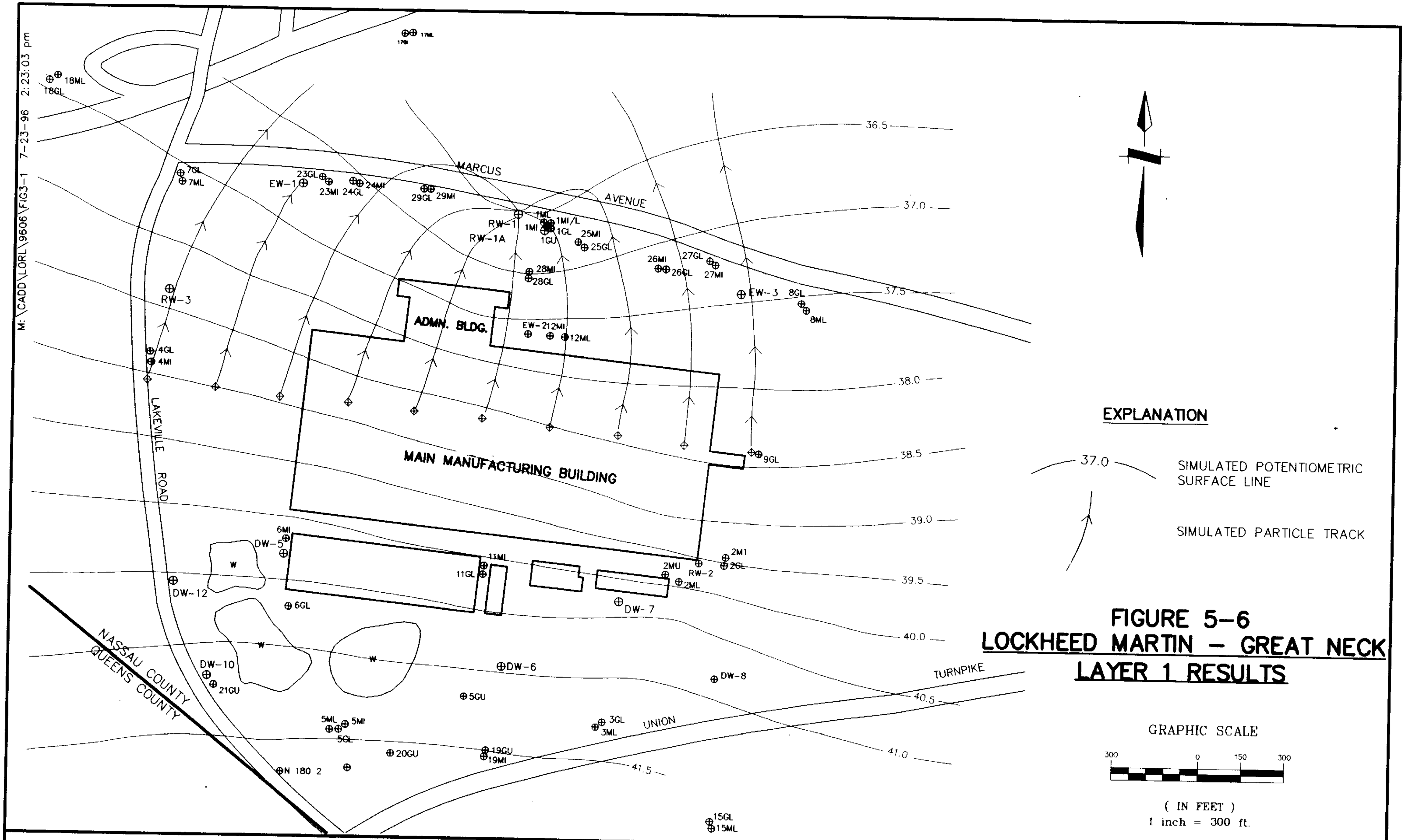
GROUNDWATER CONTOUR MAP - ML WELLS
NOVEMBER 22, 1994

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Services
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 3/3/95 FIGURE: 5-5

M:\CADD\LORI\9606\FIG5_5 7-23-96 2:20:15 pm



EXPLANATION

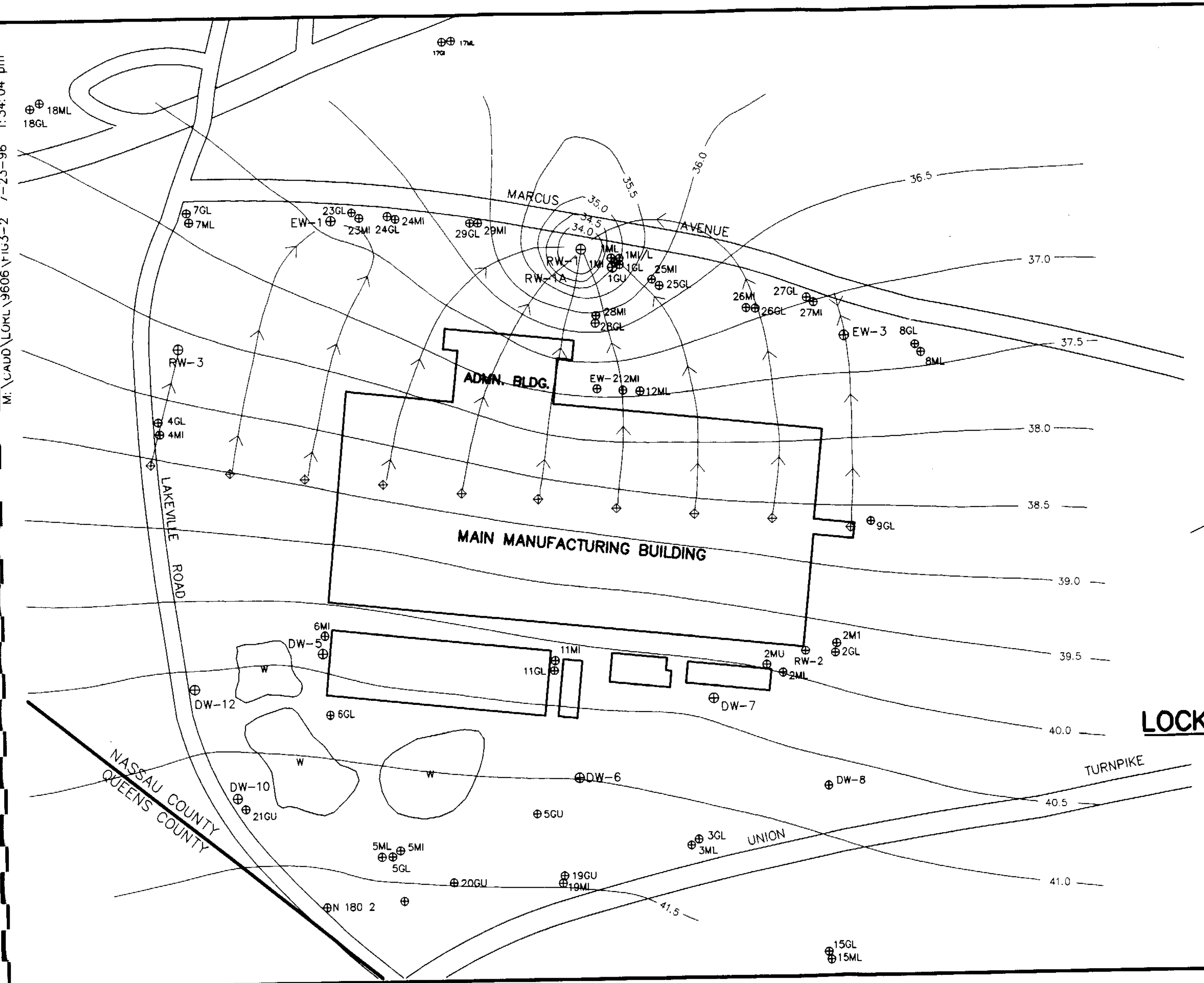
SIMULATED POTENTIOMETRIC SURFACE LINE

SIMULATED PARTICLE TRACK

FIGURE 5-6
LOCKHEED MARTIN – GREAT NECK
LAYER 1 RESULTS

GRAPHIC SCALE

(IN FEET)
1 inch = 300 ft.



EXPLANATION

37.0 SIMULATED POTENTIOMETRIC SURFACE LINE

SIMULATED PARTICLE TRACK

FIGURE 5-7
LOCKHEED MARTIN – GREAT NECK
LAYER 2 RESULTS

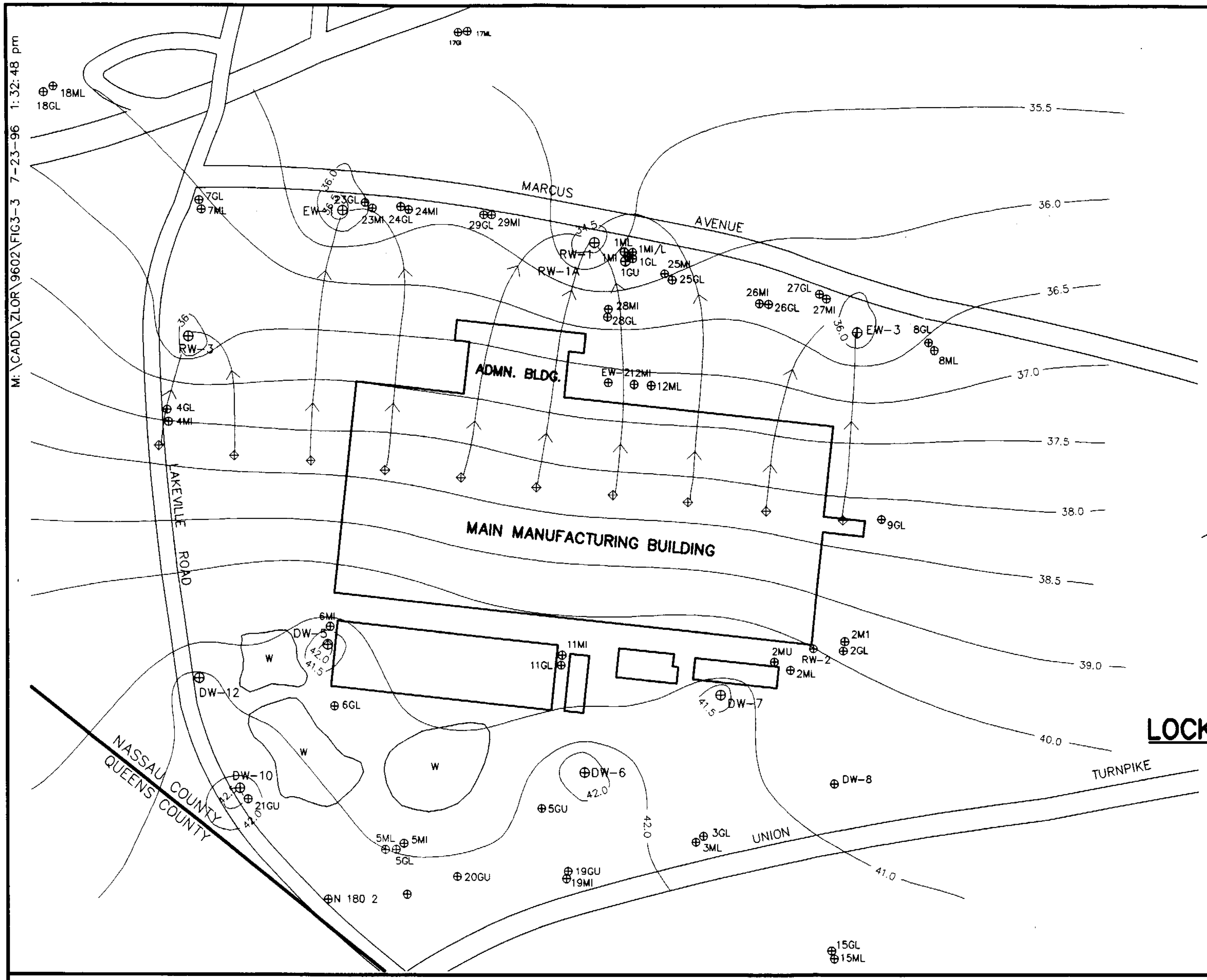
GRAPHIC SCALE

300 0 150 300

(IN FEET)
1 inch = 300 ft.

H2MGROUP ENGINEERS · ARCHITECTS · PLANNERS · SCIENTISTS · SURVEYORS
MELVILLE, N.Y. TOTOWA, N.J.

M:\CADD\LOKL\9606\FIG3-2 7-23-96 1:34:04 pm



EXPLANATION

37.0 SIMULATED POTENTIOMETRIC SURFACE LINE

SIMULATED PARTICLE TRACK

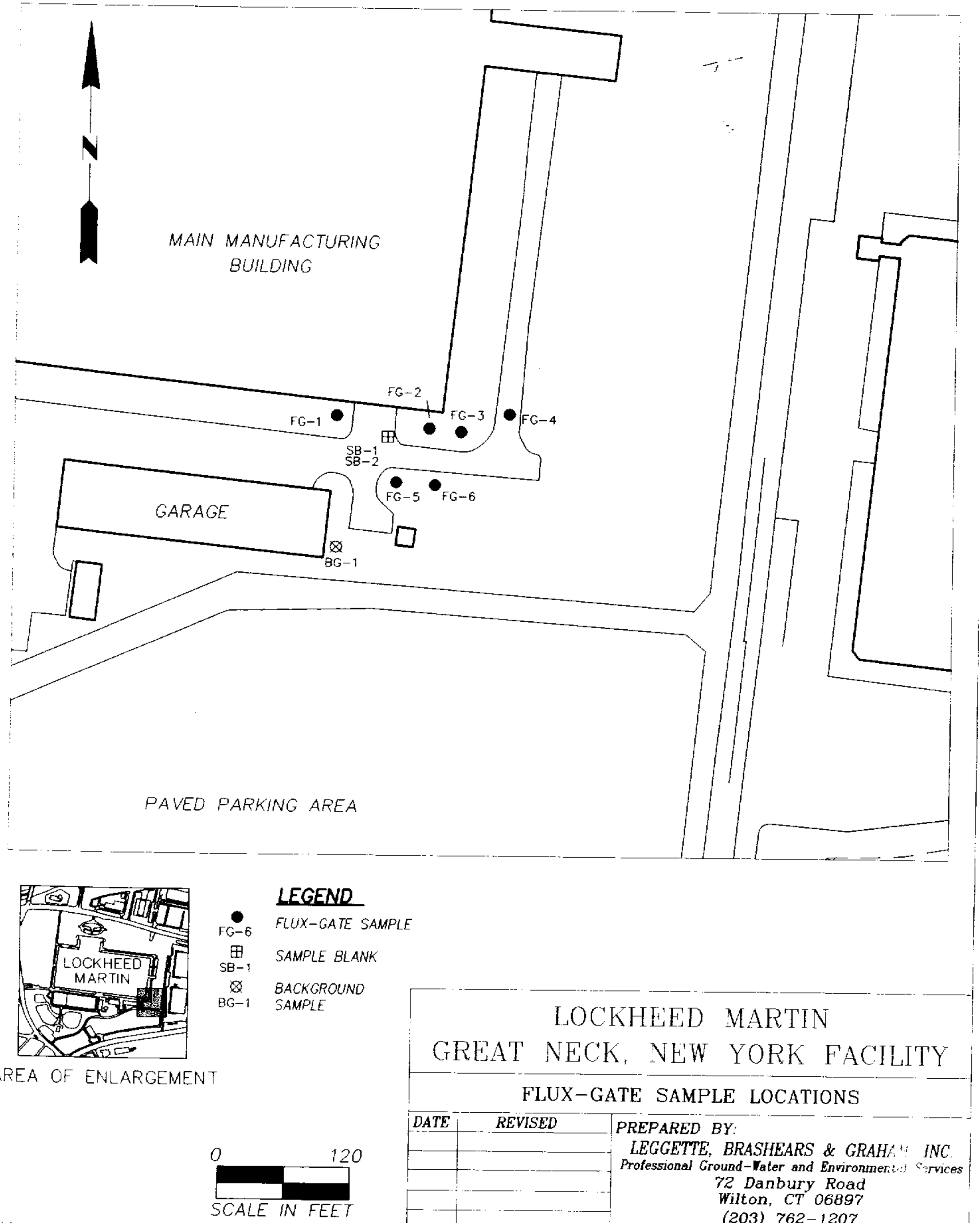
FIGURE 5-8
LOCKHEED MARTIN – GREAT NECK
LAYER 3 RESULTS

GRAPHIC SCALE

300 0 150 300

(IN FEET)
1 inch = 300 ft.

H2MGROUP ENGINEERS · ARCHITECTS · PLANNERS · SCIENTISTS · SURVEYORS
MELVILLE, N.Y. TOTOWA, N.J.



LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY

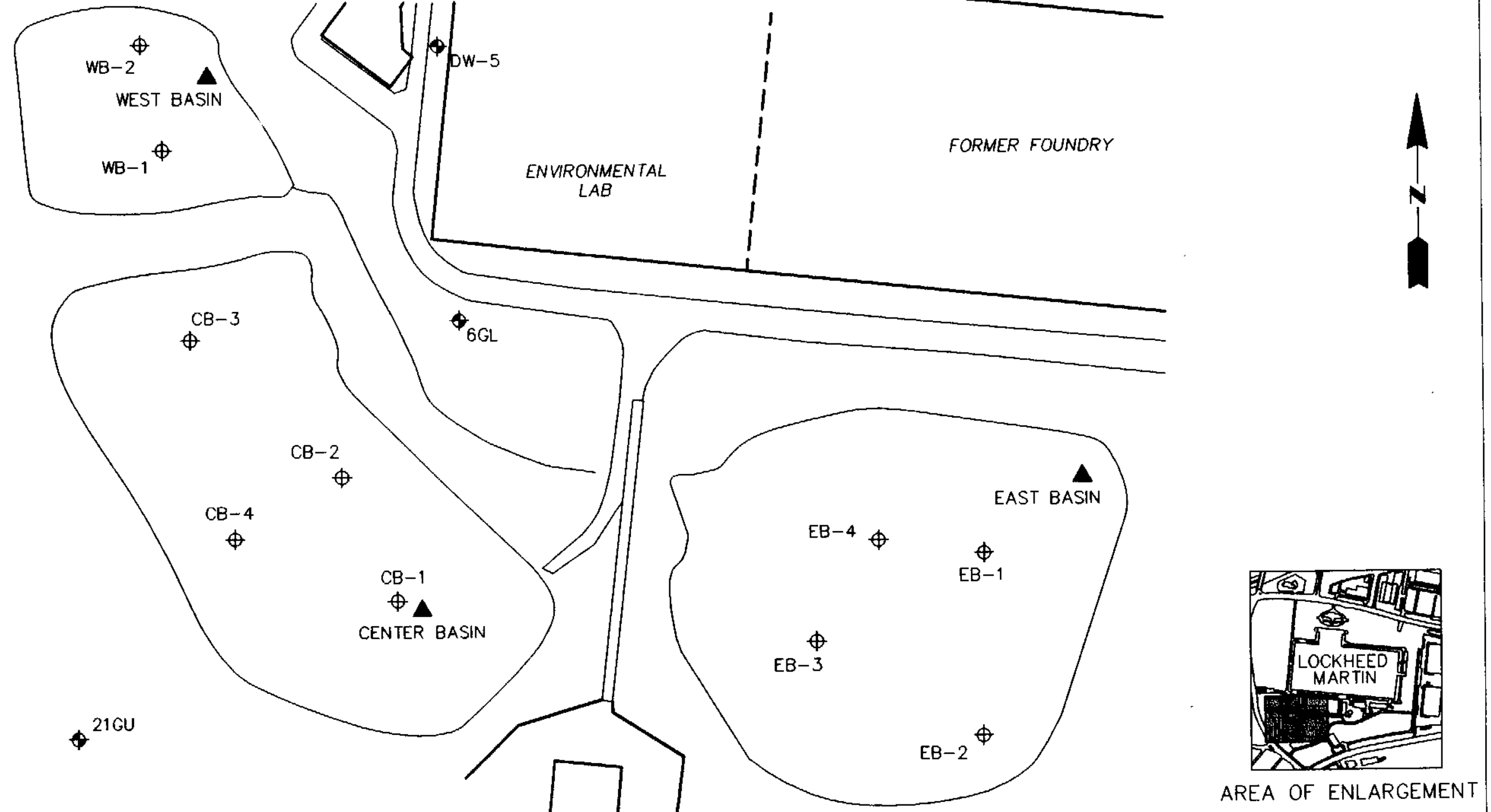
FLUX-GATE SAMPLE LOCATIONS

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Services
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 2/27/95 FIGURE: 7-1

M:\CADD\LORL\9606\FIG7_1 7-23-96 1:39:03 pm



LEGEND

⌖ CB-1/EB-1	SEDIMENT SAMPLE LOCATION
▲ CENTER BASIN	WATER SAMPLE LOCATION
● 6GL	GROUND-WATER MONITOR WELL

0 100
SCALE IN FEET

M:\CADD\LORL\9606\FIG6_1 7-23-96 1:39:37 pm

LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY

SURFACE-WATER AND SEDIMENT SAMPLING LOCATIONS (DRAINAGE BASINS)

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Services
72 Danbury Road
Wilton, CT 06897
(203) 762-1207

DATE: 2/27/95 FIGURE: 6-1

LEGEND

- ● SURFACE WATER
- ○ INTERMITTENT LAKE OR POND
- STREAM
- WETLANDS
- ▨ LAKE SUCCESS PARKWAY WOODS (NYSDEC Unique Scenic Area)
- ═ ROADWAY

UNISYS CORPORATION
GREAT NECK, NEW YORK FACILITY
2.0 MILE RADIUS

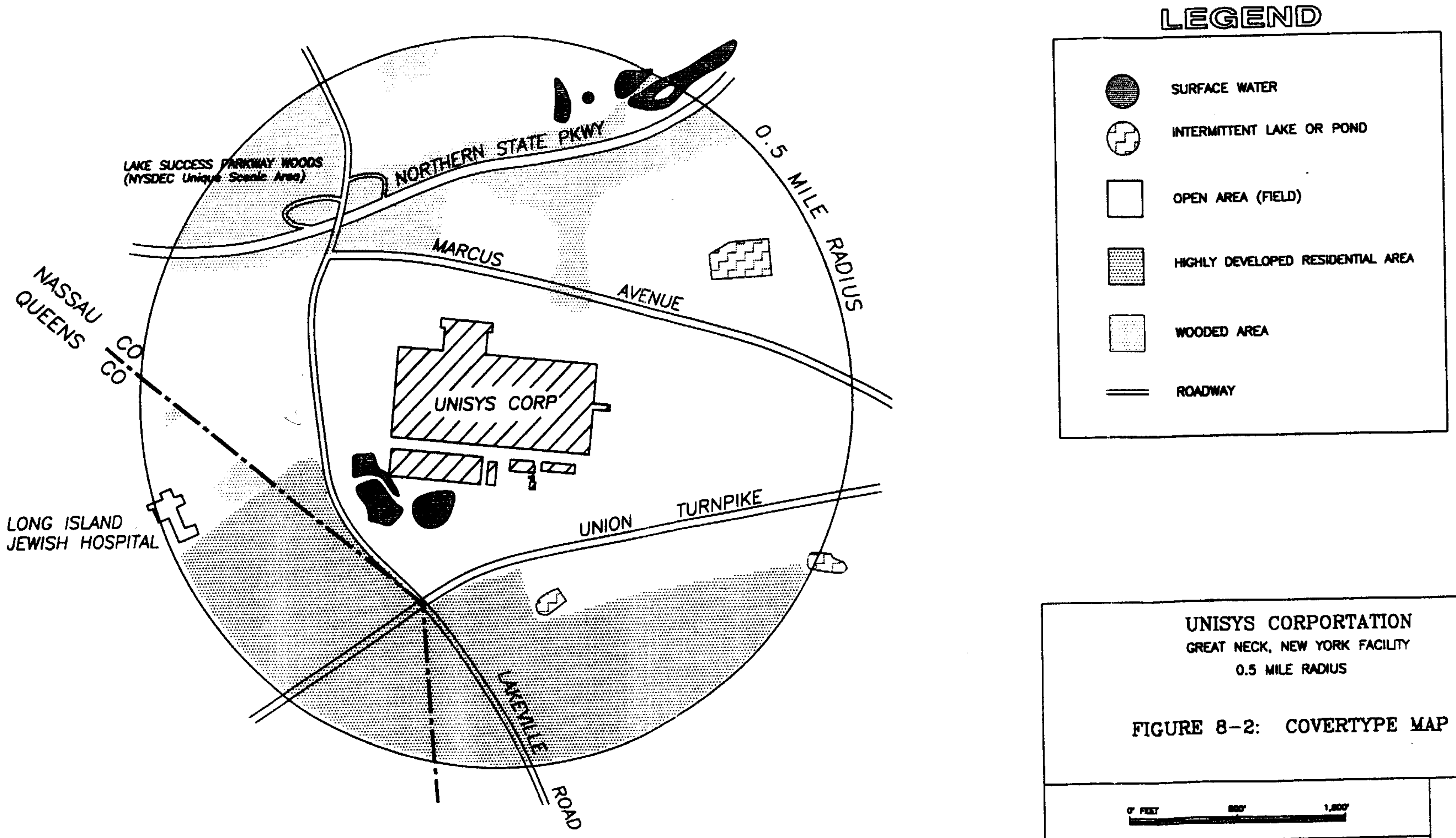
FIGURE 8-1: TOPOGRAPHICAL MAP

0' FEET 2,400' 4,800'

N

BASE MAP PROVIDED BY LEGGETTE, BRASHEARS & GRAHAM, INC.
REVISED BY ENVIRONMENTAL STANDARDS, INC.
DATE: 17-FEB-95

ENVIRONMENTAL STANDARDS, INC.



UNISYS CORPORATION
GREAT NECK, NEW YORK FACILITY
0.5 MILE RADIUS

FIGURE 8-2: COVERTYPE MAP

0' FEET 800' 1,600'

BASE MAP PROVIDED BY LEGGETTE, BRASHEARS & GRAHAM, INC.
REVISED BY ENVIRONMENTAL STANDARDS, INC.
DATE: 17-FEB-95

ENVIRONMENTAL STANDARDS, INC.

TABLES

Compound				LILCO SOIL SAMPLES			
	B-15		8ML	LILCO 1A	LILCO 2A	LILCO 19A	LILCO 21A
	10-12ft	18-20ft	8-10 ft	3-3.5 ft	3-3.5 ft	3-3.5 ft	3-3.5 ft
Acetone	ND	ND	ND	ND	ND	ND	0.160 JB
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	0.030 JB
1,1,1-Trichloroethane (total)	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.002 J	ND	ND	ND	ND	ND	ND
Benzene	0.0009 J	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.021	0.002 J	ND	ND	ND	ND	ND
Toluene	0.0007 J	0.001 J	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND
Xylene(total)	ND	ND	ND	ND	ND	ND	ND

ND	Not detected.
J	Value is estimated - Compound either detected bel or other limitations were identified during data vali
B	Compound detected in either field blank, trip blank

table1.95/UNISYS

Compound		LILCO SOIL SAMPLES			
		ILCO 1A	LILCO 2A	LILCO 19A	LILCO 21A
	10-1	3-3.5 ft	3-3.5 ft	3-3.5 ft	3-3.5 ft
Semi-Volatiles					
Phenol	N	ND	ND	ND	ND
1,3-Dichlorobenzene	N	ND	ND	ND	ND
1,4-Dichlorobenzene	N	ND	ND	ND	ND
1,2-Dichlorobenzene	N	ND	ND	ND	ND
4-Methylphenol	N	ND	ND	ND	ND
2,4-Dimethylphenol	N	ND	ND	ND	ND
1,2,4-Trichlorobenzene	N	ND	ND	ND	ND
Naphthalene	N	ND	0.60 J	0.033 J	0.024 J
2-Methylnaphthalene	N	0.035 J	0.18 J	0.021 J	0.035 J
Acenaphthylene	N	0.064 J	0.78 J	0.16 J	0.18 J
Acenaphthene	N	0.034 J	ND	ND	0.02 J
Dibenzofuran	N	0.016 J	0.1 J	ND	0.015 J
Fluorene	N	0.072 J	0.087 J	0.017 J	0.045 J
Phenanthrene	0.04	0.68 J	1.3 J	0.24 J	0.65 J
Anthracene	0.009	0.11 J	0.48 J	0.14 J	0.17 J
Carbazole	N	0.027 J	0.094 J	0.019 J	0.044 J
Di-n-butylphthalate	N	ND	ND	ND	ND
Fluoranthene	0.11	0.99 J	3.2 J	1.5 J	1.2 J
Pyrene	0.12	1.0 J	3.1 J	1.8 J	1.4 J
Benzo(a)anthracene	0.079	0.52 J	1.9 J	1.0 J	0.52 J
Chrysene	0.085	0.65 J	2.0 J	1.3 J	0.88 J
bis(2-Ethylhexyl)phthalate	N	0.026 J	ND	ND	ND
Benzo(b)fluoranthene	0.087	0.51 J	3.1 J	1.5 J	0.94 J
Benzo(k)fluoranthene	0.076	0.44 J	1.7 J	0.86 J	0.69 J

Compound		LILCO SOIL SAMPLES			
		LILCO 1A	LILCO 2A	LILCO 19A	LILCO 21A
	10-	3-3.5 ft	3-3.5 ft	3-3.5 ft	3-3.5 ft
Semi-Volatiles					
Benzo(a)pyrene	N	0.50 J	2.2 J	1.2 J	0.71 J
Indeno(1,2,3-cd)pyrene	0.05	0.35 J	0.55 J	0.65 J	0.43 J
Benzo(g,h,i)perylene	0.04	0.41 J	0.47 J	0.67 J	0.46 J
Pesticides/PCB's					
gamma-BHC	ND	--	--	--	--
Heptachlor	ND	--	--	--	--
Aldrin	ND	--	--	--	--
Endosulfan II	ND	--	--	--	--
4,4-DDD	ND	--	--	--	--
Endosulfan Sulfate	ND	--	--	--	--
4,4-DDT	ND	--	--	--	--
alpha-Chlordane	0.0006	--	--	--	--
gamma-Chlordane	0.00028	--	--	--	--
Aroclor - 1016	ND	ND	ND	ND	ND
Aroclor - 1232	ND	ND	ND	ND	ND
Aroclor - 1242	ND	ND	ND	ND	ND
Aroclor - 1248	ND	ND	ND	ND	ND
Aroclor - 1254	0.016 J	ND	ND	ND	ND
Aroclor - 1260	0.035 J	ND	ND	ND	0.390 J

ND	Not detected.
--	Not tested.
J	Value is estimated - Compound either detected below practical qu or other limitations were identified during data validation.
B	Compound detected in either field blank, trip blank and/or labora

table1.95/UNISYS

TABLE 4-3
LOCKHEED MARTIN
GREAT NECK, NEW YORK

Soil-Quality Summary - Inorganics

(See Appendix C for detection limits)

Compound	B-15		B-16		B-17		B-18		B-19		Average concentration range[1/]
	10-12 ft	18-20 ft	13-15 ft	19-21 ft	16-18 ft	18-20 ft	6-8 ft	22-24 ft	6-8 ft	18-20 ft	
	Milligrams per kilogram										
Aluminum	4,670	4,550	1,720	2,170	1,690	1,270	20,600	2,050	12,400	1,350	700-2,000
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
Arsenic	1.9	1.3	0.99	1.6	0.61	0.23	4.7	1.0	6.4	0.54	3-12
Barium	23.7	38.7	8.3	30.6	13.1	6.9	491	18.5	161	7.9	20-600
Beryllium	0.22	0.20 R	0.27	ND	0.23	ND	2.6	0.24	0.91	ND	0-1.75
Cadmium	ND	ND	0.81 J	2.1 J	0.58 J	ND	23.9	8.4	3.1 J	ND	0.45
Calcium	1,770	553	459	27,300	397	223	1,410	311	1,440	345	150-5,000
Chromium	9.4 J	ND	ND	55.0 J	5.4 J	3.7 J	670 J	5.3 J	42.5 J	3.1 J	1.5-40
Cobalt	4.3	4.8	3.9	3.8	3.0	2.3	98.8	2.9	7.0	1.8	2.5-8.5
Copper	ND	ND	41.8	187	29.5	ND	9,570	29.9	315	ND	1-200
Iron	10,300	10,400	9,270	7,380	5,730	3,530	21,200	6,000	18,100	4,990	17,500-25,000
Lead	14.0 J	2.2 J	80.3 J	146 J	29.0 J	18.5 J	9,780 J	188 J	146 J	3.9 J	10-37
Magnesium	1,100	1,570	398	15,300	457	400	1,080	523	1,630	488	2,500-6,000
Manganese	145	162	65.3	138	44.7	36.9	242	39.1	254	45.2	400-600
Mercury	ND	ND	0.52	1.6	0.20	0.12	23.1	0.20	2.20	ND	0.01-0.3
Nickel	13.3	14.0	13.7	25.1	13.5	12.6	679	16.7	23.9	12.6	0.5-25
Potassium	390	886	236	222	227	179	236	344	306	174	12,500-17,500
Selenium	ND	ND	ND	ND	ND	ND	9.4	ND	0.73	ND	0.01-2.0
Silver	ND	ND	ND	1.9 J	ND	ND	6.7 J	ND	ND	ND	0.01-5.0
Sodium	92	124	110	149	61.5	36.2	127	48.1	151	65.0	500-17,500
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
Vanadium	9.9	9.3	ND	7.9	ND	ND	34.7	3.7	36.8	ND	1-300

TABLE 5-1

LOCKHEED MARTIN
GREAT NECK, NEW YORK

Well Construction Details for New and Existing Wells

Well no.	Date drilled	Top-of-casing elevation (feet)	Total depth (ft bg)	Screen interval (ft bg)	Depth to water (ft btoc)	Water-level elevation (11/22/94)
1GU	May 1988	143.77	115	105 - 115	102.78	40.99
1GL	May 1988	144.41	147	127 - 147	103.01	41.40
1MI	May 1988	144.39	255	235 - 255	103.52	40.87
1MI/L	May 1989	144.55	342	322 - 342	--	--
1ML	May 1991	144.89	395	390 - 400	104.45	40.44
2GL	May 1988	128.35	147	127 - 147	85.00	43.35
2MU	July 1991	125.90	185	175 - 185	82.38	43.52
2MI	April 1989	128.57	250	230 - 250	85.17	43.40
2ML	August 1994	125.69	447	397 - 407	83.16	42.53
3GL	May 1988	139.50	149	129 - 149	95.91	43.59
3ML	July 1994	137.02	350	325 - 335	94.24	42.78
4GL	May 1988	144.81	150	130 - 150	101.46	43.35
4MI	March 1989	145.10	250	230 - 250	103.78	41.32
5GU	January 1992	131.32	95	74 - 94	88.20	43.15
5GL	February 1989	130.32	130	110-130	87.12	43.20
5MI	February 1989	130.31	250	239 - 250	87.54	42.77
5ML	July 1994	129.17	350	325 - 335	86.13	43.04
6GL	February 1989	128.30	125	105 - 125	85.15	43.15
6MI	July 1991	128.80	240	215 - 235	85.59	43.21
7GL	March 1989	149.76	150	130 - 150	108.13	41.63
7ML	June 1994	148.98	355	323 - 333	108.73	40.25
8GU	April 1989	120.42	90	80 - 90	75.80	44.62
8GL	April 1989	120.32	150	130 - 150	79.45	40.87
8ML	June 1994	126.94	355	328 - 338	78.35	41.28
9GL	April 1989	126.94	155	135 - 155	84.4	42.54
10GL	April 1989	126.03	132	112 - 132	83.98	42.05
11GL	May 1989	129.02	140	120 - 140	85.89	43.15
11MI	May 1989	129.39	250	230 - 250	86.61	42.78
12MI	May 1991	133.61	253	243 - 253	92.03	41.58
12ML	May 1991	133.85	393	383 - 393	92.47	41.38
15GL	August 1994	132.57	170	150-160	89.35	93.22
15ML	August 1994	132.63	340	328-338	88.69	43.94

TABLE 5-1
(continued)

LOCKHEED MARTIN
GREAT NECK, NEW YORK

Well Construction Details for New and Existing Wells

Well no.	Date drilled	Top-of-casing elevation (feet)	Total depth (ft bg)	Screen interval (ft bg)	Depth to water (ft btoc)	Water-level elevation (11/22/94)
DW-6	September 1942	--	259	209-259	--	--
DW-7	June 1954	--	245	199-239	--	--
DW-8	June 1942	--	195	140-190	--	--
DW-9	October 1951	--	108	68-108	--	--

-- Not available or not measured.

wellspec.tbl/UNISYS

TABLE 5-3

LOCKHEED MARTIN
GREAT NECK, NEW YORK

Ground-Water Quality Summary - Semi-Volatiles
Pesticides/PCBs

(Detected compounds only - See Appendix E for full analyte list and detection limits)

Well number	Semi-Volatiles				Pesticide/PCBs
	Phenol	Diethyl-phthalate	Di-n-butyl-phthalate	Butylbenzyl-phthalate	Heptachlor
	Micrograms per liter				
1-ML	45	ND	ND	ND	ND
1-GL	ND	0.7 J	ND	ND	ND
3-GL	ND	ND	ND	0.6 J	ND
8-ML	ND	ND	ND	0.7 J	ND
11-MI	ND	1 J	0.6 J	ND	ND
15-ML	2,100	ND	ND	ND	ND
15-GL	ND	1 J	ND	ND	0.034 J
17-GL	ND	1 J	ND	ND	ND
19-MI	ND	ND	ND	0.6 J	ND
22-ML	ND	ND	15	0.6 J	ND

ND Not detected.
J Value is estimated - Compound either detected below practical quantitation limit or other limitations were identified during data validation.

gwtbl/unisy

TABLE 5-4
(continued)
LOCKHEED MARTIN
GREAT NECK, NEW YORK

Ground-Water Quality Summary - Inorganics

(See Appendix E for detection limits)

Compound	MW-5ML	MW-5GL	MW-6MI	MW-6GL	MW-7ML	MW-7GL	MW-8ML	MW-8GL
	Milligrams per liter							
Aluminum	ND	0.205	ND	0.219	0.0827	0.459	0.564	1.01
Antimony	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	0.0025	ND	ND
Barium	0.0292	0.130	0.014	0.037	0.0723	0.0524	0.0273	0.0636
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	0.0031	ND	0.00074	0.0041	ND	0.0022
Calcium	5.05	33.4	7.18	21.4	28.4	19.4	23.3	25.8
Chromium	0.0229 R	0.0014 R	0.0011 R	0.0015 R	0.0016	0.0034	0.0024	0.0035
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.002	ND	0.0139	0.0187	0.0019	0.0103	0.0035	0.0056
Iron	0.105	ND	0.175	0.141	0.0707	1.9	0.675	1.8
Lead	ND	ND	0.0041	ND	0.0015	0.0552	0.0017	0.0035
Magnesium	1.99	3.26	2.8	3.29	16.3	5.17	10.9	11.2
Manganese	0.0029 R	0.00073 J	0.0123 J	0.0088 J	0.0217	0.0931	0.0457	0.126
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	ND	ND	ND	ND	0.0012	0.0081	0.0012	0.0053
Potassium	47.5 J	6.96 J	1.12 J	2.98 J	7.64	1.51	11.3	2.75
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	89.3	131	49.1	60.0	30.3	18.4	24.7	24.1
Thallium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	0.0156	ND	ND	ND	ND	0.0039	0.0019	0.0025
Zinc	0.0126	0.0019	0.017	0.0196	0.0101	0.0711	0.0206	0.0439
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 5-4
(continued)
LOCKHEED MARTIN
GREAT NECK, NEW YORK

Ground-Water Quality Summary - Inorganics

(See Appendix E for detection limits)

Compound	MW-15GL	MW-17ML	MW-17GL	MW-18ML	MW-18GL	MW-19MI	MW-19GU	MW-21GU	MW-22ML	MW-22GL
	Milligrams per liter									
Aluminum	0.268	0.198	0.047	0.197	0.0356	ND	7.46	0.370	0.0596	0.0815
Antimony	0.0036	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND	0.0054	ND	ND	ND
Barium	0.0722	0.0902	0.0749	0.0284	0.0506	0.0353	0.204	0.0419	0.0214	0.122
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.0036	ND	ND	ND	0.0014	ND	ND	ND	ND	ND
Calcium	29.2	20.6	34.3	16.8	24.4	23.1	18.3	12.9	22.2	50.9
Chromium	0.0027	0.0022	ND	0.0028	0.0011	0.0023	0.0178	0.0023 R	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	0.0239	0.0019	ND	ND
Copper	0.0093	0.0352	0.0014	0.0042	0.0024	0.003	0.029	0.0022	0.0048	0.0032
Iron	0.696	0.421 J	0.0603	0.565	0.140	0.0349	19.9	0.805	0.103	0.276
Lead	0.0054	0.0016	ND	0.002	ND	ND	0.0244	0.0018	0.0023	ND
Magnesium	11.3	3.30	13.7	7.67	10.8	11.1	9.01	6.79	12.0	20.6
Manganese	0.168	0.0128	0.0079	0.0219	0.0693	0.0021	3.43	0.104 J	0.0161	0.184
Mercury	ND	ND	ND	ND	ND	ND	0.00008	ND	ND	0.00039
Nickel	0.0032	0.0025	ND	0.0017	0.0019	0.0014	0.107	0.003 R	ND	0.0052
Potassium	15.0	19.2 J	16.3	9.970 J	12.2	2.4	3.82	1.68 J	2.55	14.0
Selenium	0.0031	ND	ND	ND	ND	ND	0.0038	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	49.5	31.80 J	69.3	17.5 J	36.2	26.5	112	62.8	ND	74.6
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	0.0028	ND	ND	0.002	ND	ND	0.0177	0.0013	ND	ND

Table 5-4A

Lockheed Martin Tactical Defense Systems

Groundwater Quality
VOC Analytical Results

November 1994

WELL (ug/l)	TOTAL VOCS	1,1-DCE	1,2-DCE	TCE	PCE	1,1,1-TCA	OTHER
1GU	131	2J	69	35	23	2J	--
1GL	2560	--	2100	130J	330	--	--
1MI	1560	--	1200	160	200	--	--
1MI/L	733	--	450	190	93	--	--
1ML	52	--	29	13	10	--	--
2GL	281	--	210	33	38	--	--
2MI	1040	--	760	140	140	--	--
2MU	1270	--	920	170	180	--	--
2ML	27	--	19	4	4	--	--
3GL	1090	--	770	160	160	--	--
3ML	109	--	19	16	3	--	71
4GL	618	--	450	100	68	--	--
4MI	729	--	530	100	99	--	--
5GU	265	--	180	43	42	--	--
5GL	116	--	81	18	17	--	--
5MI	800	--	560	140	100	--	--
5ML	260	--	210	27	23	--	--
6GL	97	--	63	15	12	--	7
6MI	20	--	15	3J	2J	--	--
7GL	207	--	140	41	26	--	--
7ML	463	--	320	94	46	3	--
8GU	69	2	30	19	16	2	--
8GL	132	2J	62	40	28	--	--
8ML	84	2	32	27	19	4	--
9GL	93	2J	41	28	21	1	--
10GL	91	2J	37	27	23	2	--
11GL	930	--	670	100	160	--	--
11MI	26	--	22	2J	2J	--	--
12MI	163	--	83	34	44	2	--
12ML	270	--	230	14	26	--	--
15GL	1110	--	810	160	140	--	--
15ML	41	--	26	8	7	--	--
17GL	1350	--	1000	240	110	--	--
17ML	20	--	11	6	3	--	--
18GL	336	--	230	64	36	--	6
18ML	428	--	260	120	48	--	--
19GU	9	--	4	3	2	--	--
19MI	675	--	490	110	75	--	--
21GU	6	1	3	2	--	--	--
22GL	544	--	460	47	37	--	--
22ML	569	--	260	240	67	--	2
23GL	205	--	140	46	19	--	--
23MI	17	--	15	1.1	0.8	--	--
24GL	3070	--	2400	320	350	--	--
24MI	192	--	140	34	18	--	--
25GL	482	--	39	300	--	120	23
25MI	3620	--	3300	--	320	--	--
26GL	95	--	55	25	15	--	--
26MI	183	--	134	16	24	--	8.7
27GL	87	--	39	23	17	0.8	7.5
27MI	96	--	54	16	22	--	4.1
28GL	11000	--	11000	--	--	--	--
28MI	3245	--	3100	--	68	--	77
29GL	4940	--	4700	--	240	--	--
29MI	344	--	260	42	25	--	17

NOTE:

J = Parameter was determined to be present below the method detection limit. The concentration is an estimated value.

-- = Not detected.

1,2-DCE = Total 1,2-Dichloroethene (Cis and Trans Isomers), TCE = Trichloroethene, PCE = Tetrachloroethene, TCA = Trichloroethane

TABLE 5-6
LOCKHEED MARTIN
GREAT NECK, NEW YORK
GROUNDWATER MODEL PUMPING SCENARIOS

Well ID	Screened Interval (ft msl)	Model Layer	Pumping Rate[1] (gpm)
EW-1	-60 to -95	3	-400
RW-1	0 to -50	2	-400
RW-1A	-75 to -115	3	-400
EW-3	-100 to -145	3	-300
RW-3	-60 to -95	3	-300
DW-5	-90 to -140	3	+400
DW-6	-80 to -120	3	+400
DW-7	-60 to -105	3	+400
DW-10	-70 to -120	3	+300
DW-12	-70 to -120	3	+300
Total Groundwater Removal:			**-1800**
Total Groundwater Injection:			**+1800**

Notes:

[1] A (-) denotes groundwater withdrawel.
A (+) denotes groundwater injection.

Compound		WATER SAMPLES		
	EB-1	enter Basin	West Basin	East Basin
Volatiles		Micrograms per liter		
Carbon Disulfide	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	1 J	2 J	ND
Trichloroethene	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
Xylene (total)	ND	ND	ND	ND
Semi-Volatiles				
1,2-Dichlorobenzene	0.16 J	ND	ND	ND
Naphthalene	0.15 J	ND	ND	ND
2-Methylnaphthalene	0.11 J	ND	ND	ND
Acenaphthylene	0.25 J	ND	ND	ND
Acenaphthene	0.31 J	ND	ND	ND
Dibenzofuran	0.15 J	ND	ND	ND
Fluorene	0.44 J	ND	ND	ND
Phenanthrene	3.2	ND	ND	ND
Anthracene	0.75 J	ND	ND	ND
Carbazole	0.54 J	ND	ND	ND
Di-n-butylphthalate	ND	ND	ND	ND
Fluoranthene	6.4	ND	ND	ND
Pyrene	4.7 J	ND	ND	ND
Benzo(a)anthracene	3.2	ND	ND	ND

Compound		**WATER SAMPLES**		
	EB-1	**enter Basin**	**West Basin**	**East Basin**
Volatiles		**Micrograms per liter**		
Chrysene	3.8	ND	ND	ND
bis(2-Ethylhexyl) phthalate	2.0 JB	ND	ND	ND
Benzo(b)flubranthene	5.2	ND	ND	ND
Benzo(k)fluoranthene	4.3	ND	ND	ND
Benzo(a)pyrene	3.8	ND	ND	ND
Indeno(1,2,3-cd)pyrene	1.8 J	ND	ND	ND
Dibenzo(a,h)anthracene	0.36 J	ND	ND	ND
Benzo(g,h,i)perylene	0.32 J	ND	ND	ND
Pesticides/PCB's				
4,4-DDE	0.026 J	ND	ND	ND
4,4-DDD	0.068 J	ND	ND	ND
4.4'-DDT	0.016 J	ND	ND	ND
Mehtoxychlor	ND	ND	ND	ND
gamma-Chlordane	0.011 J	ND	ND	ND
Aroclor - 1242	0.12 J	ND	ND	ND
Aroclor - 1248	ND	ND	ND	ND
Aroclor - 1254	0.33	ND	ND	ND
Aroclor - 1260	ND	ND	ND	ND

ND	Not detected.
J	Value is estimated - Compound either detec
B	Compound detected in either field blank, tri

table1.95/UNISYS

TABLE 6-2
LOCKHEED MARTIN
GREAT NECK, NEW YORK

Surface-Water and Sediment Quality Summary (Drainage Basins) - Inorganics

(See Appendix I for detection limits)

Compound	SEDIMENT SAMPLES						
	EB-1	EB-2	EB-3	EB-4	CB-1	CB-2	CB-3
	Milligrams per kilogram						
Aluminum	5,470	13,300	8,270	4,030	18,500	5,140	7,570
Antimony	ND	ND	5.5 J	ND	ND	ND	ND
Arsenic	5	21.3	4.2	0.72	18.6	2.7	4.8
Barium	43.1 J	108 J	53.6 J	35.7 J	118 J	35.1 J	52.1 J
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	2.9	13.1	1.1	ND	12.7	1.7	2
Calcium	2,700	4,890	1,180	677	7,230	1,690	2,230
Chromium	50.5 J	153 J	42.5 J	14.1 J	171 J	60 J	106 J
Cobalt	6.9	15.3	8.3	5.7	13.4	4.8	5.3
Copper	717	2,700	265	33.7	2,860	793	1,600
Iron	10,700	23,900	15,300	9,210	25,900	8,330	12,300
Lead	433	1,650	84.2	12.8	1,470	489	667
Magnesium	2,470	4,610	2,440	1,690	6,510	1,630	2,500
Manganese	64.7	116	160	78.8	163	61.5	78.4
Mercury	0.38 J	3.1 J	0.23 J	ND	2.3 J	1.4 J	1.4 J
Nickel	48.7	119	31.1	13.6	90.6	30.1	38.8
Potassium	737	1,000	479	1,350	1,040	330	579
Selenium	0.69 J	6 J	ND	ND	3.1 J	0.86 J	0.58 J
Silver	245 J	626 J	26.8 J	2.4 J	402 J	207 J	248 J
Sodium	123	345	107	65.1	1,440	106	129
Thallium	0.32	ND	ND	ND	ND	ND	ND
Vanadium	110	256	44.9	18.1	190	54.7	74.3
Zinc	467 J	1,770 J	312 J	39.6 J	1,730 J	343 J	539 J
Cyanide	ND	ND	ND	ND	29.2	ND	20.6

TABLE 7-1

LOCKHEED MARTIN
GREAT NECK, NEW YORK

Subsurface VOC Emission Results

Compounds:	Flux Gate Sample Locations							QA/QC				
	FG-1	FG-2	FG-3	FG-4	FG-5	FG-5 DUP	FG-6	BG-1	SB-1	MB	QC	FB-2
Benzene	0.19 UJ	0.67 U	0.24 UJ	0.25 UJ	ND	ND	0.41 U	0.25	0.36	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorotetrafluoroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorotrifluorethane	ND	0.18 UJ	ND	ND	ND	ND	ND	0.37	ND	ND	ND	ND
1,2-Dibromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
O-Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	1.19 U	ND	ND	ND	ND	ND	ND	ND	0.13	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	0.41 U	ND	ND	ND	ND	ND	ND	0.43	ND	ND	ND