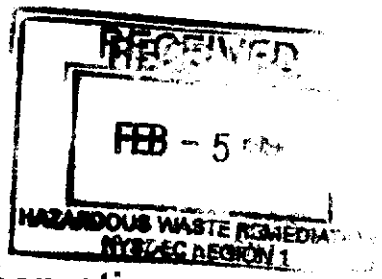
FINAL

OPERABLE UNIT 2
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WORK PLAN

LOCKHEED MARTIN CORPORATION

Great Neck, New York
NYSDEC Site No.130045



Prepared for:
New York State
Department of Environmental Conservation

On behalf of:
Lockheed Martin Corporation

JANUARY 1998

H2MGROUP

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John P. Cahill
Commissioner

January 28, 1998

Mr. R.N. Helgerson
Director
Burbank Program Office
Lockheed Martin Corporation
2550 N. Hollywood Way, 3rd Floor
Burbank, CA 91505-1055

RE: Operable Unit 2 Final Remedial Investigation/Feasibility Study (RI/FS) Work Plan dated January 1998. Lockheed Martin Corporation Site.

Dear Mr. Helgerson:

The New York State Department of Environmental Conservation (Department) Staff has reviewed the above referenced Operable Unit 2 (OU-2) Final RI/FS Work Plan dated January 1998 and your two letters addressed to me dated November 14, 1997 and January 7, 1998.

The Department hereby approves the above referenced OU-2 Final RI/FS Work Plan. It should be noted that it is the Department's policy not to approve Health and Safety Plans (HASP) such as the one submitted as part of the above referenced Final OU-2 RI/FS Work Plan. New York State Department of Health (NYSDOH) reviews the HASP from the perspective of community health and safety.

If you have any questions, please contact me at (516) 444-0243.

Sincerely,
Girish Desai
Environmental Engineer 1

cc: R. Becherer
J. Hussey, Esq., DEE
J. Lovejoy, NCDH

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Remedial Investigation/Feasibility Study
Work Plan
Lockheed Martin Corporation
Great Neck, New York

NYSDEC Site No. 130045

January 1998

Table of Contents

Table of Contents
(Continued)

Table of Contents
(Continued)

LIST OF FIGURES

LIST OF TABLES

APPENDICES

H2M GROUP

Operable Unit 2
Remedial Investigation/Feasibility Study
Work Plan
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1.0 INTRODUCTION

This work plan provides the scope of work for an off-site Remedial Investigation/Feasibility Study (RI/FS) near the Lockheed Martin Site (Former Unisys Corporation Site) located at 365 Lakeville Road, Great Neck, New York (see Figure 1.1). The Lockheed Martin site has been listed by the New York State Department of Environmental Conservation (NYSDEC) in the Registry of Inactive Hazardous Waste Disposal sites in New York State (Site No. 130045). The site is classified by the NYSDEC as a Class 2 Site due to the presence of contamination in soil and groundwater at the property.

From the late 1970s through the early 1980s, the following actions occurred: the Nassau County Department of Health (NCDOH) investigated the dry wells located at the southeast corner of the facility; lines leading to the drywells were plugged and the liquids within the dry wells were pumped out; and several above-grade and underground storage tanks were removed. Between 1988 and 1992, Unisys Corporation conducted a large-scale subsurface environmental investigation in which the on-site nature and extent of soil and groundwater contamination was evaluated. In 1991, Unisys entered into an Administrative Order on Consent (W-1-0527-91-02) with the NYSDEC which required on-site interim remedial measures (IRMs) for soil and groundwater and the completion of a RI/FS.

In 1995, the NYSDEC divided the site into two operable units for administrative purposes. Operable Unit 1 (OU-1) includes the 94 acre on-site project area owned by Lockheed Martin. Operable Unit 2 (OU-2) includes the off-site areas immediately surrounding the site. The Record of Decision (ROD) detailing the selected remedies for OU-1 was signed by the NYSDEC on March 31, 1997. In summary, the components of the OU-1 selected remedies are:

- Extraction, treatment, and reinjection of on-site groundwater.

- Conduct a remedial design program to confirm the components of the conceptual design and provide sufficient details to design, construct, operate, maintain, and monitor the selected remedies.
- Continue operation of the SVE IRM system currently operating in the Dry Well Area. The sludges present in the dry wells will be removed through excavation to enhance the SVE system.
- Implement a deed restriction in the vicinity of the three storm water recharge basins. Additionally, engineering controls (e.g., a fence with appropriate warning signs) will be constructed and maintained to prevent public access to the basins.
- Monitor the remediation systems to ensure that the remedial objectives are met.

This OU-2 work plan focuses on the off-site groundwater issues. The OU-2 RI/FS will be conducted under the executed NYSDEC Order on Consent. Data gathered during the RI/FS will be used to characterize the plume, determine potential risks to human health, and determine the need for additional action. The OU-2 RI/FS will be conducted in accordance with this work plan, the United States Environmental Protection Agency (USEPA) "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA - Interim Final" (USEPA, 1988) and appropriate NYSDEC Technical and Administrative Guidance Memoranda (TAGMs) including TAGM HWR-89-4025 "Guidelines for Remedial Investigations/Feasibility Studies" (NYSDEC, 1989).

1.1 Objectives

The overall goal of the OU-2 RI is to determine the nature and extent of site-related contaminants in groundwater off of the Lockheed Martin site.

The objectives of the RI/FS are as follows:

1. Identify and evaluate all uses of groundwater in the area and evaluate pathways of subsurface migration of contaminated groundwater recognizing that there are multiple users of groundwater downgradient of the site.
2. Determine the nature and extent of groundwater contamination off of the Lockheed Martin property in the Upper Glacial and Magothy aquifers. This will be accomplished through the development of the groundwater flow model and the installation and sampling of several additional groundwater monitoring wells off of the site.
3. Characterize the nature and extent of risks posed by contaminated groundwater off the site.

4. Gather sufficient data so that the site can be evaluated through the FS process.

The information gathered during the investigation will be presented to the NYSDEC and used to evaluate potential risks posed by the contaminants in off-site groundwater and to support the development of the OU-2 FS. If additional work is necessary, based on these investigations, it will be conducted in a subsequent phase.

2.0 SITE BACKGROUND AND 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 majority of the remaining property is used for parking.

With the exception of minor assembly, integration, prototype development and testing, the site currently is only used for engineering and administrative activities. Until 1995, the site was an active manufacturing facility. The facility was originally designed and built by the United States Government in 1941 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. 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 and the property was sold to a developer in the 1970s. The present day Triad Business Park was constructed on this property. Unisys Corporation sold the facility to Loral Corporation (Loral) in 1995. The electronics and system integration business of Loral was subsequently acquired by Lockheed Martin in 1996.

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.

Groundwater had been used for non-contact cooling purposes since the facility was constructed. The non-contact cooling system consisted of five extraction wells (EW-1, EW-2, EW-3, RW-1, and RW-2), 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 currently operating groundwater Interim Remedial Measure (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 compounds (VOCs) contamination in the area of the five former dry wells. See Figure 2.2 for the locations of the groundwater and SVE IRM systems.

3.0 HYDROGEOLOGY

The potential pathways for off-site migration of contaminants in groundwater is a direct function of the nature of the hydrogeologic conditions underlying the affected area. The presence or absence and lateral extent of clay layers, the horizontal and vertical hydraulic conductivities of aquifer and aquitard materials, etc. are all important factors in determining the ultimate fate and transport of contaminants. The regional and local hydrogeology of the area surrounding the site is presented in this section of the work plan.

3.1 Regional Hydrogeology

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 3.1).

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.

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 and Magothy aquifers 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, Water Authority of Great Neck North, New York City and Water Authority of South Western Nassau. A map showing the various water purveyors within Nassau County is included in Figure 3.2.

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). Average groundwater flow velocity in the vicinity of the site ranges from approximately 0.3 to 1.0 feet per day. Published data suggests that the regional groundwater flow direction is to the west or northwest (Doriski, 1987). According to NCDOH data, the groundwater flow divide (where groundwater changes direction to the south) occurs approximately 1/2 mile south of the site. Work completed by Roux Associates in 1990 and Leggette, Brashears & Graham, Inc. (LBG) in 1991 indicate that aquifer characteristics at the area of the site are within these published ranges.

The Magothy aquifer 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 (Franke and Cohen, 1972). 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 Lloyd aquifer in the vicinity of the site include Water Authority of South Western Nassau 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.

3.2 Local Hydrogeology

The data collected in support of the OU-1 RI show that site hydrogeology is consistent with regional hydrogeologic information (Swarzenski, 1963, Franke and Cohen, 1972, and USGS, 1989). Most noticeable is that very little of the Upper Glacial aquifer contains groundwater. The maximum thickness of saturated Upper Glacial aquifer material is approximately 70 feet near the northeast portion of the site. Groundwater occurrence beneath the site is mainly in the underlying Magothy aquifer. There does not appear to be a clear confining layer between the Upper Glacial and Magothy Aquifers beneath this site. Consistent with published information is the presence of the Raritan Clay, the confining unit between the bottom of the Magothy and the Lloyd Aquifers.

Potentiometric surface maps are prepared from data collected semi-annually in support of the currently operating groundwater IRM. On January 20, 1997, the general groundwater flow direction in the wells completed in the Upper Glacial aquifer was to the north northwest (see Figure 3.3). It should be noted that the potentiometric surface in this unit is influenced by the active extraction of contaminated groundwater and re-injection of treated water from the groundwater IRM system. The groundwater flow directions in both the intermediate and deep sections of the Magothy aquifer were to the northwest (see Figures 3.4 and 3.5, respectively).

Investigatory activities were conducted on February 21, 1997 by Lockheed Martin at Lake Success to determine the depth of the lake bottom. Depth soundings were recorded along three transect lines. As shown in Figure 3.6, the depth of the lake ranged from 4 to 71 feet. Based upon data collected from the monitoring wells located across Lakeville Road on the school property, groundwater occurs at approximately 160 feet below grade in the vicinity of Lake Success. Therefore, there is at least 80 to 90 feet between the lake bottom and the groundwater table. As such, Lake Success is not intercepting the groundwater contaminant plume.

3.3 Regional Groundwater Quality

To date, a total of 59 monitoring wells have been installed as part of the groundwater monitoring well network. This network was designed to evaluate the groundwater quality both on-site and off-site. Based upon the analytical results, the primary contaminants of concern are: tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (1,2-DCE). Concentrations of volatile organic compounds (VOCs) above New York State Department of Health (NYSDOH) public drinking water supply standards have been found in groundwater samples collected from on- and off-site wells. These chemicals are similar to those found in the

soil samples collected from the vicinity of the Dry Well Area located at the southeast corner of the Manufacturing Building (see Figure 2.2).

As part of the OU-1 RIs, a well survey and data review were conducted for private, industrial, and municipal off-site wells. The survey included a review of water quality results and well records from the Nassau County Department of Health (NCDOH), Nassau County Department of Public Works (NCDPW), and the NYSDEC. Several drinking water supply wells were identified within a 1.5 mile radius of the site (see Figure 3.7). All of the drinking water supply wells are under the management of water districts and authorities that serve the neighboring areas (e.g., Manhasset-Lakeville Water District). These drinking water wells are monitored by the water districts and authorities under regulatory oversight of the NCDOH and the NYSDOH. Those drinking water supply wells with contaminants present have installed the proper treatment systems to ensure that water distributed to the public meet all Federal and State standards.

Review of the NCDPW records indicated that off-site well Nos. N1102, N5535, N8038, N8970, N2576, N7560, N9982, and Q1909 were sampled by NCDPW for VOCs between November of 1994 and July of 1995. These wells consisted of private non contact cooling wells, private irrigation wells, and Nassau County owned monitoring wells. The results of the NCDPW groundwater sampling are as follows:

- Wells north of the Long Island Expressway had no detectable VOCs.
- Well N9982, located 2,400 feet south of the site had no detectable VOCs.
- Well N8970, located 8,500 feet west of the site had no detectable VOCs

Untreated water quality data of Public Supply Wells located within 1.5 miles radius of the site will be presented and discussed in the OU-2 RI Report.

4.0 SCHEDULE AND PROJECT MANAGEMENT

4.1 Project Schedule

The overall anticipated project schedule to perform the OU-2 RI/FS is 16 months from the submittal of the draft RI/FS work plan. The draft Final OU-2 RI/FS work plan will be finalized by September 12, 1997. The public meeting will be held on September 29, 1997. Providing for the requisite 30-day public comment period which will include a public meeting, RI activities will commence by October 27, 1997.

The first task of the RI will be to conduct the regional groundwater quality and hydrogeological review. This task will be initiated prior to the performance of any groundwater modeling since information gathered from this task will be needed to support the modeling efforts. It is anticipated that the regional groundwater quality and hydrogeological review task will be completed in 6 weeks. Since groundwater modeling is dependent upon the information gathered from the hydrogeologic review, modeling will commence when the hydrogeologic review is completed. Field activities will commence in December , 1997. A 4 week period is provided in the schedule for obtaining well drilling and road opening permits associated with the installation of well clusters MW-30, 31, 32, and 33. It is anticipated that it will take six weeks to complete well drilling activities. Drilling and development of these cluster wells will be completed by January 30, 1998. Upon completion of certain tasks of the OU-2 groundwater model, appropriate location and screened interval(s) of MW-34 will be selected. Well permits will be obtained for MW-34, as required. Installation and development of MW-34 is expected to be completed by March 20, 1998. The first round of groundwater samples will be collected one week after well development of MW-34, in April, 1998. The second round of samples will be collected one month later, in May, 1998. Following receipt of the second round of groundwater data, the data packages will be validated. Draft RI, RA, and FS reports will be prepared and submitted to NYSDEC by September 11, 1998.

A task-by-task schedule for the RI/FS activities is provided as a Milestone Chart (see Figure 4.1).

4.2 Project Management

The key individuals who are responsible for the overall coordination of efforts to be conducted, as well as the collection, validation and interpretation of data generated during the RI/FS are identified on Figure 4.2.

The Lockheed Martin Project Manager will be Mr. David J. Jensen, P.E. and the Lockheed Martin Project Supervisor will be Mr. Robert Gilbert. Mr. Eric Wang will serve as the Lockheed Martin Project Coordinator. Mr. Gilbert will be the primary contact between Lockheed Martin and the regulatory agencies. Mr. Wang will serve as the alternate point of contact.

The H2M Project Director for the work is Mr. Michael V. Tumulty, P.E. Mr. Tumulty is a Vice President and is the Director of H2M's Environmental and Engineering Services Division. Mr. Tumulty's primary role is to provide overall project direction for the consultant activities and provide general QA/QC support.

Mr. Richard J. Baldwin will serve as the H2M Project Manager. Mr. Baldwin is a certified professional geologist (C.P.G.). Mr. Baldwin's responsibilities for the OU-2 RI/FS will include coordinating the development of project plans, implementation of various RI tasks, and overseeing field activities. Mr. Baldwin will oversee all aspects of the RI/FS to ensure compliance with the work plan, with data quality objectives, and with overall project objectives of the RI/FS.

The Quality Assurance Officer (QAO) for this project will be Mr. Kenneth J. Cottrell, C.P.G. of H2M. Mr. Cottrell will be responsible for overall project quality including development of the project QA/QC plans, review of specific task QA/QC procedures, review of laboratory, vendor and subcontractor plans and procedures, and auditing specific tasks at established intervals. The QAO will report directly to the officers in charge of the project. Specific tasks that the QAO will be responsible for include reviewing laboratory results for the groundwater samples pertaining to the site from a data usability standpoint. EPA's "Laboratory Data Validation, Functional Guidelines for Evaluating Organics Analyses and NYSDEC ASP" will be used to determine data usability. Based upon the evaluation, the QAO will determine whether all data are usable. The QAO will prepare a Data Usability Report which will be included in the final RI/FS report.

5.0 TECHNICAL WORK PLAN

The following scope of work has been developed to further characterize and evaluate the environmental conditions in the off-site areas immediately surrounding the Lockheed Martin site. Additionally, it will incorporate existing data, publicly available data, and data acquired through the OU-2 field work. The data will be used to evaluate the existing laboratory data, evaluate the potential risks to human health, and prepare a FS. This RI/FS work plan outlines field investigation Procedures and Methodology; QA/QC; the Health and Safety Plan (HASP); and the Citizen Participation Plan (CPP).

5.1 Data Quality Objectives

The Data Quality Objectives (DQOs) for the RI/FS are to collect data of sufficient quality and quantity for site characterization, hydrogeologic evaluation, and risk assessment.

The types of information to be developed from the OU-2 RI include groundwater quality data, groundwater flow data, geologic data, and water usage data. These data will be used to characterize the nature and extent of off-site groundwater contamination, and to re-evaluate and amend, if necessary, the OU-1 Baseline Human Health Risk Assessment report relative to the groundwater exposure pathways (see Section 9.0). Additionally, the data will be used during the preparation of the OU-2 RI report and to support the development of the OU-2 FS. The primary data users of this data for this project will be Lockheed Martin, the NYSDEC and the NYSDOH.

To generate data of sufficient quality for plume delineation, site characterization, and risk assessment, the groundwater samples collected as part of the OU-2 RI field activities will be analyzed using NYSDEC Analytical Services Protocol (ASP) Contract Laboratory Protocol (CLP) procedures (USEPA, 1991). Analyses will be performed by a NYSDOH-certified analytical laboratory and will conform to NYSDOH Environmental Laboratory Approval Program (ELAP) CLP. The laboratory method for VOCs will be gas chromatograph/mass spectrometer (GC/MS) in order to achieve microgram per liter (ug/l) detection limits. The specific analytes and contract-required quantification limits (CRQLs) are shown in Table 5.1. The data will be validated by an validator independent of the analytical laboratory.

5.2 Preliminary Identification of ARARs and TCBs

5.2.1 Potential Applicable or Relevant and Appropriate Requirements

While the site is not a Superfund site, the National Contingency Plan (NCP) (50 Federal Register 47912, November 20, 1985) and the Superfund Amendments and Reauthorization Acts/Comprehensive Environmental Response, Compensation, and Liability Act

(SARA/CERCLA) Compliance Policy guidance define applicable requirements as the federal and state requirements for hazardous substances, which would be binding at the site. Relevant and appropriate requirements, which are defined as applicable, apply to facilities or problems similar to those encountered at this site; therefore, their use is well suited. With respect to the selection of remedial alternatives, relevant and appropriate requirements are to be afforded the same weight and consideration as applicable requirements.

ARARs were previously identified for the Lockheed Martin site as part of the OU-1 RI/FS. The ARARs for OU-2 are the same as those previously identified to address the groundwater media of the OU-1 RI/FS and include the NYS Standards, Criteria and Guidelines (SCGs). A list of federal and state ARARs, including NYS SCGs for OU-2 is included as Appendix A.

5.2.2 Potential "To Be Considered" Material (TBCs)

When ARARs do not exist for a particular chemical or remedial activity or when the existing ARARs are not protective of human health or the environment, other criteria, advisories and guidance may be useful in designing and selecting a remedial alternative. As is the case with ARARs, TBCs for groundwater have also been previously identified during the OU-1 RI/FS and are the same for OU-2. TBCs for OU-2 groundwater are also listed in Appendix A.

5.3 Potential Contamination Migration Pathways

As discussed in Sections 2.0 and 3.0, the chemical compounds present in the soils and groundwater on and off of the site have been identified by the previous sampling and analysis effort. Therefore, potential contamination migration pathways can be assessed.

The previous investigations performed at the site identified the following principal areas of concern:

- The soils present in the Dry Well Area located at the southeast corner of the manufacturing building (see Figure 2.1). These sediments are impacted by halogenated VOCs including tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (TCA), and 1,2-dichloroethene (1,2-DCE).
- The sediments present at the bottoms of three storm water retention basins located at the southwest corner of the property. These sediments contain metals and semi-volatile organic compounds (SVOCs) above NYSDEC recommended soil cleanup objectives (RSCO).

- The groundwater on and off of the facility. The groundwater is impacted by halogenated VOCs, primarily PCE, TCE, and 1,2-DCE.

In general, the data collected in support of the OU-1 RI indicated that VOC contamination is present in the soils beneath the Dry Well Area. The potential pathway for migration of VOCs is downward movement through the vadose zone in a dissolved-phase, due to recharge from precipitation. VOCs in solution which reach the groundwater will move, generally with the groundwater, in the direction of groundwater flow. The VOC-impacted groundwater in the saturated zone then flows in a generally north-northwest direction at a velocity typically consistent with the groundwater pore velocity. Other factors such as adsorption, degradation, and dispersion affect contaminant transport, but to a lesser degree than the advective flow of groundwater. On-site soil contamination is being addressed by the existing SVE IRM with additional soil excavation under the OU-1 ROD. Therefore, the soils in the Dry Well Area do not need to be addressed in OU-2.

Metals and SVOCs were primarily present in the recharge basin sediment. These two classes of compounds follow a similar migration pathway as those for the VOCs. However, they generally tend to adsorb to sediments much more than VOCs. Soil and groundwater data collected in support of the OU-1 RI indicate that these compounds are bound to the soils and have not migrated downward to impact groundwater. These data included:

- Groundwater samples from wells located directly downgradient of the recharge basins. The metals and SVOCs were not detected in the groundwater samples.
- Sediment samples from the basin sediments were analyzed by toxicity characteristic leaching procedure (TCLP) for metals to evaluate their potential mobility in the subsurface soils. The data indicated that the metals were effectively bound to the sediments.

Based upon these data, the metals and SVOCs present in the recharge basin sediments are immobile and will not affect the underlying groundwater quality. These sediments were addressed in the OU-1 RI/FS and ROD.

The groundwater quality data collected from the monitoring well network indicates that both the on- and off-site groundwater contain dissolved-phase halogenated solvents. The highest concentrations are present in the upper part of the aquifer system (e.g., the Upper Glacial and intermediate-depth Magothy aquifers). Therefore, the primary purpose of the OU-2 RI is to evaluate the extent of off-site groundwater impact.

5.4 Task 1 - Off-Site Groundwater Quality/Hydrogeology Evaluation

As discussed in Section 3.3, off-site groundwater quality data in the vicinity of the site was presented in both the Phase 1 RI and Supplemental RI Reports. However, understanding the nature and extent of off-site contamination is complicated by complex hydrogeologic conditions and the periodic pumping of high-capacity water supply wells located in the project area. In order to better evaluate these factors, an off-site evaluation of groundwater quality/hydrogeology in the vicinity of the site will be conducted as part of the OU-2 RI.

5.4.1 Review Existing Data

In order to obtain a full understanding of the effects of groundwater extraction from high-capacity public supply and irrigation wells, the following organizations/sources will be contacted during this evaluation:

Water Districts in the Vicinity of the Lockheed Martin Site:

- Manhasset-Lakeville Water District
- Water Authority of Western Nassau County
- Water Authority of Great Neck North
- Plandome Village Water Department

Public Agencies:

- New York City Department of Environmental Protection
- New York State Department of Health
- New York State Department of Environmental Conservation
- Nassau County Department of Health
- Nassau County Department of Public Works
- United States Geological Survey

The data that will be requested from these sources will include lithologic logs, well locations, previous potentiometric surface maps, well-construction details, well-completion reports, pumpage rates and schedules, groundwater treatment systems and groundwater quality data. If analytical data is not available from these existing off-site wells, and data gaps are determined to exist, selected off-site wells will be sampled, as appropriate. These data, as well as

the data collected from the proposed groundwater monitoring well network, will be tabulated, analyzed and summarized in the OU-2 RI Report.

These data will be useful in determining the following:

- Potential pathways of contaminant migration through review of the boring logs and well-construction diagrams. This information will be used to determine the thickness of clay layers and allow for a better understanding of the aquifer characteristics.
- Affects of groundwater pumping. Most public water supply wells withdraw more water from the aquifer system during the summer months. Knowledge of the cyclic pumping of nearby wells will allow for better understanding of the groundwater flow and migration of contaminants in groundwater through changes in seasonal uses.
- Extent of groundwater contamination.

The information obtained from this task will also be used to help characterize the off-site hydrogeology and provide input into the OU-2 groundwater flow model discussed below.

5.4.2 Groundwater Flow Model

A site-specific three-dimensional groundwater flow model was prepared in support of the OU-1 RI and FS. The purpose of the OU-1 groundwater model was to assist in the conceptual design of a groundwater extraction system to capture on-site groundwater contamination. The OU-2 groundwater model will expand upon the OU-1 model and will include off-site areas to develop a better understanding of regional issues. Under this task, a three-dimensional groundwater flow and contaminant transport model will be established based upon the data collected during the OU-1 RIs, the off-site groundwater quality/hydrogeology evaluation, and the results of the OU-2 RI field work. The model will be used to represent the groundwater flow conditions of the Upper Glacial, Magothy and Lloyd aquifers. The overall OU-2 groundwater model covers all of Queens and Nassau counties and the western portion of Suffolk County. The portion of the model in the vicinity of the site with higher resolution extends approximately 6 miles north (to the Long Island Sound), 4 miles west, 2 miles south and east from the site. The local model grid includes all of the Great Neck Peninsula. The objective of the model is to simulate the migration of contaminants under existing conditions (including the periodic pumping of high-capacity water supply wells) and to evaluate the effects of pumping wells on contaminant transport. Deep Magothy aquifer issues relating to OU-1 will be addressed by the OU-2 groundwater model.

The Nassau County-wide three dimensional groundwater flow model developed by the Nassau County Department of Public Works will be the computer model used for the OU-2 groundwater modeling effort. The model will be a three-dimensional mathematical finite-difference model which will evaluate the resultant potentiometric surfaces and inferred groundwater flow directions based upon known boundary conditions. A particle tracking post-processing package will be used to compute pathlines which indicate the most probable contaminant migration pathway based upon the modeled conditions and time frame. The particle tracking modeling will be useful in evaluating the effects of pumping of the nearby public water supply wells.

The OU-2 groundwater model will be calibrated by taking into account the historic fluctuations of groundwater elevations, changing location of the groundwater flow divide and water-supply use. As part of the OU-2 RI, historic groundwater maps and reports will be reviewed to evaluate past groundwater flow conditions.

In order to evaluate the transport of the halogenated VOCs in the subsurface, a solute transport model utilizing the above-referenced calibrated flow model will be constructed. The model will simulate the advection, dispersion and degradation of the contaminants within the aquifer system.

5.5 Task 2 - Well Installation/Field Sampling Plan

The media of concern for OU-2 is groundwater in the Upper Glacial and Magothy aquifers in the vicinity of the Lockheed Martin site. The on- and off-site groundwater quality data collected in support of the OU-1 RIs and the groundwater IRM has been reviewed for the purpose of determining additional monitoring well locations that will assist in delineating the groundwater contamination plume. At present, a total of 59 monitoring wells have been installed to assess groundwater quality, 47 of which are located on the site and 12 which are located off of the site. Of the 59 existing wells, 28 wells are completed within the Upper Glacial aquifer, 19 are completed in the intermediate Magothy aquifer, and 12 are completed in the deep Magothy aquifer. The most recent groundwater quality for site-perimeter and off-site wells for the Upper Glacial, intermediate Magothy and deep Magothy aquifers are shown on Figures 5.1, 5.2, and 5.3, respectively. The objective of the off-site monitoring well network is to define the extent of groundwater contamination.

Upper Glacial Aquifer

As shown on Figure 5.1, the limits of groundwater contamination in the Upper Glacial aquifer has been defined to the north of the site (VOCs were not detected in the groundwater sample collected from MW-16GL). To delineate the extent of the groundwater plume to the west, northwest, and northeast, three wells will be installed and sampled in the Upper Glacial aquifer as part of the OU-2 RI at the locations shown on Figure 5.1. The new wells will be located to the east (along the Northern State Parkway), west (in Queens northwest of Long Island Jewish Hospital), and northeast (along the Long Island Expressway (LIE) on the north side of Lake Success). Due to differences in land surface elevations, the wells will be screened at different depths below grade; however, more importantly, the wells will be completed at the same elevation to monitor the same statigraphic interval. The approximate well target depths for each well are indicated in Table 5.3. In general, these wells will range in depth from 170 to 230 feet below grade. The well construction methods and materials are discussed in Section 6.0. No additional wells are warranted south of the site because groundwater flow direction in the vicinity of the site is to the northwest (see Figures 3.3, 3.4, and 3.5), and additionally, the amount of contaminants in the groundwater at MW-19GU has been decreasing over time.

Intermediate Magothy Aquifer

As shown on Figure 5.2, the extent of the plume requires further delineation in the intermediate Magothy aquifer downgradient to the site. This is based upon groundwater samples collected from MW-14MI (located furthest to the north), MW-4MI (located furthest to the west), MW-2MI (located furthest to the east), and MW-19MI (located furthest to the south), all of which exceeded NYSDOH drinking water standards. Therefore, four wells will be installed within this zone and sampled as part of the OU-2 RI at the locations shown on Figure 5.2. These wells will range in depth from 245 to 305 feet below grade. The four new wells will be located to the north, northeast, northwest, and west of the site. The approximate well target depths for the individual wells are indicated in Table 5.2.

Deep Magothy Aquifer

As shown on Figure 5.3, additional groundwater delineation is required in the deep Magothy aquifer. VOC concentrations for groundwater samples collected from wells MW-8ML (located furthest to the east), MW-18ML (located furthest to the northwest), and MW-16ML (located furthest to the north) all exceed NYSDOH drinking water standards. Therefore, four monitoring wells will be installed and sampled to delineate VOC contamination to the north, northeast, northwest, and west of the site. The approximate locations of these wells are indicated on Figure 5.3. In general, these wells will range in depth from 365 to 425 feet below grade. The

approximate well target depths for the individual wells are indicated in Table 5.2. A well is not proposed to the south of the site since the concentrations of VOCs in groundwater samples collected from MW-15ML have been decreasing over time.

Lloyd Aquifer

Based upon available USGS data, the groundwater flow direction of the Lloyd aquifer in the vicinity of the site is to the southwest. The hydrogeologic dynamics of the Lloyd aquifer will be evaluated through use of the OU-2 groundwater model.

The analytical results of groundwater samples collected from three wells completed in the Lloyd aquifer (N-1618, N-1802 and N-1958) in the vicinity of the site (see Figure 3.7) will be utilized to evaluate the groundwater quality conditions in the Lloyd. If available from the water districts or NCDOH, recent analytical data (e.g., 1998) will be acquired and utilized for the evaluation. As part of the OU-2 RI, groundwater samples will be collected from those wells which have not been sampled during 1998 by the water districts or the NCDOH. Additional investigatory activities will be conducted if the above-referenced evaluation indicate that they are warranted.

The locations of all proposed monitoring wells are shown on Figure 5.4. Where appropriate, the wells will be constructed in three well clusters. In order to better understand the pathways for the potential migration of contaminants in the aquifer system, knowledge of the thickness and extent of clay layers versus transmissive materials (sands and gravels) is required. The hydrogeology of the area off of the Lockheed Martin site will be further defined through preparation of lithologic logs during drilling of the monitoring well borings; geophysical logging of the deep borehole at each drilling location; and determination of potentiometric surfaces through well elevation and depth to water surveys.

In addition to the monitoring wells shown on Figures 5.1, 5.2, and 5.3, an additional monitoring well(s) (i.e., MW-34) will be located to the southeast of the site (see Figure 5.4). The intent of the well(s) is to evaluate groundwater quality between the site and supply wells N4390 and N7445. The subsurface hydrogeologic conditions will be evaluated through the review of boring logs, well completion records, geologic cross-sections, and historic and current well pumping rates and schedules, and will be incorporated into the OU-2 groundwater model. The appropriate number of monitoring well(s) and screen interval will be determined based upon the results of this groundwater modeling effort conducted as described in Section 5.4.2 - Groundwater Flow Model.

Following completion of well installation, the newly installed monitoring wells will be sampled. The groundwater samples collected from the monitoring wells will be analyzed for Target Compound List (TCL) VOCs using NYSDEC Method 91-1 plus Freon 113 (which was detected in the Dry Well Area soils). The analytical samples and quality assurance/quality control samples are summarized in Table 5.3. One month later, all site monitoring wells (the newly installed and the 59 existing on- and off-site wells) will be sampled. This sampling of the entire monitoring well network will replace the semi-annual sampling round scheduled to be completed in April of 1998. All site monitoring wells will be sampled on a semi-annual basis, except for select wells, which will be identified by the NYSDEC, will be sampled quarterly. Specific details of the semi-annual and quarterly groundwater monitoring program will be described in a separate sampling plan.

The methodologies used to conduct these tasks are discussed in Section 6.0.

6.0 INVESTIGATION PROCEDURES AND METHODOLOGY

This section of the work plan outlines well drilling and construction, groundwater sampling, and aquifer characterization procedures and methodologies.

6.1 Well Drilling and Construction

The installation of the groundwater monitoring wells located along Marcus Avenue north of the site was first attempted during the Phase 1 RI by utilizing the water-rotary/casing advancement drilling method as detailed in the NYSDEC-approved OU-1 RI/FS work plan. However, this drilling method did not prove feasible and the NYSDEC approved the use of the mud-rotary drilling method to complete the monitoring wells. Therefore, the groundwater monitoring wells installed in support of the OU-2 RI/FS will be drilled and installed utilizing the mud-rotary drilling method.

The mud-rotary drilling technique involves the advancement of a borehole by simultaneously rotating and axially advancing a drill bit attached to hollow rods into the geologic material. Mud-rotary drilling can be effective in nearly all geologic media ranging from unconsolidated clay, silt, sand, and/or gravel to crystalline bedrock. In mud-rotary drilling, a drilling fluid composed of bentonite powder and water (mud) is used to cool the drill bit as it is cutting through the geologic media and to transport the cuttings to the surface. The drilling fluid is pumped down the hollow center of the drill rods and through the holes (ports) in the drill bit. As the boring is advanced, the drill bit cuts/crushes the geologic material and the drilling fluid cools the drill bit. Additionally, the cuttings are carried up and out of the borehole by the viscous mud. The drilling fluid is typically mixed in a 100 to 400 gallon portable mud pit. The mud is picked up by the drill rig pump from the mud pit; circulated though the borehole; passed though a system which removes entrained sand and gravel; and returned back into the mud pit. The mud that will be used will be prepared by mixing 100 percent pure bentonite powder and water. Synthetic polymers are often used to improve the viscosity of the mud; however, the polymers can contain chemical components that can adversely affect both VOC and SVOC analyses. Therefore, synthetic polymers will not be used during this work.

A qualified hydrogeologist will be present during all drilling activities. Grab samples of the cuttings will be collected from the mud flow during drilling for logging by the hydrogeologist. It should be noted that fine-grained sediments will become entrained in the drilling fluid and will not be present as cuttings. Therefore, the logs prepared by the on-site hydrogeologist will provide only an approximate representation of the lithologies encountered. At each drilling location, a well boring will be drilled to the maximum targeted depth for the

sampling location. A downhole geophysical survey (see Section 6.2) will be performed and the results reviewed to determine the exact screen depths of the wells to be installed. The investigation-derived waste (IDW) will be containerized, managed and disposed of following applicable regulations.

Prior to commencement of drilling, site-specific underground structures, overhead structures and other surface features which may impede drilling will be identified. This will include notifying the "Call Before You Dig" telephone number (Dig Safe) of (516) 661-6000 for utility mark outs. All drilling equipment will be steam cleaned prior to work and in between boring locations. An on-site potable water supply will be available for steam cleaning, drilling mud preparation, and other purposes, as necessary. All decontamination water will be containerized and disposed of through the groundwater treatment IRM system. The well screen and casing will be decontaminated by steam cleaning unless the well materials have been cleaned and sealed at the factory.

The groundwater monitoring wells will be constructed with 4-inch flush-threaded Schedule 80 polyvinyl chloride (PVC) risers and 4-inch diameter screens with 0.020 slots. The length and depth of the screened zones will be determined based upon the local lithologies encountered at the well location, although the screens are not expected to exceed 20 feet in length. The annular space around the well screens will be filled with an appropriately-sized sand filter pack extending from one foot below the bottom of the screen to a height of two feet above the top of screen. The sand pack will be emplaced using the tremie-pipe method. A three foot seal of bentonite pellets will be placed above the filter pack. The bentonite pellets will be continuously hydrated for sixty minutes prior to installation of the cement/bentonite grout. The depth to the bottom and top of each seal will be measured in the borehole to the nearest 0.1 foot using a weighted tape. The remaining annular space will be grouted with a bentonite/cement slurry using the tremie method. The tremie pipe will be fitted with an elbow to deflect the grout towards the side wall. A cement/bentonite surface seal will be constructed by filling the annular space of the borehole and will extend from approximately three feet below-grade level to grade where a flush mounted well manhole or stick-up type completion will be installed. A water-tight locking cap will be attached to the top of the PVC casing. A 6-inch diameter protective steel casing in a cement collar will be installed over each well. A flush to grade steel cover assembly will be set around the well casing. This steel cover will be set into a sloped concrete pad, after the grout has been allowed to set. Typical well-construction details are included in Figure 6.1.

The wells will be vigorously developed to repair damage done to the formation by the drilling operation and to alter the basic hydraulic characteristics of the formation near the well so that groundwater will move freely into the well. The methods to be employed during this RI of developing wells are a combination of over pumping, swabbing/surge blocking, and surging.

Specific conductivity, temperature and pH measurements will be taken of the discharge until all parameters stabilize to confirm adequate development. Stabilization is established when two consecutive well-volume readings taken one well casing volume apart are within 10 percent of one another. Turbidity will also be monitored and the well will be developed until a measurement of less than 50 nephelometric turbidity units (NTU) is achieved or until turbidity stabilizes. Depth to groundwater measurements will be made before and after well development. The development water will be containerized, transported to and disposed of through the on-site groundwater IRM system. Field data will be recorded on pre-printed field forms.

6.2 Geophysical Surveying

A down-hole geophysical survey will be conducted in the deep well boring at each drilling location. These data will be useful in determining potential pathways of subsurface migration of contaminated groundwater. The selected geophysical survey technique is the natural gamma method. In this method, measurements are made of naturally occurring radiation emitted from the lithologic materials encountered in the borehole. Fine-grained lithologies such as clay and silt contain high amounts of Potassium 40 which is a natural emitter of gamma radiation. Coarser-grained lithologies such as sand and gravel contain relatively lower amounts of Potassium 40 and emit much lower amounts of gamma radiation. This technique was successfully used to collect data for the OU-1 RI.

To conduct the down-hole geophysical survey, the borehole is drilled to its terminal depth and the mud is circulated from the bottom of the bore hole until just before the geophysical probe is inserted. Prior to use, the probe and wire will be thoroughly decontaminated. When ready, the rods will be removed from the borehole and the gamma probe immediately run to the bottom of the bore hole. Once the total depth has been reached, the probe will be slowly withdrawn while the data is being recorded. A hydrogeologist will oversee the logging procedure.

6.3 Groundwater Sampling

Following well construction, development, and an equilibrium period of one week, groundwater samples will be collected from the existing and newly installed monitoring wells.

The groundwater samples, as well as appropriate QA/QC samples, will be analyzed for TCL VOCs plus Freon 113. A list of the compounds to be analyzed for is summarized in Table 5.1.

The following procedure will be followed for groundwater sampling:

1. Prior to the purging of the wells for sample collection, a synoptic static water level measurement to the nearest hundredth (0.01) foot will be recorded in each monitoring well from the on- and off-site monitoring well network.

2. To ensure a representative sample from the monitoring well, purging of the well is required.

   A volume of water equal to three or more times that standing in the casing will be purged from the well before taking the sample. If the monitoring well has a low yield, standing water will be fully evacuated and a sample collected upon recovery to 80 percent of static water level. Wells with high yield can be sampled immediately after evacuation of three well volumes. A decontaminated stainless steel submersible pump shall be used to remove the required well volumes. Prior to the sampling event, sampling equipment shall be decontaminated as outlined in Section 8.3. The purged water and decontamination liquids will be containerized, transported to and disposed of through the on-site groundwater IRM system.

3. A dedicated, laboratory cleaned, polyethylene, disposable bailer will be attached to dedicated polypropylene rope or nylon line. The first full bailer will be removed and the water disposed. The appropriate laboratory-supplied, pre-cleaned sample bottles will then be filled directly from the bailer as soon as it is removed from the well. The field measurements (i.e., pH, turbidity, conductivity, and temperature) will be recorded in pre-printed field form. Requirements for field QA/QC are discussed further in Section 7.1. All field instruments shall be calibrated daily prior to the sampling events, and cleaned between each sampling point.

4. The well cap shall be secured and the above process shall be repeated at the next monitoring well.

The pH probe will first be field calibrated with a No. 7 buffer solution and then with either a No. 10 or No. 4 buffer solution, depending on the anticipated pH of the groundwater sample. The specific conductivity probe will be calibrated with an ionic solution that is closest in conductivity to that anticipated in the groundwater sample. The thermometer will be used to measure temperature of the groundwater during purging. The thermometer will be tested to ensure its calibration in the laboratory prior to sampling.

Appropriate QA/QC methodology and sampling protocol for these water quality analyses is reported in Section 8.0.

6.4 Aquifer Characterization

Determining the characteristics of the underlying aquifer system is key to developing a understanding of the nature and extent of contamination as well as assisting in the evaluation of the potential pathways for contaminant migration.

6.4.1 Well Elevation Survey

Following installation of the groundwater monitoring wells, a well survey will be performed by a New York State licensed surveyor. It will include the wells installed during the OU-2 work as well as the OU-1 that have not previously been surveyed (MW-13ML, MW-14MI, MW-16GL, and MW-16ML). The elevation of the top of the riser pipe of the wells will be measured to the nearest 0.01 foot as well as the ground elevation to the nearest 0.1 foot. The survey points will be tied into an appropriate USGS survey datum point.

6.4.2 Potentiometric Surface Maps

Groundwater depth and elevation data collected during sampling will be used to generate potentiometric surface maps. The maps will be prepared for the Upper Glacial aquifer and the intermediate-depth and deep Magothy aquifers to indicate groundwater flow direction and horizontal and vertical flow velocities. These data will be compared to potentiometric surface maps prepared for earlier periods to evaluate seasonal fluctuations in groundwater flow directions.

7.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

The overall QA/QC plan objective is to produce data at the highest quality level to provide direct support for the RI and FS. QA/QC samples will be collected and will represent all sampling locations to assure quality control for the groundwater characterization of this site. Analyses of QA/QC samples will enable data evaluation for accuracy and integrity. QA/QC sample sets include a field blank, a trip blank, a site specific matrix spike/matrix spike duplicate (MS/MSD), and a blind duplicate.

Specifically, all data will be gathered or developed using procedures appropriate for the intended use. Standard procedures are used so that known and acceptable levels of accuracy, precision, representatives, completeness, and comparability (PARCC) are maintained for each data set. Descriptions of these criteria are presented in the following subsections.

7.1 Field QA/QC

In order to ensure that data collected in the field is consistent and accurate, forms will be utilized for repetitive data collection, such as depth to water in wells, boring logs, etc. These field forms include Boring Log, Field Sampling and Water Level Data Records (see Figures 7.1 and 7.2).

Blanks and duplicate samples will be used to verify the quality of the field sampling results. A brief description of these samples follows.

Field Blanks

A field (equipment rinsate) blank will be used to determine whether the disposable polyethylene bailers contain chemicals of concern as delivered from the factory. Analyte free water will be poured into the new disposable bailer and then transferred to sample containers before use in sampling. One field blank per 20 samples or per sampling day, whichever is greater, will be utilized.

Trip Blanks

A trip blank will contain analyte-free water and will be transported to the site and returned without opening. This will serve as a check for contamination originating from sample transport, shipping, and from site conditions. One trip blank per day will be utilized.

Blind Duplicates

The analytical results between the sample/blind duplicate will be used to determine if the data reported by the laboratory are precise, accurate, representative, and comparable. The blind duplicate samples will be assigned fictitious identifications. The correct sample identification number will be recorded in the field log book. One blind duplicate sample per 20 groundwater samples or one per day (whichever is greater) will be used.

MS/MSD Samples

Site-specific MS and MSD samples will be collected and submitted to the laboratory as separate samples to provide site-specific matrix-interference data. Upon arrival at the laboratory, the MS/MSD samples will be spiked with appropriate analytes and analyzed by the appropriate method. The purpose of spiking and analyzing the samples is to evaluate any site-specific matrix interference on the analytical results. One MS/MSD sample set will be collected for every 20 samples per matrix.

A summary of the QA/QC samples is provided in Table 5.4.

7.1.1 Field Records

All information pertinent to any field activities will be recorded in bound, waterproof field books. Duplicates of all notes will be prepared and kept in a secure place away from the site. Proper documentation will consist of all field personnel maintaining records of all work accomplished including the items listed below:

- Date and time of work events;
- Purpose of work;
- Description of methods;
- Description of samples;
- Number and size of samples;
- Description of sampling point;
- Date and time of collection of sample;
- Sample collector's name;
- Field observations; and
- Field measurements with portable instruments.

7.2 Preparation and Preservation of Sample Containers

Laboratory pre-cleaned sample containers will be provided by the laboratory (see Appendix B). Each sample container will be provided with a label for sample identification purposes. The information on the label will include a sample identification number, time, date and initials of the sample collector. All sample containers will be accompanied by a full chain-of-custody.

All sample containers will be thoroughly pre-cleaned at the laboratory prior to sampling. Appropriate sample preservatives will be pre-added in the bottles. Procedures vary according to the type of analysis to be performed. Individual procedures are outlined below. It is lab practice to pre-preserve sample containers in order to minimize potential contaminants in the field and to reduce unnecessary sample handling in the field (see Appendix B for description of sample analysis methods, holding time and preservation procedures).

7.3 Decontamination

Proper decontamination of all drilling and sampling equipment will ensure that the data collected in support of the OU-2 RI/FS will meet the PARCCs requirements.

7.3.1 Decontamination Zone

The decontamination zone will be located near the granulated-activated carbon (GAC) filters of the groundwater IRM system. The driller will prepare a decontamination station whose bottom is lined and perimeter is diked to prevent ground contamination from wash waters running out of the area. All drilling equipment shall be decontaminated in this area. Wash waters from equipment requiring decontamination will be disposed of in the groundwater IRM system.

7.3.2 Decontamination Procedures

Field equipment will be decontaminated by the following procedures:

Field Decontamination for Drilling Equipment

Field decontamination will consist of steam cleaning and/or a manual scrubbing to remove foreign material and steam cleaning inside and out. These items will then be stored in such a manner as to preserve their decontaminated condition. Well casing materials will also be decontaminated by steam cleaning unless they are delivered to the site decontaminated by the factory.

Field Decontamination for the Pumps and Hoses

The procedures for the field decontamination of the pumps and hoses shall consist of a manual scrubbing to remove foreign materials followed by an Alconox scrub and de-ionized water rinse.

Personnel Protective Equipment Decontamination Procedures

The personnel protective equipment decontamination procedure shall consist of the minimum decontamination stations outlined in the Site Health and Safety Plan (Appendix C). These stations will be set up at each drilling location.

7.4 Sample Custody

To maintain and document sample possession, chain-of-custody procedures will be followed. A chain-of-custody form contains the signatures of individuals who have possession of the samples after collection in the field (see Figure 7.3).

A sample is under custody if it is:

1. In one's actual possession; or
2. In one's view, after being in your physical possession; or
3. Was in one's physical possession and then was locked up or sealed to prevent tampering; or
4. It is in a designated secure place restricted to authorized personnel.

Each person involved with the samples will know chain-of-custody procedures. A detailed discussion of the stages of possession; (1) field collection, (2) transfer, and (3) laboratory custody is presented below in the following sections:

7.4.1 Environmental Samples Chain-of-Custody

The laboratory initiates the chain-of-custody procedure with the preparation of the sample bottles. The field sampler continues the chain-of-custody procedure in the field and is the first to sign the form upon collection of samples. The field sampler is personally responsible for the care and custody of the samples until they are transferred and properly dispatched. Sample labels shall be completed for each sample, using waterproof ink, subjected to proper preservation, and packaged to preclude breakage during shipment. Every sample shall be assigned a unique identification number that is entered on the chain-of-custody form. Samples can be grouped for shipment using a single form.

7.7 Laboratory Analyses

All groundwater samples will be analyzed by H2M Labs, Inc., a NYSDEC CLP-certified laboratory. The QA/QC methods to be utilized by the laboratory are included in Appendix B.

7.8 Data Validation

The independent data validation will be performed by Ms. Judy Harry of Data Validation Services, Inc., an independent data validator, utilizing the methodologies of the 1991 NYSDEC ASP. Data review starts with an analyst, independent of the data acquisition and processing, reviewing and confirming that data processing has been correctly performed. It continues through verifying that the reported analytical results correspond to the data required and processed. The data validation report will present the critical points with respect to compliance with data holding times, detection limits, and quantification values. All validation procedures and reports will conform to NYSDEC approved methods. The data reported in the OU-2 RI Report will reflect the changes recommended by the data validator.

7.9 Data Usability

The quality assurance officer for the project will review the analytical data for usability including determining if the data are accurate, precise, representative, complete, and comparable.

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The quality assurance officer for the project will review the analytical data for usability including determining if the data are accurate, precise, representative, complete, and comparable.

8.0 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY REPORTS

This section of the work plan presents the proposed outlines for the OU-2 RI and FS reports.

8.1 Outline of RI Report

The following is a proposed outline of the OU-2 RI Report.

1.0 INTRODUCTION
- 1.1 Purpose of the Report
- 1.2 Site Background
  - 1.2.1 Site Description
  - 1.2.2 Site History
  - 1.2.3 Previous Investigations and Remedial Activities
- 1.3 RI Report Organization

2.0 STUDY AREA INVESTIGATION TECHNIQUES
- 2.1 Groundwater Monitoring Well Installation and Sampling
  - 2.1.1 Groundwater Monitoring Well Installation
  - 2.1.2 Groundwater Monitoring Well Sampling
- 2.2 Geophysical Surveying
- 2.3 Aquifer Characterization

3.0 PHYSICAL CHARACTERISTICS
- 3.1 Surface Features
- 3.2 Surface Water Hydrology
- 3.3 Regional Geology and Hydrogeology
- 3.4 Regional Soils
- 3.5 Demography and Land Use

4.0 NATURE AND EXTENT OF CONTAMINATION IN GROUNDWATER

5.0 QA/QC, DATA VALIDATION AND DATA USABILITY
- 5.1 QA/QC
  - 5.1.1 Field QA/QC
  - 5.1.2 Field Blanks and Duplicate Samples
  - 5.1.3 Laboratory QA/QC
- 5.2 Data Validation
- 5.3 Data Usability

6.0 CONTAMINANT FATE AND TRANSPORT

7.0 BASELINE RISK ASSESSMENT

8.0 SUMMARY AND CONCLUSIONS

- 8.1 Summary of Nature and Extent of Contamination
- 8.2 Summary of Fate and Transport Modeling
- 8.4 Summary of Risk Assessment Evaluation
- 8.5 Conclusions and Recommendations

Tables

Figures

References

Appendices

8.2 Outline of FS Report

The following is a proposed outline of the OU-2 FS Report.

1.0 INTRODUCTION

- 1.1 Purpose and Organization of Report
- 1.2 Background Information

2.0 Identification and Screening of Technologies

- 2.1 Introduction
- 2.2 Remedial Action Objectives
- 2.3 General Response Actions
- 2.4 Identification and Screening of Technology Types and Process Options

3.0 Development and Screening of Alternatives

- 3.1 Development of Alternatives
- 3.2 Screening of Alternatives

4.0 Detailed Analysis of Alternatives

- 4.1 Introduction
- 4.2 Individual Analysis of Alternatives
- 4.3 Comparative Analysis

Tables

Figures

References

Appendices

9.0 BASELINE HUMAN HEALTH EVALUATION

A Baseline Human Health Risk Assessment report was completed during the OU-1 RI/FS (H2M, 1997a). The quantitative-phase of the risk assessment for groundwater identified potential exposure risks to residents drinking contaminated groundwater if not treated. The qualitative-phase of the risk assessment determined that the potential exposure pathway would not be completed and the potentially exposed populations in fact would not be exposed to site-related contaminants. All potable water users in the vicinity of the site receive their water from water purveyors. The water purveyors are regulated under the Safe Drinking Water Act and their water supplies are regularly monitored, and if required, treated to remove contaminants. Therefore, residents in the vicinity of the site do not use untreated groundwater for potable uses.

The OU-2 RI will evaluate the nature and extent of the groundwater contamination related to the site and the OU-2 monitoring wells will be located in areas where the site-related contamination is expected to be low or non-detectable. During the OU-2 Risk Assessment, current and future potential receptors, and current and future potential contaminant migration pathways will be determined. Findings from the OU-2 RI will be used to re-evaluate the potential for risk to the public. The OU-2 Risk Assessment will expand upon the findings of the OU-1 Risk Assessment and its conclusions will be used to help support the development of the OU-2 FS.

10.0 REMEDIAL ALTERNATIVES

The OU-2 RI/FS report will follow the latest EPA formats as described in EPA guidance documents such as the 1985 "Guidance on RI under CERCLA", the 1988 draft "Interim Final Guidance for Conducting RI/FS under CERCLA" EPA October, 1988, and NYSDEC TAGM HWR-90-4030, "Selection of Remedial Actions at Inactive Hazardous Waste Sites". The report will include discussion of the data from the previous sampling programs as well as the data and analyses performed as part of the OU-2 RI/FS. NYSDEC TAGM Scoring Sheets will be used to score the remedial alternatives and document and support the remedial alternatives selection process.

10.1 Development of Remedial Action Objectives and General Response Actions

Based on the data collected in the RI/FS along with other existing data, the remedial action objectives will be developed. Prior to the development of these objectives, any significant site problems and contaminant pathways will be identified. Considering these problems and pathways, the remedial response objectives that would eliminate or minimize substantial risks to public health or the environment will be developed further. ARARs will be refined by considering site-specific conditions. Based on the response objectives, general response actions will be delineated to address each of the site problem areas. These response actions will form the foundation for the screening of remedial technologies. General response actions considered will include the No Action alternative (beyond the remedial action taken for OU-1) as a baseline against which all other alternatives will be compared.

10.2 Identification of Applicable Technologies and Development of Alternatives

Based on the remedial action objectives and each identified general response action, potential treatment technologies and their associated containment or treatment and disposal requirements will be identified. A pre-screening of these potential treatment technologies for suitability, as part of a remedial alternative, will be conducted. Where several process options exist for a particular technology, the process option for which most data exists and whose capacities/constraints most closely match site conditions will be selected for further detailed evaluation. The final selection of a process option will occur following the completion of the RI/FS.

Technologies that could prove extremely difficult to implement, might not achieve the remedial objective in a reasonable time, or might not be applicable or feasible based on the site-specific conditions will be eliminated from further consideration.

Technologies which provide a permanent remedy shall be considered the most favorable. However, in many cases, permanent remedies are not practicable and non-permanent solutions may be necessary. The screening process will also review the benefits and deficiencies associated with the use of permanent and non-permanent remedies.

Those remedial technologies and process operations which are applicable and capable of attaining the remedial action objectives will be grouped together as remedial alternatives.

10.3 Preliminary Screening of Remedial Alternatives

The list of potential remedial alternatives developed above will be screened. The objective of this effort is to reduce the number of technologies and alternatives for further analysis while preserving a range of options. This screening will be accomplished by evaluating alternatives on the basis of effectiveness, implementability and cost. These screening criteria are briefly described below.

Effectiveness Evaluation - The effectiveness evaluation will consider the capability of each remedial alternative to protect human health and the environment. Each alternative will be evaluated as to the protection it would provide, and the reductions in toxicity, mobility or volume of contaminants it would achieve. Both short-term and long-term effectiveness will be evaluated. Short-term effectiveness will focus on the construction and implementation period. Long-term effectiveness will concentrate on the period of time after the remedial action is in place and operational.

Implementability Evaluation - The implementability evaluation of the screening process will be used to measure the technical feasibility of constructing, operating and maintaining a remedial action alternative. In addition, the availability of the technologies involved in a remedial alternative will be considered. Innovative technologies will be considered throughout the screening process if there is a reasonable belief that they offer potential for better treatment performance or implementability, few or lesser adverse impacts than other available approaches, or lower costs than demonstrated technologies.

10.4 Detailed Evaluation of Remedial Alternatives

The remedial alternatives that pass the initial screening will be further evaluated. During this phase, administrative difficulties, and costs will be considered for the remaining alternatives. The evaluation will conform to the requirements of the NCP, in particular Section 300.68 (h) and

Subpart F and NYSDEC TAGM-HWR-89-4025. The evaluation criteria used for the detailed analysis will consists of the following:

Overall Protection of Human Health and the Environment - The evaluation criterion assesses whether each alternative provides adequate protection to human health and the environment. This criterion also evaluates how each alternative relates to site risks posed by each pathway being addressed by the FS as the alternative is eliminated, reduced, or controlled through treatment, engineering or institutional controls.

Compliance with ARARs and NYS Standards, Goals and Criteria (SGCs) - The data obtained during the RI will be evaluated and compared against ARARs and SGCs. Alternatives unable to comply with chemical-specific, location-specific, and action-specific ARARs , and SGCs will be eliminated from further screening.

Long-Term Effectiveness - Under this criterion, each alternative is evaluated based on risk remaining at the site after the remedial objectives have been met. The focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. Factors that must be addressed include magnitude of residual risk and adequacy and reliability of controls.

Reduction of Toxicity, Mobility, or Volume Through Treatment - Specific factors to be evaluated will include: the treatment process, amount of hazardous materials that will be treated or destroyed, the degree of expected reduction in toxicity, mobility or volume, degree to which treatment will be irreversible, type and quantity of treatment residuals that will remain following treatment, and whether the alternative would satisfy the statutory preference for treatment.

Short-Term Effectiveness - Effects of the remedial alternative on human health and the environment during implementation of the remedial action is evaluated. This includes protection to the community, protection of workers during remedial actions, environmental impacts, and time until the remedial objectives are achieved.

Implementability - The technical and administrative feasibility of implementing an alternatives will be evaluated including the availability of services and materials. Technical difficulties associated with construction and operation, reliability of the

technology, ease of undertaking additional remedial actions once the alternative has been implemented, and monitoring considerations will be assessed and discussed.

Costs - Capital and O&M Costs will be developed for each alternative to within an accuracy of -30% and +50%. A present worth analyses will be performed on the alternatives by discounting to a common year basis. Assumptions will be made regarding the discount rate and period of performance.

Community Acceptance - Issues and concerns that the public may have regarding the remedial alternative will be considered.

The detailed evaluation will follow the process specified in the "Guidance on FS under CERCLA" as updated in the December, 1986, the July, 1987 Memoranda and "Interim Guidance for Conducting RI/FS under CERCLA", and the May 1990 "Selection of Remedial Actions at Inactive Hazardous Waste Sites". Based on the detailed evaluation, recommendations for a remedial action will be provided.

10.5 Feasibility Study Report

A FS report will be prepared to summarize the activities performed in the RI and to present the results and associated conclusions. The proposed table of contents for the FS report is included in Section 8.2.

11.0 HEALTH AND SAFETY PLAN

The primary health and safety concerns for the off-site investigation are physical hazards. However, precautions will be taken to minimize inhalation or dermal-contact exposure to contaminated groundwater. The following are the specific hazards expected to be encountered during the work and summaries of the methods which will be used for their minimization:

1. Physical Hazards: Hard hats, hearing protection and steel-toed safety boots will be mandatory during drilling activities. Safety glasses will be used during equipment decontamination. Air monitoring using an PID will be used during drilling activities. Much of the work is expected to be conducted within public right-of-ways. All field personnel will wear high-visibility vests when working in high-traffic areas. Additionally, traffic warning sign/barricades will be used where appropriate.

2. Inhalation: Ambient air will be monitored using a PID during any intrusive activities. All work will be performed in EPA Level D Personal Protective Equipment (PPE). EPA Level C PPE (air-purifying respirators) or Level B (self-contained breathing apparatus) will be considered if ambient air concentrations of VOCs exceed appropriate guidelines. This is addressed in the HASP (see Appendix C).

3. Dermal Contact: Synthetic gloves with low permeability to liquids and dedicated work coveralls or regular Tyvek suits will be used by all field staff in contact with soil or groundwater.

This OU-2 HASP (see Appendix C) establishes a protocol for protecting field personnel and the public from incidents that may arise while performing field activities at and near the Lockheed Martin site. This plan establishes personnel protection standards, mandatory operation procedures, and provides for contingencies that may arise while field work is being conducted at the site. Field crews and all subcontractors will be provided a copy of the HASP. In addition, all subcontractors must provide their own HASP or provide written acceptance of the HASP. Any visitors will be required to abide by the procedures outlined in the HASP.

12.0 CITIZEN PARTICIPATION PLAN

12.1 Introduction

The purpose of the Citizen Participation Plan (CPP) is to provide a clear set of opportunities and procedures for citizens to receive information about and provide input into the RI/FS process. The plan seeks to assure an open process for the interested and possibly affected public. This includes providing information and receiving comments from public officials, citizen interest groups, commercial interests, individuals in the area of the site and the media. These parties need to be a part of the decision-making process for this site, and will be informed about intended site-related activities.

Specifically, the plan identifies community officials, groups and individuals who may be affected by or have interest in these investigations, and identifies locations where these parties can obtain additional information about the remedial program for this site. Specific opportunities for public and community input into the decision-making process are outlined in the plan. The CPP is a working document and can be enhanced to accommodate major changes either in public attitude or in the nature and scope of technical activities at the site. For instance, the public contact list will be supplemented as the project proceeds to include all citizens who attend public meetings or otherwise express interest.

12.2 Contact List of Potentially Affected/Interested Public

The following presents a summary of the potentially affected/interested public mailing list. A full listing including the Public/Special Interest Groups and Interested Public is included in Appendix D.

- NYSDEC and NYSDOH
- New York State
- Federal
- Nassau County
- Town of North Hempstead
- Village of Lake Success
- Village of Great Neck Plaza
- Public/Special Interest Groups
- Public Water Districts
- Schools

- Media
- Residents in the Area of the Site
- Interested Public

Document Repositories

The following are the project document repositories:

1. Hillside Public Library
   1950 Hillside Avenue
   New Hyde Park, NY 11040
   (516) 488-3316
   10:00 AM to 9:00 PM - Weekdays
   10:00 AM to 5:00 PM - Saturdays
   12:00 PM to 4:00 PM - Sundays

2. Parkville Branch Library
   10 Campbell Street
   New Hyde Park, NY 11040
   (516) 466-8055
   9:00 AM to 6:00 PM - Mondays, Fridays, and Saturdays
   9:00 AM to 9:00 PM - Tuesdays and Thursdays
   10:00 AM to 6:00 PM - Wednesdays
   1:00 PM to 5:00 PM - Sundays

3. Region 1 - NYSDEC
   Hazardous Waste Remediation Unit
   SUNY Campus, Building 40
   Stony Brook, NY 11790-2356
   (516) 444-0249
   8:30 AM to 4:45 PM - Weekdays

12.3 Contact Personnel

The contacts for obtaining additional project information are:

Girish Desai
Project Manager
Region I, NYSDEC
Building 40, SUNY Campus
Stony Brook, NY 11790-2356
(516) 444-0243

Joshua Epstein
Citizen Participation Specialist
Region I, NYSDEC
Building 40, SUNY Campus
Stony Brook, NY 11790-2356
(516) 444-0249

Nina Knapp
Health Liaison Program
NYS Department of Health
2 University Place, Room 240
Albany, NY 12203-3399
(800) 458-1158 ext. 402

Maureen Schuck
Public Health Specialist
NYS Department of Health
Bureau of Env. Exposure Investigation
2 University Place
Albany, NY 12203-3399
(800) 458-1158 ext. 402

12.4 Description of CP Activities for the RI/FS Phase of the Remedial Program

Table 12.1 illustrates the activities to be carried out as part of the Citizen Participation Plan for the Lockheed Martin site. The NYSDEC will be responsible for implementing the CPP.

A copy of the RI/FS work plan will be placed in the document repositories. A notice to the media and public detailing the availability of the work plan and summarizing the contents will be mailed to the public contact list. This mailing will include information about the document repositories, the name and address of the NYSDEC Citizen Participation Specialist, Project Manager and NYS Department of Health contact, and will request information and comments from the public. A fact sheet on the site and information on the regulations and procedures which govern the investigation and remedial process will be included in this mailing. Individuals or groups who respond to this mailing expressing interest in the site, will be added to the contact list.

Prior to final NYSDEC approval of the OU-2 Work Plan, a public meeting will be held to discuss the project objectives and scope of work. The public will be advised of the meeting by the NYSDEC sufficiently in advance, with notification through the above-mentioned fact-sheet

and a NYSDEC press notice to the newspaper of general circulation (Newsday's "Government Watch" section) and local weeklies. A fact sheet, describing the conduct and results of the Remedial Investigation and mentioning steps, will be distributed by the NYSDEC to the contact list.

The following Citizen Participation activities, associated with the Proposed Remedial Action Plan (PRAP), will be conducted. A public meeting will be held. Notifications will be through a meeting invitation/fact sheet, which will be distributed by the NYSDEC at least 15 days in advance to the public contact list, including to the media. The media on the list will also be provided with a NYSDEC press notice, to help notify the public.

The public will also be notified of a public comment period consisting of 30 days, and of the relevant documents being placed into the information repositories. A transcript of any such meeting as well as a responsiveness summary will be prepared and will be placed into the information repositories. The responsiveness summary will be distributed to those who attended the PRAP meeting and who sent in written comments during the comment period. There may well be circumstances and times wherein smaller-scale and less formal NYSDEC briefings, updates, and meetings with various elected representatives and community groups will be beneficial.

12.5 Glossary of Key Terms and Major Program Elements

12.5.1 Key Terms

AQUIFER: A geologic formation that is sufficiently permeable to conduct groundwater and to yield significant quantities of water to wells and springs.

CITIZEN PARTICIPATION: A process to inform and involve the interested/affected public in the decision-making process during the investigation and remediation of sites. The process helps to assure that the best decisions are made from an environmental, human health, economic, social and political perspective.

CITIZEN PARTICIPATION PLAN: A document that describes the site-specific citizen participation activities that will occur in order to complement remedial activities. It also provides site background and the rationale for the selected citizen participation program for the site.

CITIZEN PARTICIPATION SPECIALIST: An NYSDEC staff member within the Division of Hazardous Waste who provides guidance, evaluation and assistance to the project manager in carrying out the site-specific Citizen Participation Plan.

CONSENT ORDER: A legal, enforceable, negotiated agreement between NYSDEC and responsible parties where the latter agrees to undertake or pay for the costs of an investigation and/or cleanup of a site. The order includes a description of the remedial actions to be undertaken at the site and the schedule for implementation.

CONTACT LIST: Names, addresses, and telephone numbers of individuals, groups, organizations and media interested and/or affected by a particular site in the remedial program. It is used to inform and involve the interested/affected public.

DELISTING: Removal of a site from the state Registry based on study which shows the site does not contain hazardous waste or levels of hazardous wastes that pose a significant threat to public health or the environment.

DOCUMENT REPOSITORY: Typically a regional NYSDEC office and/or public building, such as a library, at which documents related to site remedial and citizen participation activities are available for public review.

FACT SHEET: A written discussion of a site's remedial process, or some part of it, prepared for the public and written in easily understandable language. A sheet may be prepared for the general public or a particular sector. Its uses may include discussion of an element of the remedial program, opportunities for public involvement, availability of a report or other information, or announcement of a public meeting. It may be mailed to all or part of the interested public, distributed at meetings or during sampling efforts, or sent when requested.

NYSDEC PROJECT MANAGER: A NYSDEC staff member, usually an engineer, geologist, or hydrogeologist within the Division of Hazardous Waste Remediation who is responsible for the day to day administration and ultimate disposition of one or more hazardous waste sites. The project manager works with the Office of Public Affairs as well as fiscal and legal staff to accomplish site-related goals and objectives.

POTENTIALLY RESPONSIBLE PARTY-LEAD SITE: A site at which those legally liable have accepted responsibility for the investigation and/or the development and implementation of its remedial program. Potentially Responsible Parties (PRPs) may be current owners, past and present site operators, or those who generated waste placed at the site. Remedial programs developed and implemented by PRPs generally result from an

enforcement action taken by the state. PRPs usually incur the costs associated with the remedial program.

PUBLIC MEETING: A scheduled gathering of the NYSDEC staff and the public to give and receive information, ask questions and discuss concerns. A public meeting may take many forms and could be a large group meeting or a workshop.

PUBLIC NOTICE: A written informational technique used to inform the public of an important upcoming activity or phase in a site's remedial program. Some public notices are formal and meet legal requirements, such as those published in a local newspaper of general circulation. Others are informal notices, which may be made through telephone calls to key citizen leaders or through targeted mailings.

RANKING SYSTEM: The United States Environmental Protection Agency uses a Hazard Ranking System (HRS) to assign numerical scores to each inactive hazardous waste site. The scores express the relative risk or danger from the site.

RESPONSIBLE PARTIES: Those individuals or groups responsible for, or contributing to, the contamination of a hazardous waste site.

RESPONSIVENESS SUMMARY: A formal or informal written or verbal summary and response to public questions and comments. It is usually prepared during or after important elements in a site's remedial program. The responsiveness summary may list and respond to each question or summarize and respond to questions in categories.

STATE LEAD SITE: An inactive hazardous waste site at which the NYSDEC has responsibility for investigating problems at the site and for developing and implementing the site's remedial program.

SITE PLACED ON REGISTRY OF INACTIVE HAZARDOUS WASTE SITES: Each inactive site known or suspected of containing hazardous wastes must be included in the Registry. Therefore all sites which state or county environmental or public health agencies identify as known or suspected to have received hazardous waste should be listed in the Registry as they are identified. Whenever possible, the NYSDEC carries out an initial evaluation of the site before listing.

PHASE I SITE INVESTIGATION: An investigation that includes preliminary characterizations of hazardous substances present at a site, identifies pathways by which contaminants may be migrating away from the original area of disposal, identifies resources or populations that may be affected by site contamination, and researches waste disposal practices and potentially responsible parties. The investigation therefore involves research of

records from all agencies known to be involved with a site and interviews with site owners, employees, and local residents to gather pertinent information about a site. Information gathered is summarized in a Phase I Report.

12.5.2 Major Program Elements

The following eight definitions represent major elements of the remedial process. They are presented in the order in which they occur, rather than in alphabetical order, to provide a context to aid in their definition.

After a Phase I Investigation, the NYSDEC may choose to initiate an emergency response, to nominate the site for the National Priorities List (NPL) or, where additional information is needed to determine site significance, to conduct a Phase II Site Investigation.

PHASE II SITE INVESTIGATION: An order by the NYSDEC when the results from a Phase I investigation are insufficient for properly classifying a site. Information gathered is summarized in a Phase II report and is used to arrive at a final hazard ranking score to classify the site. A Phase II investigation is not sufficiently detailed, however, to determine the full extent of the contamination, evaluate remedial alternatives, or prepare a conceptual design for construction.

REMEDIAL INVESTIGATION (RI): A process to determine the existence, nature and extent of contamination through data collection and analysis. The process may include sampling, monitoring, and other information-gathering techniques which are used to determine the necessity for, and proposed extent of, a remedial program for the site.

FEASIBILITY STUDY (FS): A process for developing, evaluating and selecting remedial actions and alternatives. Data gathered during the RI are used to: define the objectives of the site remedial program and broadly develop remedial action alternatives; perform an initial screening of alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

REMEDIAL DESIGN: Once a remedial action has been selected, technical drawings and specification for remedial construction at a site are developed in accordance with the final RI/FS report. Design documents are used to bid and construct the chosen remedial actions. Remedial design is prepared by consulting engineers with experience in inactive hazardous waste site remediation.

CONSTRUCTION: The selection and supervision of contractors who work to carry out the designed remedial alternative. Construction may be as straightforward as excavation of contaminated soil with disposal at a permitted hazardous waste facility. One the other hand, it may involve drum sampling and identification, complete encapsulation, leachate collection, storage and treatment, groundwater management, or other technologies.

MONITORING/MAINTENANCE: Denotes post-closure activities to ensure continued effectiveness of remedial actions. Typical monitoring/maintenance activities include quarterly inspection by an engineering technician, collection of groundwater or surface water samples, water quality analysis, and other indices of possible site contamination.

13.0 LIST OF REFERENCES

Doriski, T.P., 1987, Potentiometric-Surface of the Water-Table Magothy and Lloyd Aquifers on Long Island, New York in 1984, U.S. Geological Survey Water Resources Investigation Report 86-4189.

Franke, O.L. and P. Cohen, 1972, Regional Rates of Ground-Water Movement on Long Island, New York, U.S. Geological Survey Water-Supply Paper 800-C.

H2M, 1996a, Phase I RI Report Lockheed Martin Tactical Defense Systems Division of Lockheed Martin Tactical Systems, Inc.(Former Unisys Corp. Site) Great Neck, New York.

H2M, 1996b, Supplemental Remedial Investigation Report Lockheed Martin Tactical Defense Systems Division of Lockheed Martin Tactical Systems, Inc.(Former Unisys Corp. Site) Great Neck, New York.

H2M, 1997a, Baseline Human Health Risk Assessment Report OU-1 Lockheed Martin Tactical Defense Systems Division of Lockheed Martin Tactical Systems, Inc.(Former Unisys Corp. Site) Great Neck, New York.

H2M, 1997b, Feasibility Study Report OU-1 Lockheed Martin Tactical Defense Systems Division of Lockheed Martin Tactical Systems, Inc.(Former Unisys Corp. Site) Great Neck, New York.

NYSDEC, 1989, Guidelines for Remedial Investigations/Feasibility Studies, TAGM HWR-89-4025

NYSDEC, 1990, Selection of Remedial Actions at Inactive Hazardous Waste Sites, TAGM HWR-90-4030.

NYSDEC, 1995, Determination of Soil Cleanup Objectives and Cleanup Levels, HWR-94-4046, (revised 4/95)

Swarzenski, W.V., 1963, Hydrogeology of Northwestern Nassau and Northeastern Queens Counties, Long Island, New York, U.S. Geological Survey Water-Supply Paper 1657.

USEPA, 1987, Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration, IFB WA 85-J680, USEPA CLP, July 1987 Revision.

USEPA, 1988a, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988.

USEPA, 1991, Contracts Laboratory Protocol Statement of Work.

United States Geological Survey, 1989, Hydrogeologic Framework of Long Island, New York, Smolensky, D.A., Buxton, H.T., and Shernoff, P.K., 3 sheets.

FIGURES

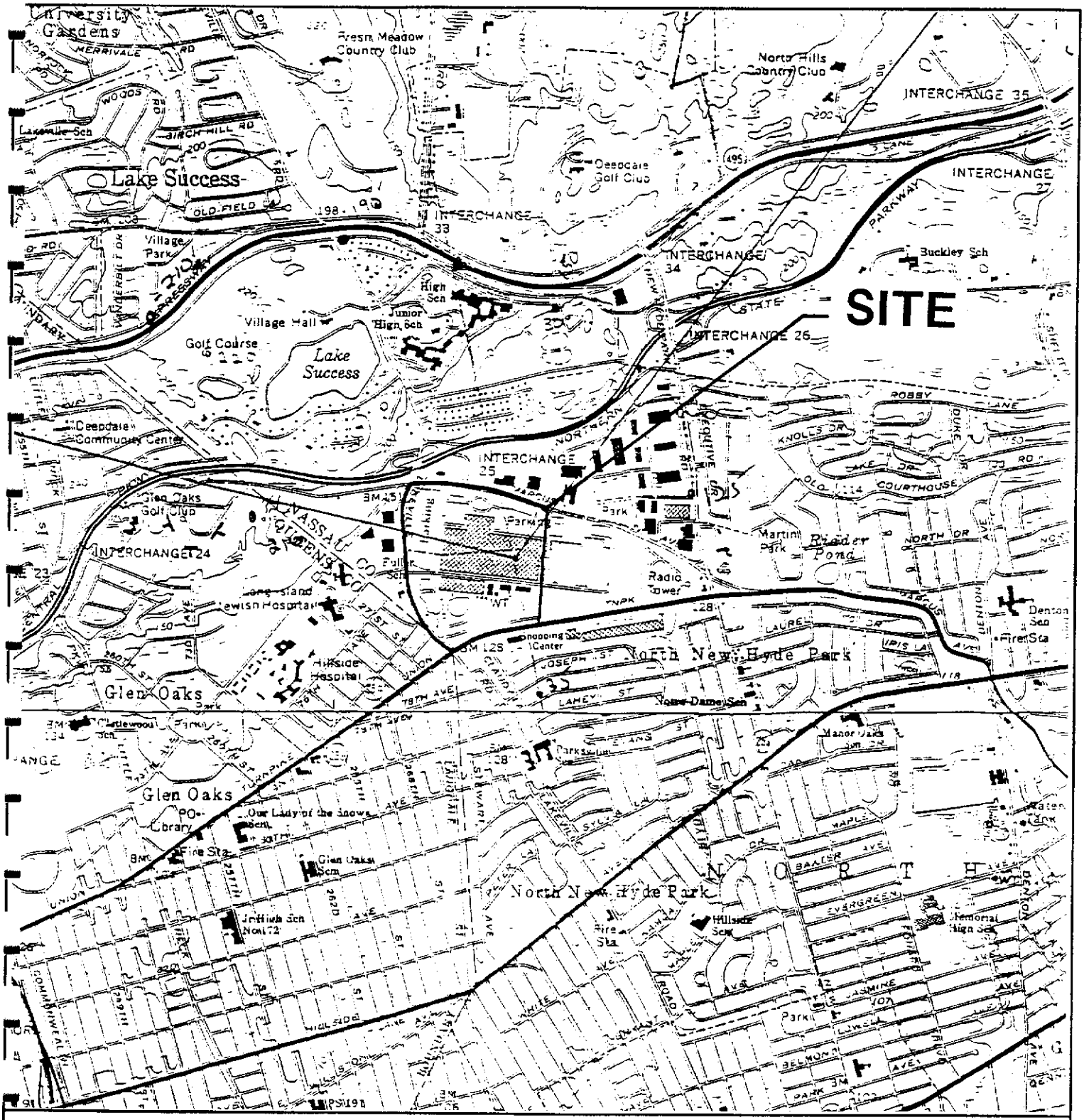


FIGURE 1.1
SITE LOCATION MAP
LOCKHEED MARTIN
GREAT NECK, NEW YORK

SOURCE: U.S.G.S. LYNBROOK QUADRANGLE 1975

SCALE: 1" = 2000'

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

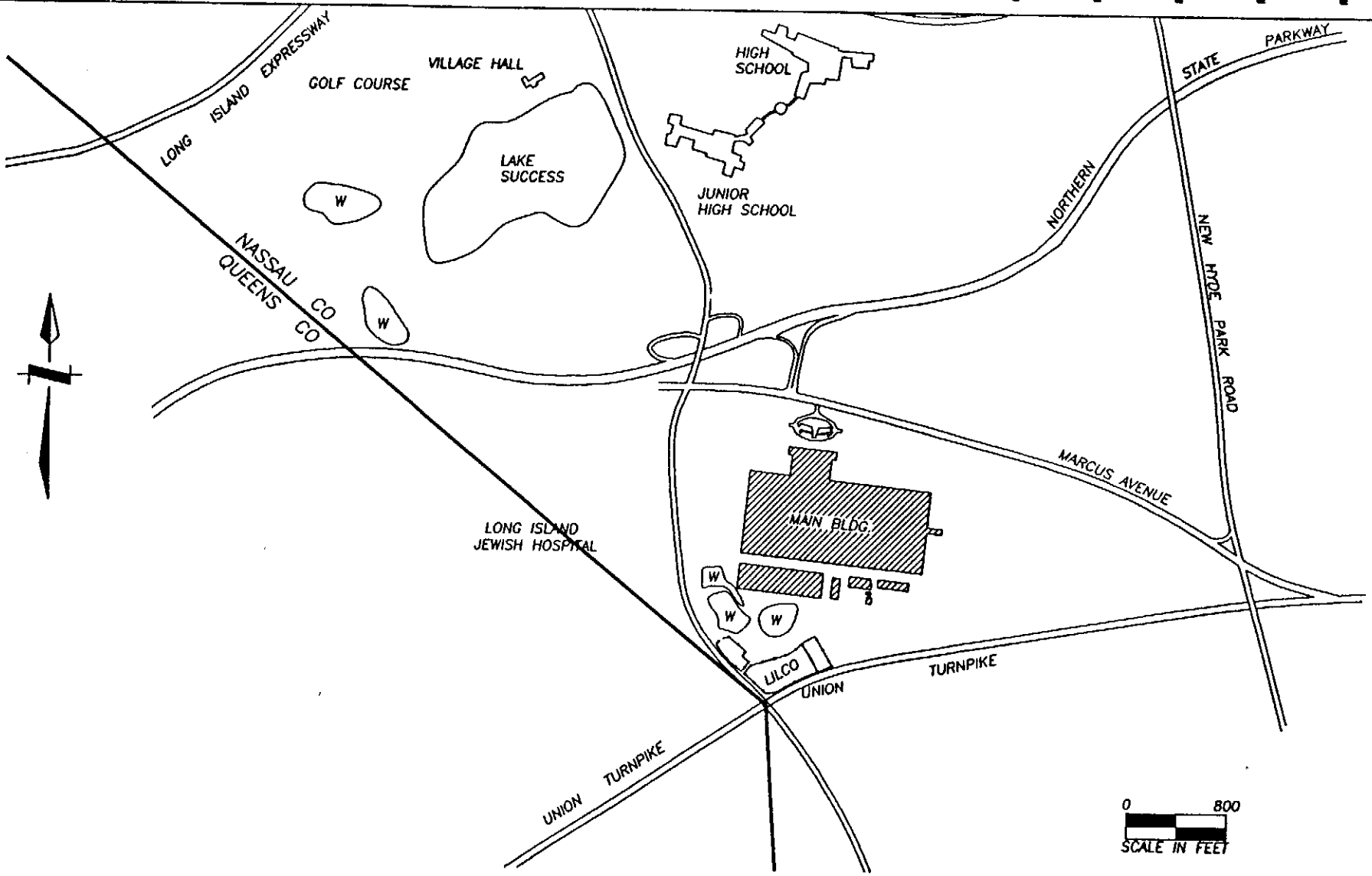


FIGURE 2.1
SITE MAP
LOCKHEED MARTIN
GREAT NECK, NEW YORK

H:\CADD\LOCK\9703\2-1FIG 5-19-97 4:27:18 pm

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

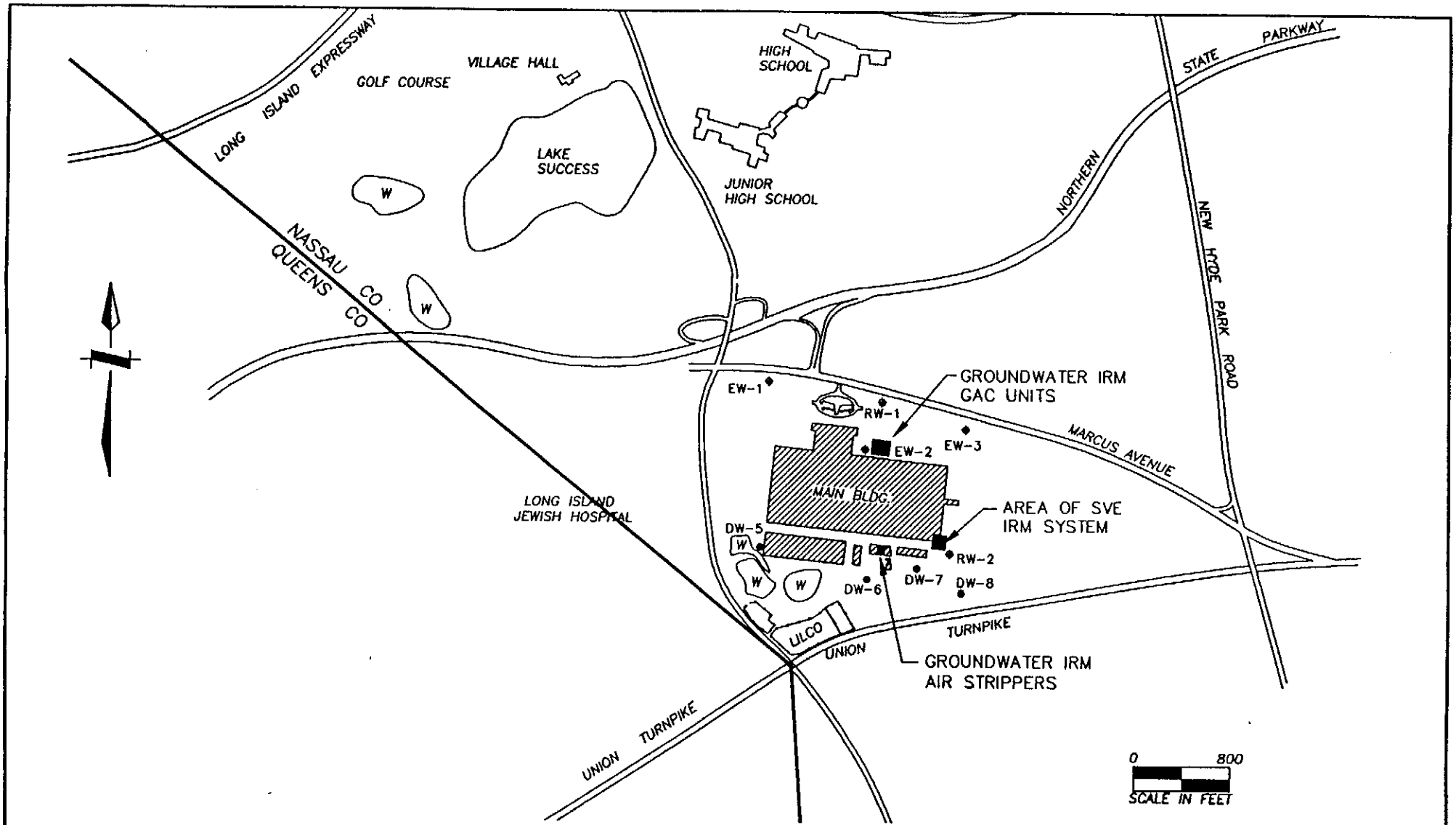


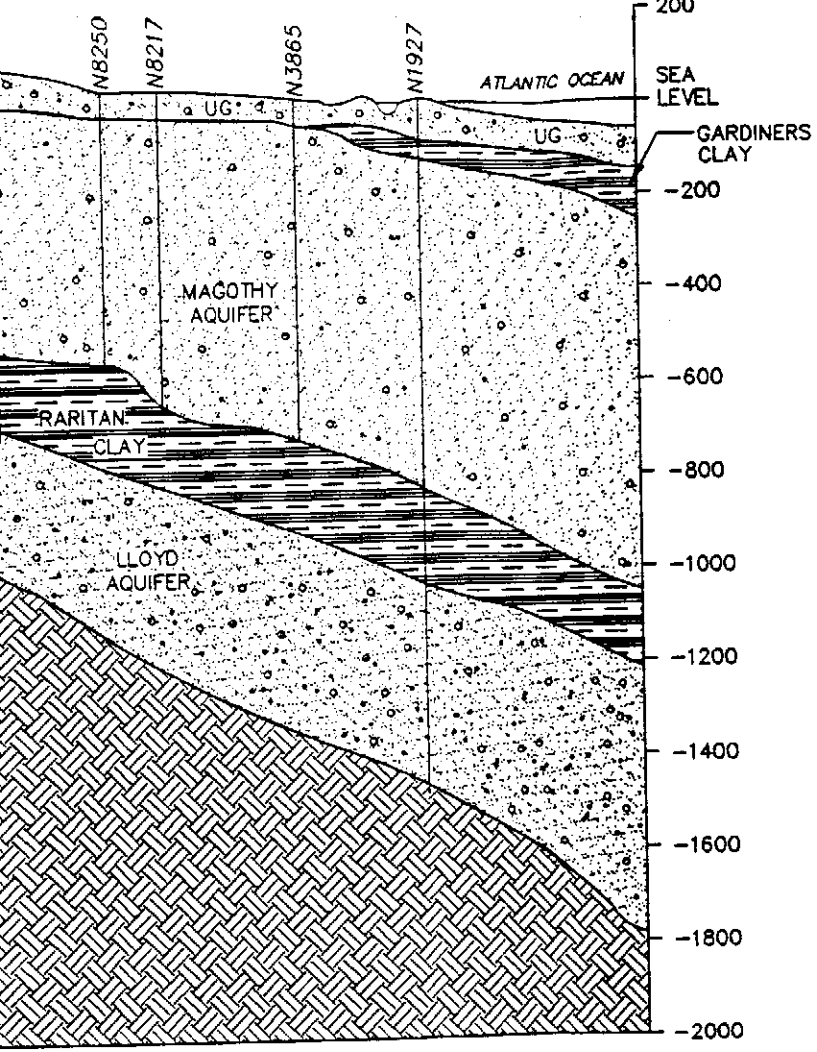
FIGURE 2.2
LOCATION OF IRM SYSTEMS
LOCKHEED MARTIN
GREAT NECK, NEW YORK

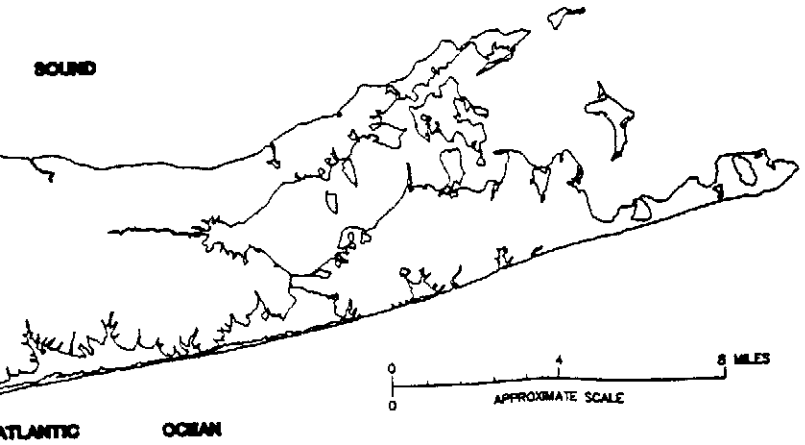
EXPLANATION

- EW/RW – GROUNDWATER IRM EXTRACTION WELL
- DW – GROUNDWATER IRM INJECTION WELL

M:\CADD\LOCK\9703\2-1FIG 5-19-97 4:27:18 pm

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





EXPLANATION

HYDROGEOLOGIC UNIT

- UG — Upper glacial aquifer
- Gc — Gardiners Clay
- M — Magothy aquifer
- Rc — Raritan confining unit
- L — Lloyd aquifer
- Br — Bedrock

S34 — WELL AND NUMBER—Vertical line indicates depth of borehole or well. Prefix letter (K, Q, N or S) indicates Kings, Queens, or Nassau County.

Hydrogeologic Contract

0 5 10 MILES
0 5 KILOMETERS

VERTICAL SCALE IS GREATLY EXAGGERATED
NATIONAL GEODETIC DATUM OF 1929

FIGURE AFTER SMOLENSKY, ETAL 1989

FIGURE 3.1
REGIONAL GEOLOGIC CROSS SECTION
THROUGH CENTRAL NASSAU COUNTY
LOCKHEED MARTIN
GREAT NECK, NEW YORK

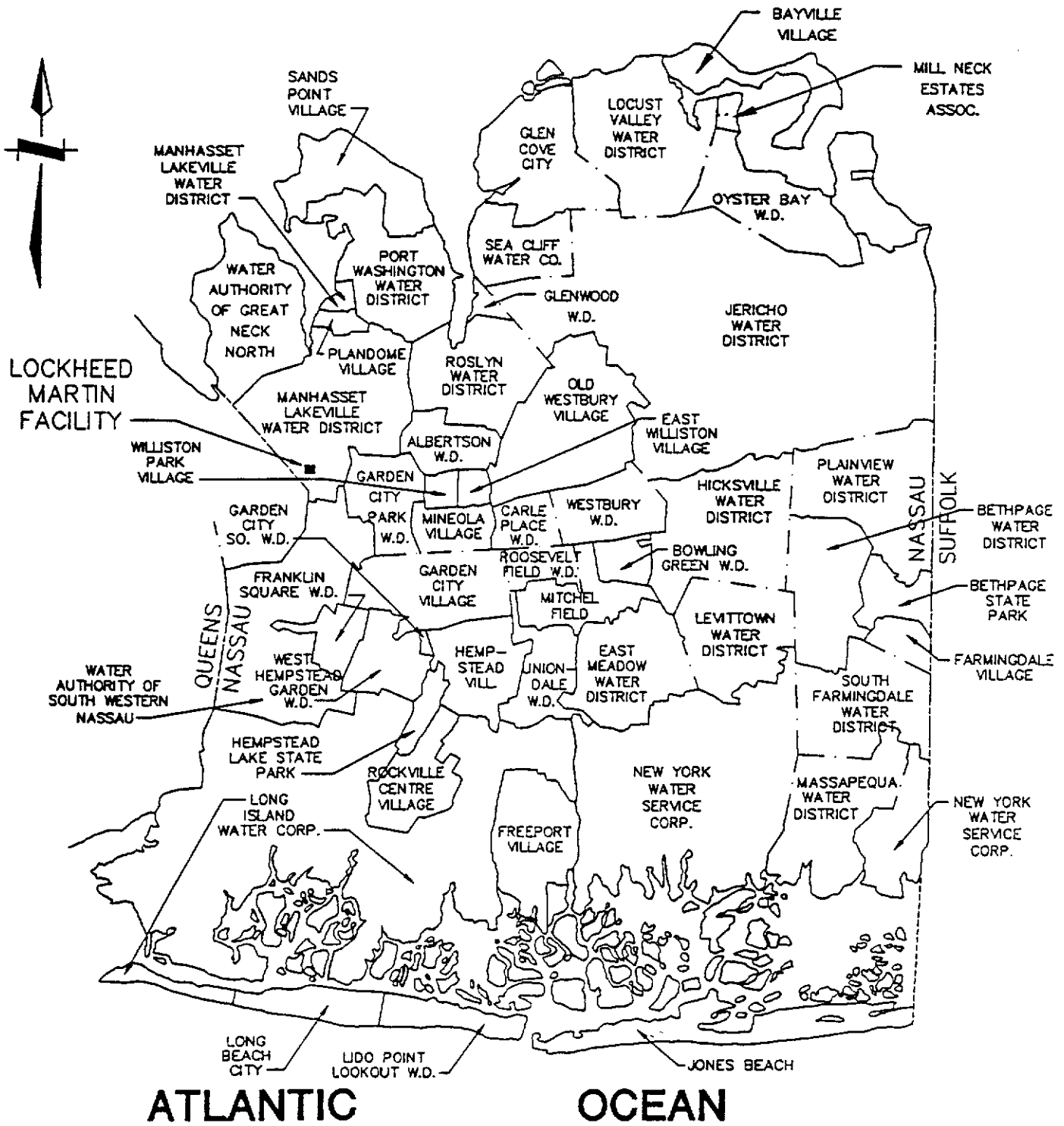
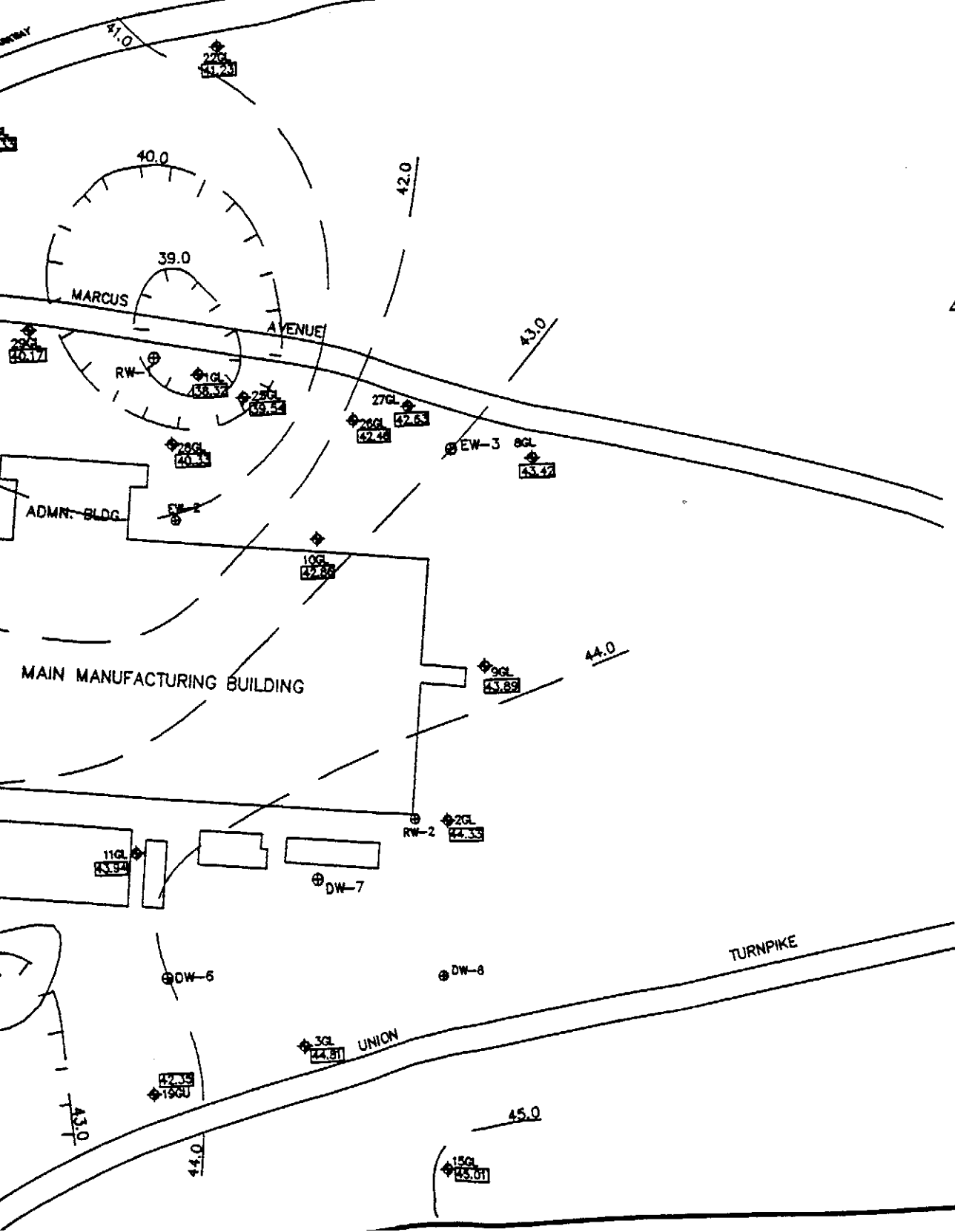


FIGURE 3.2
NASSAU COUNTY WATER PURVEYORS
LOCKHEED MARTIN
GREAT NECK, NEW YORK



LEGEND

44.0 — —	GROUNDWATER CONTOUR LINE (DASHED WHERE INFERRED)
⌖ 27GL	MONITOR WELL LOCATION
40.51	WATER LEVEL ELEVATION
GU	GLACIAL UPPER (90–115 ft bg)
GL	GLACIAL LOWER (125–185 ft bg)
⊕ DW-6	DIFFUSION WELL
⊕ RW-1	RECOVERY WELL
⊕ EW-1	EXTRACTION WELL

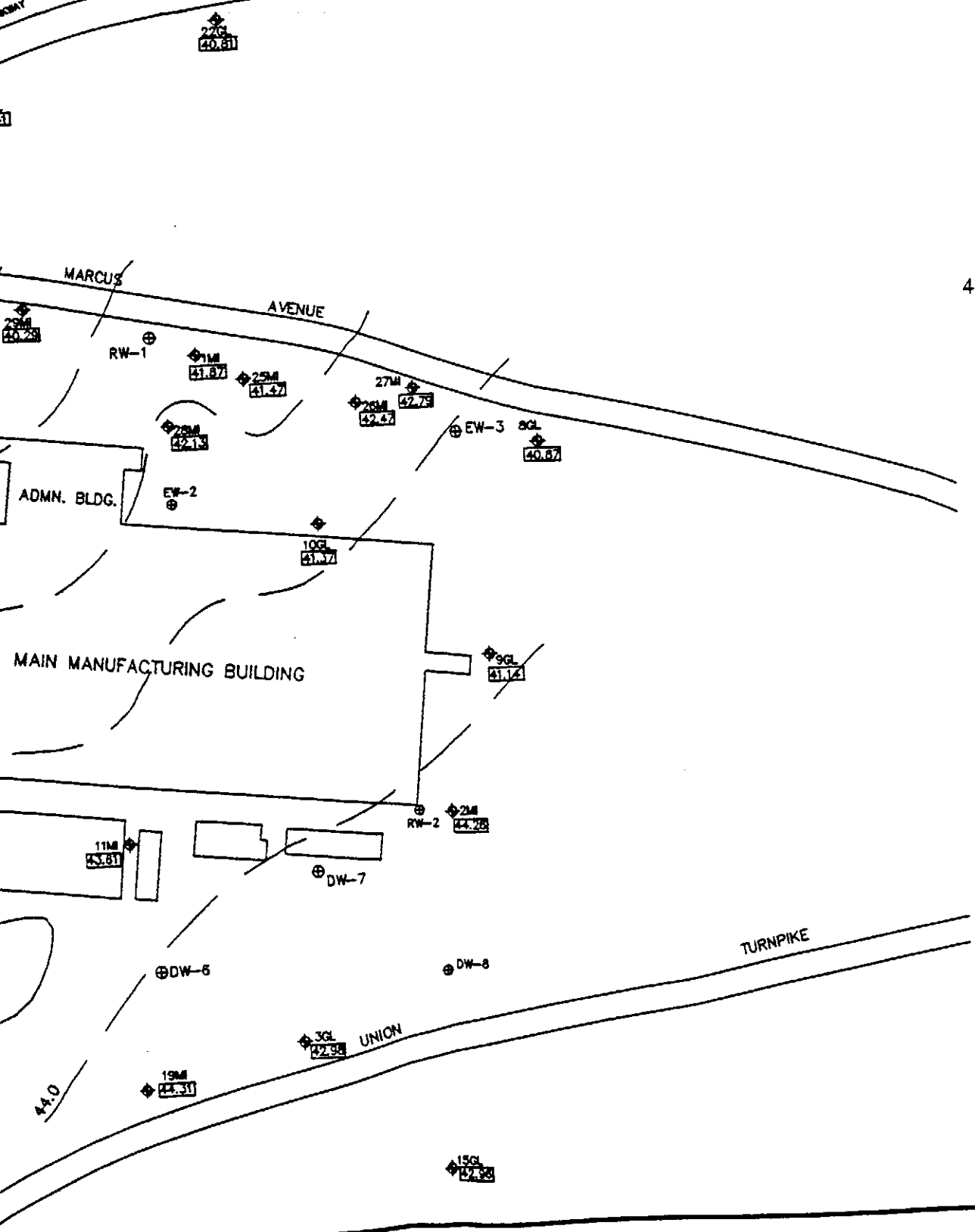
FIGURE 3.3
GROUNDWATER CONTOUR MAP GL WELLS 1/20/97 LOCKHEED MARTIN GREAT NECK, NEW YORK

GRAPHIC SCALE

350 0 175 350

(IN FEET)

1 inch = 350 ft.



LEGEND

44.0 — ——	GROUNDWATER CONTOUR LINE (DASHED WHERE INFERRED)
⊕ 27GL	MONITOR WELL LOCATION
40.51	WATER LEVEL ELEVATION
GU	GLACIAL UPPER (90–115 ft bg)
GL	GLACIAL LOWER (125–185 ft bg)
⊕ DW-6	DIFFUSION WELL
⊕ RW-1	RECOVERY WELL
⊕ EW-1	EXTRACTION WELL

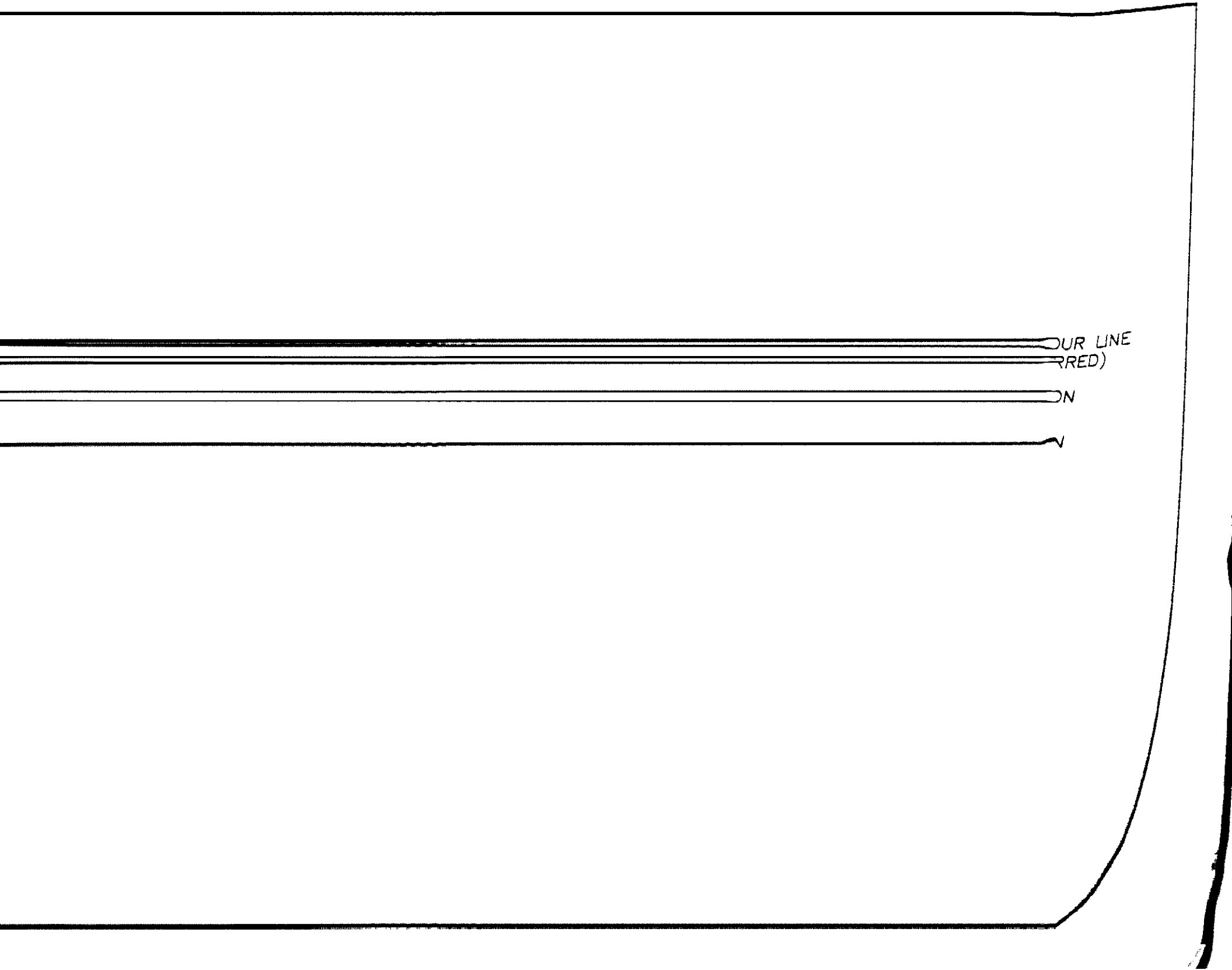
FIGURE 3.4
GROUNDWATER CONTOUR MAP MI WELLS 1/20/97
LOCKHEED MARTIN
GREAT NECK, NEW YORK

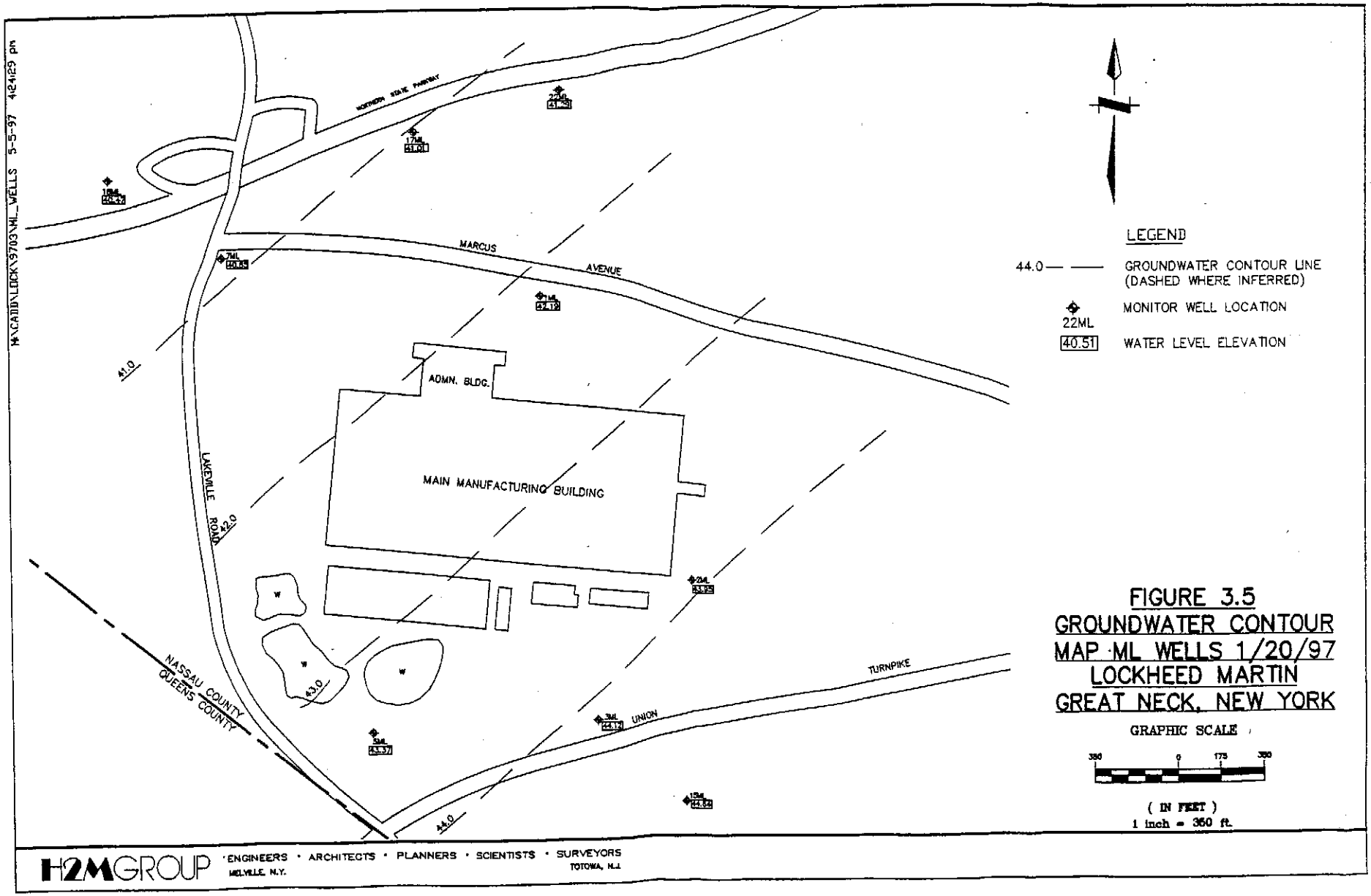
GRAPHIC SCALE

350 0 175 350

(IN FEET)

1 inch = 350 ft.


UR LINE
RRED)
N
V


H:\CADD\LOCK\9703\ML_WELLS 5-5-97 4:24:29 pm
NORTHERN STATE PARKWAY
MARCUS AVENUE
LAKEVILLE ROAD
ADMN. BLDG.
MAIN MANUFACTURING BUILDING
NASSAU COUNTY
QUEENS COUNTY
UNION TURNPIKE
41.0
42.0
43.0
44.0
LEGEND
44.0 GROUNDWATER CONTOUR LINE (DASHED WHERE INFERRED)
MONITOR WELL LOCATION
22ML
40.51 WATER LEVEL ELEVATION
FIGURE 3.5
GROUNDWATER CONTOUR MAP ML WELLS 1/20/97
LOCKHEED MARTIN
GREAT NECK, NEW YORK
GRAPHIC SCALE
350 0 175 350
(IN FEET)
1 inch = 350 ft.
H2MGROUP ENGINEERS • ARCHITECTS • PLANNERS • SCIENTISTS • SURVEYORS
MELVILLE, N.Y.
TOTOWA, N.J.

M:\CADD\LOCK\9703\LAKE 8-13-97 10:50:08 am EST

VILLAGE HALL

LAKEVILLE ROAD

LAKE SUCCESS

+22' +4' +18' +48' +43' +5' +49' +50' +19' +59' +28' +65' +52' +46' +67' +32' +59' +65' +61' +71' +70' +49' +58' +47' +21' +31' +4' +38' +24' +12' +8'

LEGEND

+24' DEPTH SOUNDING LOCATION & VALUE

FIGURE 3.6
LOCKHEED MARTIN
GREAT NECK, NEW YORK FACILITY
LAKE SUCCESS
DEPTH SOUNDING
FEBRUARY 21, 1997

GRAPHIC SCALE

200 0 100 200

(IN FEET)
1 inch = 200 ft.

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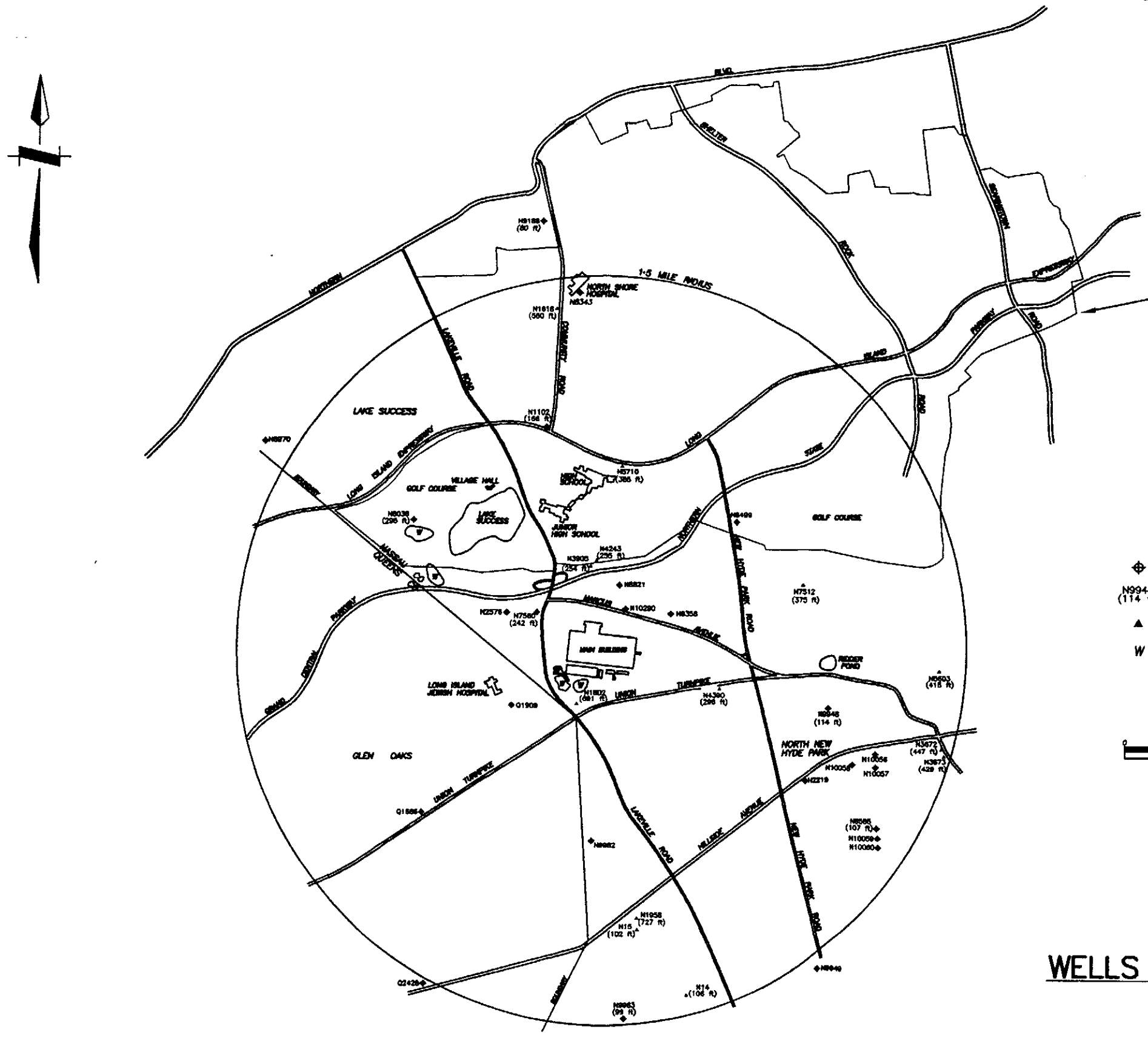
MELVILLE, N.Y. TOTOWA, N.J.



NORTH HILLS SPECIAL GROUNDWATER PROTECTION AREA *

LEGEND

⊕	INDUSTRIAL OR MONITORING WELL
N9948 (114 ft)	NASSAU COUNTY WELL NUMBER AND TOTAL DEPTH (IF AVAILABLE)
▲	MUNICIPAL WELL
W	UNNAMED SURFACE WATER BODY

* NOTE: LOCATION APPROXIMATE

0 1150 2300
SCALE IN FEET

FIGURE 3.7
WELLS LOCATED WITHIN 1.5 MILE RADIUS
LOCKHEED MARTIN
GREAT NECK, NEW YORK

M:\CADD\LOCK\9703\FIG3-6 8-15-97 10:38:32 am

TASK	START DATE	COMPLETION DATE
Submit draft OU-2 RI/FS Work Plan to NYSDEC	NA	NA
NYSDEC Review and Comment	6-1-97	7-22-97
Work Plan Revisions and Submit Draft Final RI/FS Work Plan to NYSDEC	7-22-97	9-12-97
RI/FS Work Plan Public Meeting	NA	NA
NYSDEC Approval of Work Plan - Commence RI/FS Activities	NA	NA
Regional Groundwater and Hydrogeologic Review	10-27-97	12-12-97
Groundwater Flow Model	11-17-97	4-24-98
Well Permits (MW-30,31,32,33)	11-17-97	12-19-97
Well Installation (MW-30,31,32,33)	12-19-97	1-30-98
Review OU-2 Groundwater Model to determine location and screen(s) of MW-34.	2-1-98	2-28-98
Well Permit for MW-34	3-1-98	3-13-98
Installation of MW-34	3-14-98	3-20-98
Groundwater Sampling	3-28-98	5-22-98
Lab Analysis and Data Validation	4-6-98	7-17-98
Prepare RI, RA and FS Reports	5-25-98	9-11-98
Submit Draft RI, RA and FS Reports to NYSDEC	NA	NA

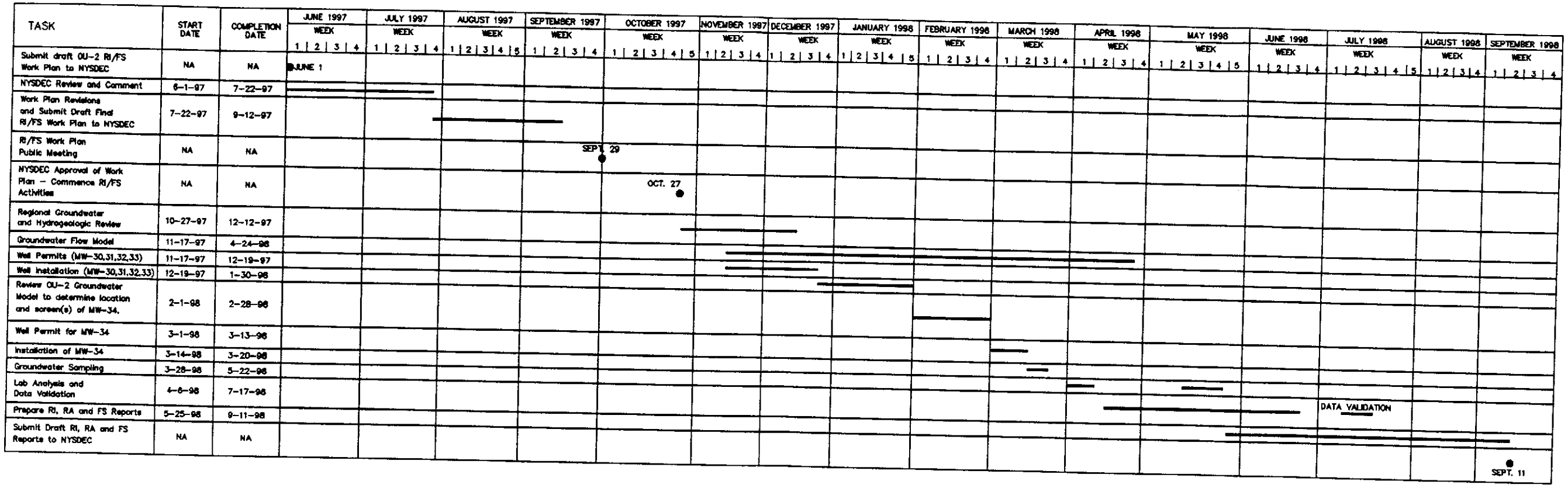


FIGURE 4.1
RI/FS PROJECT SCHEDULE
LOCKHEED MARTIN
GREAT NECK, NEW YORK

M:\CADD\LOCK\9703\5-6PR.JSC 5-19-97 4:04:58 pm

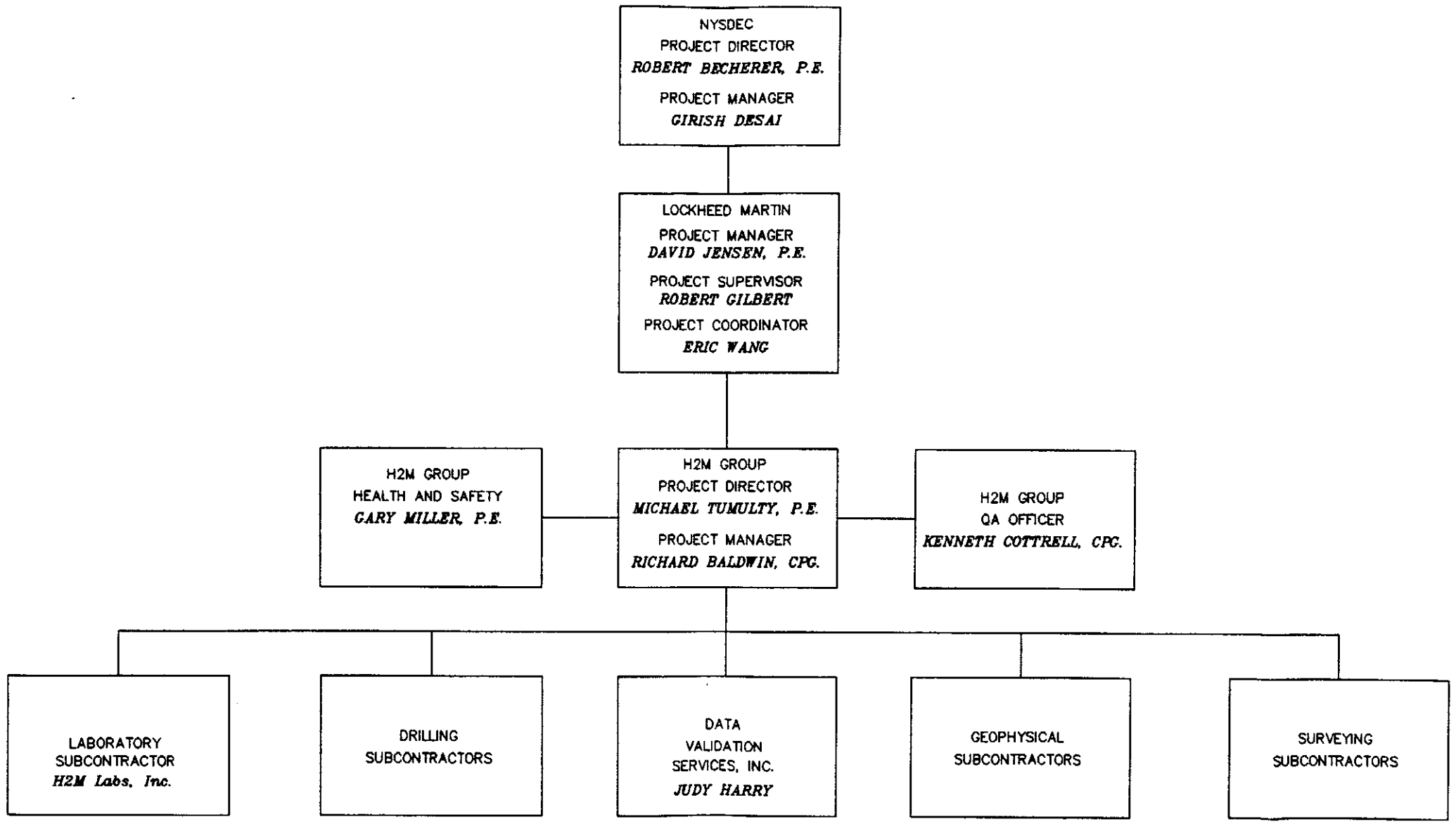
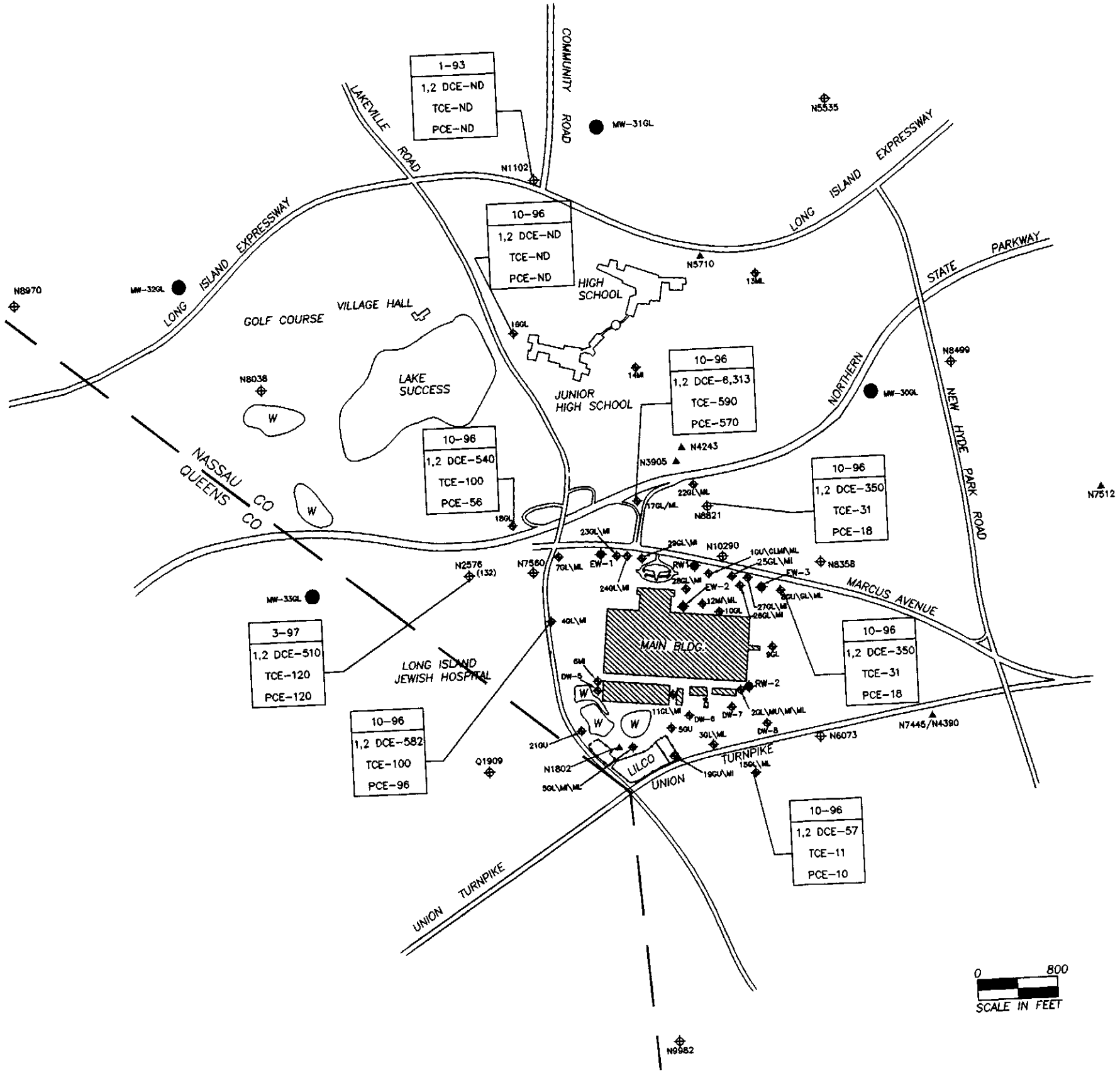


FIGURE 4.2
PROJECT ORGANIZATION CHART
LOCKHEED MARTIN
GREAT NECK, NEW YORK



LEGEND

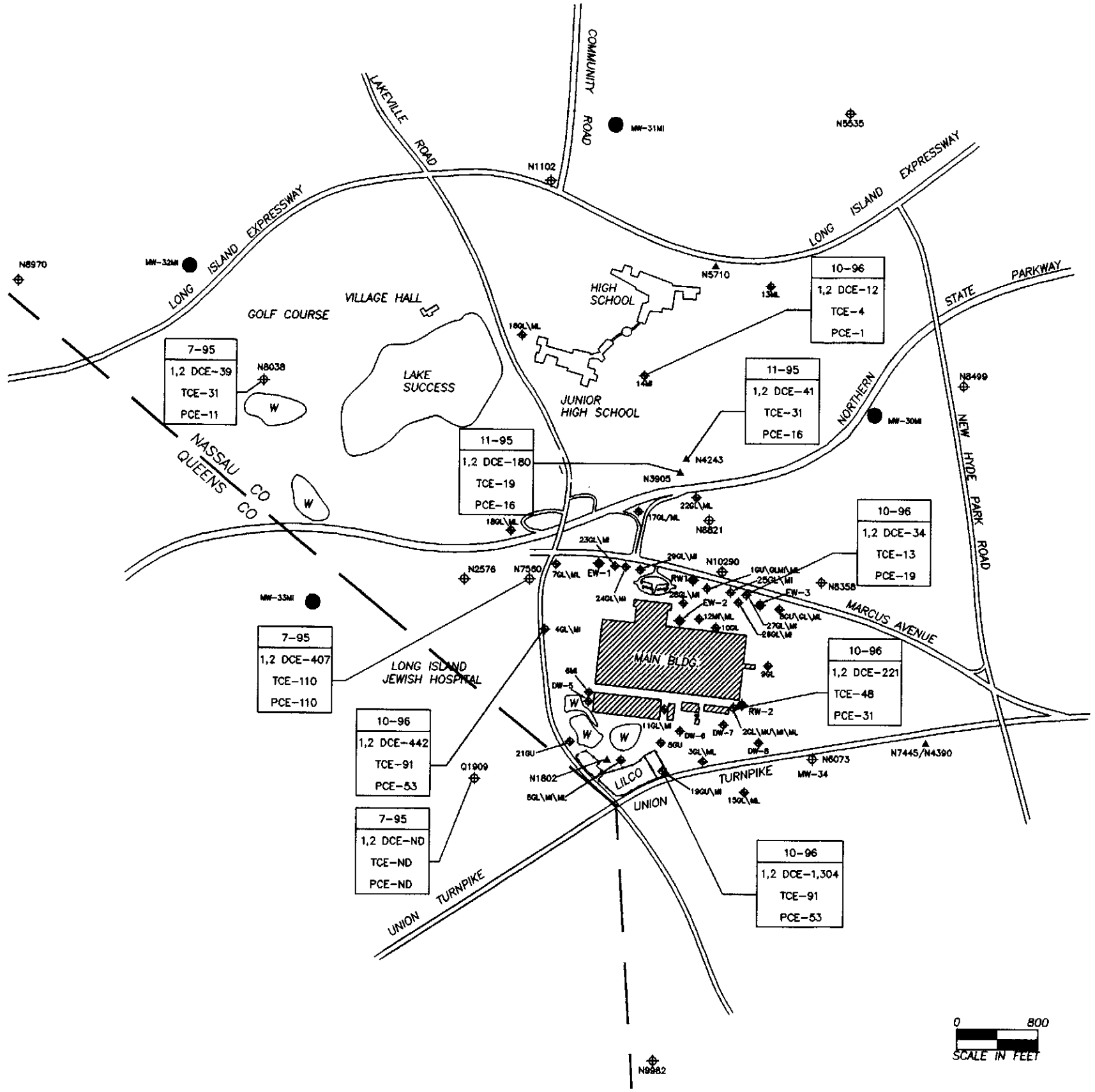
- ▲ MUNICIPAL WELL
- ⊕ MONITORING WELL
- W UNNAMED SURFACE WATER BODY
- GU GLACIAL UPPER (90–115 ft bg)
- GL GLACIAL LOWER (125–185 ft bg)
- MI MAGOTHY INTERMEDIATE (210–250 ft bg)
- ML MAGOTHY LOWER (300–400 ft bg)
- RW RECOVERY WELL
- EW EXTRACTION WELL
- DW DIFFUSION WELL

10-96
1,2 DCE-39
TCE-31
PCE-11

DATE SAMPLED AND CONCENTRATION IN UG/L

● PROPOSED LOCATION – SHALLOW WELL

FIGURE 5-1
GROUNDWATER QUALITY
IN PERIMETER/OFF-SITE WELLS
GLACIAL AQUIFER
LOCKHEED MARTIN
GREAT NECK, NEW YORK



N

LEGEND

- ▲ MUNICIPAL WELL
- ⊕ MONITORING WELL
- W UNNAMED SURFACE WATER BODY
- 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

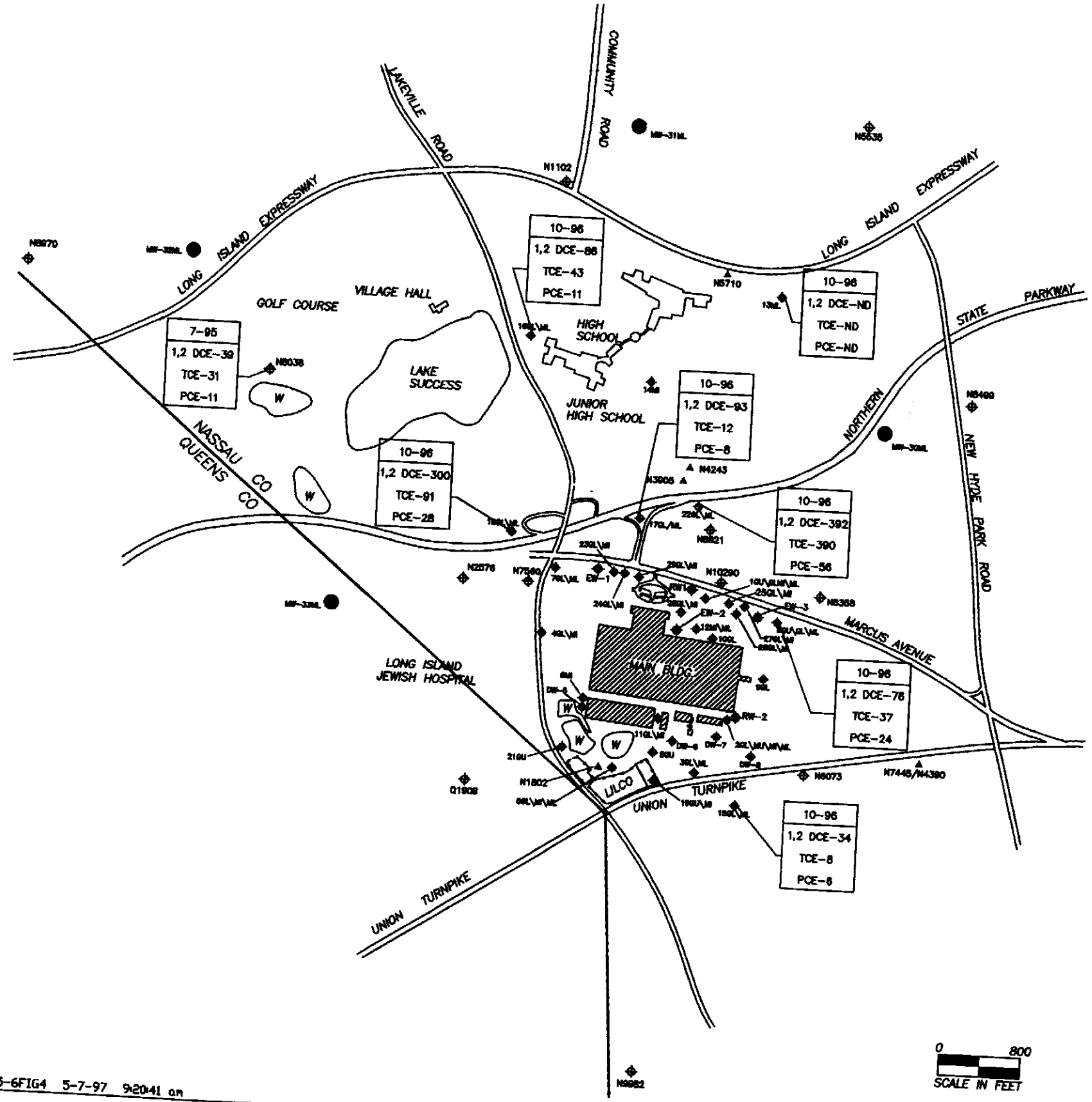
10-96
1,2 DCE–1,304
TCE–91
PCE–53

DATE SAMPLED AND CONCENTRATION IN UG/L

● PROPOSED LOCATION – INTERMEDIATE WELLS

FIGURE 5–2
GROUNDWATER QUALITY IN PERIMETER/OFF–SITE WELLS INTERMEDIATE MAGOTHY AQUIFER LOCKHEED MARTIN GREAT NECK, NEW YORK

M:\CADD\LOCK\9703\5-6FIG3 8-15-97 10:00:34 am



LEGEND

- ▲ MUNICIPAL WELL
- ⊕ MONITORING WELL
- W UNNAMED SURFACE WATER BODY
- 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

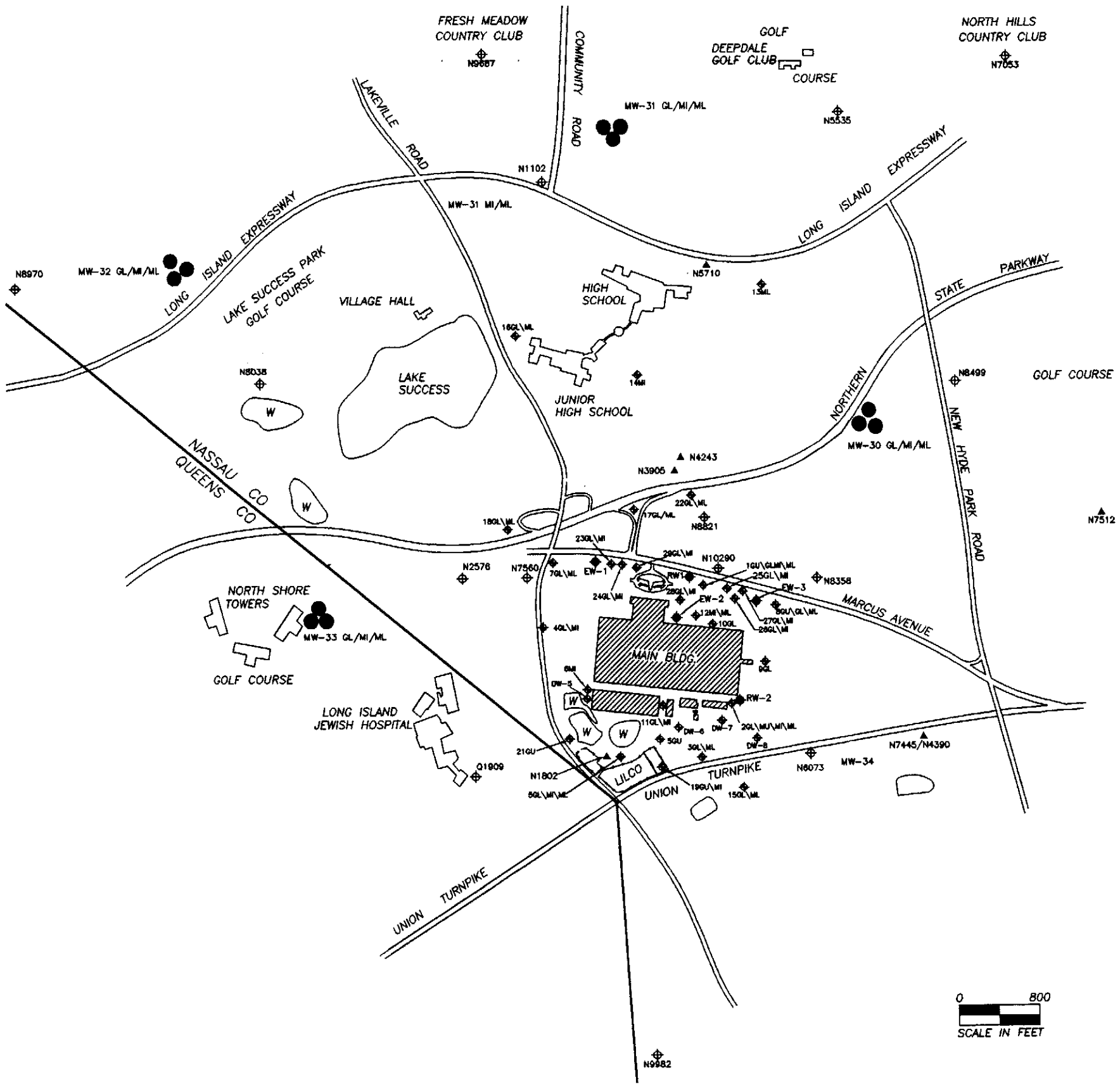
10-96
1,2 DCE-39
TCE-31
PCE-11

DATE SAMPLED AND CONCENTRATION IN UG/L

● PROPOSED LOCATION – DEEP WELL

M:\CADD\LOCK\9703\5-6FIG4 5-7-97 9:20:41 am

FIGURE 5-3
GROUNDWATER QUALITY
IN PERIMETER/OFF-SITE WELLS
DEEP MAGOTHY
LOCKHEED MARTIN
GREAT NECK, NEW YORK



LEGEND

- ▲ MUNICIPAL WELL
- ⊕ MONITORING WELL
- W UNNAMED SURFACE WATER BODY
- 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

- ● PROPOSED LOCATION – SHALLOW WELL
- ● PROPOSED LOCATION – INTERMEDIATE WELL
- ● PROPOSED LOCATION – DEEP WELL

LOCATION SHOWN IS APPROXIMATE.
ACTUAL LOCATION AND SCREEN INTERVAL(S) FOR MW-34 WILL BE DETERMINED BASED ON THE RESULTS OF THE OU-2 GROUNDWATER MODEL.

FIGURE 5-4
PROPOSED MONITORING WELL LOCATIONS
LOCKHEED MARTIN
GREAT NECK, NEW YORK

M:\CADD\LOCK\9703\5-6FIG5 8-15-97 9:42:11 am

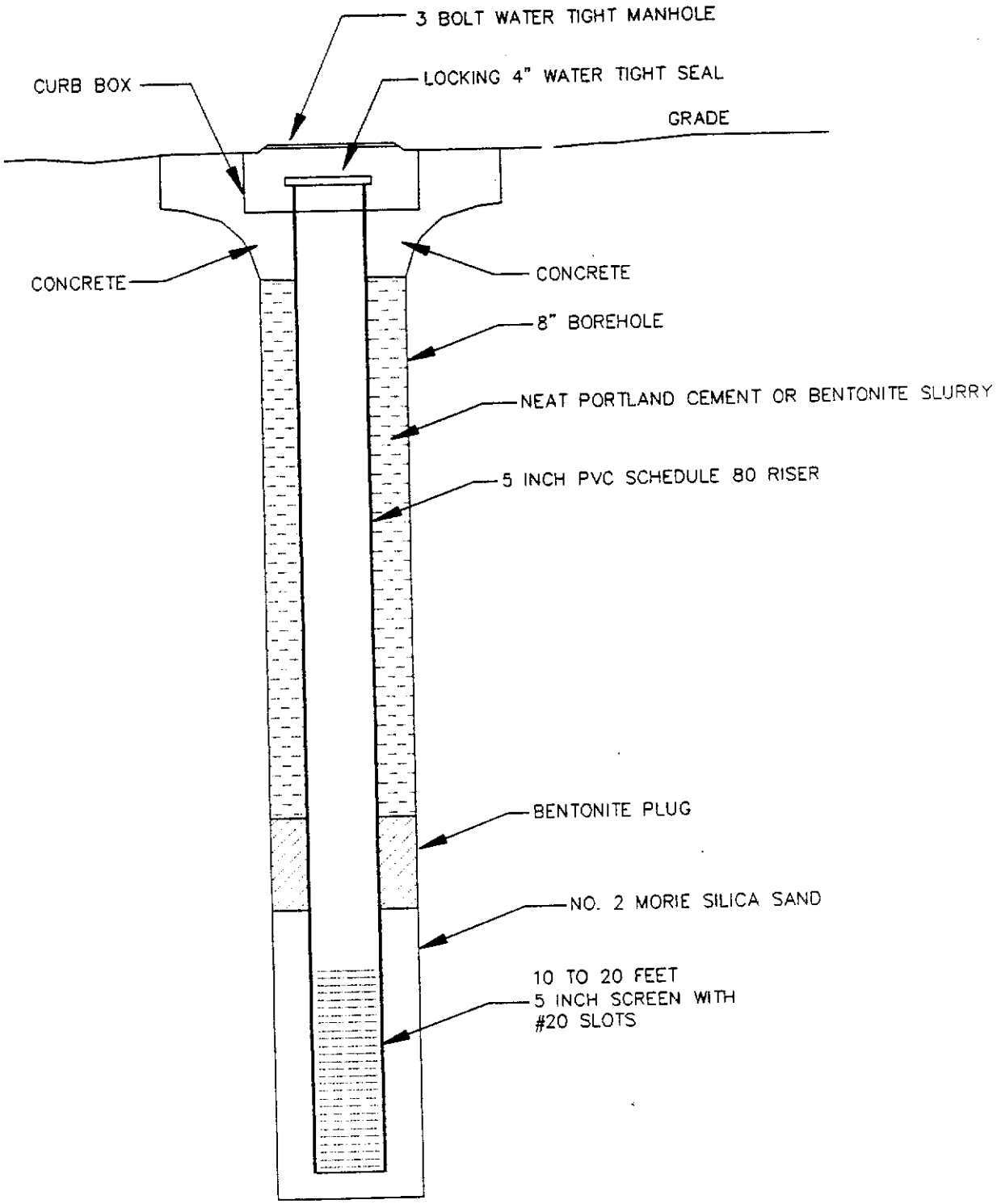


FIGURE 6.1
TYPICAL WELL CONSTRUCTION DIAGRAM
LOCKHEED MARTIN
GREAT NECK, NEW YORK

M:\CADD\LOCK\9703\5-6FIG2 5-6-97 1:30:48 pm

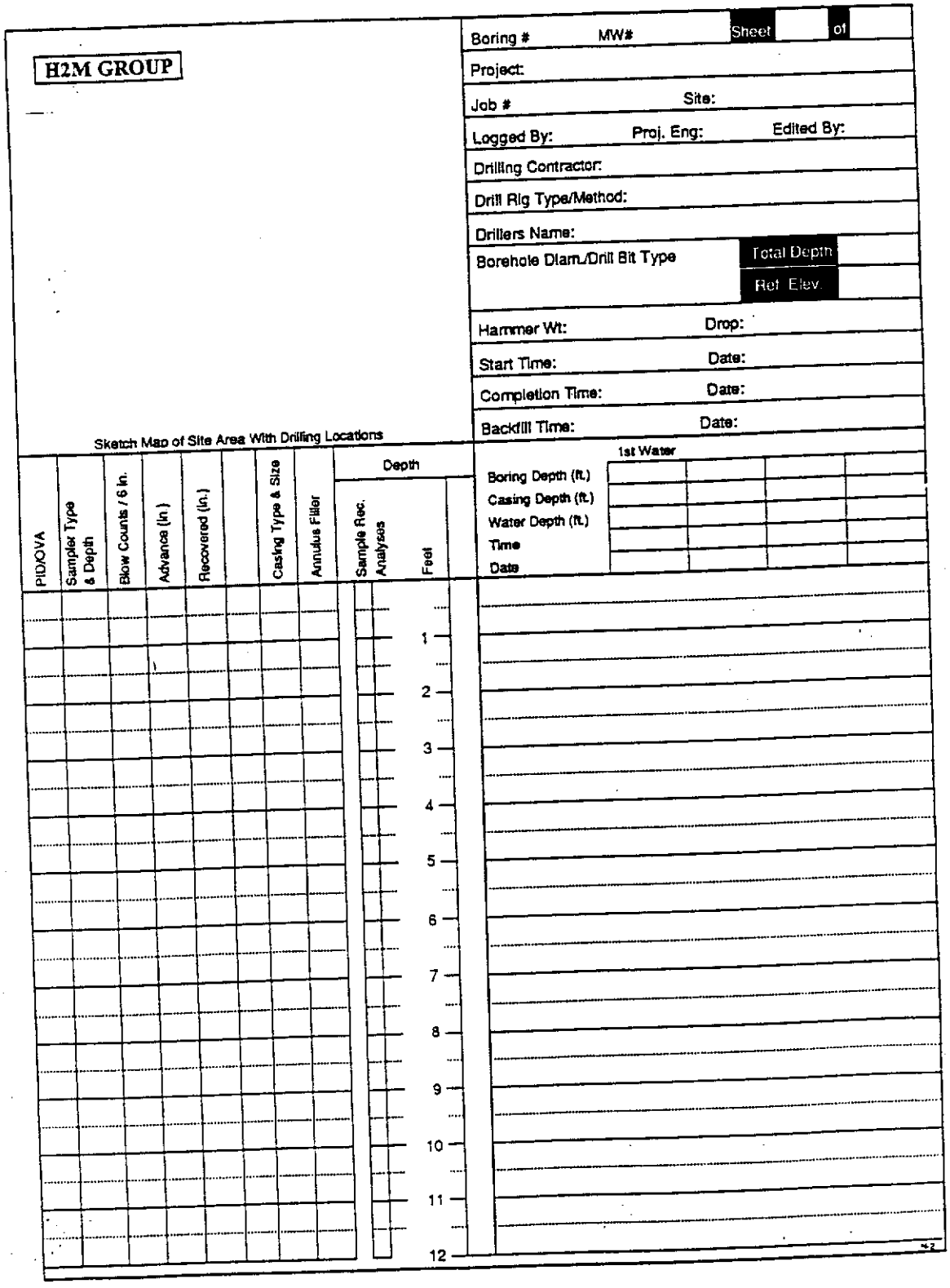


FIGURE 7.1
BORING AND WELL COMPLETION FORM
LOCKHEED MARTIN
GREAT NECK, NEW YORK

H2M GROUP

GROUNDWATER SAMPLING/DEVELOPMENT LOG

Page ___ of ___

Client:___
Site:_____
Job#:_____
Well ID:_____

Total Well Depth*:_____
Well Dia:_____
Borehole Dia:_____
Min. Vol. to be Removed:_____

Vol./ft of casing:_____
Vol./ft of borehole:_____

Waste:

Date:_____

Static Water Level*:_____
Standing Water Column:_____
Amnt of One Well Vol:_____
Total Water to be Pumped:_____

Develop Method:_____
Presamp Purge Method:_____
Sampling Method:_____
Field Tech:_____

* All measurements taken from: __ Top of Casing; ___ Protective Casing; ___ Ground Level

TIME	AMOUNT PURGED (GAL)	FIELD PARAMETER MEASURED					COMMENTS
		EC	pH	TEMP	TURB	PID	

FIGURE 7.2
GROUNDWATER SAMPLING/DEVELOPEMENT SHEET
LOCKHEED MARTIN
GREAT NECK, NEW YORK

№ 6852

HZM LABS, INC.
Environmental and Industrial Analytical Laboratory
575 Broad Hollow Road, Melville, N.Y. 11747-5076
(516) 694-3040
FAX: 516-694-4122

EXTERNAL CHAIN OF CUSTODY

PROJ. NO.	PROJECT NAME	Refrigerator #	NOTES:
		SAMPLE CONTAINER DESCRIPTION →	
SAMPLERS: (Signature)/Client			
DELIVERABLES:		TOTAL NO. OF CONTAINERS ↓	

DATE	TIME	MATRIX	FIELD I.D.	ANALYSIS REQUESTED: ORGANIC VOA	ORGANIC BNA	ORGANIC Pest/PCB	INORG. Metal	INORG. Cl	LAB I.D. No.	REMARKS

Relinquished by: (Signature)	Date	time	Received by: (Signature)	Date	time
Relinquished by: (Signature)	Date	time	Received by: (Signature)	Date	time
Relinquished by: (Signature)	Date	time	Received for Laboratory by: (Signature)	Date	time

PROJECT CONTACT:

PHONE NUMBER:

Discrepancies Between Sample Labels and COC Record? Y or N
NOTES:

LABORATORY USE ONLY

Samples were:
1)Shipped___or Hand Delivered___
Airbill #_____
2)Ambient or Chilled
3)Recieved in Good Condition Y or N
4)Properly Preserved Y or N
5)Samples returned to lab.___ hours from Collection

COC Tape was:
1)Present on Outer Package Y or N
2)Unbroken on Outer Package Y or N
3)COC Record Present and Complete Upon Sample Rec't. Y or N

ORIGINAL COPY

FIGURE 7.3
CHAIN-OF-CUSTODY
LOCKHEED MARTIN
GREAT NECK, NEW YORK

TABLES

H2MGROUP

TABLE 5.1
TCL VOC ANALYTE LIST PLUS FREON 113
WITH CRQLS
LOCKHEED MARTIN
GREAT NECK, NEW YORK

Compound	Contract-Required Quantiation Limits (ug/l)
Chloromethane	10
Bromomethane	10
Vinyl Chloride	10
Chloroethane	10
Methylene Chloride	10
Acetone	10
Carbon Disulfide	10
1,1-Dichloroethene	10
1,1-Dichloroethane	10
1,2-Dichloroethene (total)	10
Chloroform	10
1,2-Dichloroethane	10
2-Butanone	10
1,1,1-Trichloroethane	10
Carbon Tetrachloride	10
Bromodichloromethane	10
1,2-Dichloropropane	10
cis-1,3-Dichloropropene	10
Trichloroethene	10
Dibromochloromethane	10
1,1,2-Trichloroethane	10
Benzene	10
trans-1,3-Dichloropropene	10
Bromoform	10
4-Methyl-2-Pentanone	10
2-Hexanone	10
Tetrachloroethene	10
Toluene	10
1,1,2,2-Tetrachloroethane	10
Chlorobenzene	10
Ethylbenzene	10
Styrene	10
Xylene (total)	10
Freon 113	10

H2M GROUP

TABLE 5.2
TARGET WELL DEPTHS
LOCKHEED MARTIN
GREAT NECK, NEW YORK

Well ID	Approx. Surface Elevation (ft msl)[1]	Target Screen Elevation (ft msl)[2]	Target Well Depth (ft bgs)[3]
MW-30GL	150	-20	170
MW-30MI	150	-95	245
MW-30ML	150	-215	365
MW-31GL	160	-20	180
MW-31MI	160	-95	255
MW-31ML	160	-215	375
MW-32GL	210	-20	210
MW-32MI	210	-95	305
MW-32ML	210	-215	425
MW-33GL	210	-20	230
MW-33MI	210	-95	305
MW-33ML	210	-215	425
MW-34 [4]	TBD	TBD	TBD

Notes:

[1] Elevations from USGS topographic map.

[2] The target screen elevations and depths are based upon the following rationale:

Assume average surface elevation at Lockheed site is 135 feet above mean sea level (msl)

The wells are classified by the following depths below ground surface (bgs).

GL Wells: 125 to 185 feet bgs	Average depth: 155 feet bgs.
MI Wells: 210 to 250 feet bgs	Average depth: 230 feet bgs
ML Wells: 300 to 400 feet bgs	Average depth: 350 feet bgs

Therefore, the elevations of the wells with respect to mean sea level are:

GL Wells: 10 to -50 msl	Average elevation: -20 feet msl
MI Wells: -75 to -115 msl	Average elevation: -95 feet msl
ML Wells: -165 to 265 msl	Average elevation: -215 feet msl

[3] Actual well depths will be based upon the review of the bore-hole geophysical surveying and lithologies encountered.

[4] Location and screen interval(s) for MW-34 will be determined based on the results of the OU-2 groundwater model.

TBD- To be determined.

TABLE 5.3
ANALYTICAL AND QA/QC SAMPLES
LOCKHEED MARTIN
GREAT NECK, NEW YORK

Sampling Event	Number of Field Samples	Chemical Analyses	QA/QC Samples				Total Number of Samples
			Field Blanks	Trip Blanks	Blind Duplicates	MS/MSD Samples	
Initial Sampling Event[1]	12 [4]	TCL VOCs plus Freon 113[3]	2	2	2	4	10
Second Sampling Event[2]	71 [4]	TCL VOCs plus Freon 113	10	10	10	20	50

Notes:

[1] The initial sampling event is expected to take two days.

[2] The second sampling event is expected to take ten days.

[3] All samples will be analyzed for TCL VOCs plus Freon 113 using NYSDEC Method 91-1. The holding time for TCL VOCs is seven days and the samples must be cooled to 4°C for preservation (HCl is optional). Two 40 milliliter vials with Teflon caps are the required containers.

[4] The number of field samples listed does not include MW-34. The screen zone(s) for MW-34 will be determined based on the OU-2 groundwater model.

TABLE 12.1
CITIZEN PARTICIPATION ACTIVITIES
LOCKHEED MARTIN
GREAT NECK, NEW YORK

CPP Task	Final Draft RI/FS Work Plan	Final Draft RI Report	Final Draft FS Report	Proposed Remedial Action Plan
Document placed in public Repositories.	X	X	X	X
Public notice mailing to contact list.	X	X	X	X
Fact Sheet distributed to contact list.	X	X		X
Public meeting.	X			X
Public comment period.	X			X
Transcript placed in public repositories.	X			X
Responsiveness summary.				X

APPENDIX A

ARARS AND TBCS

H2M GROUP

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS INCLUDING NYS SCGS

1.0 ARARs for Groundwater Cleanup Criteria

1.1 Federal Regulations

The following sources of ARARs have been identified for site groundwater:

40 CFR	Part 141	National Primary Drinking Water Regulations
	Subpart B	Maximum Contaminant Levels
	Section 141.11	Maximum Contaminant Levels for Inorganic Chemicals
	Section 141.12	Maximum Contaminant Levels for Organic Chemicals
	Subpart F	Maximum Contaminant Level Goals
	Section 141.50	Maximum Contaminant Level Goals for Inorganic Chemicals
	Section 141.51	Maximum Contaminant Level Goals for Organic Chemicals
	Subpart G	National Revised Drinking Water Regulations: Maximum Contaminant Levels
	Section 141.61	Maximum Contaminant Levels for Organic Contaminants
40 CFR	Part 143	National Secondary Drinking Water Regulations
	Section 143.3	Secondary Maximum Contaminant Levels

1.2 New York Regulations

The following sources of ARARs have been identified for site groundwater:

6 NYCRR	Part 701	Classification - Surface Waters and Ground Waters
	Section 701.15	Class GA Fresh Ground Waters
	Part 702	Derivation and Use of Standards and Guidance Values
	Section 702.1	Basis for Derivation of Water Quality Standards and Guidance Values
	Section 702.2	Standards and Guidance Values for Protection of Human Health and Sources of Potable Water Supplies
	Part 703	Surface Water and Ground Water Quality Standards and Groundwater Quality Standards and Ground Water Effluent Standards
	Section 703.5	Water Quality Standards for Taste, Color and Odor-Producing, Toxic and Other Deleterious Substances
10 NYCRR	Part 5	Drinking Water Supplies
	Subpart 5-1	Public Water Systems
	Section 5-1.51	Maximum Contaminant Levels
	Section 5-1.52	Tables; Table 1 - Inorganic Chemicals and Physical Characteristics Maximum Contaminant Level Determination, Table 3 - Organic Chemicals Maximum Contaminant Level Determination

2.0 ARARs for Air Emission Discharge Criteria

2.1 Federal Regulations

The EPA has established guidance values on the control of air emissions through the Clean Air Act at CERCLA sites for groundwater treatment (EPA, 1989).

2.2 New York Guidelines

The New York Ste DEC Division of Air Resources has issued draft guidelines for the control of toxic ambient air contaminants in New York State. The guidelines are presented in the New York State Air Guide-1.

3.0 ARARs for Transport and Disposal Criteria

3.1 Federal Regulations

The following sources of ARARs have been identified for treatment, transportation and disposal of hazardous byproducts:

40 CFR	Part 261	Identification and Listing of Hazardous Waste
	Part 262	Standards Applicable to Generators of Hazardous Waste
	Part 263	Standards Applicable to Transporters of Hazardous Waste
	Part 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
	Subpart B	General Facility Standards
	Subpart E	Manifest System, Record keeping and Reporting
	Subpart N	Landfills
	Subpart O	Incinerators
	Part 265	Interim Status Standards of Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
	Subpart B	General Facility Standards
	Subpart E	Manifest System, Record keeping and Reporting
	Subpart N	Landfills
	Subpart O	Incinerators
	Subpart P	Thermal Treatment
	Subpart Q	Chemical, Physical and Biological Treatment
	Part 268	Land Disposal Restrictions
49 CFR	Part 172	Hazardous Material Regulations of the Department of Transportation, Hazardous Materials Tables and Hazardous Communications Requirements and Emergency Response Information Requirements
	Part 173	Hazardous Material Regulations of the Department of Transportation, Shippers, General Requirements for Shipping and Packaging
	Part 178	Hazardous Material Regulations of the Department of Transportation's, Shipping Container Specifications

3.2 New York Regulations

The following sources of ARARs have been identified for treatment, transportation and disposal of hazardous byproducts:

6 NYCRR	Part 360	Solid Waste Management Facilities
	Part 370	Hazardous Waste Management System - General
	Part 371	Identification and Listing of Hazardous Waste
	Part 372	Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
	Part 373	Hazardous Waste Management Facilities
	Subpart 373.1	Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements
	Subpart 373.2	Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
	Subpart 373.3	Interim Status Standards Regulation for Owners and Operators of Hazardous Waste Facilities
	Part 375	Inactive Hazardous Waste Disposal Sites
	Part 376	Land Disposal Restrictions

APPENDIX B

Analytical Procedures and Laboratory Testing

APPENDIX B

ANALYTICAL PROCEDURES AND LABORATORY TESTING

All chemical analyses will be conducted following NYSDEC- and NYSDOH-approved procedures to ensure that the work conforms with the National Contingency Plan (NCP). The data will be appropriate for supporting cost-recovery actions.

1.0 Analytical Laboratory

The samples will be analyzed by a NYSDOH Environmental Laboratory Approval Program (ELAP) CLP-certified laboratory proficient in all aspects of the 1991 ASP including the ability to perform continuous liquid-liquid extraction. A copy of this RI/FS work plan will be supplied to the laboratory prior to analyses.

2.0 Analytical Parameters

All groundwater and QA/QC samples will be analyzed for Volatile Organic Compounds (VOCs) on the Target Compound List (TCL) plus Freon 113 to evaluate the presence of halogenated VOCs and hydrocarbon compounds. The list of parameters included in this analyses is summarized in Table 1.

3.0 Analytical Methods

The analytical procedures for the parameters associated with this project will be from the "New York State Department of Environmental Conservation Analytical Services Protocol, September 1989 12/91, Latest Revision 10/95". Samples for VOC analyses will be performed using NYSDEC ASP Method 95-1.

4.0 Laboratory Procedures

4.1 Calibration Practices

Instruments and equipment used in the selected laboratory will be controlled by a formal calibration program. The program verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. All instruments and equipment which measure a quantity (with performance expected at a stated level) are subject to calibration. Calibration may be performed by laboratory personnel using reference standards or externally by calibration agencies or equipment manufacturers.

Implementation of the laboratory calibration program is the responsibility of the Laboratory Manager and Analysts. The Laboratory QA Manager shall review the implementation of the program.

There are two types of calibration pertinent to these laboratory procedures including:

1. Operational Calibration which is routinely performed as part of instrument usage, such as the development of a standard curve for use with an Atomic Absorption Spectrophotometer. Operational calibration is generally performed for instrument systems.
2. Periodic Calibration which is performed at prescribed intervals for equipment, such as balances and ovens. In general, equipment which can be calibrated periodically is a distinct single purpose unit and is relatively stable in performance.

Whenever possible, recognized procedures, such as those published by American Society for Testing and Materials (ASTM) or USEPA, or procedures provided by manufacturers shall be utilized.

4.2 Equipment Identification

Equipment that is subject to calibration shall be uniquely identified so that calibration records can be designated with a specific instrument.

4.3 Calibration Frequency

Instruments and equipment shall be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Frequency shall be based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended use, effect of error upon the measurement process, and prior experience.

4.4 Calibration Reference Standards

Two types of reference standards are used within the laboratory for calibration - physical and chemical:

1. Physical Standards, such as weights for calibrating balances and certified thermometers for calibrating working thermometers and ovens, which are generally used for periodic calibration.
2. Chemical Standards primarily used for operational calibration.

Whenever possible, physical and chemical reference standards shall be known relationships to nationally recognized standards (e.g., National Bureau of Standards) or accepted values of natural physical constants. If national standards do not exist, the basis for the reference standard shall be documented.

4.5 Calibration Failure

Equipment that fails calibration or becomes inoperable during use shall be removed from service and segregated to prevent inadvertent use, or shall be tagged to indicate it is out of calibration. Such equipment shall be repaired and satisfactorily recalibrated before reuse.

4.6 Calibration Records

Records shall be prepared and maintained for each piece of equipment subject to calibration. Records demonstrating accuracy of reference standards shall also be maintained.

For instruments and equipment that are calibrated on an operational basis, calibration generally consists of determining instrumental response against compounds of known composition and concentration or the preparation of a standard response curve of the same compound at different concentrations. Records of these calibration can be maintained in several ways:

1. The calibration data can be kept with analytical sample data.
2. A log book can be prepared for each instrument which contains all calibration data.

Method 1 provides response factor information, etc., directly with analytical data so that the data can be readily processed and verified. Also, the raw data package is completed as a unit.

Method 2 provides an on-going record of calibration undertaken for a specific instrument; however, to process and verify the analytical data, the log must be used in conjunction with the raw data.

For operational calibration of instrumentation used for this project, calibration data will be included with the raw analytical data and maintained in project files.

5.0 Laboratory Data Processing and Reporting

5.1 Review of Data Processing

The following is a discussion of the method to be used for reviewing (checking) data processing. At least 20 percent of all data shall be checked in this manner. If, during the checking process, errors are determined, checking shall be completely (100 percent) performed for the data set.

The analyst performing the data processing shall give an independent analyst, the data package. The package shall include, as appropriate, raw data, data sheets, strip charts, computer input/output, calculations, sources for input parameters such as response factors, etc.

The independent analyst (checker) shall review the data for:

1. Appropriateness of equations used.
2. Correctness of numerical input.
3. Numerical correctness of all calculations. This will be conducted by re-performing numerical computations.

The checking process must be thorough enough to validate that the results are correct. If the checker disagrees with any part of the computations, the checker shall mark through the number with a single line and place the revised number above it.

Any changes made by the checker shall be back-checked by the originator. If the originator agrees with the change, no action is necessary. If the originator disagrees, the originator and checker must resolve the difference so they agree with the result presented.

5.2 Data Reduction

Laboratory data reduction and analysis for organic analyses involves relating a "peak area" to the mass of a constituent. This is accomplished by digital computers. The computer hardware and software is designed to allow the analyst to create libraries or files of calibration standards, and then compare raw sample data against these libraries to produce a report which contains the identification and qualification of constituents present in the sample. The computer-reduced data are manually checked by the analysts. For laboratory reporting, the results of the organic analyses are typed.

5.3 Data Reporting

The format for reporting will follow that the NYSDEC CLP and procedures. The following are applicable to CLP data presentation:

1. The final presentation shall be checked in accordance with data verification requirements and approved by the Laboratory QA Manager.
2. Data presentation will include:
   a) Sample identification number used by laboratory and/or the sample identification provided to the laboratory (if different).
   b) Chemical parameters analyzed, reported values, and units of measurements.
   c) Detection limit of the analytical procedure, if the reported value is less than the detection limit.
   d) Data for a chemical parameter are reported with consistent significant figures for all samples.

e) Results of QC sample analysis, if appropriate.

f) Footnotes referenced to specific data, if required to explain reported values.

The laboratory QA officer will provide the Project Manager and the project Quality Assurance Officer with a QA summary sheet including a narrative of data rejection or acceptance.

5.4 Review of Data Reporting

Review of data reports is required to verify that information reported by the laboratory corresponds with processed analytical results. Review is only required of the data as it is presented for issuance. Intermediate steps performed after the processed data are checked to prepare the data report (such as data summaries) do not require validation.

After the draft data report is prepared (generally in tabular form), the reported results should be checked against the reviewed processed data so that transcription errors do not occur. The checking process follows:

1. Using the draft report, all data entries are checked. The checker is not required to be independent of the work because only the transcription from the reviewed data to the data report is being checked.
2. The draft data report will be checked so that the items cited for data presentation are complete and correct. Corrected entries are marked through with a single line and the correct entry provided. The reviewer will indicate that corrections have been made in the report by placing a second check mark by the correction after comparing the change with the revised copy. The checker shall sign and date every page of the data report in ink.
3. Use of the draft data report results in a check-print which should be maintained as a record to demonstrate the review.
4. If computer output is used directly as the data report without further transcription, only the input requires review.

After checking of the data report is complete, it is given to the Laboratory QA Manager or designated representative for final review. This step is not intended for verifying the reported data. This review is intended to determine that the report meets project requirements. The data report is approved for issue by the Laboratory QA Manager.

5.5 Documentation, Data Reduction and Reporting Field Data

All information pertinent to any field activities will be recorded in bound, waterproof field books. Duplicates of all notes will be prepared each night and kept in a secure place away from the site.

Proper documentation will consist of all field personnel maintaining detailed records of all work accomplished including:

1. date and time of work events;
2. purpose of work;
3. names of people relevant to the project;
4. description of all methods;
5. description of all samples;
6. number and size of samples collected;
7. description of sampling point;
8. date and time of collection of sample;
9. sample collector's name;
10. reference to site map and/or photograph;
11. field observations; and
12. any field measurements with portable instruments.

Each sample collected in the field will be labeled using waterproof ink. Each bottle will be labeled with a location, identification, parameter to be analyzed, sampling time and date. The field hydrogeologist will be responsible for ensuring that hydrogeological data are properly recorded.

The data reporting scheme and key individuals who will handle the data are as follows:

1. data collection by the field hydrogeologist;
2. data reduction, also by the field hydrogeologist;
3. data review by the Project Manager;
4. data validation by independent qualified validator;
5. data usability by the QA officer; and
6. Final data interpretation by Project Manager.

Appendix C

Health and Safety Plan

OPERABLE UNIT 2
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HEALTH AND SAFETY PLAN

LOCKHEED MARTIN CORPORATION

Great Neck, New York
NYSDEC Site No.130045

Prepared for:
New York State
Department of Environmental Conservation

On behalf of:
Lockheed Martin Corporation

JANUARY 1998

H2MGROUP

H2M GROUP

Operable Unit 2
Remedial Investigation/Feasibility Study
Health and Safety Plan
Lockheed Martin Corporation
Great Neck, New York

NYSDEC Site No. 130045

January 1998

TABLE OF CONTENTS

H2M GROUP

TABLE OF CONTENTS

(Continued)

APPENDICES

H2MGROUP

Operable Unit 2
Remedial Investigation/Feasibility Study
Health and Safety Plan
Lockheed Martin Corporation
Great Neck, New York

NYSDEC Site No. 130045

January 1998

1.0 PURPOSE

The purpose of this Health and Safety Plan (HASP) is to establish a protocol for protecting H2M and other on-site and off-site personnel from incidents that may arise while performing field activities in support of the Remedial Investigation (RI) for Operable Unit-2 (OU-2) at the Lockheed Martin site located in Great Neck, New York. This HASP has been prepared in accordance with the United States Environmental Protection Agency (US EPA) document, "Emergency and Remedial Response Division's Standard Operating Safety Guides", November 1984. This plan establishes personnel protection standards, mandatory operations procedures, and provides contingencies for situations that may arise while field work is being conducted at the site. In addition, this Plan incorporates the requirements of Lockheed Martin's Contractor's Safety Handbook, which is appended to this Plan as Appendix 3. All H2M field personnel will be required to abide by the procedures set forth in this HASP. Adherence to this HASP will minimize the possibility that personnel at the site or the surrounding community will be injured or exposed to site-related contaminants during field activities. Subcontractor personnel will be provided with a copy of this plan for their consideration. A copy of this HASP will be maintained at the project site for the duration of the field project.

Personnel performing the environmental field work involving chemical substances may encounter conditions that are unsafe or potentially unsafe. In addition to the potential risks associated with the physical, chemical, biological and toxicological properties of the material(s) which may be encountered, other types of hazards (i.e., electricity, water, temperature, heavy equipment, falling objects, loss of balance, tripping, etc.) can have an adverse effect on the health and safety of personnel. It is important that personnel protective equipment (PPE) and safety requirements be appropriate to protect against potential and/or known hazards. PPE will be selected based on the type(s), concentration(s), and routes of personnel exposure from hazardous substances at a site. In situations where the type of materials and possibilities of contact are

unknown or the potential hazards are not clearly identifiable, a more subjective (but conservative) determination will be made of the PPE required for initial safety.

2.0 SITE CONDITIONS

The Lockheed Martin Site (Former Unisys Corporation Site) 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). Three small drainage basins are located in the southwest corner of the property adjacent to Lakeville Road.

The Lockheed Martin site has been listed by the New York State Department of Environmental Conservation (NYSDEC) in the Registry of Inactive Hazardous Waste Disposal sites in New York State (Site No. 130045). The NYSDEC classified the site as a Class 2 Site due to the presence of volatile organic compound (VOC) contamination in soil and groundwater at the property. In addition to VOCs present in groundwater, VOCs are present in on-site subsurface soil in the area of the inactive Dry Wells, and metals and semi-volatile organic compounds (SVOCs) are present in the sediment of the recharge basins. The field work to be performed under this OU-2 RI will address off-site groundwater.

2.1 Proposed Field Activities

The field investigation will be conducted at the Lockheed Martin site with the overall objective of determining the nature and extent of site-related contaminants in off-site groundwater. The field work that will be conducted will include drilling for the installation of groundwater monitoring wells, developing and sampling of these monitoring wells, field surveying of well locations, and aquifer testing. The intrusive field activities for the OU-2 RI will be performed off of the Lockheed Martin property.

The primary site related contaminants of concern in groundwater are volatile organic compounds (VOCs) including tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (1,2-DCE). The routes of potential exposure include inhalation, ingestion and adsorption through dermal contact. At the work site, the most probable route of exposure, if any, is via the inhalation of VOCs from contaminated groundwater. Based on the concentrations of VOCs previously quantified in groundwater, and since drilling is not being performed through any known source areas where elevated concentrations of VOCs may be encountered, it is not anticipated that site activities would pose an inhalation hazard to field personnel. All proposed work will be completed in Level D PPE. Ambient air will be monitored using an PID during any

intrusive activities. Upgrading to EPA Level C PPE (air-purifying respirators) or Level B (self-contained breathing apparatus) will be considered if ambient air concentrations of VOCs exceed appropriate guidelines. Guidance for Level B, C and D are summarized in Sections 4.2, 4.3 and 4.4, respectively.

In addition, several of the monitoring wells that will be installed is expected to be located within public right-of-ways. All field personnel will wear high-visibility vests when working in high-traffic areas. Traffic cones will also be used to section off work areas to provide protection to both site personnel and the public. Hard hats, hearing protection, and steel-toed safety boots will also be required during drilling activities. Traffic control requirements have been summarized and are included as Appendix 4. The State of New York Manual of Uniform Traffic Control Devices is included as an attachment to Appendix 4.

3.0 PERSONNEL SAFETY

Personnel involved in field operations must often make complex decisions regarding safety. To make these decisions correctly requires more than elementary knowledge. For example, selecting the most effective PPE requires not only expertise in the technical areas of respirators, protective clothing, air monitoring, physical stress, etc., but also experience and professional judgment. Only competent, qualified personnel having the technical judgment to evaluate a particular situation and determine the appropriate safety requirements will perform field investigations at the site. These individuals, through a combination of professional education, on-the-job experience, specialized training, and continual study, have the expertise to make sound decisions.

3.1 Training and Medical Surveillance

All personnel involved in field work will be trained to carry out their designated field operations. Training will be provided in the use of all equipment, including respiratory protection apparatus and protective clothing; safety practices and procedures; general safety requirements; and hazard recognition and evaluation. Each individual involved with the field work must provide documentation of training and medical surveillance, as per 29 CFR 1910.120. Pursuant to 29 CFR 1910.120 et seq., all H2M personnel who are involved in field operations potentially exposing them to hazardous substances and/or situations receive initial 40-hour training and three-day on-the-job training. These personnel also receive 8-hour annual refresher training. H2M's 40-hour and 8-hour training sessions are conducted off-premises by an experienced professional. The on-site Health and Safety officer as well as supervisory and management personnel have received an additional eight hours of supervisory training in the

enforcement of the health and safety program. This training is typically conducted by qualified H2M supervisory-trained personnel.

H2M's medical surveillance program consists of baseline medical examinations and testing conducted immediately following hire, immediately prior to an individual leaving the firm, and annually in accordance with the OSHA standard. The medical program is conducted by a licensed physician knowledgeable in internal and occupational medicine who provides a report of fitness to the individual as well as H2M. The testing and examination includes but is not limited to blood pressure, spirometry, blood and urine testing for heavy metals and lyme disease, electrocardiogram, a chest X-ray, and a general physical examination.

A copy of the employee training and medical surveillance documentation must be maintained at the job site for the duration of the project. In addition, each individual must sign for, and be provided with, a copy of this Health and Safety Plan, indicating they have read and understood its contents. The Health and Safety Plan acknowledgment form is included in Appendix 1.

3.2 Health and Safety Manager

The Health and Safety Manager shall be responsible for overall implementation and coordination of the Health and Safety Program for field personnel at the site. Responsibilities include providing adequate staffing, materials, equipment, and time needed to safely accomplish the tasks under the site investigation. The Health and Safety Manager is also responsible for taking appropriate corrective actions when unsafe acts or practices arise. The Health and Safety Manager for the investigation project is Gary J. Miller, P.E. of H2M.

3.3 Site Health and Safety Officer

A designated individual(s) will perform the function of the project Site Health and Safety Officer (SHSO). Vincent Amendola, P.E. will serve as the Site Health and Safety Officer during the site work. At all times the Site Health and Safety Officer will report directly to the Health and Safety Manager. As a minimum, the Site Health and Safety Officer will be responsible for the following:

1. Assuring that all personnel protective equipment is available and properly utilized by all field personnel at the site.
2. Assuring that all personnel are familiar with standard operating safety procedures and additional instructions contained in the Health and Safety Plan.

3. Assuring that all personnel are aware of the hazards associated with the field operations.
4. Conducting and documenting daily site safety briefings for field personnel.
5. Inspecting and documenting the site for hazards before field operations.
6. Conducting daily work area inspections to determine the effectiveness of the site HASP and identify and correct unsafe conditions in the responsible work area. Daily inspections and corrective actions taken shall be documented on daily inspection forms. A copy of the Daily Inspection Form is included in Appendix 5.
7. Determining personal protection levels including clothing and equipment for personnel and periodic inspection of protective clothing and equipment.
8. Monitoring of site conditions prior to initiation of field activities, and at various intervals during on-going operations as deemed necessary for any changes in site hazard conditions. (Monitoring parameters include, but are not limited to, volatile organic contaminant levels in the atmosphere, chemical hazard information, and weather conditions.)
9. Executing decontamination procedures.
10. Monitoring the work parties for signs of stress such as cold exposure, heat stress, or fatigue.
11. Prepare reports pertaining to incidents resulting in physical injuries or exposure to hazardous materials.

Vincent Amendola, P.E. may designate another qualified H2M employee as Site Health and Safety Officer. All designees will be familiar with all aspects of the HASP and their responsibilities. At all times the Site Health and Safety Officer shall report directly to the Health and Safety Manager.

4.0 LEVELS OF PROTECTION

Anyone entering the investigation site must be protected against potential hazards. The purpose of the personal protection clothing and equipment is to minimize exposure to hazards while working on site. Careful selection and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing of all personnel.

The appropriate level of protection is determined prior to the initial entry on site based on available information and preliminary monitoring of the site. Subsequent information may warrant changes in the original level selected. Appropriate equipment to protect personnel

against exposure to known or anticipated chemical hazards has been divided into four categories (i.e., Levels A, B, C and D) according to the degree of protection afforded.

The following subsections provide a general overview of the various levels of personal protection and their generic requirements associated with each (Level A, B, C and D), that are available for potential use during hazardous waste operations. Determination of the site specific levels of protection, and the rationale for selection is described in Section 6.0 of this Plan.

4.1 Level A Protection

The highest degree of protection is used in a Level A situation. It should be worn when the highest available level of respiratory, skin and eye protection is needed. This level of protection is placed in effect when there is no historic information about the site and it is assumed that the worst possible conditions exist.

4.1.1 Personal Protective Equipment

a. Pressure demand, self-contained breathing apparatus-, approved by the Occupational Safety and Health Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH).

b. Fully encapsulating chemical-resistant suit.

c. Coveralls*.

d. Long cotton underwear*.

e. Gloves (outer), chemical-resistant.

f. Gloves (inner), chemical-resistant.

g. Boots, chemical-resistant, steel toe and shank. (Depending on suit construction, worn over or under suit boot.)

h. Hard hat (under suit), as required based on potential for head injuries.

i. Disposable protective suit, gloves and boots* (worn over fully-encapsulating suit).

j. Two-way radio communications (intrinsically safe).

* Optional

4.1.2 Criteria for Selection

Meeting any of the criteria listed below warrants use of Level A protection:

a. The chemical substance(s) has been identified and requires the highest level of protection for skin, eyes and the respiratory system based on:

(1) Measured (or potential for) high concentrations-of atmospheric vapors, gases, or particulates; or

(2) Site operations and work functions involving high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates.

b. Extremely hazardous substances are known or suspected to be present and skin contact is possible.

c. The potential exists for contact with substances that destroy skin.

d. Operations must be conducted in confined, poorly ventilated areas until the absence of hazards requiring Level A protection is demonstrated.

e. An oxygen deficient atmosphere where the oxygen level is less than 20.9 percent (%) by volume as measured with an oxygen meter. This condition, existing alone, could result in a down grade to EPA Level B PPE.

f. Total atmospheric readings on photoionization detector indicate readings above 500 parts per million (ppm) of calibration gas equivalents (cge) of unidentified substances.

4.1.3 Limiting Criteria

a. Fully encapsulating suit material must be compatible with the substances involved.

4.1.4 Minimum Decontamination Procedure

Station 1: Segregated equipment drop.

Station 2: Outer garment, boots and gloves wash and rinse.

Station 3: Outer boot and glove removal.

Station 4: Tank change.

Station 5: Boots, gloves and outer garment removal.

Station 6: SCBA removal.

Station 7: Field wash.

4.2 Level B Protection

Level B protection will be used by all personnel if the conditions outlined in Section 4.2.2 are encountered.

4.2.1 Personal Protective Equipment

a. Pressure-demand, self-contained breathing apparatus or cascade supplied air system (OSHA/NIOSH approved).

b. Chemical-resistant clothing (coveralls and long-sleeved jacket; coveralls, hooded, one or two-piece chemical-splash suit; disposable chemical-resistant coveralls).

c. Coveralls.*

d. Gloves (outer), chemical-resistant.

e. Gloves (inner), chemical-resistant.

f. Boots, chemical-resistant, steel toe and shank.

g. Boots (outer), chemical resistant (disposable*).

h. Hard hat must be worn in the vicinity of all heavy equipment and during situations or activities that may pose a potential for head injuries. Face shields must be worn where there is a splash hazard.

i. Two-way radio communications (intrinsically safe).

* Optional

4.2.2 Criteria for Selection

Meeting any one of these criteria warrants use of Level B protection:

a. The type(s) and atmospheric concentration(s) of toxic substances have been identified and require the highest level of respiratory protection, but a lower level of skin and eye protection than is required with Level A. These would be atmospheres:

(1) With concentrations immediately dangerous-to life and health (IDLH); or

(2) Exceeding limits of protection afforded by a full-face, air-purifying mask; or

(3) Containing substances for which air-purifying canisters do not exist or have low removal efficiency; and/or

(4) Containing substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard.

b. The atmosphere contains less than 20.9 percent oxygen.

c. Site operations make it highly unlikely that the small, unprotected area of the head or neck will be contacted by splashes of extremely hazardous substances.

d. Total atmospheric concentrations in the breathing zone of unidentified vapors or gases range from 50 ppm to 500 ppm (calibration gas equivalence units) on monitoring instruments, and vapors are not suspected of containing high levels of chemicals toxic to skin.

4.2.3 Limiting Criteria

a. Use only when the vapor or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through skin contact.

b. Use only when it is highly unlikely that the work being done will generate high concentrations of vapors, gases, or particulates or splashes of material that will affect exposed skin.

4.2.4 Minimum Decontamination Procedures

Station 1: Equipment drop.

Station 2: Outer garment, boots and gloves wash and rinse.

Station 3: Outer boot and glove removal.

Station 4: Tank change.

Station 5: Boot, gloves and outer glove removal.

Station 6: SCBA removal.

Station 7: Field wash.

4.3 Level C Protection

Level C protection will be used by all personnel if the conditions outline in Section 4.3.2 are encountered.

4.3.1 Personal Protective Equipment

a. Full-face, air purifying, canister-equipped respirator (Mine Safety and Health Administration (MSHA) and NIOSH approved).

b. Chemical-resistant clothing (coveralls; hooded, two-piece chemical splash suits; chemical-resistant hood and apron; disposable chemical-resistant coveralls).

c. Coveralls.*

d. Gloves, chemical-resistant.

e. Boots, steel toe and shank.

f. Boots cover (outer), chemical-resistant (disposable*).

g. Hard hat must be worn in the vicinity of all drilling equipment and during situations or activities that may pose a potential for head injuries. Face shields must be worn where there is a splash hazard.

h. Escape mask, as may be required based on site hazards.

i. High-visibility vests**

*Optional

**Vests must be worn when working in high-traffic areas.

4.3.2 Criteria for Selection

Meeting all of these criteria permits use of Level C Protection:

a. Measured air concentrations of identified substances will be reduced by the respirator to, at or below the substance's exposure limit, and the concentration is below the assigned protection factor (APF) of the respirator.

b. Atmospheric contaminant concentrations do not exceed IDLH levels.

c. Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.

d. Job functions have been determined not to require self-contained breathing apparatus.

e. Total VOC readings register between 5 ppm cge and 50 ppm cge above background on instruments. If TVOC levels are greater than 1/2 PEL of the primary contaminants of concern (Section 6.0) respiratory protection shall be required (Level C, B, or A).

f. Air will be monitored periodically.

g. Cartridges are available and are approved by NIOSH and MSHA for the specific chemical(s) encountered.

4.3.3 Limiting Criteria

a. Atmospheric concentration of chemicals must not exceed IDLH levels.

b. The atmosphere must contain at least 20.9 percent oxygen.

c. Must have sufficient information available regarding specific compounds, and their concentrations, likely to be encountered.

d. The contaminant concentrations as measured using a PID do not exceed the assigned protection factor (APF) of the respirator.

4.3.4 Minimum Decontamination Procedures

Station 1: Equipment drop.

Station 2: Outer boot and glove removal.

Station 3: Canister or mask change.

Station 4: Boots, gloves and outer garment removal.

Station 5: Face piece removal.

Station 6: Field wash.

4.4 Level D Protection

Level C protection will be used by all personnel if the conditions outline in Section 4.4.2 are encountered.

4.4.1 Personal Protective Equipment

a. General work clothes or coveralls.

b. Gloves.

c. Boots/shoes, leather or chemical-resistant, steel toe and shank.

d. Boots (outer), chemical/resistant (disposable)*.

e. Safety glasses or chemical splash goggles when there is a splash hazard.*.

f. Hard hat must be worn in the vicinity of all drilling equipment and during situations or activities that may pose a potential for head injuries. Face shields must be worn when there is a splash hazard.

g. High-visibility vests**

* Optional

** Vests must be worn when working in high-traffic areas.

4.4.2 Criteria for Selection

Meeting all of these criteria allows the use of Level D protection:

a. No hazardous air pollutants have been measured.

b. Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

c. Extensive information on suspected hazards/risks are known.

4.4.3 Limiting Criteria

a. The atmosphere must contain at least 20.9 percent oxygen.

b. VOC concentrations in the breathing zone are below established concentration levels (contaminant and instrument specific criteria).

4.4.4 Minimum Decontamination Procedure

Station 1: Equipment drop.

Station 2: Hand and face wash.

4.5 Duration of Work Period

The anticipated duration of the work period will be established prior to daily activities. The work will only be performed during daylight hours. Other factors that may affect the length of time personnel may work include:

a. Air supply consumption (however SCBA assisted work - Level A and Level B is not anticipated);

b. Suit/ensemble, air purifying chemical cartridge, permeation and penetration by chemical contaminants; and

c. Ambient temperature and weather conditions.

d. Contractual requirements.

4.5.1 Air Supply Consumption

The duration of the air supply must be considered before any SCBA-assisted work activity commences (however, Level A and B assisted work is not anticipated). Although the anticipated operating time of an SCBA is clearly indicated on the breathing apparatus the following variables should be considered and work actions and operating time adjusted accordingly:

Work Rate:	The actual in-use duration of SCBA's may be reduced by one-third to one-half during strenuous work, e.g. drum handling, major lifting or any task requiring repetitive speed of motion.
Fitness:	Well conditioned individuals generally utilize oxygen more efficiently and can extract more oxygen from a given volume of air than unfit individuals, thereby slightly increasing the SCBA operating time.
Body Size:	Larger individuals generally consume air at a higher rate than smaller individuals, thereby decreasing the SCBA operating time.
Breathing Patterns:	Quick, shallow or irregular breaths consume air more rapidly than deep, regular spaced breaths. Heat induced anxiety and lack of acclimatization may induce hyperventilation, resulting in decreased SCBA operating times.

It is not anticipated that site conditions to warrant use of SCBA's will be encountered during this field program.

4.5.2 Suit/Ensemble, Air Purifying Chemical Cartridge, Permeation and Penetration

The possibility of chemical permeation or penetration of chemical protective clothing (CPC) ensembles and air purifying respirators (APR) chemical cartridges during the work mission is always a matter of concern and may limit mission duration. It should be remembered that no single clothing material is an effective barrier to all chemicals or all combinations of chemicals, and no material is an effective barrier to prolonged chemical exposure. Manufacturer recommendations should be followed.

In addition, when performing work in Level C respiratory protection, care shall be taken to inspect the respirators prior to usage. The chemical cartridges should be changed, at a minimum, on a daily basis, or when the cartridge becomes dirty, damaged or when breakthrough is suspected.

4.5.3 Ambient Temperature

The ambient temperature has a major influence on work period duration as it effects both the worker and the protective integrity of ensembles (see Section 11.4.1) as well as the operation of the monitoring equipment. When ambient temperatures rise or falls to a level which may hinder personnel performance or becomes a threat to personal safety, consideration should be given to stop work and recommence work when temperatures or conditions are less severe.

5.0 AMBIENT AIR MONITORING

Based on site-specific air monitoring data, elevated levels of volatile organic compounds (VOCs) in the atmosphere are not anticipated during site activities. The presence of VOCs will be evaluated using a photoionization detector (PID). Air monitoring shall be required during all intrusive investigation (monitoring well installation or soil sampling) or remedial activities being conducted onsite. Ambient air quality monitoring will be performed continuously in the Work/Exclusion Zone and the Contamination Reduction Zone (see Section 7.0). PID measurements shall be recorded hourly if levels are within 5 ppm of background levels. If readings exceed 5 ppm above background in the breathing zone, activities will be halted and monitoring will continue until readings fall within 5 ppm of the background concentration. If concentrations remain greater than 5 ppm above background in the breathing zone, an upgrade in respiratory protection will be warranted. For PID readings above 5 ppm of background levels, readings shall be recorded in 15 minute intervals or whenever a new high PID reading is

encountered. In addition, periodic air monitoring will be conducted in the Support Zone. Readings taken with a PID will be recorded every hour.

The PID used for ambient air monitoring shall be calibrated at the start and finish of each workday. Calibration will be performed in accordance with manufacturer's requirements.

If necessary, the level of personal protection required will be upgraded based upon ambient air monitoring results. PID measurements shall be recorded every hour, at a minimum, if VOC levels are within 5 ppm of background levels. If PID levels deviate from within 5 ppm of background, the readings shall be recorded every 15 minutes or whenever a new PID reading is encountered.

6.0 DETERMINATION OF THE SITE-SPECIAL LEVEL OF HAZARD AND LEVEL OF PROTECTION

Categories of personnel protection required depend on the degree of hazard and probability of exposure by a route of entry into the body. For this site, the most probable potential route of entry is via inhalation of VOCs, and potentially by dermal adsorbtion of contaminates released from field activities.

Based upon site data generated to date, it is anticipated that Level D will be required for site activities. The determination of Level D protection is based on the fact that field work will be performed in open, well-ventilated areas and that the potential for accidents and injuries due to obstructions caused by and/or magnified by the use of level A, B, or C protection (i.e., slip/trip hazards) is greater than the potential for problems associated with potential exposure from contaminants using level D protection. Should conditions change, re-evaluation of personnel protection will be conducted.

The following PPE are required for Level D.

a. General work clothes or coveralls.

b. Gloves. Disposable chemical resistant gloves (neoprene, nitrile, etc.) are required during monitoring well and soil sampling activities, otherwise, during other activities such as drilling and well development, leather gloves may be worn due to no chemical hazards.

c. Boots/shoes, leather or chemical-resistant, steel toe and shank.

d. Boots (outer), chemical/resistant (disposable) are optional; and may be worn if site conditions are wet or muddy.

e. Safety glasses or chemical splash goggles are required when there is a splash hazard or hazard from flying debris.

f. Hard hat must be worn in the vicinity of all drilling equipment and during situations or activities that may pose a potential for head injuries (e.g., suspended loads). Face shields must be worn when there is a splash hazard.

g. High-visibility vests must be worn when working in high traffic areas.

A PID will be used to monitor air quality throughout the course of field work. If readings recorded within the breathing zone during site activity are sustained at levels between 5 ppm to 50 ppm cge above background concentrations, activities will be halted and the Work/Exclusion Zone will be evacuated. Monitoring of the Work/Exclusion Zone will continue until readings fall within 5 ppm of the background concentration. If concentrations are sustained at 5 ppm above background in the breathing zone, consideration will be given to upgrading the level of protection to Level C. An upgrade to the appropriate level of protection for field personnel will be required before re-entering the Work/Exclusion Zone. The Site Health and Safety Officer will be responsible for requesting an upgrade in the level of personnel protection. The final decision will be made by the Health and Safety Manager in conjunction with the Project Manager and the appropriate regulatory authorities. Use of 5 ppm to 50 ppm as the criteria for respiratory protection upgrade to Level C is appropriate for this site since 50 ppm is equal to or lower than 1/2 the PEL for cis-1,2-dichloroethene, the primary constituent of concern for this site. The PEL for cis-1,2-dichloroethene (based on time-weighted average) is 200 ppm, and 1/2 of its PEL is 100 ppm.

In addition to potential chemical hazards, there also exists potentially greater physical hazards associated with the activities at the facility. Due to the nature of the facility operations, heavy equipment including drilling rigs and trucks will be on the job site throughout the well installation and development phase of the field project. Therefore, all personnel should always be aware of vehicular traffic while working at the facility. Further, hard hats must be worn at all times around heavy equipment and/or in the vicinity of suspended loads. All work must be performed in strict accordance with OSHA regulations.

In addition, several of the off-site wells are or will be located in public right-of-ways. Therefore, the work associated with installing, hydraulic testing and sampling of these off-site wells will likely be in high vehicular traffic areas. All field personnel will wear high-visibility vests when working in high-traffic areas. Additionally, traffic cones or other barricades will be used to provide for safe work areas for the protection of both field workers and the public. In

addition, local requirements for traffic control will also be adhered to (e.g., obtaining appropriate permits, and provisions for a flagman), as warranted.

Prior to initiating field activities, local police and fire departments will be notified of the schedule and location of the upcoming field activities.

7.0 DESIGNATED WORK ZONES

Work zones will be determined prior to commencement of a specific field activity. An area large enough to encompass the activity will be demarcated as the Work/Exclusion Zone. If necessary, the Work/Exclusion Zone will be demarcated with temporary barriers. Only qualified field personnel with the proper PPE and training will be allowed into the designated zone. Within the Work/Exclusion Zone, ambient air quality will be periodically monitored using a PID to determine any changes from background air quality. If subsequent measurements suggest a significant change in air quality, the work area will be immediately evacuated. An upgrade to the appropriate level of PPE for field personnel will be required before re-entering the Work/Exclusion Zone.

8.0 DECONTAMINATION STATIONS

Decontamination stations will be located within the Contaminant Reduction Zone to be used for the cleaning of all heavy equipment, vehicles, tools and supplies required for the completion of field operations. Personnel decontamination procedures for the appropriate levels of protection are described in Section 4.0.

9.0 SITE ACCESS CONTROL

Appropriate traffic controls and barricades will used in areas of vehicular and pedestrian traffic. Local requirements for traffic control will be adhered to (e.g., obtaining appropriate permits, and provisions for a flagman), as may be warranted.

10.0 PERSONAL HYGIENE

The following personal hygiene rules must be followed while performing work at the site:

1. Eating, drinking, chewing gum or tobacco, smoking, or any other practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the work area.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activities.

3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

4. No excessive facial hair (i.e., beards), which interferes with a satisfactory fit of the mask-to-face seal, is allowed on personnel required who wear respiratory protective equipment.

5. Contact with contaminated or suspected contaminated surfaces will be avoided. Whenever possible, walking through puddles, mud and discolored surfaces; kneeling on ground; leaning, sitting, or placing equipment on drums, containers, vehicles, or the ground will be avoided.

6. Medicine and alcohol can increase the effects from exposure to toxic chemicals. Prescribed drugs will not be taken by personnel on site where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverage intake will be prohibited during all on-site field operations.

11.0 CONTINGENCY PLAN

Section 11.0 shall serve as the investigation Contingency Plan. It has been developed to identify precautionary measures, possible emergency conditions, and emergency procedures. The plan shall be implemented by the Site Health and Safety Officer.

11.1 Emergency Medical Care and Treatment

This section addresses emergency medical care and treatment of field personnel, resulting from possible exposures to toxic substances and injuries due to accidents. The following items will be included in emergency care provisions (see Appendix 2):

a. Name, address and telephone number of the nearest medical treatment facility will be conspicuously posted. Directions for locating the facility, plus the travel time, will be readily available.

b. Names and telephone numbers of ambulance service, police and fire departments, and procedures for obtaining these services will be conspicuously posted.

c. Procedure for prompt notification of the H2M Site Health and Safety Officer.

In addition, the following emergency equipment will be available at the project site at all times when any field activities are being performed.

1. Emergency eyewash fountains and first aid equipment will be readily available on site and located in an area known to all personnel. Eyewash stations shall be ANSI approved portable emergency eye wash station.

2. Readily available dry-chemical fire extinguisher.

11.2 Off-Site Emergency Medical Care

The Site Health and Safety Officer shall pre-arrange for access to emergency medical care services at a convenient and readily accessible medical facility and establish emergency routes. The Site Health and Safety Officer shall establish emergency communications with emergency response services.

11.3 Personnel Accidents

Bodily injuries which occur as a result of an accident during the operation at the site will be handled in the following manner:

a. First aid equipment will be available on site for minor injuries. If the injuries are not considered minor, proceed to the next step.

b. Manhasset- Lakeville First Aid Rescue Squad Unit, the local first aid squad rescue unit, a paramedic unit, the local hospital and the Site Health and Safety Officer shall be notified of the nature of the emergency.

c. The injured employee shall be transported by the local emergency vehicle to the local hospital.

d. LMC shall be notified of the nature of the emergency.

e. A written report shall be prepared by the Site Health and Safety Officer detailing the events and actions taken during the emergency within 24 hours of the accident. A copy of this report will be provided to LMC.

f. See Appendix 2 for a list of emergency contacts in the Great Neck, New York area.

11.4 Personnel Exposure

In the event that any person is splashed or otherwise excessively contaminated by chemicals, the following procedure will be undertaken:

a. Disposable clothing contaminated with observable amounts of chemical residue is to be removed and replaced immediately.

b. In the event of direct skin contact in Level D, the affected area is to be washed immediately with soap and water, or other solutions as directed by medical personnel.

c. The Site Health and Safety Officer or other individuals who hold a current first aid certificate will determine the immediate course of action to be undertaken. This may involve using the first aid kit and/or eyewash stations.

11.4.1 Weather

Adverse weather conditions are an important consideration in planning and conducting site operations. Hot or cold weather can cause physical discomfort, loss of efficiency, and personal injury. Of particular importance is heat stress resulting when protective clothing decreases natural body ventilation. One or more of the following will help reduce heat stress:

a. Provide plenty of liquids. To replace body fluids (water and electrolytes) lost because of sweating, use a 0.1 percent salt water solution, more heavily salted foods, or commercial mixes. The commercial mixes may be preferable for those employees on a low sodium diet.

b. Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. Long cotton underwear help absorb moisture and protect the skin from direct contact with heat absorbing protective clothing.

c. Install mobile showers and/or hose down facilities to reduce body temperature and cool protective clothing.

d. In extremely hot weather, conduct operations in the early morning or evening.

e. Ensure that adequate shelter is available to protect personnel against heat, cold, rain, snow, etc.

f. In hot weather, rotate shifts of workers wearing impervious clothing.

11.4.2 Heat Stress

If field operations are conducted in the warm summer months, heat related fatigue will be closely monitored. Monitoring of personnel wearing impervious clothing or wearing respiratory protection shall commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceeds 85 degrees Fahrenheit, workers should be monitored for heat stress after every work period. The following screening mechanism will be used to monitor for heat stress:

Heart rate (HR) will be periodically measured by the radial pulse for 30 seconds during a resting period. The HR should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 33 percent. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

Heat-related illnesses range from heat fatigue to heat stroke, the most serious. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately. Heat-related problems can be categorized into:

Heat Rash:	Caused by continuous exposure to hot and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat as well as being a nuisance.
Heat Cramps	Caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.
Heat Exhaustion	Caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.
Heat Stroke:	The most severe form of heat stress. The body must be cooled immediately to prevent severe injury and/or death. Signs and symptoms are: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

Some of the symptoms of heat stress are: hot dry skin, fever, nausea, cramps, red or spotted skin, confusion, lightheadedness, delirium, rapid pulse, convulsions and unconsciousness. For workers suffering from heat stress, the following actions should be taken:

1. Remove the victim to a cool area
2. Loosen clothing
3. Thoroughly soak the victim in cool water or apply cold compresses
4. Call for medical assistance.

11.4.3 Cold Stress

If field operations are conducted in the cold winter months, cold stress will be monitored. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit air with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

Frost Nip or Incipient Frostbite.	Characterized by suddenly blanching or whitening of skin.
Superficial Frostbite.	Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
Deep Frostbite.	Tissues are cold, pale and solid; extremely serious injury.
Hypothermia.	Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperatures. Its symptoms are usually exhibited in five stages: (1) shivering; (2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body temperature to less than 95 degrees Fahrenheit; (3) unconsciousness, glassy stare, slow pulse and slow respiratory rate; (4) freezing of the extremities; and finally, (5) death.

11.5 Fire

The telephone number to the local fire department will be posted along with other emergency numbers conspicuously on-site at all times. (see Appendix 2). In the event of a fire occurring at the site, the following actions will be undertaken by the Site Health and Safety Officer:

a. Evacuate all unnecessary personnel from the area of the fire and site, if necessary.

b. Contact the local fire and police departments informing them of the fire and any injuries if they have occurred.

c. Contact the local hospital of the possibility of fire victims.

d. Contact the Site Health and Safety Officer, Health and Safety Manager, and the H2M Project Manager.

11.6 Personnel Protective Equipment Failure

If any site worker experiences a failure or alteration of PPE that affects the protection factor, that person and his/her buddy shall immediately leave the Work/Exclusion Zone. Re-

entry shall not be permitted until the equipment has been repaired or replaced to the satisfaction of the Site Health and Safety Officer.

11.7 Spill Prevention and Containment

Personnel onsite shall be adequately trained in the operation and maintenance of equipment used onsite. Equipment shall be inspected on a daily basis to minimize the potential for spillage of equipment related fluids. Personnel shall also be adequately trained to recognize and respond to a spill situation. Absorbent materials will be maintained on-site for potential spill containment and mitigation.

12.0 SUMMARY

The Health and Safety Plan establishes practices and procedures to be followed so that the welfare and safety of workers and the public are protected. It is important that personal equipment and safety requirements be appropriate to protect against the potential or known hazards at a site. Protective equipment will be based upon the type(s), concentration(s), and routes of personal exposure from substances at the site, as well as the potential for hazards due to heavy equipment use, vision impairment, weather, etc. All site operation planning incorporates an analysis of the hazards involved and procedures for preventing or minimizing the risk to personnel. The following summarizes the rules which must be obeyed:

a. The Health and Safety Plan will be made available to all personnel doing field work on site. All personnel must sign this plan, indicating they have read and understood its terms.

b. All personnel will be familiar with standard operating safety procedures and additional instructions contained in the Health and Safety Plan.

c. All personnel going on site will be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures and communications.

d. Any required respiratory protective devices and protective clothing will be worn by all personnel going into work areas.

FIGURES

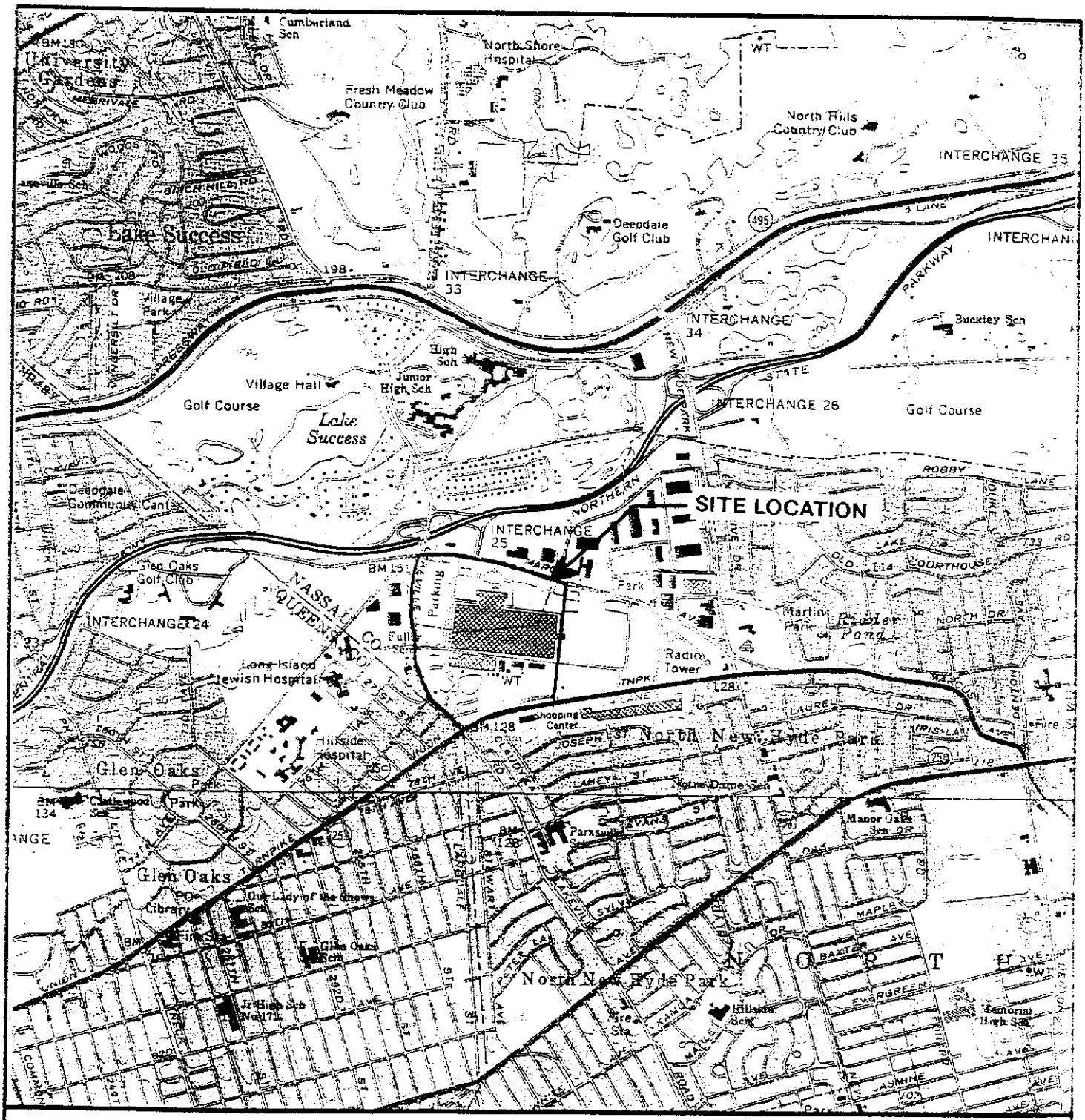


FIGURE 2-1

SITE LOCATION MAP

SCALE: 1" = 2000'

LOCKHEED MARTIN
GREAT NECK, NEW YORK

SOURCE: U.S.G.S. SEACLIFF QUADRANGLE 1975

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

APPENDIX 1

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT FORM

H2M GROUP

I acknowledge that I have read and understand the provisions of this Health and Safety Plan, and that I will, to the best of my ability, abide by the terms of this plan:

Name	Date	Name	Date

APPENDIX 2

EMERGENCY RESPONSE INFORMATION

H2M GROUP

EMERGENCY TELEPHONE NUMBERS

Emergency Rescue Services (Fire, Ambulance)
Manhasset- Lakeville First Aid Rescue Squad Unit ..... (516) 466-4411

Village of Lake Success Police (emergency) ..... (516) 482-4600

Fire Department (non-emergency) ..... (516) 466-4412

NYSDEC Emergency Spill Response: ..... (516) 444-0320

Long Island Jewish Medical Center (non-emergency) ..... (718) 470-7000

Lockheed Martin Project Coordinator: Robert Gilbert ..... (818) 847-0210

H2M Site Safety Officer: Vincent Amendola ..... (973) 942-0700
Pager (800) 759-8888 Pin # 226-1633

Health & Safety Manager: Gary Miller ..... (516) 756 - 8000, ext. 620

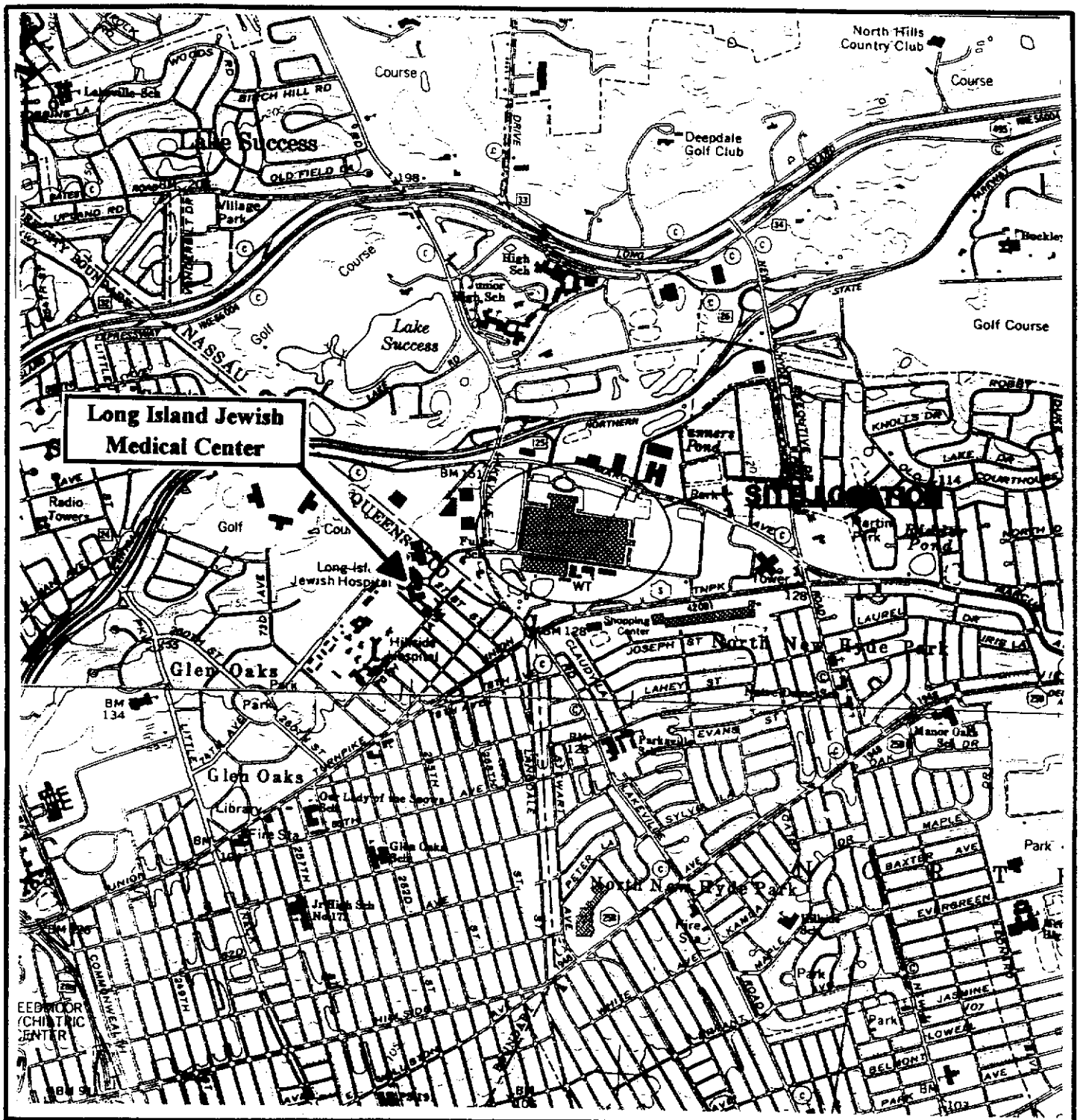
H2M Project Manager: Richard J. Baldwin ..... (516) 756 - 8000, ext. 611

HOSPITAL LOCATION:

The Long Island Jewish Medical Center is located on Lakeville Road just opposite to the Lockheed Martin employee parking lot entrance and Gate 6. The hospital location map is attached. Travel time to the hospital is estimated at five minutes.

In the event of an emergency condition (i.e. fire, injured personnel) the Lockheed Martin Great Neck Security must be immediately notified of the conditions and location. The security department will arrange for outside services (medical or fire) notification and response, if necessary.

Upon obtaining medical, fire or other emergency services LMC will be immediately notified and a written report shall be submitted to LMC within 24 hours.



SOURCE: USGS QUADRANGLES
SEA CLIFF & LYNBROOK, N.Y.

HOSPITAL LOCATION MAP

APPENDIX 3

LOCKHEED MARTIN CONTRACTOR'S SAFETY HANDBOOK

ATTACHMENT "D"

CONTRACTOR'S SAFETY HANDBOOK

GENERAL:

The Contractor agrees to comply with all rules and procedures contained in this document, known as the Contractors Safety Handbook, unless Lockheed Martin specifically agrees, in writing, to a modification or exemption. In addition, to the Contractors Safety Handbook provisions, the Contractor, Contractor's officers, employees and agents, subcontractors at any tier and subcontractor employees at any tier shall:

1) Take all prudent and proper environmental, health and safety precautions to protect Lockheed Martin employees, all other workers, and the public;

2) Comply with all applicable Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority (including but not limited to *Title 29, Code of Federal Regulations Parts 1910* and *1926*);

3) Comply with all applicable Federal, State, municipal, local, and any other applicable air pollution statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority; and

4) Comply with all Federal, State, municipal, local and any other applicable hazardous materials, hazardous waste, and non-hazardous waste statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority (including but not limited to *Title 40, Code of Federal Regulations*).

Contractor also agrees:

1) To instruct, prior to commencement of operations, all agents and employees about relevant governmental laws and regulations, specific hazards expected to be encountered, and proper safety precautions to be observed;

2) To submit for Lockheed Martin review a copy of your company's written comprehensive Health and Safety/Accident Prevention Program.

3) To submit to Lockheed Martin a completed Contractor's Environmental, Safety, and Health Checklist (Attachment "F") before commencement of operations;

4) If contractor is to perform hazardous waste-type operations, submit for Lockheed Martin review a copy of your **site specific safety and health plan.** This plan shall meet the requirements of *Title 29, Code of Federal Regulations, Section 1910.120 - Hazardous Waste Operations and Emergency Response*;

5) To ensure Contractor's on-site foreman or supervisor has received a copy of the Contractors Safety Handbook, maintains a copy at the site, and that employees, Contractor's officers, agents, subcontractors at any tier and subcontractor employees are supplied a copy of the Contractor's Safety Handbook for their implementation;

6) That Lockheed Martin may immediately stop Contractor's work if Contractor violates any applicable Federal, State, municipal, or local, or any other rules, regulations, and requirements, Contractors Safety Handbook provisions, or other contract terms and conditions regarding environmental safety and health;

7) That Lockheed Martin may conduct periodic inspections of Contractor operations and document violations. Documented violations will be considered in evaluation of Contractor's performance. The Lockheed Martin inspection program in no way relieves the Contractor of the obligation to maintain its own safety program and conduct safety inspections as required by Federal, State, municipal, local and any other rules, regulations or requirements;

8) Maintain copies all pertinent health & safety records at the job site. These records will be made available to Lockheed Martin and will be subject to periodic audits by Lockheed Martin. Pertinent records include, but is not limited to, the following: personnel training documentation, medical surveillance, accident/injury reporting, daily site inspections, daily safety briefings, MSDS's, air monitoring data, etc.; and

RULES AND PROCEDURES

I. DEFINITIONS:

A. Contractor: the party entering into a construction, maintenance or service contract with Lockheed Martin, also that party's agent, or other person authorized to represent the Contractor, such as the Contractor's superintendent or foreman. For the purposes of this Contractor's Safety Handbook, "Contractor" shall also include Contractor's subcontractors at any tier.

B. Contractors Handbook: Contractors Safety Handbook.

C. EPA: the Environmental Protection Agency.

D. Fed/OSHA: the Federal Occupational Safety and Health Administration.

E. Hazard Communication Program: a program meeting the requirements of *Title 29, Code of Federal Regulations, Section 1910.1200 - Hazard Communication.*

F. Lockheed Martin: Lockheed Martin Corporation - Burbank Program Office.

G. Lockheed Martin Project Coordinator: the Lockheed Martin Project Coordinator, the individual that has been designated for each project.

H. Lockheed Martin Environmental, Safety and Health (ESH) Compliance: the Lockheed Martin Corporation - Burbank Program Office, Regulatory Affairs Department.

I. Lockheed Martin Contract Representative: the Lockheed Martin Corporation - Burbank Program Office contract representative for the project.

J. Lockheed Martin Safety and Health Coordinator: the Lockheed Martin Corporation - Burbank Program Office Injury and Illness Prevention Program Administrator, who will also be known as and referred to as the Safety & Health (S & H) Coordinator.

K. Lockheed Martin Hazardous Waste Coordinator: the Lockheed Martin Corporation - Burbank Program Office hazardous waste technical contact/coordinator, who will also be known as and referred to as the Environmental Coordinator.

L. RCRA: the Federal Resource Conservation and Recovery Act and all amendments or revisions.

M. Safety Program, Accident Prevention Program, or Injury and Illness Prevention Program: a comprehensive written safety and health program which includes all applicable OSHA required written programs. Contents of the written safety program are dependent on the contractors' primary type of work.

N. UFC: the Uniform Fire Code.

II. SAFETY AND HEALTH:

Contractor shall comply with applicable provisions of Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations and requirements. Contractor shall take all precautions for the protection of the safety and health of Contractor employees and Lockheed Martin employees to prevent accidents or injury to them or to other persons on, about, or adjacent to site of work performance.

A. PROTECTIVE CLOTHING AND EQUIPMENT

1. Contractor personnel must obtain and utilize appropriate personal protective equipment for the work performed in accordance with applicable state and federal OSHA standards. This includes but is not limited to the use of eye protection, foot protection, respiratory protection, protective clothing, hearing protection and head protection.

   a. Eye Protection. Safety eyewear meeting ANSI Z87.1 shall be worn in areas designated as "Eye Protection Required" and on all jobs where a potential injury to the eyes is possible whether or not the area is posted. Special eye protection and/or face protection will be worn when applicable.

   b. Foot Protection. Affected employee(s) shall wear protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards. Safety shoes and boot which meet the ANSI Z41 Standard shall be provided when impact and/or compression hazards exists. Soft shoes, including but not limited to, tennis shoes, athletic shoes, moccasins, sandals, and open-toed or open-heeled shoes shall not be worn.

   c. Respiratory Protection. Appropriate, MSHA/NIOSH-approved respiratory protective devices must be worn when applicable state and/or federal action levels or permissible exposure levels are exceeded. Contractor must have fully implemented a respiratory protection program meeting the requirements of *Title 29, Code of Federal Regulations, Section 1910.134 / 1926.103* prior to issuing and using respiratory equipment. Contractor shall supply and maintain appropriate air monitoring and respiratory protection equipment in areas expected to pose such hazards.

   d. Protection Clothing such as suits, aprons, boots, or gloves shall be worn where there is a hazard to the body through dermal contact with chemicals, dusts, heat or other harmful agents or conditions.

   e. Hearing Protection (muffs and/or plugs) must be worn in all areas posted to indicate high noise level or where Contractor employees are exposed to noise levels in excess of the OSHA permissible exposure limit.

2. Prior to performing any welding or cutting operation outside of a welding booth, Contractor will contact the local fire department to determine if cutting and welding permits are required. Notify the Lockheed Martin Project Coordinator of any permit requirements.

3. Contractor personnel must secure all oxygen and acetylene cylinders in a manner complying with OSHA regulations. Oxygen and acetylene cylinders must be stored separately. Oxygen cylinders in storage must be separated from fuel gas cylinders a distance of 20 feet or by a noncombustible barrier 5 feet high.
Acetylene cylinders shall not be stored horizontally; laying on their side.

4. When welding, Contractor personnel shall use welding curtains and/or suitable protective devices to protect persons from indirect exposure to welding flashes.

D. LOCK OUT/LINE BREAKING (Lockout/Tagout)

1. Contractor shall not perform work on electrical circuits, machinery, or lines (or connected equipment) carrying hazardous liquids or gases under pressure until Contractor institutes appropriate protective measures. Such measures shall include ensuring that controlling switches and valves have been identified, positively locked out, and appropriately tagged to prevent personal injury to its employees or others and/or damage to equipment due to unexpected start-up of electrical or mechanical equipment. This shall be done in accordance with *29 CFR 1910.147 - The control of hazardous energy (lockout/tagout)* and/or applicable state OSHA requirements.

2. If Contractor needs to lock-out Lockheed Martin equipment, Contractor(s) shall notify the Lockheed Martin Project Coordinator. Contractor(s) shall not, under any circumstances, lock-out Lockheed Martin equipment or enter an electrical control room unescorted by a Lockheed Martin representative.

3. Upon completion of the job, Contractor is to notify the Lockheed Martin Project Coordinator so power can be resumed to the equipment after the lock-outs have been removed.

E. USE OF Lockheed Martin MATERIALS AND EQUIPMENT

1. Contractor's employees shall not use Lockheed Martin tools, equipment, materials, or personal protective equipment unless otherwise authorized by Lockheed Martin.

2. Contractor shall not start or stop any production equipment without the approval of the Lockheed Martin Project Coordinator, who will contact appropriate Lockheed Martin production personnel.

3. Contractor shall not adjust or relocate any Lockheed Martin process equipment without the approval of the Lockheed Martin Project Coordinator, who will contact appropriate Lockheed Martin production personnel.

F. DANGEROUS OPERATIONS - WARNINGS AND BARRICADES

1. Contractor shall isolate Contractor's work areas from Lockheed Martin operations, employees, and the public by using warning tape or another effective means of isolation.

2. Prior to commencing work, Contractor must inform the Lockheed Martin Project Coordinator (who will contact appropriate Lockheed Martin production or supervisory personnel) of any work posing a potential danger to Lockheed Martin personnel.

3. Contractor personnel shall erect and properly maintain, at all times, all necessary safeguards for the protection of both Contractor personnel, Lockheed Martin employees and others. This includes:

   a. If doing any overhead work, Contractor must utilize warning signs and barricades, or station someone to warn passers-by;

   b. Contractor must effectively barricade excavations, floor openings, etc., as required by OSHA regulations;

   c. Contractor must construct and maintain all scaffolds and working platforms in accordance with OSHA regulations; and

   d. If Contractor's equipment, barricades or other safeguards restrict fire lanes or fire equipment access, the Contractor shall notify the Lockheed Martin Project Coordinator, who will inform the local fire department.

G. ELECTRICAL SAFETY

1. Contractor personnel shall properly ground all electrical tools, mechanical digging or concrete breaking equipment, and all other electrical equipment while in use.

2. All electrical equipment shall be appropriately rated (under OSHA and NEC regulations) for the work done.

H. HOUSEKEEPING/CLEANUP

1. Contractor shall continuously clean-up its work area. Contractor shall maintain its area free from all tripping and slipping hazards at all times.

2. The work area must be left free from accumulation of waste and rubbish at the end of each work shift.

3. At the end of each working day and/or the conclusion of work being performed, Contractor shall restore the work area to the same degree of neatness as when work commenced.

4. Contractor shall furnish necessary equipment and/or receptacles to remove waste and rubbish from the job site unless otherwise specified by the Lockheed Martin.

I. ACCIDENT/INJURY/SPILL REPORTING

1. Contractor shall promptly report all accidents and injuries to the Lockheed Martin Project Coordinator. This shall include all near-miss incidents which did not, but could have, resulted in serious personal injury or property damage. A written report of the incident and corrective action(s) taken shall be submitted to the Lockheed Martin Project Coordinator within one (1) day. Representatives from Lockheed Martin may conduct joint investigations with contractors if deemed necessary.

2. In case of a spill or release of hazardous chemicals, Contractor shall immediately notify the Lockheed Martin Project Coordinator and if the severity of the spill warrants, the local fire department or call 9-1-1. The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

J. LOSS PREVENTION (FIRE)

1. Contractor shall familiarize Contractor's employees with the locations of fire extinguishers in their respective work areas and ensure they are prepared to use them safely if necessary. In certain field locations or within abandoned facilities where fire extinguishers may not exist in the immediate work area, contractor agrees to provide fire extinguisher(s) in close proximity to the contractor's work area.

2. In case of fire, Contractor shall turn in an alarm to the local fire department or call 9-1-1. Contractor shall then inform all Contractor and Lockheed Martin employees in the area to evacuate to a safe place and direct arriving fire response personnel to the fire. Notify the Lockheed Martin Project Coordinator as soon as reasonably possible.

3. Contractor employees shall only attempt to put out a fire when such action can be performed safely.

4. Contractor shall not use water to extinguish fires near electrical equipment. CO_2 or dry chemical extinguishers shall be used.

5. If a Contractor's employee uses a Lockheed Martin fire extinguisher, Contractor shall report it to the Lockheed Martin Project Coordinator.

6. Contractor shall report all fires extinguished by the Contractor to the Lockheed Martin Project Coordinator. The Lockheed Martin Project Coordinator will determine if the local fire department is to be notified.

7. Contractor employees shall not smoke inside buildings. Smoking outside buildings is allowed only where a potential for fire does not exist. No smoking is allowed within 50 feet of aircraft, within paint hangers or spray booths, or within 20 feet of any painting operations or fueling operations.

8. Prior to commencing hot work (burning, cutting, welding or tar pot work), Contractor shall contact the local fire department to determine hot work or burn permit requirements.

9. Contractors are to store, dispense, and use flammable and combustible liquids in accordance with OSHA regulations and the Uniform Fire Code.

10. Contractor shall proved sufficient fire extinguishers necessary for their work activities.

K. USE OF HAZARDOUS MATERIALS - HAZARD COMMUNICATION

1. Contractor personnel shall not bring any hazardous substances (as defined by OSHA) onto Lockheed Martin premises unless accompanied by a Material Safety Data Sheets (MSDS). MSDS's must be maintained at the job site.

2. Contractor shall ensure all containers of hazardous materials are labeled in compliance with state and federal OSHA regulations with the product name, appropriate hazard warnings, and the name and address of the manufacturer.

3. The Lockheed Martin Project Coordinator shall inform the Contractor(s) of the identity of hazardous chemicals to which Contractor's employees may be exposed from Lockheed Martin operations. The Lockheed Martin Project Coordinator shall provide the following information:

   a) Where to obtain information concerning any hazardous substances used in Lockheed Martin operations that the Contractor's employees may come in contact with while performing their work;

   b) Lockheed Martin shall make available to the Contractor, Material Safety Data Sheets (MSDS), and sufficient information to permit the Contractor to train its employees;

   c) Appropriate protective measure Contractor's employees may take to protect themselves from exposure to known hazards from Lockheed Martin operations; and

   d) Appropriate work practice procedures (safety rules) for the location where work is to be performed.

4. Contractor shall ensure its' employees are trained in the safe handling and use of hazardous materials in accordance with *Title 29 CFR 1910.1200* - Hazard Communication.

5. Contractor shall ensure that all applicable employees are medically qualified (as defined by OSHA) to perform the work assigned.

L. INCIDENTAL CONTACT WITH ASBESTOS

1. This section applies to all contractors who incidentally come into contact with asbestos-containing materials or suspected asbestos-containing materials; i.e., contractors who have not been specifically hired to perform abatement, maintenance, construction, repair, renovation, demolition, salvage, or any other operation in which any material containing more than 0.1% asbestos is sanded, abrasive blasted, sawed, shoveled, removed, or otherwise handled in a manner that would generate airborne asbestos fibers.

2. All Contractors shall immediately report to the Lockheed Martin Project Coordinator, or if the Lockheed Martin Coordinator is not available, directly to Lockheed Martin S&H Coordinator, any discovery/spill of suspected asbestos. Contractor(s) is to cease all operations in the immediate area of the discovery/spill. The approval of Lockheed Martin is required before resuming operations.

3. Contractor shall not disturb any pipe insulation, boiler insulation, or any other material reasonably suspected of containing asbestos until the Contractor notifies the Lockheed Martin Project Coordinator. Lockheed Martin approval is required before operations may commence.

4. Abatement of asbestos can only be performed by persons properly trained and licensed to perform such activities.

M. ASBESTOS REMOVAL CONTRACTORS

1. This section applies to Contractors performing maintenance, construction, repair, renovation, demolition, salvage, or any other operation in which any material containing more than 0.1% asbestos is sanded, abrasive blasted, sawed, shoveled, removed, or otherwise handled in a manner that would generate airborne asbestos fibers. These requirements are in addition to any requirements contained in Contractor's scope of work.

2. All Contractors working with asbestos shall comply with applicable federal and state OSHA, EPA, local air district, and other applicable Federal, State, municipal, and local statutes, regulations, rules, and ordinances; specific contract terms and conditions; and specific instructions from Lockheed Martin regarding the handling of, use of, and work involving asbestos.

3. All Contractors working with asbestos must be approved by Lockheed Martin.

4. Before commencing work, all Contractors shall supply to Lockheed Martin proof of:

   a. Asbestos abatement contractor certification by the state Contractor's License Board;

   b. Liability insurance for Contractor employees engaged in asbestos work operations;

   c. Copies of asbestos work notification letters to state OSHA;

   d. Local air district Asbestos Demolition/Renovation Notification;

   e. Adequate health insurance to cover any asbestos-related medical monitoring for contractor employees; and

   f. Proof of employee medical surveillance examinations and asbestos training as required by federal and state OSHA regulations.

5. Contractors shall minimize the creation and spread of airborne asbestos fibers by using appropriate work practices and procedures, including HEPA filter vacuums, wet methods, negative pressure, clean rooms, etc.

6. Contractors shall barricade and post asbestos work areas with warning signs complying with federal and state OSHA, local air district, and other relevant regulatory requirements.

7. Contractors shall package and label asbestos waste in accordance with federal and state OSHA and federal and state hazardous waste regulations.

8. Contractors shall properly dispose of all asbestos waste. Proper disposal includes the use of hazardous waste manifests and Lockheed Martin approved and licensed waste haulers, and disposal facilities according to federal RCRA law and applicable state hazardous waste regulations. Contractor shall contact the Lockheed Martin Project Coordinator before transporting or disposing of any hazardous waste. Lockheed Martin must review all hazardous waste manifests prior to shipment.

9. Contractors shall ensure that employee exposure air monitoring is conducted as required by federal and state OSHA regulations. All other air monitoring (i.e. clearance sampling) shall be conducted by a third-party contracted air monitoring firm not affiliated with the Contractor.

10. Contractor shall allow Lockheed Martin or its designated representative to inspect the work area.

N. HAZARDOUS WASTE OPERATIONS

1. This section applies to Contractors performing hazardous aste-type activities. This includes operations that pose a potential or reasonable possibility for employee exposure to hazardous waste/chemical contaminants during site investigations, clean-up operations, abatement, or hazardous substance removal work (remedial actions). These requirements are in addition to any requirements contained in Contractor's scope of work.

2. All Contractors performing hazardous waste-type operations shall perform all site operations in accordance with *29 CFR 1910.120 - Hazardous Waste Operations and Emergency Response.*

3. Training: Contractor employees must have training for work on hazardous waste operations, in accordance with *29 CFR 1910.120(e).* If respiratory protection devices are to be worn, contractor employees shall be medically qualified and trained in accordance with *29 CFR 1910.134.* Lockheed Martin does not provide training for contractor employees. In addition, contractor shall hold pre-entry briefings prior to initiating any site activity, and at such other times as necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed. Documentation of the above mentioned training must be maintained at the job site and be available for Lockheed Martin inspection.

4. Medical Surveillance: Contractor employees must be enrolled in a medical surveillance program prior to performing hazardous waste operations, in accordance with *29 CFR 1910.120(f).* Upon request, contractor must provide documentation of medical surveillance for project employees. Lockheed Martin does not provide medical surveillance examinations for contractor employees.

5. Site specific safety and health plan: Contractor must develop and implement a written site/task-specific safety and health plan. This plan must meet the requirements of *29 CFR 1910.120 (b)(4) - Site-specific safety and health plan part of the program.*

6. Daily work area inspections: Contractor agrees to perform daily work area inspections to determine the effectiveness of the site safety and health plan and to identify and correct unsafe conditions in contractor's responsible work area. These inspections shall be documented and available to Lockheed Martin upon request for review.

7. For contractors performing any remedial work, cleaning activity, or general earthmoving with heavy equipment; the contractor shall maintain in writing that maintenance and inspections are performed on equipment on a regularly scheduled basis in accordance with *29 CFR 1910/1926* and any other applicable state requirements.

III. ENVIRONMENTAL:

Contractors shall comply with all applicable provisions of Federal, State, municipal, local, and other environmental statutes, rules, and regulations. Contractor shall take all necessary precautions to protect the environment; and to store, transport, dispose, or otherwise handle hazardous wastes and non-hazardous wastes; and to prevent discharges of materials into the environment except in accordance with applicable governmental regulations.

A. HAZARDOUS WASTE HANDLING, STORAGE, TRANSPORT, AND DISPOSAL

1. Contractor shall handle, transport, and dispose of all hazardous wastes in accordance with Federal, State, municipal, local, and other rules, regulations, ordinances and requirements.

2. Contractor must segregate hazardous from non-hazardous waste; all hazardous waste generated by its operations must be labeled in accordance with all governmental regulations.

3. Contractor shall dispose of all hazardous waste within 60 days of its accumulation start date. Contractor shall not leave behind on Lockheed Martin property any containers of hazardous materials or waste (including drums, roll-offs, maintenance chemicals, etc.), empty or not, after the termination of operations.

4. All Contractors generating hazardous waste in its operations must have its own EPA Generator Identification Number (EPA ID Number) for use on manifests.

   a. Contractor shall use its own EPA ID Number, sign manifests, and arrange for transportation and disposal for all Contractor-generated hazardous wastes unless Lockheed Martin determines otherwise.

   b. Lockheed Martin accepts no liability for the transportation and disposal of wastes generated by the Contractor. The Contractor shall indemnify and hold harmless Lockheed Martin, its officers, employees, representatives, and agents from any and all liability, loss, cost, damage, or expense (including attorney's fees) arising out of Contractor's transportation or disposal of wastes.

   c. Where Lockheed Martin determines that hazardous wastes are Lockheed Martin-generated, Lockheed Martin's EPA ID Number shall be used on corresponding manifests. Only an authorized Lockheed Martin person may sign manifests for Lockheed Martin-generated waste.

5. Transporting, disposal, and landfill locations must be approved by Lockheed Martin prior to work commencement.

6. To ensure compliance with the above procedures, Contractor shall contact Lockheed Martin before transporting or disposing of any hazardous waste. Lockheed Martin must review all hazardous waste manifests prior to the shipment of any hazardous wastes.

7. If Contractor's transportation or disposal arrangements are inappropriate and require Lockheed Martin to dispose of Contractor's waste, Lockheed Martin reserves the right to bill the Contractor for the reasonable costs of transportation and disposal.

8. In case of a spill or release of hazardous chemicals or waste, Contractor shall immediately notify the Lockheed Martin Project Coordinator and if the severity of the spill warrants, notify the local fire department (Call 9-1-1). The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

B. NON-HAZARDOUS WASTE DISPOSAL

1. Contractor shall handle, transport, and dispose of all non-hazardous wastes in accordance with Federal, State, municipal, local and other rules, regulations, ordinances and requirements.

2. Contractor shall not dispose of any non-hazardous wastes on Lockheed Martin property without the express written permission of Lockheed Martin.

C. WORK INVOLVING AIR EMISSIONS

1. If Contractor's operations require an air pollution permit, Contractor must provide copies of local air district Permit(s) to Operate (or Applications for Permits to Operate) to the Buyer or the Lockheed Martin Project Coordinator for all equipment to be used by the Contractor on Lockheed Martin property. In the alternative, Contractor shall document an exemption from the permit requirements.

2. Contractor shall submit to the Lockheed Martin Project Coordinator daily records of all coatings, solvents and other materials used for which a local air district Permit is required, or for which documentation justifying a permit exemption is required.

D. WORK INVOLVING WATER DISCHARGES

1. Contractor shall notify the Lockheed Martin Project Coordinator and obtain the approval of Lockheed Martin before discharging any material into storm drains or sewers.

IV. FINES, PENALTIES AND COSTS:

Contractor shall indemnify and hold Lockheed Martin harmless from any and all liability (including but not limited to fines and penalties), loss, cost, damage, or expense (including attorney's fees) suffered or incurred by Lockheed Martin by reason of Contractor's failure to comply with Federal, State, municipal, local or other laws, rules, regulations, ordinances and requirements, or failure to comply with generally accepted environmental safety and health practices.

V. Lockheed Martin CONTACTS

Title	Name	Phone Number	Pager number
Project Coordinator	See Subcontract Agreement Article #32		
Environmental Coordinator (Hazardous Waste)	Bob Gilbert	(818) 847-0210	(818) 499-3025
Safety & Health Coordinator	Brian Shaughnessy	(818) 847-0232	(818) 499-3038
Lockheed Martin General Office	Receptionist	(818) 847-0828	
Lockheed Martin Procurement Representative	Dean Horton	(818) 847-0584	(818) 499-3027

LOCKHEED MARTIN

ATTACHMENT "D"

CONTRACTOR'S SAFETY HANDBOOK ACKNOWLEDGEMENT

Contractor has read and understands the contents of the *Contractor's Safety Handbook*. Contractor agrees while performing work on Lockheed Martin-owned or Lockheed Martin-controlled premises, that the Contractor shall, and shall require its subcontractors at any tier, to comply with the contents of this *Contractor's Safety Handbook*. A copy of this handbook shall be maintained at the site, and employees, Contractor's officers, agents, subcontractors at any tier and subcontractor employees are supplied a copy of the *Contractor's Safety Handbook* for their implementation.

COMPANY H2M Associates, Inc.

Name Michael V. Tumulty

Signature Michael V Tumulty

Title Vice President

Date 9/17/96

Complete, sign and return this certificate to Lockheed Martin

APPENDIX 4

TRAFFIC CONTROL REQUIREMENTS

New monitoring wells are planned to be installed on or near the Long Island Expressway Service Road. A traffic control plan outlines required traffic control devices to provide safe conditions for workers. The requirement and level of detail for such a plan is dependent upon the location of work zone in relation to roadways and shoulders.

If a monitoring well is to be located on a shoulder or within a traffic lane of a state roadway, the Traffic Control Plan must be prepared and submitted to the New York State Department of Transportation (NYSDOT) for approval prior to initiation of work. A Traffic Control Plan must be developed specifically for each section of a roadway in which work is planned.

New monitoring wells installed and sampled outside of the traffic lanes or shoulders preclude the need for NYSDOT approval for a Traffic Control Plan as long as there is no obstruction to the traffic lanes or shoulders. The new monitoring wells are proposed to be installed outside of the roadways and shoulders. The property outside of the highway shoulder is generally regulated under a separate agency (i.e., Long Island State Park Region). Permits must be filed with the appropriate agency(s) for property access to install and sample monitoring wells. Generally, these permits do not require the development of formalized Traffic Control Plans. Any traffic maintenance, if required, must be performed in accordance with the New York State Manual of Traffic Control. Traffic maintenance may require utilizing cones, flaggers and/or warning signs to control approaching traffic. Traffic control devices will be chosen, if required, upon determination of monitoring well location(s).

In the event that monitoring wells are to be installed within the roadway or shoulder a more formalized Traffic Control Plan will be developed. This plan shall include a map depicting the roadway, work zone and traffic control device locations. Traffic control devices are dependent upon the work zone location in relation to intersections, exit/entrance ramps, roadway configuration, etc. These devices shall be in accordance with NYSDOT requirements for sign size, shape, color, and height off ground and may include a combination of the following: a warning sign stating the specific distance to a work zone (i.e. "Road Work 1000 FT"), a sign depicting people working (W8-20), a no shoulder sign (W4-13), arrows to merge traffic lanes (W1-11 or W1-12), lane closed sign (W8-7), flagger warning sign (W8-22), lane/shoulder barricades, cones, flaggers, or work vehicles equipped with lights, flags and traffic control devices.

The installation of these traffic devices, if required, for normal traffic situations would proceed from the beginning (upstream of traffic) of the workzone to the end. Removal of these devices normally is started on the downstream end to the beginning.

It appears that the NYSDOT would classify the monitoring well installation and sampling as short duration stationary work. According to the Subchapter H Highway Work Zone Traffic Control, for short duration stationary work, at least one advance warning sign shall face each direction of traffic approaching the work area. If the work zone occupies the roadway, channelizing devices (including cones, and barricades) should be used. This section further states that for short duration stationary work areas, portable signs cones and single rail barricades are generally sufficient to control traffic.

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES

STATE OF NEW YORK

GEORGE E. PATAKI
Governor

DEPARTMENT OF TRANSPORTATION

JOSEPH H. BOARDMAN
Acting Commissioner

SUBCHAPTER H

HIGHWAY WORK ZONE TRAFFIC CONTROL

PART

PART 300

GENERAL

Section 300.1 General.

(a) **Purpose.** Highways are primarily for use by traffic for travel. At times, they must also be used, or occupied, by workers, equipment, excavations, and materials necessary to repair, or improve, the highway, related utilities, or adjacent property. Traffic should be warned of such secondary uses, guided past work areas, and regulated as necessary while moving through work zones. This subchapter deals with highway work zone traffic control, and is intended to assure safe and orderly traffic movement, with minimum risk to workers.

(b) **General provisions.** The general provisions for traffic control elsewhere in this manual are applicable for highway work zone traffic control. These provisions include those in parts 200, 201, 210, 230, 250, 260, 270, 290, and 300.

(c) **Devices.**

(1) Any traffic control device authorized in this manual may be used, where applicable, for highway work zone traffic control. Devices not authorized in this manual should not be used for work zone traffic control. Devices provided for use only in work zones are in parts 218, 238, and 254.

(2) Warning signs are important in advance of work areas, to enable motorists to adjust vehicle operation and exercise due caution.

(3) Guide signs are important at turns along temporary route changes necessitated by highway closures and detours.

300.2 Terminology.

(a) **Highway work.** Highway work is any operation of a highway agency, public or private utility, adjacent property owner or developer; or of a contractor employed by any of them; which uses or occupies the highway for purposes other than travel under circumstances that may affect traffic.

(b) **Work area.** A work area is the part of the highway being used or occupied for conduct of highway work, within which workers, vehicles, equipment, materials, supplies, excavations, or other obstructions may be present.

(c) **Work zone.** A work zone is the connected highway segments, or lengths, along which permanent long-term traffic operations, or traffic control devices, or both, are directly affected by highway work. It includes the work area, the path used by traffic to pass by the work area, the distance in advance of the work area necessary for traffic control and guidance around the work area, the distance beyond the work area necessary for returning traffic to normal flow and control, and highways in use as detours.

(d) **Highway work classification.** Section 300.3, subdivision (h), describes categories of highway work and traffic control requirements generally associated with each.

300.3 Traffic control considerations.

(a) **General.** Work area traffic control considerations are grouped in the subdivisions within this section. Within each subdivision, those related to the subdivision caption are discussed independent from the other subdivisions. In practice, however, the considerations must be combined to determine how traffic should flow and be controlled.

(b) **Highway type and traffic patterns.**

(1) **Highway function.** Control of traffic unfamiliar with the work zone environment usually requires more guidance about proper traffic flow paths and vehicular movements than control of familiar local traffic.

(2) **Two-way traffic.** Control of two-way traffic involves separating the opposing traffic flows, and providing appropriate regulatory, warning, and guidance devices for each travel direction. Where motorists are expected to drive across a barrier pavement marking, they should be guided along the proper traffic flow path by channelizing devices. Channelizing devices may be placed on the centerline of a two-lane, two-way highway to restrict passing, even where a broken pavement marking centerline exists.

(3) **Property access.** Traffic entering and exiting adjacent property should be controlled, as warranted by work area needs, particularly where large numbers of vehicles are involved. Left turns to and from driveways may be restricted by the work area location, or placement of channelizing devices. If one-lane, two-way traffic control is being used, consideration should be given to control of wrong way movements by traffic entering the one-lane section.

(4) **Highway geometry.** Traffic operating environments in work zones should provide geometry and traffic control devices compatible with the permanent roadway and roadside, thereby avoiding unexpected, or complex, driving tasks. Temporary work zone geometrics should not require frequent, abrupt, or erratic driving maneuvers.

(5) **Maneuver space.** Where ample paved or stabilized width is available, the traffic flow path may be laterally shifted to a parking lane or shoulder, with little or no lane width reduction. Where such space is slightly limited, both lateral shifting of traffic and lane width reduction may be necessary. Where such space is severely limited, the number of lanes passing by the work area may have to be reduced.

(6) **Number of traffic approaches.** All traffic approaches to a work area should be controlled, as warranted. A freeway work area beyond an interchange requires consideration of traffic approaching on both the main roadway and the freeway entrance ramp. A conventional highway work area located within, or near, an intersection, requires consideration of the work area relationship to all legal vehicle movements through the intersection.

(7) **Width of traffic approaches.** For multi-lane approaches to a work area, consideration should be given to positioning traffic control devices where they are readily visible to traffic in the center lane, as well as the outside lane. Supplemental signs along the highway centerline, or median, may be desirable in these cases.

(8) **Traffic conflicts.**

(i) **Traffic types.** Consideration should be given to all types of legal traffic through the work zone, including bicyclists, pedestrians, and handicapped persons. At a crosswalk, the pedestrian's view of oncoming traffic should be maintained.

(ii) **Delivery of material and supplies.** Consideration should be given to methods for delivery of material and supplies to the work area. Adverse effects of such operations on traffic should be kept to a minimum. Paving is an example of an activity that requires particular attention to these effects.

(iii) **Driver alertness to conflict.** Work zone traffic control emphasis should be considered on facilities where drivers do not usually expect conflicts, obstacles, and hazards. Greater emphasis would be warranted for an obstruction in the center lane of a freeway, than for one in a travel lane of a local street in a residential district.

(9) **Traffic patterns.** Traffic patterns and operations change greatly by hour of day, day of week, and month of year, particularly on urban freeways and arterial streets. Consideration should be given to these changing patterns when establishing work zone traffic control.

(c) **Work location.**

(1) **Traffic proximity.** The level of traffic control, and number of devices needed, are greatest when a work area obstructs portions of the highway normally used by pedestrian, bicycle, and vehicular traffic. Fewer devices, and less control, are needed when the work area occupies a shoulder or parking lane adjacent to traffic. The least control, and fewest number of devices, are required when the work area is not adjacent to a travel lane, sidewalk, or bikeway.

(2) **Area type.** Work areas in urban locations may require prudent adaptation of the general traffic control principles in this manual, which cannot specifically address the numerous and unique situations that may be encountered.

(d) **Traffic speed.**

(1) **Delay.** Highway work activities should, to the extent possible, allow traffic the right-of-way and avoid excessive delays. Traffic flow should not be unnecessarily inhibited by activities in the adjacent work area.

(2) **Approach speed.** Where approach speed is high, greater distance is traveled during the time it takes a driver to perceive a traffic control device, identify its meaning, judge a proper course, and execute a required maneuver. Consequently, higher traffic speeds require longer advance posting distances for warning signs, longer tapers when traffic is shifted laterally or required to merge, greater spacing between devices, and larger sign sizes.

(3) **Speed reduction.** Where traffic path geometry is such that the recommended speed is less than the approaching traffic speed, the appropriate advance warning signs may be supplemented with advisory speed signs (see section 239.1). The advisory speed should be realistically related to the maximum safe speed.

(e) **Traffic volumes.** In high-volume traffic, motorists have more driving tasks requiring constant attention, often concentrate on the vehicle ahead, have limited maneuver space, and have a view of the highway environment that is partially obscured by other traffic. Dense traffic may warrant placing signs on each shoulder of a multi-lane one-way roadway, using larger signs, and supplementing signs with flags, flag trees, warning lights, or beacons.

(f) **Positive guidance.**

(1) **Positive control.** Positive control of all traffic approaching a work area should be accomplished using devices that are selected, placed, and maintained to be easily comprehended and command respect. Positive control includes a notice that a work area exists, warning of required traffic maneuvers, and definition of the proper traffic path past the work area.

(2) **Motorist confusion.** Traffic control, and control devices, should be reviewed when it is evident that motorists are unsure of the intended traffic operation. Traffic controls or working conditions that do not encourage safe traffic movement and promote worker safety should be appropriately modified.

(3) **Maintenance.** Necessary devices should be installed at the time the work area is established. Devices shall be kept in proper position, clean, and legible, regardless of varying conditions. Damaged, defaced, or dirty devices should be cleaned, repaired or replaced. Where work is accomplished in stages, only those devices applicable to the stage in progress should be displayed. Devices no longer applicable should be promptly removed or covered.

(4) **Visibility.** Weeds, shrubbery, construction materials, equipment, vehicles, or workers should not obscure traffic control devices, or obstruct traffic.

(g) Installation and removal of devices.

(1) **Protection.** Installation and removal of devices, in itself, constitutes highway work that should be protected by means appropriate to the situation, such as hazard vehicle lights and vehicle emergency flashers. Establishing a work area within an intersection, or at a freeway interchange, may warrant greater protection.

(2) **Order of work.**

(i) Device installation normally proceeds from the beginning of the work zone to the far end. On a two-way road, the less affected direction should be set up before the more affected one. The work vehicle used should move in the same direction as traffic in the roadway half being set up.

(ii) On a one-way roadway, device removal is normally started at the downstream end, with removal of the end road work sign. Channelizing devices are then removed, from downstream to upstream, with those in advance of the workers continuing to provide protection, until the roadway is cleared. Removal of advance warning signs on the shoulder is normally accomplished with a work vehicle traveling in the direction of traffic.

(iii) On a two-way roadway, device removal normally begins with removal of channelizing devices that separate traffic from the work area, followed by those that separate opposing traffic. Advance warning signs are then removed, with the work vehicle moving with the flow of traffic in its half of the roadway. Where traffic volume is light, workers may carry signs across the road to a work vehicle on the opposite side.

(h) Work area duration.

(1) **Highway work classification.** Highway work is considered in one of five categories for purposes of traffic control.

(i) **Work vehicle work.** Work vehicle work is accomplished by a work vehicle, or series of work vehicles, driving along a highway. It includes operations such as plowing, sanding, salting, pavement marking, mowing, mechanical street cleaning, and inspection of utilities from a moving vehicle. It does not include work that involves parking the work vehicle, or workers on foot in the roadway. No traffic control devices are mandatory at, or in advance of, a work vehicle doing work vehicle work. Such vehicles should, however, be equipped and operated pursuant to the *Vehicle and Traffic Law*. Where continuously moving highway work occupies a travel lane, a vehicle may be stationed in advance of the work vehicle to display appropriate warning traffic control devices.

(ii) **Mobile work.** Mobile work involves one or more workers on foot in a roadway, or the parking of a work vehicle, for only a brief period. It includes operations such as: removal of debris from the roadway, operating a power distribution switch, changing a traffic signal lamp, operating a water main valve, installing or removing a traffic counter, washing a small traffic sign, or inspection of the roadway or a utility. Each worker or work operation shall be made highly visible to approaching traffic. Traffic should be warned of the work area by vehicle equipment, flaggers, traffic control devices, or a combination of these methods. Traffic should be controlled, as necessary, to avoid the need for workers to make unprotected movements in traffic.

(iii) **Slowly moving work.** Slowly moving work involves special purpose work equipment, and/or workers on foot in the roadway, which move slowly along a roadway. The rate of movement makes placement of channelizing devices impractical, but is not so fast that control of traffic by flaggers is impractical. It includes opera-

tions such as pouring cracks and joints, pavement overlayment, and hand application of pavement markings. A minimum of one warning sign should face each traffic approach to a slowly moving work area. Positive control of right-of-way assignment past the work area should be provided, where needed. A work vehicle, with attention-getting equipment and/or traffic control devices, may be placed in a travel lane, in advance of the work area, to protect workers on foot from approaching traffic.

(iv) **Short duration stationary work.** Short duration stationary work involves establishing and occupying a work area for more than a brief period. It includes operations such as installing traffic signs, installing or repairing guide rail, cleaning drop inlets, removing and patching distressed pavement, pavement cuts for utility work, overhead utility repair, and work on underground utilities at manholes. At least one advance warning sign shall face each direction of traffic approaching the work area. When such an area occupies a portion of the roadway, channelizing devices should be used. As the duration of a work area that occupies a travel lane increases, the number of traffic control devices should be increased. For short duration stationary work areas, portable signs, consistent with the need for advance warning and adequate notice, supplemented with cones and single rail barricades, are generally sufficient to control traffic.

(v) **Long duration stationary work.** Long duration stationary work involves establishing and occupying a work area for an extended period. Typically, the work area is occupied by excavations, materials, and/or equipment at times when workers are not present. At least one advance warning sign should face each direction of traffic approaching a long duration stationary work area. When such an area uses a portion of the roadway, channelizing devices should be used. For long duration work areas, larger signs and more conspicuous channelizing devices are usually warranted to control traffic. Conditions normally require attention by the person responsible for traffic control during highway work of long duration. Staged construction may require adjustment of detour roadways and associated signing. Warning, delineation, and channelization devices should be effective under varying conditions of light and weather. Devices should be kept current (for example, worker signs should be replaced by road work signs when workers are off duty, and flagger signs should be covered or turned from view when the flagger is not on duty).

(2) **Warning sign stated distances.** The distance legend on advance warning signs should state specific distances (for example, "500 FT"). However, where signs are used successively for different stationary work areas, warning signs with the legend "AHEAD" instead of specific distance legends may be used. The "AHEAD" legend may also be used for slowly moving work areas. Signs should be frequently moved with such operation, so they remain an appropriate distance from the work area.

(3) **Pavement marking.** For a short duration work area, where the hazard, practicality, or expense of pavement marking removal exceeds the potential benefits, channelizing devices should guide motorists past any misleading pavement marking. For long duration work areas, pavement markings that mislead motorists should be removed.

300.4 Related considerations.

(a) **General.** The considerations in this section are not, in themselves, traffic control considerations. However, they are related to the traffic control considerations in section 300.3.

(b) **Delegation of responsibility.** It is recommended that responsibility for traffic control in a highway work zone be delegated to a worker competent, by training or experience, to make necessary judgments, and establish and maintain traffic controls that are in the overall public interest.

(c) **Traffic control plan.** Consideration should be given to the preparation of a traffic control plan specifically for a highway work project, to assure systematic adherence to provisions of this manual, and to provide workers with clear and detailed instructions.

(d) **Scheduling.** Less risk and exposure of workers to traffic hazards will occur when the more disruptive operations are performed during off-peak traffic periods. Night work may reduce traffic control complexity, especially on major freeways and urban arterial streets in business districts. However, the added requirements of delineation and warning devices should also be considered.

(e) **Public relations.** Local news media are usually willing to disseminate information about traffic control in highway work zones. Consideration should be given to regularly issuing traffic advisories to help traffic move through, or around, major work zones.

PART 301

DEVICE APPLICATION

Section 301.1 General.

(a) **General.** This part provides guidelines for use of traffic control devices in highway work zones. Some are in addition to, or modifications of, provisions elsewhere in this manual for normal application of the devices.

(b) **Permanent devices.** Permanent traffic control devices that are not consistent with work zone traffic control should be covered or removed. Compliance with this provision is particularly important where projects are of long duration. For example, misleading pavement markings in long-duration work areas should be removed; traffic signal faces not in use should be covered or removed when in a long-duration situation; and misleading route marker assemblies should be suitably modified, or covered, when a detour is in effect.

301.2 Signs general.

(a) Portable signs.

(1) **Proper position.** Signs should be moved, as necessary, during highway work operations, to maintain proper sight distance and advance warning, and meet other requirements of this manual.

(2) **Vehicle mounting.** Signs may be effectively mounted on vehicles or trailers stationed in advance of the work areas, or moving along with them. The vehicles may be ones provided expressly for this purpose, or the work vehicles themselves.

(3) **Portable supports.** Methods of displaying signs for short time periods, or on a part-time basis, are in section 201.4. Figures 302-1 and 302-2 illustrate examples of portable sign supports. Barricades, trailers, and vehicles may also serve as portable sign supports. Portable sign supports should be designed to withstand overturning by wind, but should minimize the risk of damage or injury if struck by an errant vehicle.

(b) **Sign location.** The locations of signs associated with highway work zones shall comply with provisions of section 201.5, except as provided in paragraphs (1), (2) and (3) below.

(1) **Longitudinal distance.**

(i) Advance posting distances for warning signs may be different from those in section 230.2 when, in the judgment of the person responsible for work zone traffic control, signs placed at the distances specified would

not effectively warn traffic approaching the work area. Signs should effectively warn traffic, allowing adequate time for driver response. The advance posting distances should not be unnecessarily shortened.

(ii) The standard distance between the initial warning sign and the beginning of a lane closure taper, or a shoulder work area, is given in table 301-1. Different distances may be used where necessary for more effective warning and guidance. An example of possible need for greater advance distance is a freeway location where traffic must wait in line, during high volume periods, to pass by a work area. An example of possible need for shorter advance distance is where traffic on an entrance ramp is warned of a work area just ahead on the mainline.

TABLE 301-1
ADVANCE DISTANCE BETWEEN INITIAL WARNING SIGN AND BEGINNING OF LANE CLOSURE OR WORK AREA

HIGHWAY SITUATION	WORK LOCATION	WORK AREA TYPE	ADVANCE DISTANCE (FEET)
Low speed conventional	Shoulder or parking lane	Long duration	150 - 300
		Short duration	150 - 300
		Slowly moving	150 - 300
	Travel lane	Long duration	300 - 600
		Short duration	150 - 600
		Slowly moving	150 - 600
High speed conventional	Shoulder or parking lane	Long duration	300 - 750
		Short duration	300 - 750
		Slowly moving	300 - 1000
	Travel lane	Long duration	1500 - 5000
		Short duration	600 - 2500
		Slowly moving	400 - 1500
Freeway and expressway	Shoulder or parking lane	Long duration	1000 - 1500
		Short duration	1000 - 1500
		Slowly moving	1000 - 1500
	Travel lane	Long duration	2500 - 5000
		Short duration	1500 - 5000
		Slowly moving	1000 - 2000

(iii) The standard spacing for a series of advance warning signs associated with a long-duration stationary highway work area is three hundred feet in urban districts, and five hundred feet in rural districts. A different spacing may be used where it will provide more effective warning and guidance. Spaces between permanent traffic signs and signs associated with work zones should be sufficient to assure that permanent signs are not obscured.

(2) **Lateral placement.** Portable signs may be placed on the roadside, sidewalk, shoulder, parking lane, or roadway, at lateral distances different from those in section 201.5, to make them clearly visible to approaching traffic. Temporary signs on non-portable supports should comply with section 201.5.

(3) **Height.** Signs mounted on vehicles, barricades, or portable supports, may be at heights lower than standard, but should be at least one foot above the pavement. Heights greater than the one-foot minimum provide better target value and visibility, and are desirable. Temporary signs on non-portable supports should comply with section 201.5.

(c) **Sign size.** Signs larger than size E may be used where added target value and emphasis are necessary along a freeway or expressway. For warning signs larger than forty-eight inches by forty-eight inches, a rectangular sign may be used when the diamond shaped panel is impractical.

(d) **Target value.** Stripes (other than the standard margin and border), geometric patterns, or contrasting color panels, shall not be displayed on, or around, a sign in an attempt to make it more conspicuous. These methods are distracting and violate fundamental uniformity and simplicity of design principles. The proper methods of increasing target value are the use of warning flags (see section 294.2) and/or warning lights (see section 294.3).

(e) **Warning and guide sign color.** Warning and guide signs installed specifically for highway work zones should have black legends on an orange backgrounds, except the W5-14 railroad advance warning sign, which shall have black legend on a yellow background. Signs shall be reflectorized, or adequately illuminated, for night use. Fluorescent red-orange, or fluorescent yellow-orange, may be substituted for highway orange in sign backgrounds; but such signs must also be reflectorized, or adequately illuminated, for night use. All signs in a warning sign assembly should have the same color background. Permanent yellow warning signs and green guide signs may remain in use, within the work zone, if the legends are compatible with work zone conditions.

301.3 Regulatory devices.

(a) **Authority.** The agency having jurisdiction must take appropriate regulatory action where regulatory devices are to be used in a work zone. Enforcement of regulatory devices requires that the restrictions they impose be established by statute, or by properly enacted orders, ordinances, rules, or regulations.

(b) **Alternatives.** Special regulatory measures, such as speed limit reductions, are usually unnecessary in work zones because conditions are temporary, change frequently, and are often self-regulating. Warning signs, channelizing devices, and flaggers can usually control traffic effectively.

(c) **Passing.** No passing signs (see section 214.2) may be used in work zones where pavement markings are obscured by repaving, to indicate permanent no passing zones.

(d) **Road closed.** The closing of a highway to all traffic requires type C-3 barricades (see section 292.2), and road closed signs (see section 218.2). If closed during hours of darkness, the need for flashing beacons and/or portable warning lights (see sections 274.3, and 294.3) should also be considered.

301.4 Warning signs.

(a) **Shape.** Where this manual provides both diamond and rectangular versions of a sign, the diamond version should be used, except when mounting, transport, portability, or storage requirements require use of the rectangular alternate.

(b) **Distance legend.** An overlay panel may be used within a sign face to facilitate changing the distance legend. The word "AHEAD" may be displayed, as an alternate to the specific distance legend, when a work area is not fixed in location and specific distance legends may mislead drivers.

(c) **Arrow signs.** Single arrow signs (see section 231.4) and double arrow signs (see section 232.7) may be displayed alone, or as supplemental signs below other warning signs, to encourage traffic to merge in advance of a lane closure, or to emphasize a lateral shift in the traffic flow path.

(d) **Positive guidance.**

(1) **Sign sequence.** Care should be taken to assure that the sequence of warning signs approaching a work area gives motorists clear information and provides them with orderly positive guidance.

(2) **General warning.** The first warning sign should be a general warning that a work zone exists. Signs such as G11-1 road construction, W8-1 road work, or W8-20 worker may be appropriate.

(3) **Road feature and condition warning.** The second warning sign should warn of the specific highway condition ahead. Signs such as W8-6 one lane road, W8-7 left lane closed, W8-8 detour, W8-29 loose stone, W3-6 road narrows, W4-4 rough road, or W4-13 no shoulder may be appropriate.

(4) **Alignment, intersection, and control warning.** The third warning, or guidance, sign should warn drivers of the next geometric feature, or traffic control, in the work zone. Signs such as W2-17 signal ahead, W1-6 reverse turn, G11-3 detour, W1-11 or W1-12 single arrow, W8-22 Flagger, or R7-8 or R7-9 stop here on red, may be appropriate.

(5) **Driver response.** For short duration highway work, particularly on lightly traveled roads or local streets, the warning sign sequence described in preceding paragraphs may not be necessary. A single warning sign, with several channelizing devices, for each direction of approaching traffic, may result in proper driver concern for workers in the roadway, and the exercise of due caution.

(e) **Overnight equipment parking.** Where equipment or materials must be stored overnight on a shoulder, or in a parking lane, appropriate devices such as the W8-1 road work sign, W4-13 no shoulder sign, and some channelizing devices may be used to emphasize the obstruction adjacent to the travel lane.

(f) **Countdown legends.** When a long-duration work area occupies a high speed travel lane, warning messages may be repeated at different advance distances. Examples include a series of road work signs at one mile, one-half mile, and one-quarter mile advance distances; or a series of detour signs at fifteen-hundred foot, one-thousand foot, and five-hundred foot advance distances. To avoid driver confusion, only one such series of "countdown" signs should be encountered at a time. Two series of these signs should not be interspersed. Such location should be treated by warning sequentially of the next geometric condition or traffic control to be encountered, and omitting "countdown" signs of a more general nature.

(g) **Lane closures.** Sign legends should advise motorists of lane closures by identifying which lane is being closed (for example right lane closed) rather than the number remaining open (two lanes).

301.5 Guide signs.

(a) **Detour without closing.** Where traffic is permitted through a section of highway partially occupied by a work area, detour guide signs and route markers may be installed to divert traffic to alternate routes, even though the highway is not closed. This method has particular application for arterial streets subject to peak-hour congestion or delay.

(b) **Advance information.** Signs with legends such as "BRIDGE REPAIRS START MARCH 3", may be installed before the start of major highway work projects to provide advance information that congestion and delays may occur. Such signs also provide regular highway users with opportunity to consider alternate routes.

301.6 Pavement markings.

(a) **Uniformity.** Pavement markings in work zones shall conform to Subchapter E.

(b) **Positive guidance.**

(1) **Detours.** Pavement markings should be considered for major highway detours. Detour pavement markings are particularly desirable when the highway to be detoured is marked. Channelizing devices may be used to define traffic lanes where markings are not possible on a temporary detour roadway. Delineators (see section 291.2) and arrow signs (see sections 231.4 and 232.7) may also be used to guide traffic along the proper detour path.

(2) **Conflicting markings.** Where a temporary traffic path past a work area requires a driver to cross a permanent pavement marking line, channelization devices should be used to provide positive guidance. Removal of pavement markings that would mislead motorists into barricades or fixed objects should be considered for long-duration work areas.

(3) **Barrier lines.** Where highway work obliterates barrier lines, or otherwise makes them ineffective, other devices may be used to restrict passing. Placement of channelizing devices along a center line will physically deter passing regardless of the markings on the pavement. The R4-1 do not pass sign and R4-2 pass with care signs (see section 214.2) may be used in lieu of, or to supplement, barrier lines in work zones. R4-2 signs should be used at the ends of all no-passing zones where R4-1 signs are used.

(4) **Authority.** Barrier markings are regulatory devices, and should be altered only upon appropriate action by the agency having jurisdiction.

301.7 Traffic signals.

(a) **Authority.** Traffic signals are regulatory devices and their use requires appropriate action by the agency having jurisdiction.

(b) **Uniformity.** Traffic signals installed for work zone traffic control shall conform to subchapter F, except that a mid-block signal need not be suspended over the roadway.

(c) **One lane control.** One lane traffic control is a common application of signals in work zones.

301.8 Other devices.

(a) **Channelizing devices.**

(1) **Application.** Channelizing devices are for use to separate the parts of the highway being used for highway work from those being used by traffic, and to separate opposing traffic streams.

(2) **Work vehicles.** Work vehicles equipped with lights, flags, and traffic control devices may be used to protect work vehicle, mobile and slowly-moving highway work.

(3) **Warning signs.** Warning signs and associated supplemental devices, adequate in size, number, and location, shall precede a taper defined by channelizing devices in the roadway.

(b) **Delineators.** Delineators may be used, as provided in part 291, to guide traffic through a work zone by indicating the horizontal and vertical alignment of the proper travel path. They should be spaced sufficiently close to clearly indicate the proper vehicle path during darkness. They are not a subsitute for reflectorizaion of channelizing devices, or warning lights.

(c) **Warning lights.** Consideration should be given to the need for warning lights, during hours of darkness, as a supplement to channelizing devices. The first two warning lights used in a longitudinal series may be flashed. The remainder should be steady burning.

301.9 Flagging stations.

(a) **Application.** A flagging station may be established, and a flagger assigned, to positively control the right-of-way by signaling drivers to stop or proceed, or to maintain proper traffic flow past a work area by signaling drivers to reduce speed.

(b) **Location.**

(1) **Sight distance.** Flagging stations should be positioned adjacent to the traffic lanes being controlled, at locations that provide drivers with good sight distance while approaching, and sufficient distance to permit proper response to the flagger's signals.

(2) **Spot work area.** For a short one-lane two-way travel path past a small work area, one flagging station may be adequate. It should be located on the shoulder opposite the work area.

(3) **Longer work area.** For a longer one-lane two-way travel path past a larger work area, flagging stations may be necessary in advance of each end of the work area, and at crossroads or driveways intersecting the one-lane section.

(4) **Lane reduction.** For lane reductions, the flagging station should be near the beginning of the channelizing device taper, or at an appropriate distance in advance of the work area.

(5) **Other factors.** The flagging station should not be located in the traffic lanes being used by traffic, where workers gather, or where the orange vest worn by the flagger would not contrast with the background.

(c) **Equipment.**

(1) **Signaling device.** Each flagger shall use an appropriate hand signaling device (see section 293.2).

(2) **Orange vest.** Each flagger shall use an orange safety vest. The vest should be reflectorized if used at night, and shall be worn outside all other clothing worn by the flagger.

(3) **Advance warning.** A flagger warning sign (see section 238.7) shall be used facing each direction of approaching traffic subject to signals from a flagger at any flagging station associated with a stationary work area in use more than briefly. A flagger warning sign should also be used facing each direction of approaching traffic subject to flagger signals from any flagging station in use more than briefly. A flagger may control traffic for brief periods without use of flagger advance warning signs.

(4) **Coordination equipment.** Where more than one flagging station is established to control traffic in a work zone, consideration should be given to equipment for communication among the flaggers. In some cases, flaggers may be able to coordinate by voice or visual signal. In other cases, however, appropriate equipment is necessary, and may include intercoms, two-way radios, walkie-talkies, flags or tokens carried by a passing motorist, or pilot vehicles (see section 254.5).

(5) **Floodlight illumination.** Consideration should be given to floodlight illumination flagging stations in use during hours of darkness.

(d) **Flagger's duties.**

(1) **Reliability.** The flagger should remain on duty at a flagging station until relieved by the person responsible for work zone traffic control, or a replacement flagger. The flagger should be alert, responsive to shifting work area and worker locations, and remain in a position to effectively control traffic approaching, and passing by, the work area. When stationed to signal for reduced speed, the flagger should concentrate on the need for speed reduction by approaching traffic, and should continue signaling as necessary to achieve motorist compliance.

(2) **Equipment.** The flagger shall use proper equipment (see section 301.9, subdivision (c)).

(3) **Control.** Flaggers controlling one direction of traffic should face approaching traffic. Flaggers controlling two directions of traffic should be alert to traffic on each approach. Flaggers controlling traffic at intersections should be sure that traffic on all conflicting approaches is halted before assigning right-of-way to a particular approach.

(4) **Signals.** The flagger should control traffic clearly and authoritatively by signaling stop, proceed, or reduce speed. The flagger should know and use standard signaling procedures (see section 293.3). Traffic should be granted the right-of-way expeditiously, to avoid unreasonable delays.

(5) **Coordination.** The flagger shall coordinate right-of-way assignment with other flaggers, control devices, and highway conditions, as necessary.

(6) **Warning.** The flagger should, when necessary, warn other workers to keep away from the flagging station, or to move away from the traffic path. The flagger should warn co-workers of imminent danger, such as an errant vehicle.

(7) **Concentration.** The flagger should refrain from other work involvement, or distracting conversations with passing motorists or other workers.

(8) **Courtesy.** The flagger should treat motorists, and the public, with courtesy and respect.

301.10 **One-lane two-way control.** The locations where vehicles wait to enter a one-lane two-way control section should be chosen to permit easy passing of opposing traffic.

301.11 **Freeway control.**

(a) **Ramp traffic.** Appropriate warning signs should be placed for traffic entering a freeway work zone from a ramp.

(b) **Lane occupancy.** Traffic lanes should not be occupied unnecessarily. The maximum number reasonable should be kept open to traffic at all times.

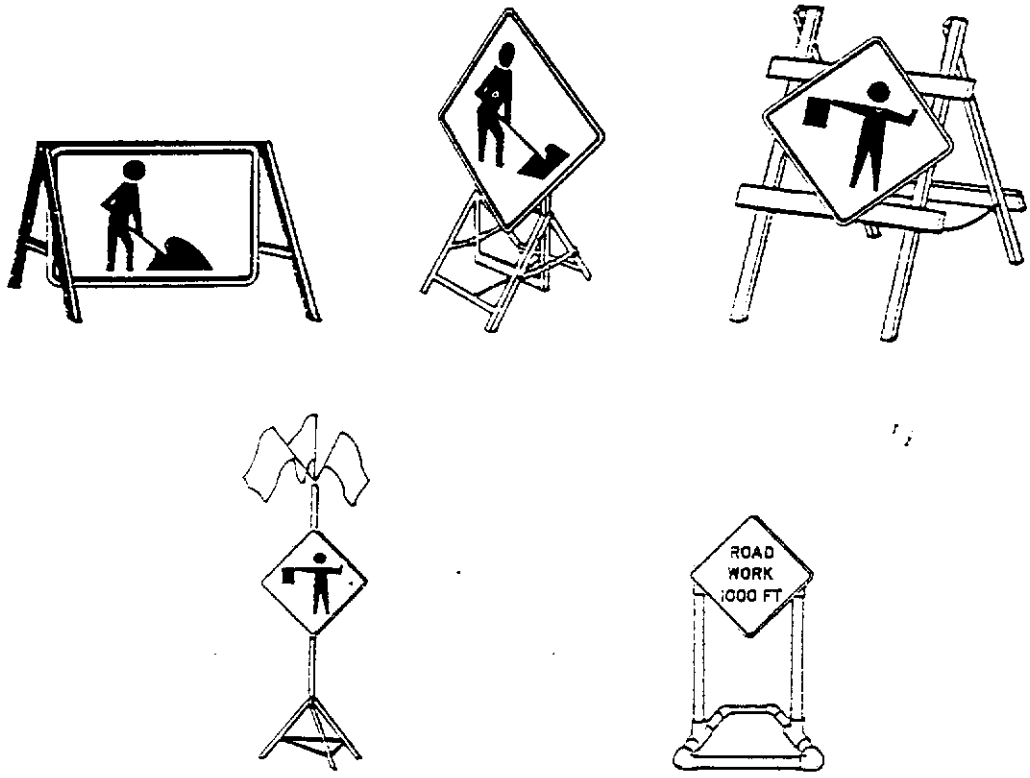
(c) **Congestion.** When congestion causes erratic traffic flow at a lane reduction, a flagging station established to direct traffic alternately from each approach lane may eliminate erratic driver behavior and restore orderly flow.

(d) **Emergencies.** Consideration should be given to preparation of an emergency traffic plan, to become effective if an unexpected incident causes complete closure of a roadway. It should include provisions for traffic diversion to alternate routes and emergency vehicle access. It should also provide for ready availability of devices to replace those which may be damaged, and to control traffic while police and equipment are clearing the work zone.

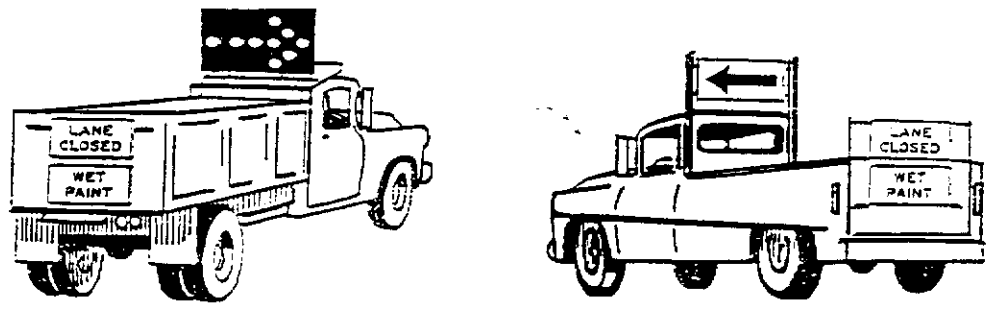
PART 302
SUBCHAPTER H ILLUSTRATIONS

FIGURE 302-1
EXAMPLES OF PORTABLE SIGN SUPPORTS

A. PORTABLE SIGN SUPPORTS.



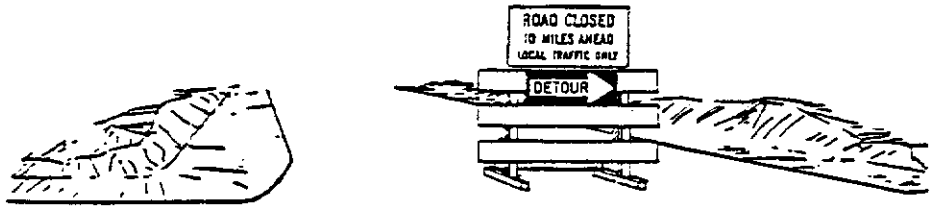
B. VEHICLE MOUNTED SIGNS AND ARROW PANEL.



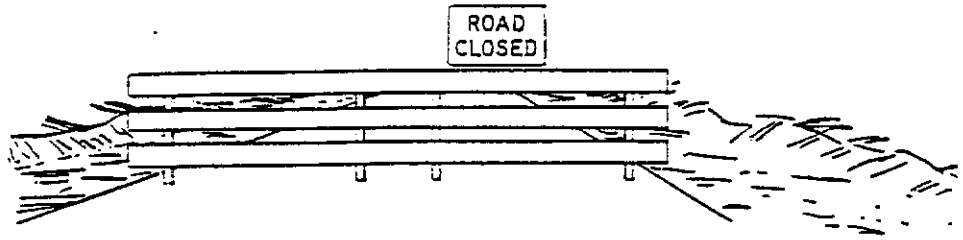
Note: 1. See section 301.2.

FIGURE 302-2
EXAMPLES OF SIGNS ON BARRICADES

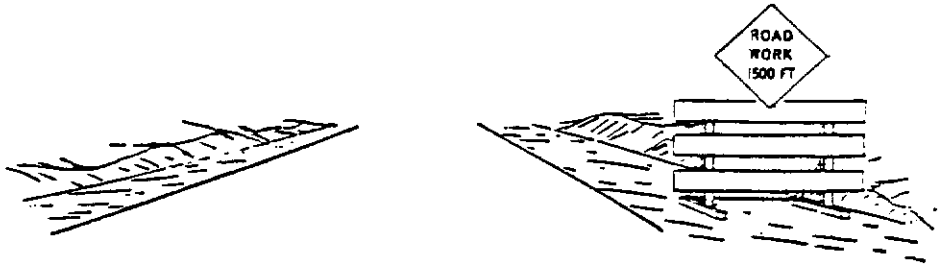
A. PARTIAL BARRICADE.



B. ROAD CLOSED BARRICADE.



C. SHOULDER BARRICADE.



Note: See sections 218.2, 218.3, 238.2, 254.3, and subchapter G.

FIGURE 302-3
EXAMPLES OF TRAFFIC CONTROL
AT SHORT DURATION WORK AREAS ON LOW SPEED HIGHWAYS

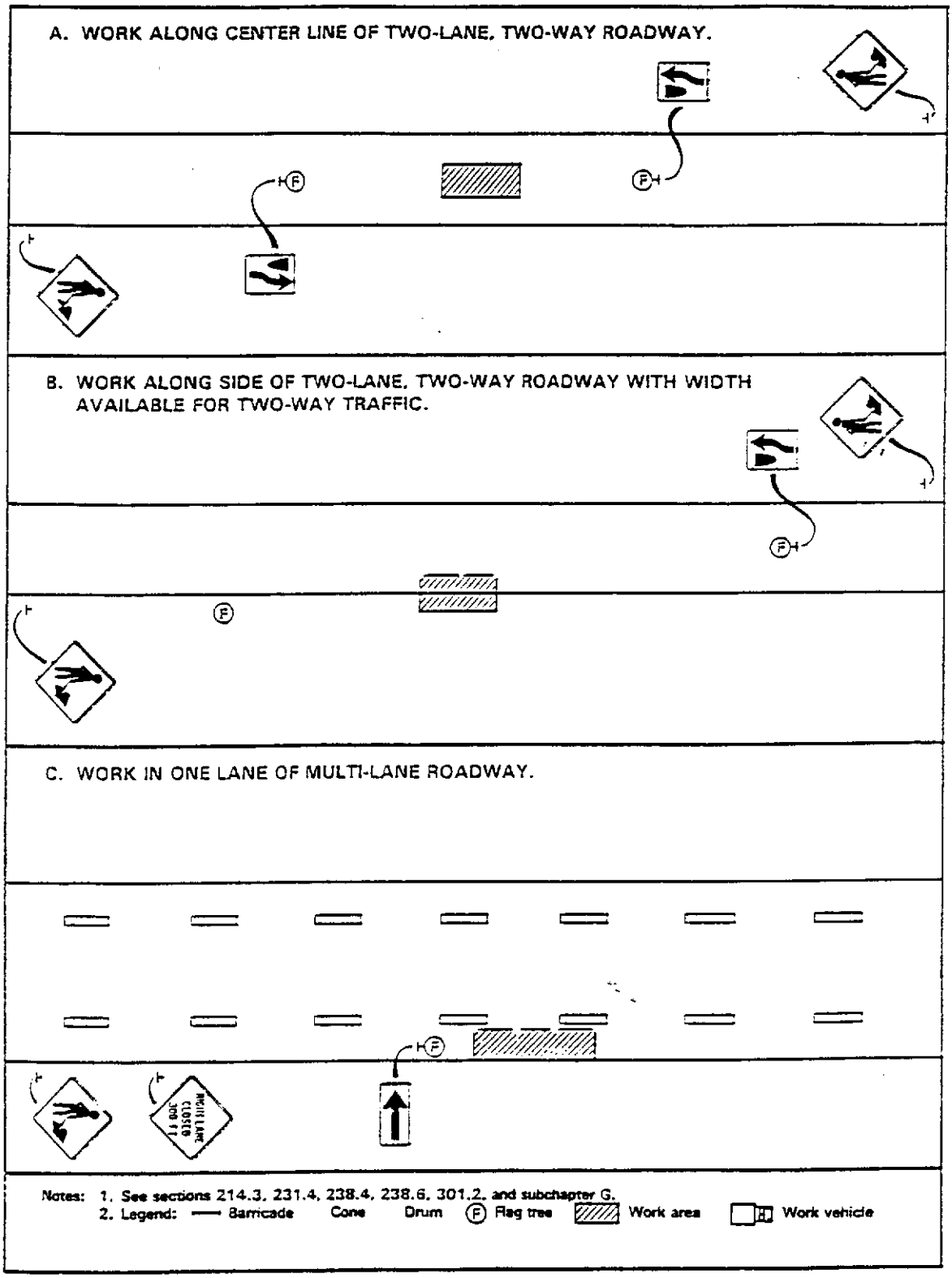
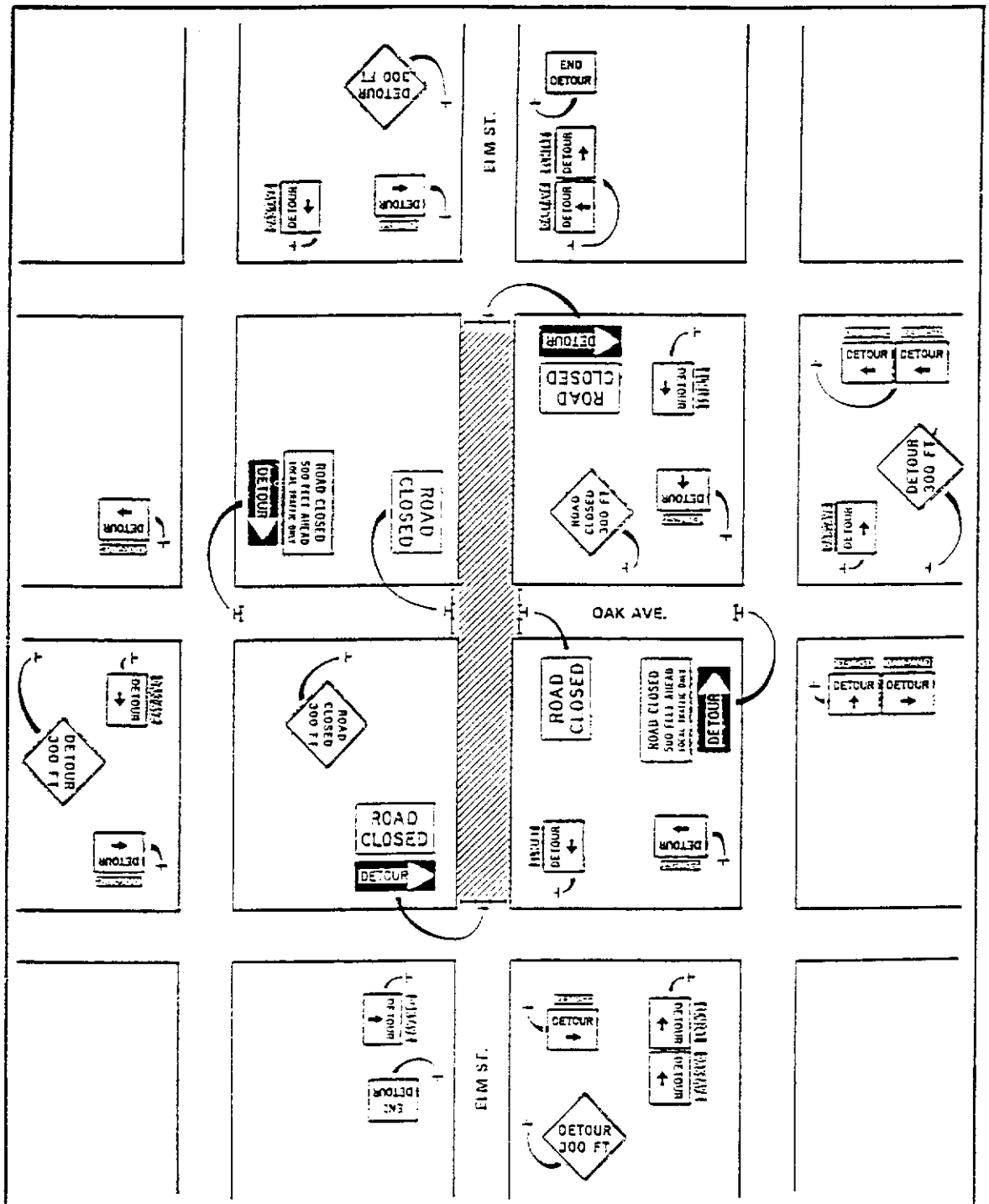
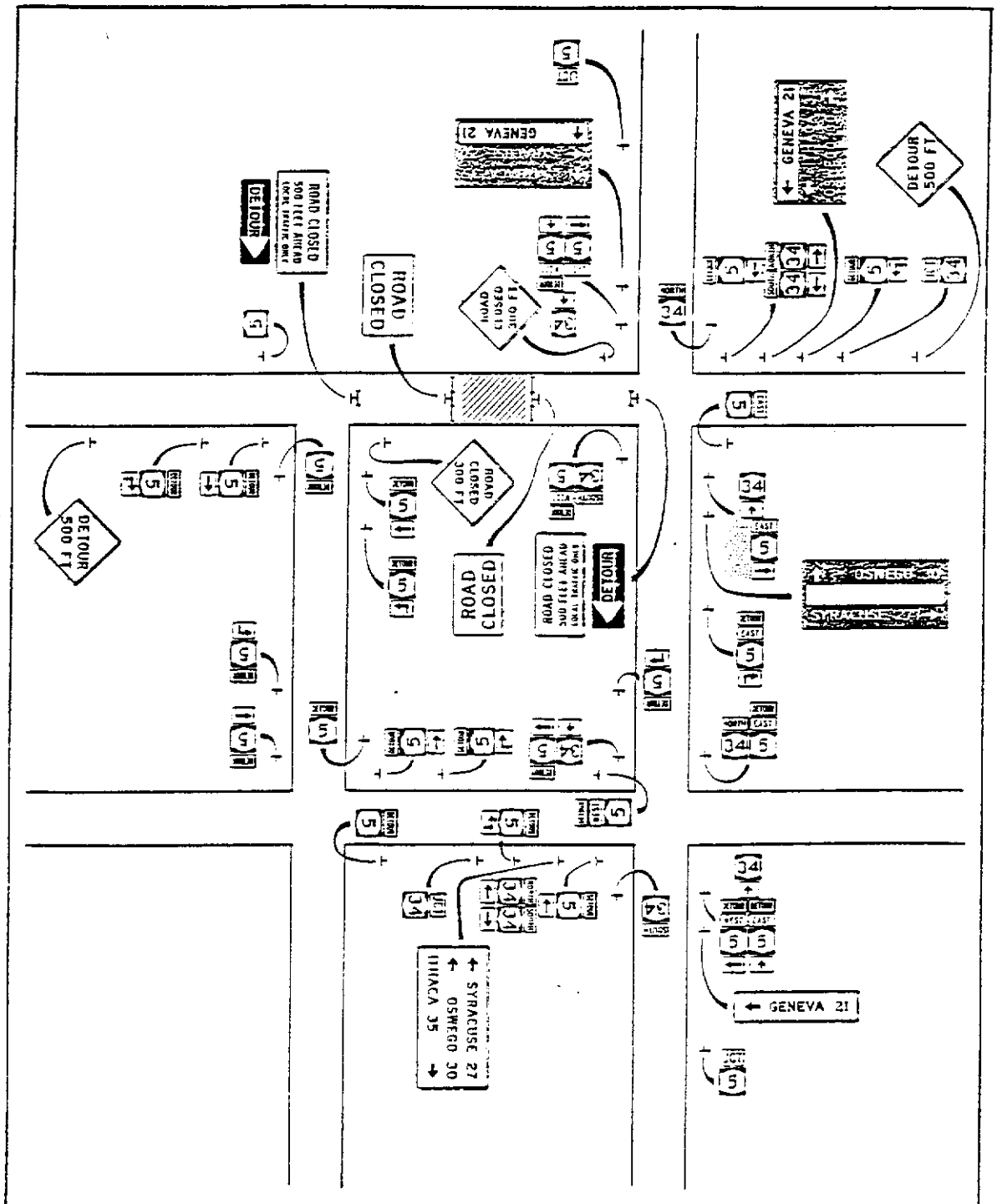


FIGURE 302-4
EXAMPLE OF LOCAL STREET CLOSURE WITH DETOURS



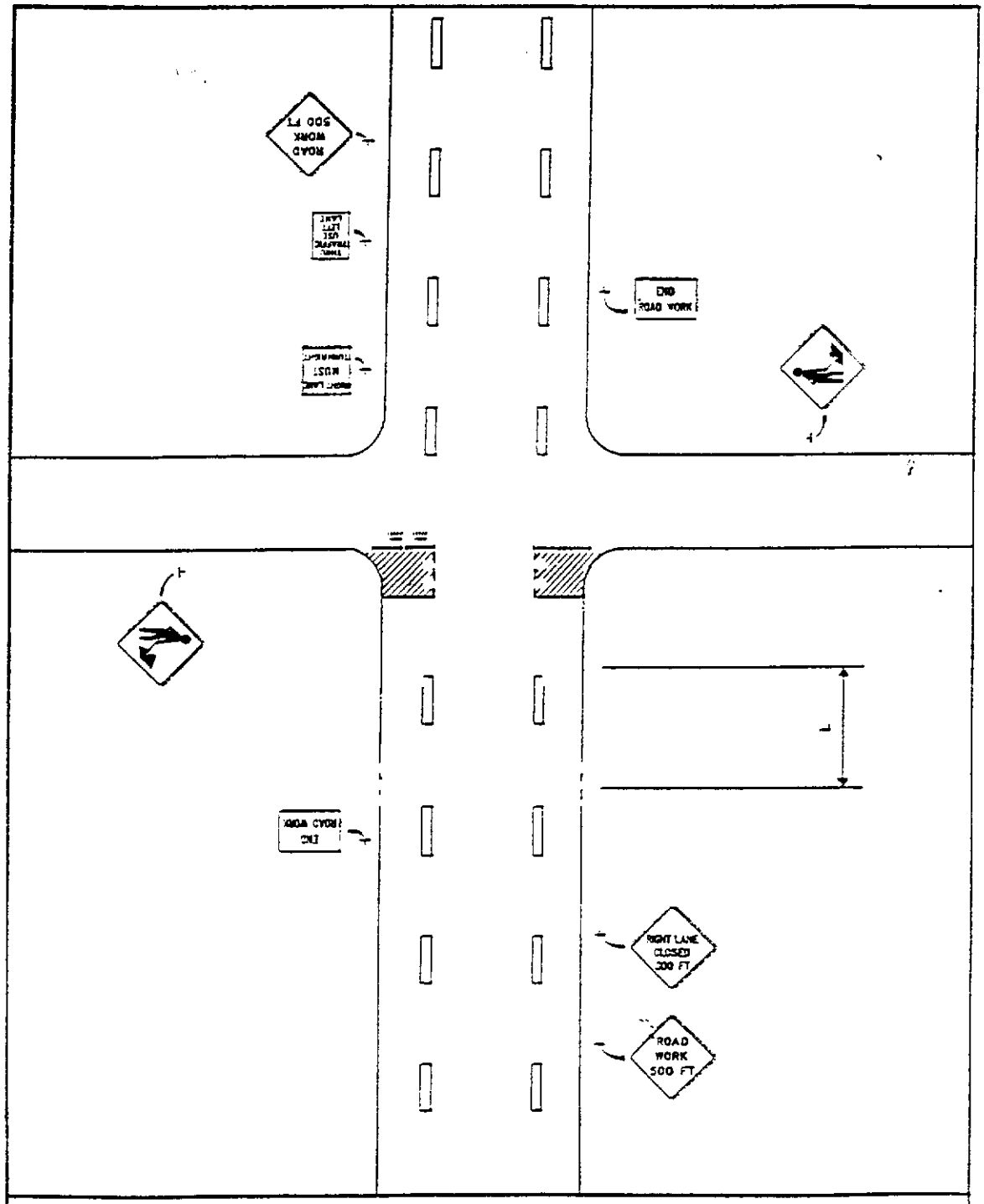
Notes: 1. See sections 218.2, 218.3, 238.3, 238.5, 253.2, 254.3, 254.4, and subchapter G.
2. Legend: —— Barricade Flashing warning light Work area

FIGURE 302-5
EXAMPLE OF TOURING ROUTE CLOSURE WITH DETOUR



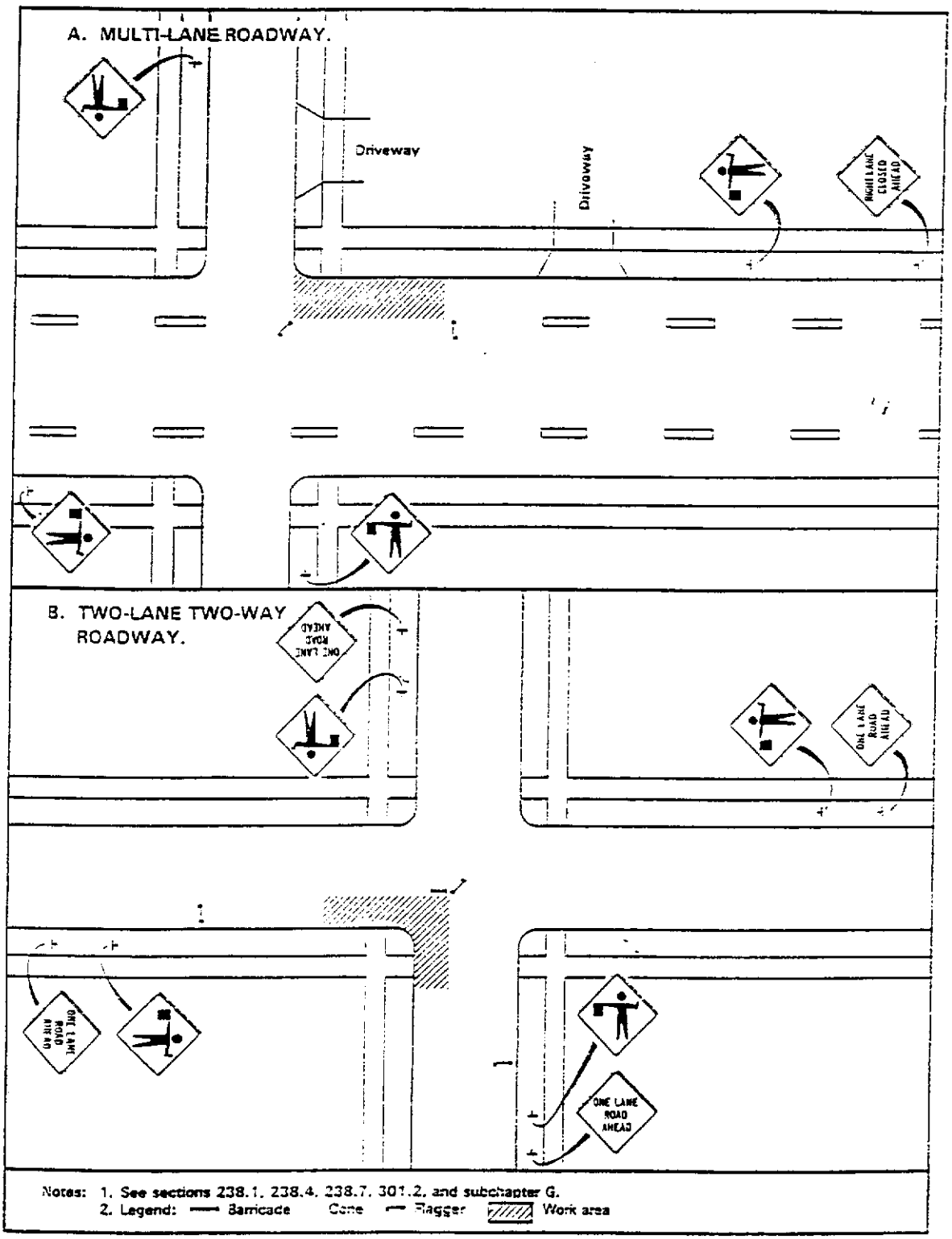
Notes: 1. See sections 218.2, 218.3, 238.3, 238.5, 251.4, 251.14 thru 251.21, 252.4, 301.2, and subchapter G.
2. Legend: ⟶ Barricade Covered route markers Flashing warning light Work area

FIGURE 302-6
EXAMPLES OF TRAFFIC CONTROL AT WORK AREAS NEAR INTERSECTIONS



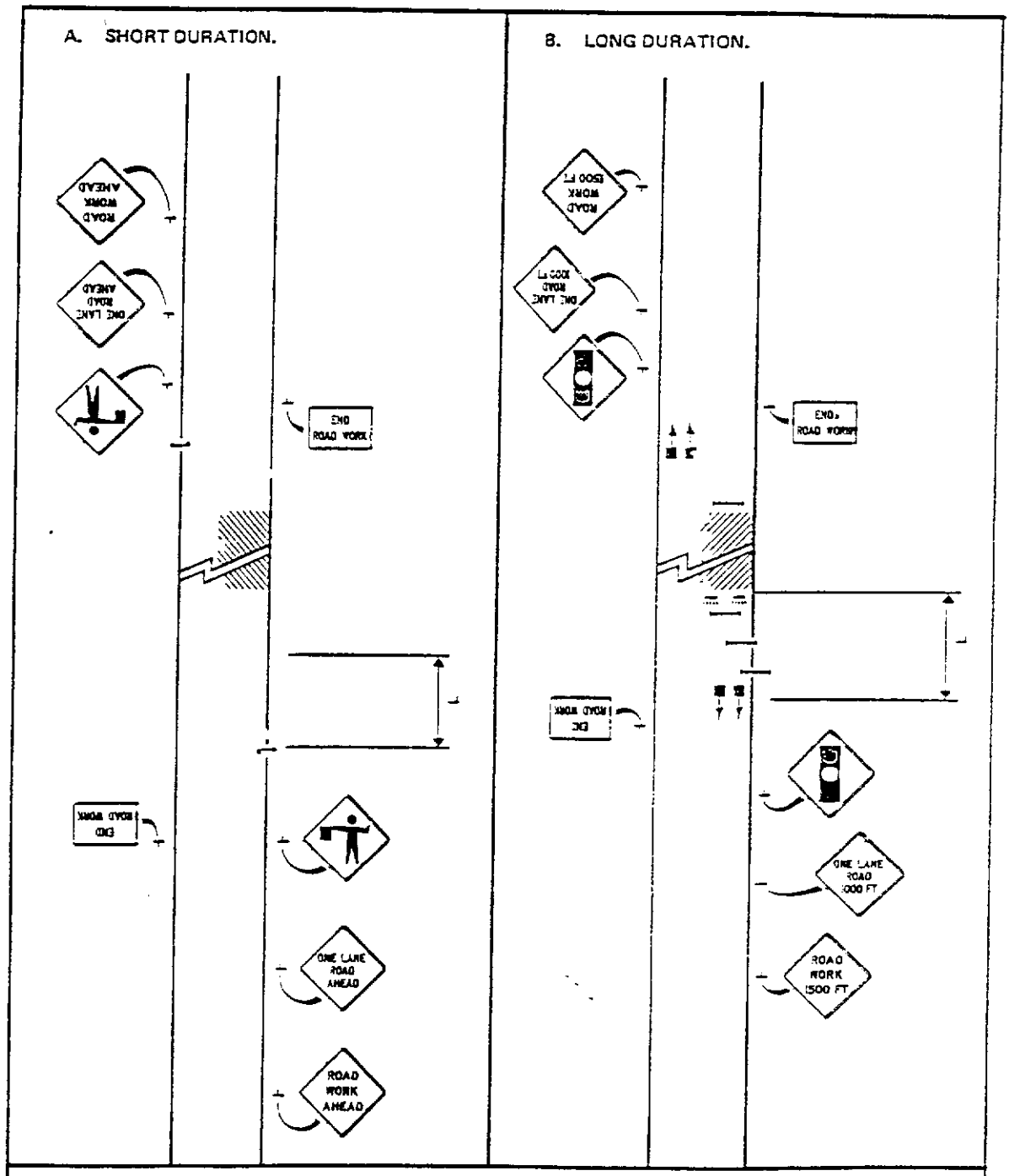
Notes: 1. See sections 213.5, 238.2, 238.4, 238.6, 254.2, and subchapter G.
2. Legend: —— Barricade Cone Drum Flashing warning light Work area Vertical panel
3. L approx. = transition length (see section 262.22).

FIGURE 302-7
EXAMPLES OF TRAFFIC CONTROL AT WORK AREAS IN INTERSECTIONS



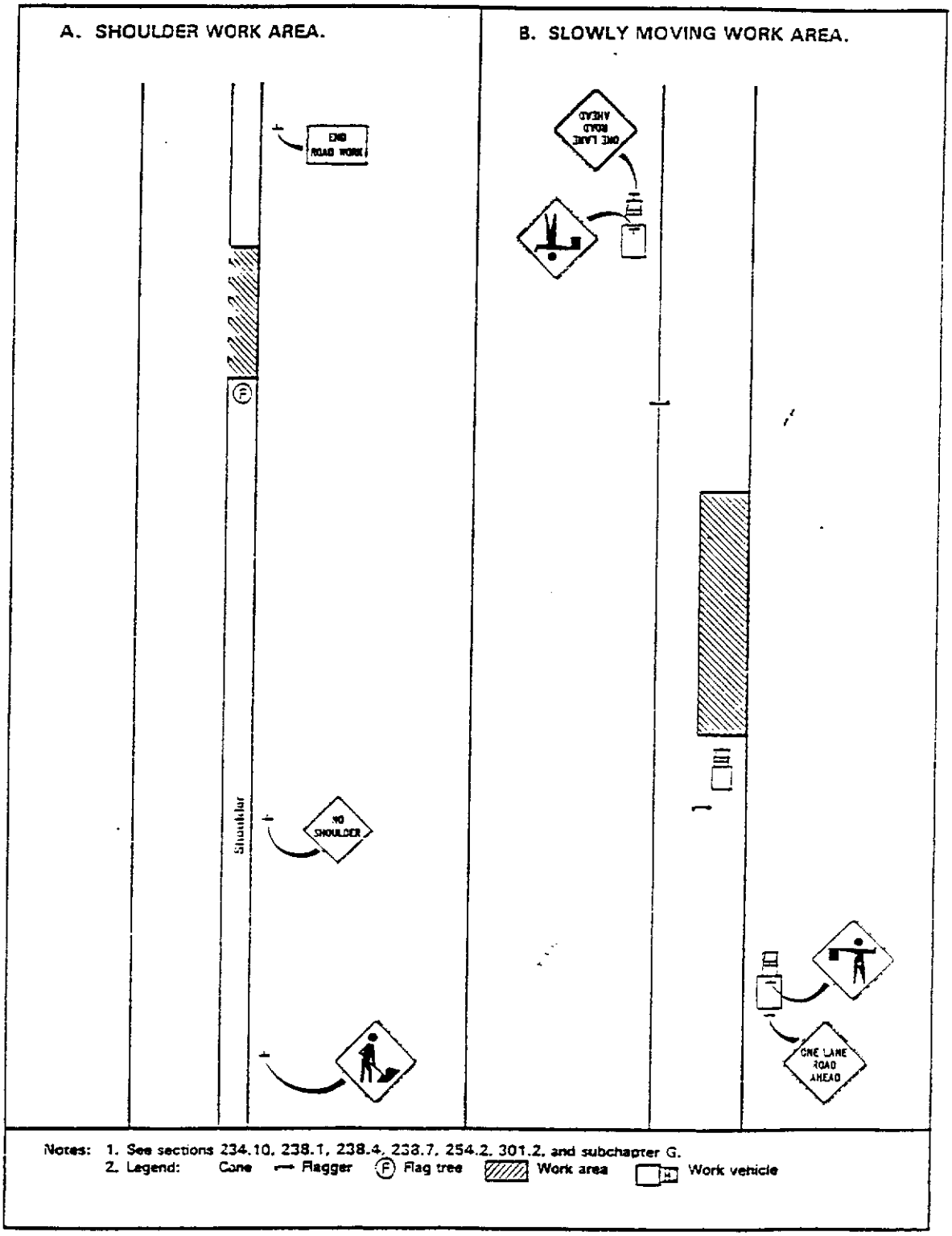
Notes: 1. See sections 238.1, 238.4, 238.7, 301.2, and subchapter G.
2. Legend: Barricade Cone Flagger Work area

FIGURE 302-8
EXAMPLES OF TRAFFIC CONTROL FOR ONE-LANE SECTIONS ON TWO-LANE TWO-WAY HIGHWAYS



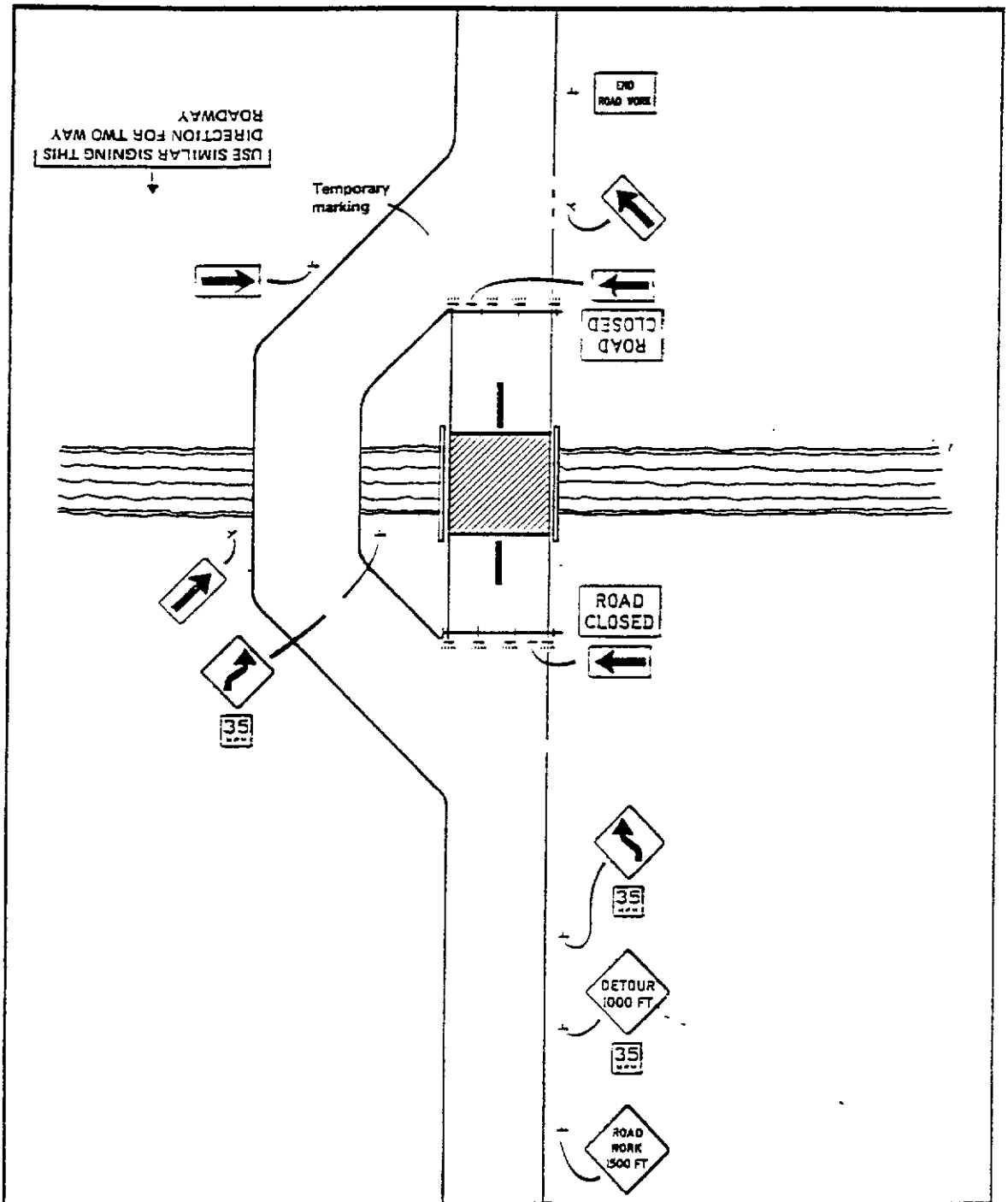
Notes: 1. See sections 232.6, 238.1, 238.2, 238.4, 254.2, 301.2, and subchapter G.
2. Legend: ⟶ Barricade ● Cone ▮ Drum ⟶ Flagger or ⁞ Flashing warning light
⟶■ Signal face ▨ Work area
3. L approx. = transition length (see section 262.221).

FIGURE 302-9
EXAMPLES OF TRAFFIC CONTROL AT SHOULDER AND SLOWLY MOVING WORK AREAS



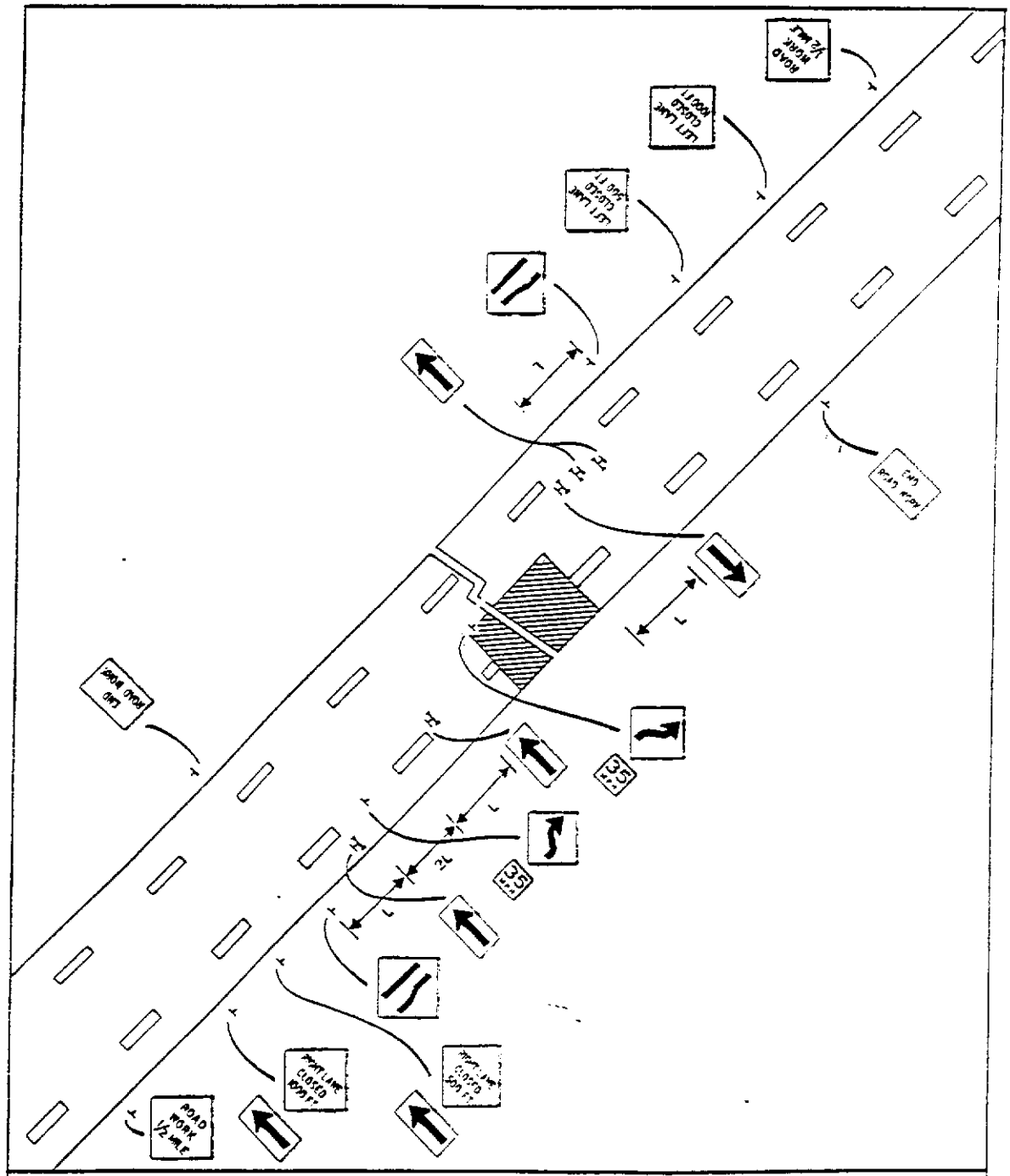
Notes: 1. See sections 234.10, 238.1, 238.4, 238.7, 254.2, 301.2, and subchapter G.
2. Legend: Cone — Flagger (F) Flag tree Work area Work vehicle

FIGURE 302-10
EXAMPLE OF TRAFFIC CONTROL FOR WORK AREA TRAFFIC DETOUR



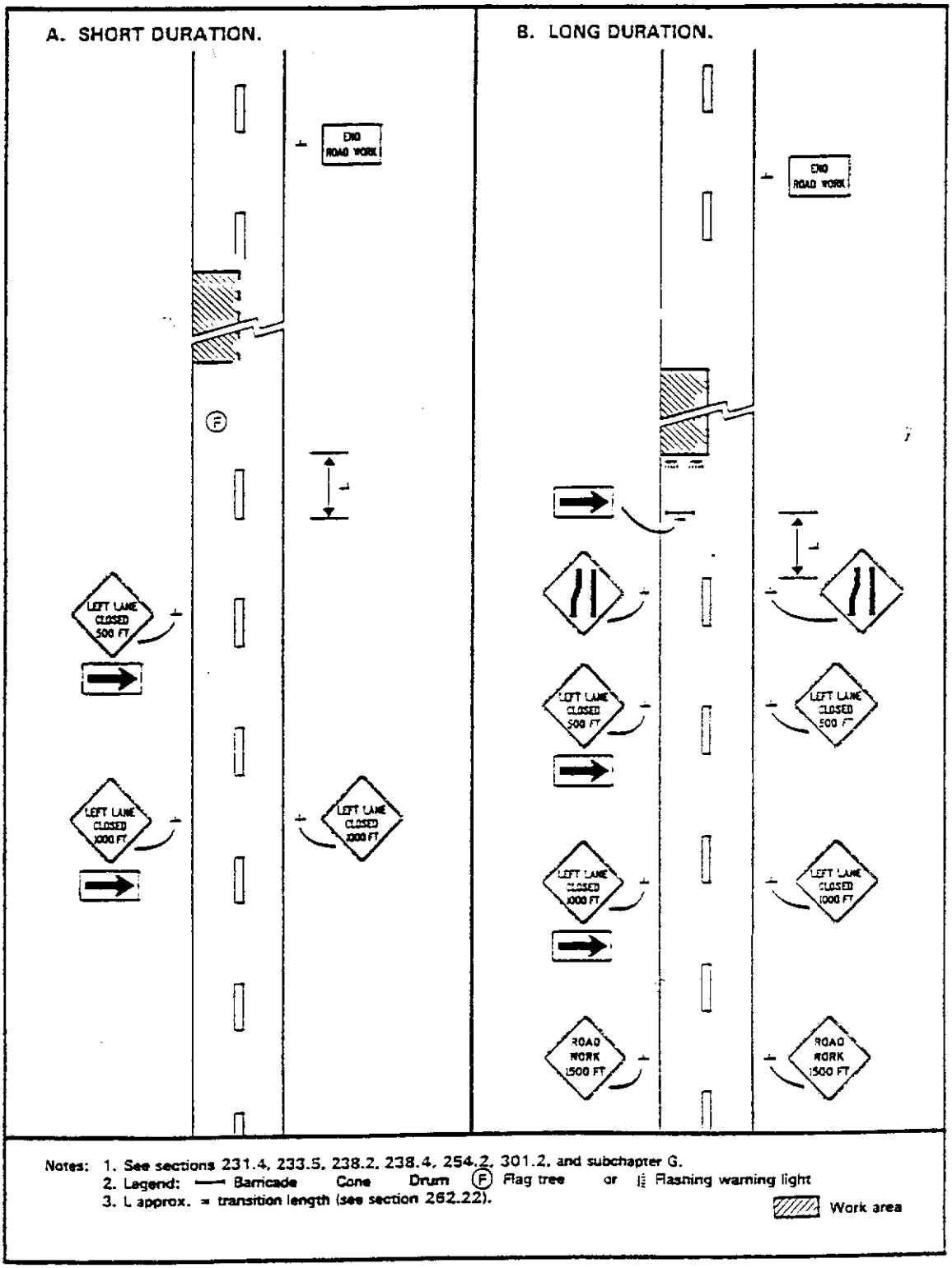
Notes: 1. See sections 218.2, 231.3, 231.4, 238.2, 238.5, 239.1 254.2, 301.2, and subchapter G.
2. Legend: ⟶ Barricade Cone Drum or Flashing warning light Work area

FIGURE 302-11
EXAMPLE OF TRAFFIC CONTROL FOR WORK AREA ON A MULTI-LANE ROADWAY



Notes: 1. See sections 231.3, 231.4, 233.5, 238.2, 238.4, 239.1, 254.2, 301.2, and subchapter G.
2. Legend: ═══ Barricade ○ Cone ▮ Drum or ⁞ Flashing warning light ▨ Work area
3. L approx. = transition length (see section 262.22).

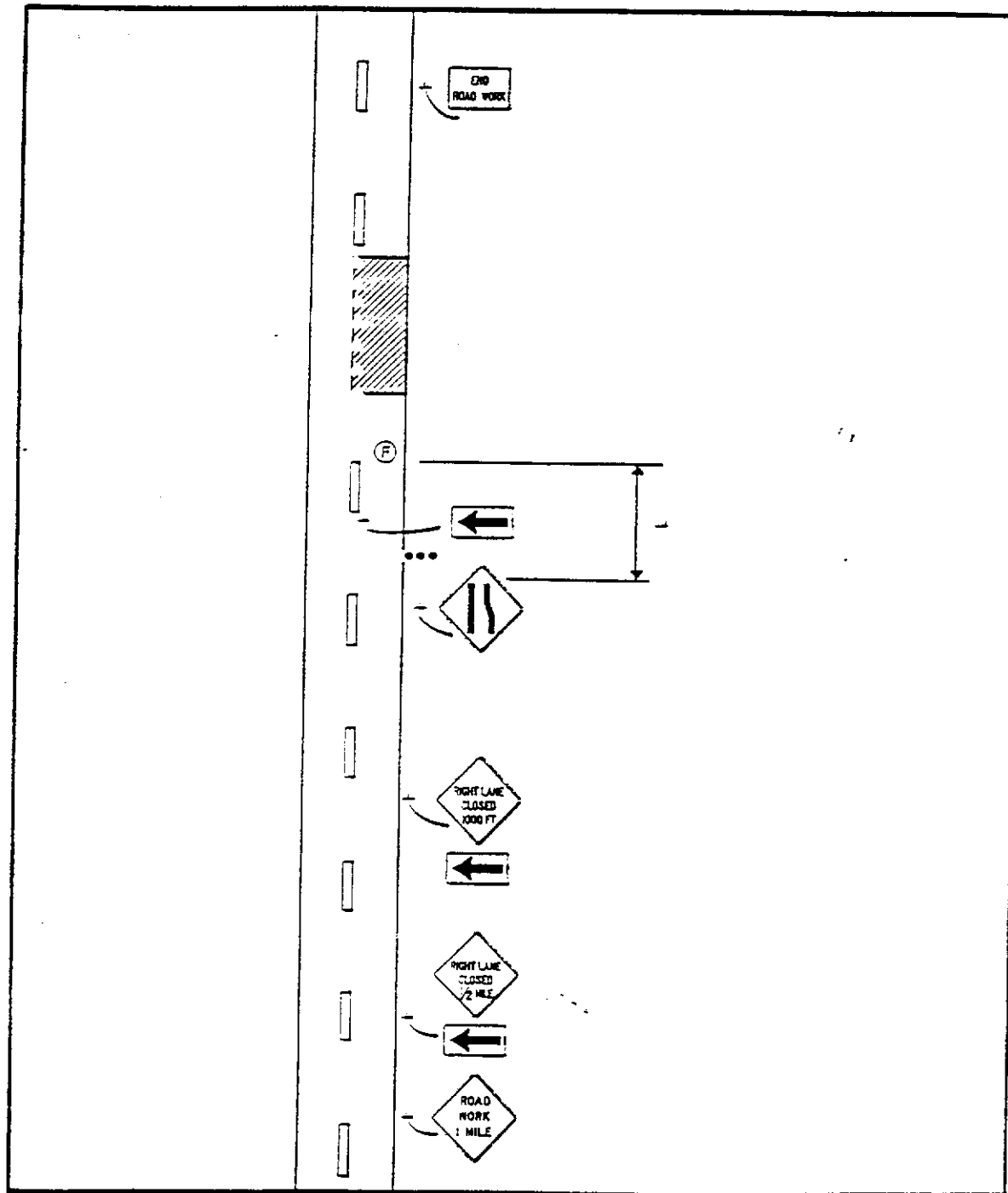
FIGURE 302-12
EXAMPLES OF TRAFFIC CONTROL FOR WORK AREAS ON ONE-WAY ROADWAYS



Notes: 1. See sections 231.4, 233.5, 238.2, 238.4, 254.2, 301.2, and subchapter G.
2. Legend: —— Barricade Cone Drum (F) Flag tree or Flashing warning light
3. L approx. = transition length (see section 262.22).

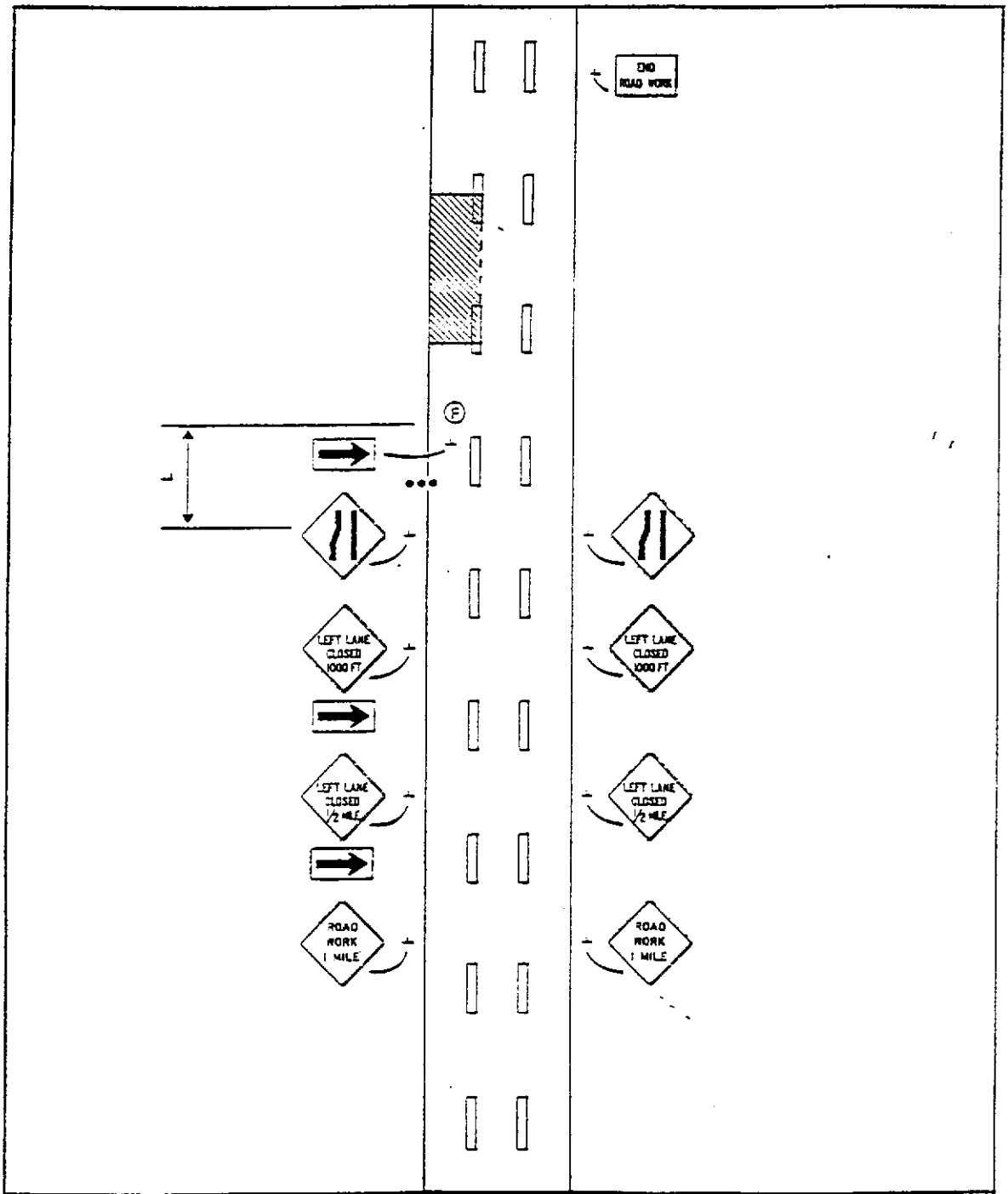
Work area

FIGURE 302-13
EXAMPLE OF TRAFFIC CONTROL AT SHORT DURATION WORK AREA ON A ONE-WAY ROADWAY



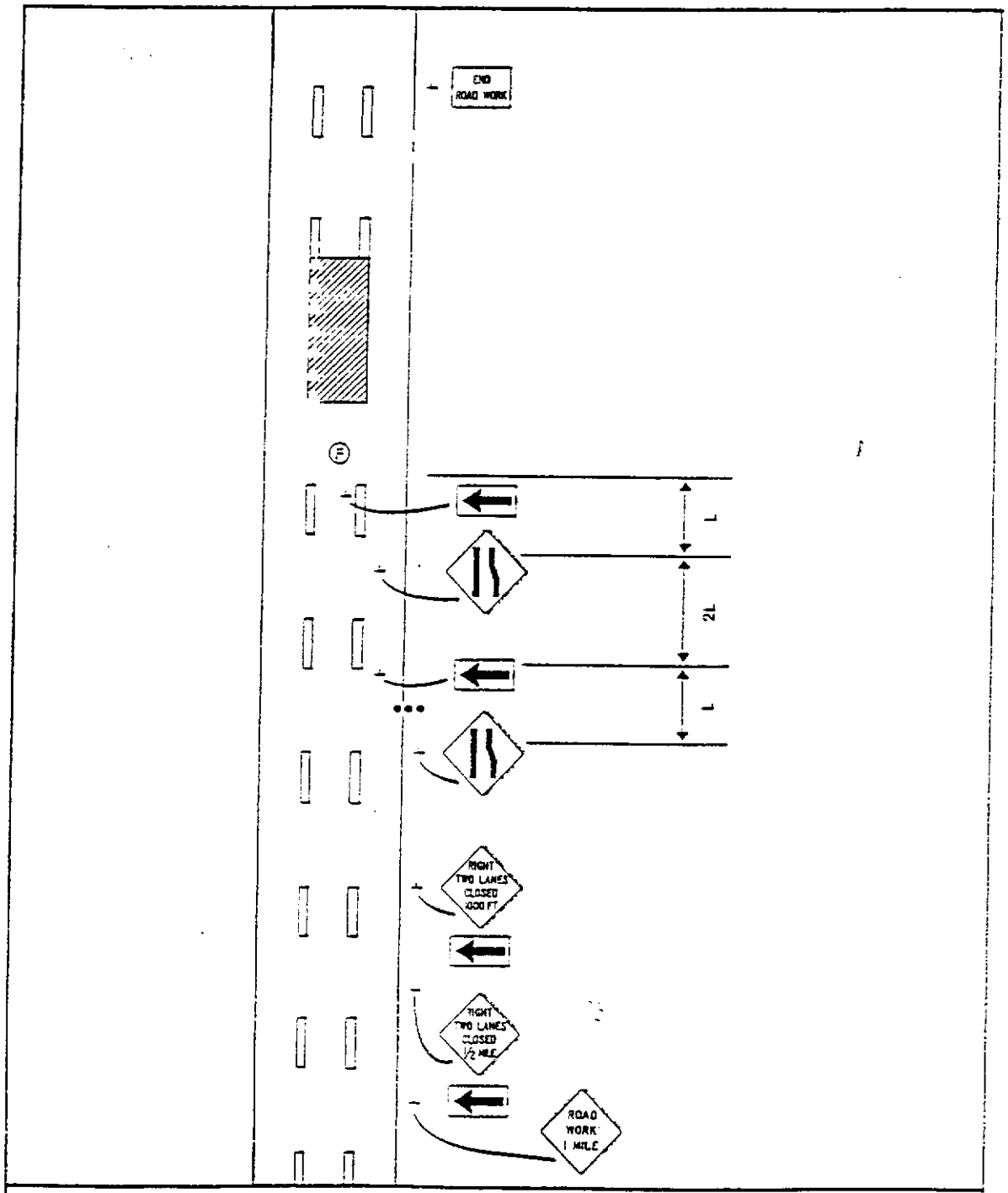
Notes: 1. See sections 231.4, 233.5, 238.2, 238.4, 254.2, 294.5, 301.2, and subchapter G.
2. Legend: ●●● Arrow panel Cone (F) Flag tree Work area
3. L approx. = transition length (see section 262.22).

FIGURE 302-14
EXAMPLE OF TRAFFIC CONTROL AT SHORT DURATION WORK AREA ON A ONE-WAY ROADWAY



Notes: 1. See sections 231.4, 233.5, 238.2, 238.4, 254.2, 294.5, 301.2, and subchapter G.
2. Legend: ●●● Arrow panel Cone (F) Flag tree Flashing warning light Work area
3. L approx. = transition length (see section 262.221).

FIGURE 302-15
EXAMPLE OF TRAFFIC CONTROL AT SHORT DURATION WORK AREA ON A ONE-WAY ROADWAY



Notes: 1. See sections 231.4, 233.5, 238.2, 238.4, 294.2, 294.5, 301.2, and subchapter G.
2. Legend: ●●● Arrow panel Cone (F) Flag tree Work area
3. L approx. = transition length (see section 262.221).

FIGURE 302-16
EXAMPLES OF TRAFFIC CONTROL AT SLOWLY MOVING WORK AREAS ON ONE-WAY ROADWAYS

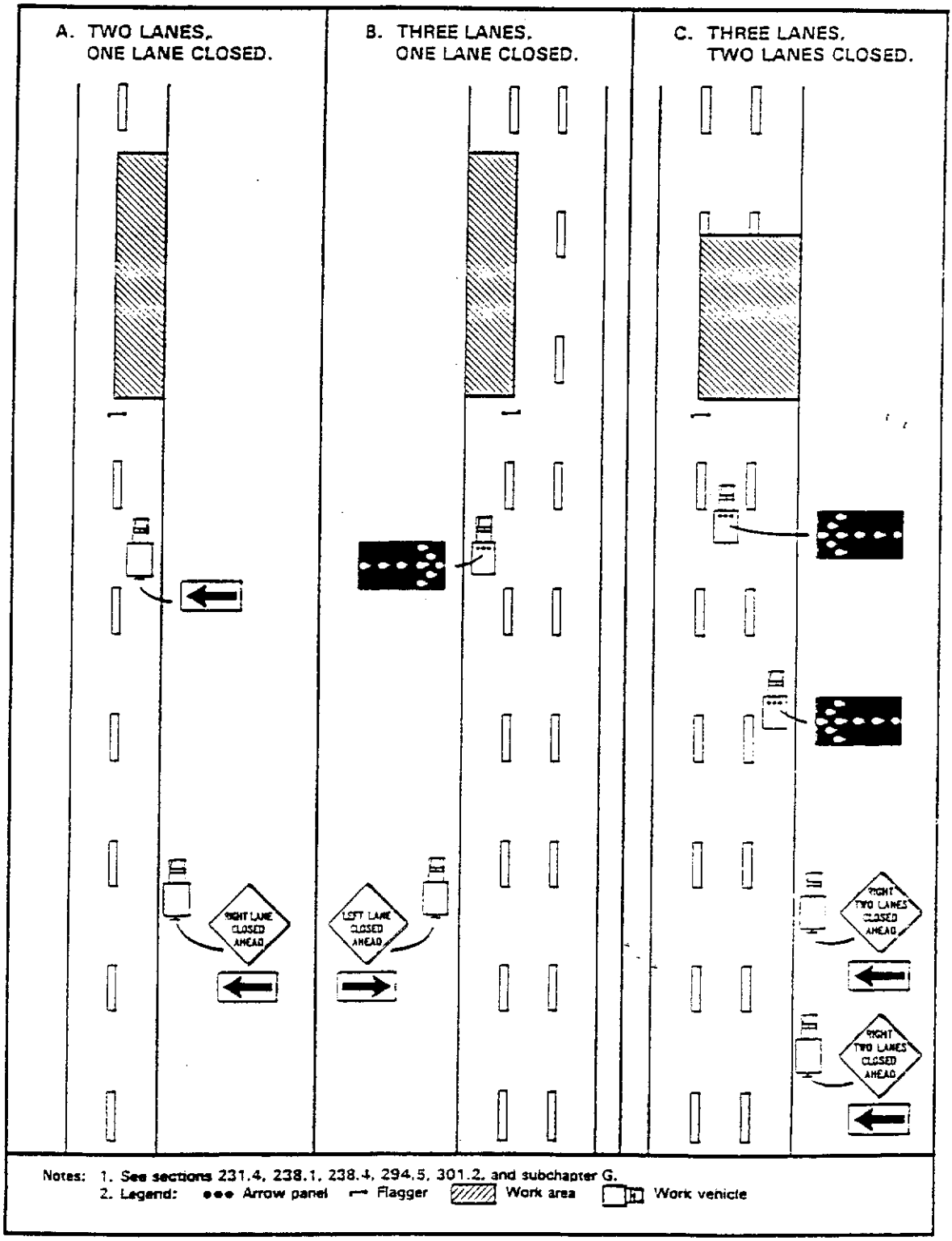
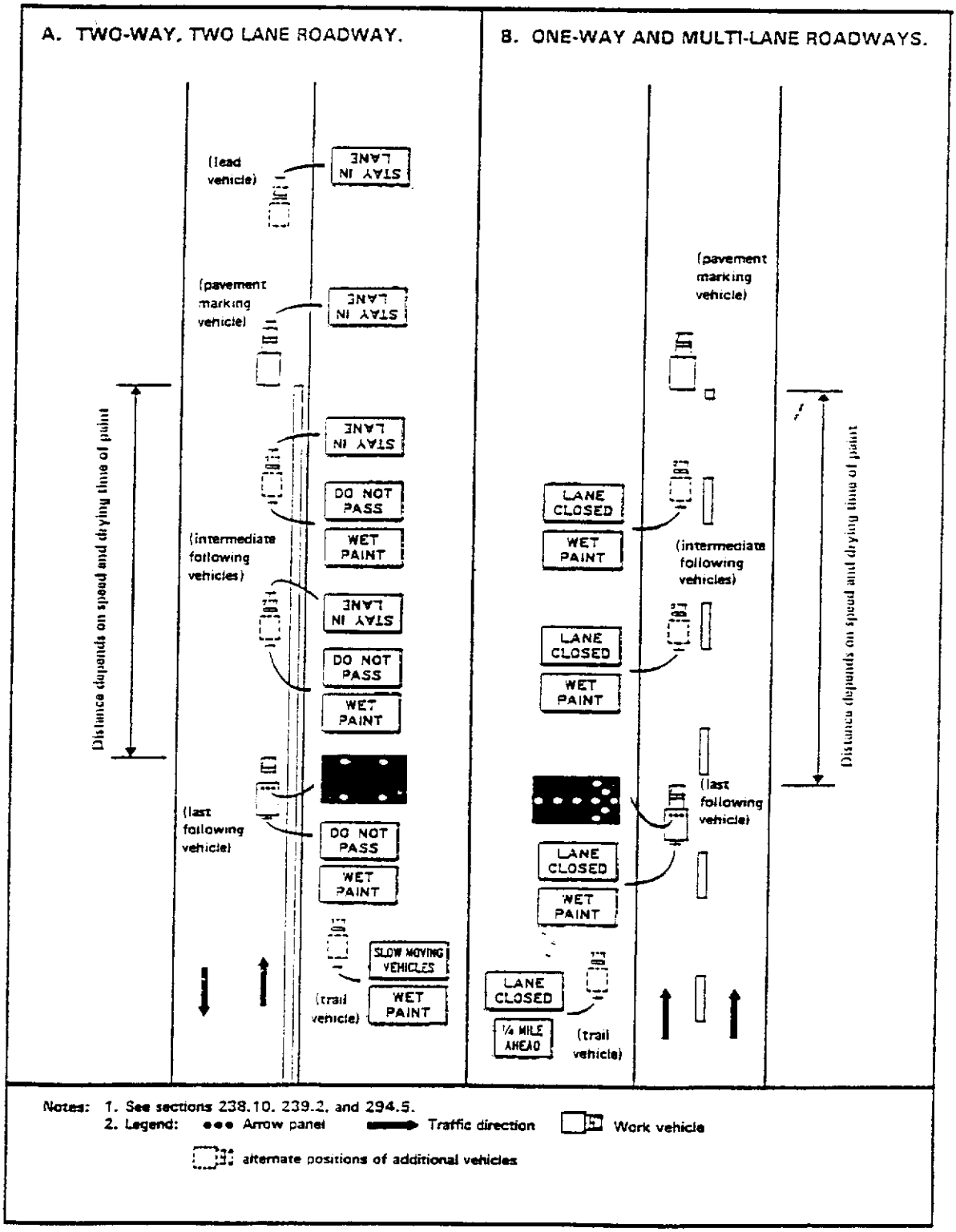


FIGURE 302-19
EXAMPLES OF TRAFFIC CONTROL AT MOBILE PAVEMENT MARKING OPERATIONS



APPENDIX 5

DAILY INSPECTION FORM

DAILY INSPECTION FORM

PROJECT NAME:	
DATE:	PROJECT NO.:
LOCATION:	
TIME START:	TIME END:
PERSONNEL ON SITE:	

SUMMARY OF SITE SAFETY BRIEFING:

SUMMARY OF ACTIVITIES:

Signature

Appendix D

List of Public/Special Interest Groups and Interested Public

H2M GROUP

NYSDEC and NYSDOH

Girish Desai
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Stony Brook, NY 11790-2356

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H2M GROUP

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Roslyn Heights, NY 11577

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Great Neck, NY 11021

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Gary L. Ackerman
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Bayside, NY 11361

Alfonse D'Amato
United States Senator
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Westbury, NY 11590

James Mullligan
Nassau County Department of Public Works
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Westbury, NY 11590

Lisanne Altmann
Nassau County Legislator
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Mineola, NY 11501

Timothy Mulvihill
Nassau County Health Department
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Mineola, NY 11501

Thomas S. Gulotta
Nassau County Executive
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Mineola, NY 11501

John Lovejoy
Nassau County Health Department
240 Old Country Road
Mineola, NY 11501

Nassau County Clerks Office
Property Owners - Deeds
240 Old Country Road
Mineola, NY 11501

Town of North Hempstead

Councilman Fred Pollack
Town of North Hempstead
220 Plandome Road
Manhasset, NY 11030

Councilman Anthony D'Urso
Town of North Hempstead
220 Plandome Road
Manhasset, NY 11030

Councilwoman Doreen E. Banks
Town of North Hempstead
220 Plandome Road
Manhasset, NY 11030

Councilman John Fabio
Town of North Hempstead
220 Plandome Road
Manhasset, NY 11030

Paul Roth
Director of Solid Waste
Town of North Hempstead
220 Plandome Road
Manhasset, NY 11030

May W. Newburger
Town Supervisor
Town of North Hempstead
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Manhasset, NY 11030

Town of North Hempstead
220 Plandome Road
Manhasset, NY 11030

Town of North Hempstead
Parks and Recreation Department
1801 Evergreen Avenue
New Hyde Park, NY 11040

Alma E. Hyman - Commissioner
Town of North Hempstead
Department of Planning & Economics
Town Hall
P O Box 3000
Manhasset, NY 11030

Village of Lake Success

Mayor Roberta Chavis
Village of Lake Success
318 Lakeville Road
Lake Success, NY 11020

Roberta Penchina
Village Clerk
Village of Lake Success
318 Lakeville Road
Lake Success, NY 11020

Robert Bernstein
Deputy Mayor Village of Lake Success
318 Lakeville Road
Lake Success, NY 11020

Steven Lam
Village of Lake Success Trustee
318 Lakeville Road
Lake Success, NY 11020

Shirely Libby
Village of Lake Success Trustee
318 Lakeville Road
Lake Success, NY 11020

Albert Arkus
Village of Lake Success Trustee
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Lake Success, NY 11020

Karen Vardi
Village of Lake Success Trustee
318 Lakeville Road
Lake Success, NY 11020

Fred Handsman
Village of Lake Success Trustee
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Lake Success, NY 11020

Village of Great Neck Plaza

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Village of Great Neck Plaza
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Great Neck, NY 11022

Patricia O'Byrne
Village Clerk
Village of Great Neck Plaza
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Great Neck, NY 11022

Public/Special Interest Groups

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Floral Park, NY 11005

Kathleen Semfried
Lakeville Estates Civic Association
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New Hyde Park, NY 11040

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Manhasset Hills Herricks Civil Association
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Holiday Park AE Manhasset Hills
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Marietta DiCamillo
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New Hyde Park, NY 11040

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Great Neck Village Officials Association
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ELAN
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Kip Lomoaica
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United States Geological Survey
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Huntington Station, NY 11746

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Peck & Heller Atty.
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Scarsdale. NY 10583

A L L Associates
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Manhasset, NY 11030

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Long Island Medical Center
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New Hyde Park, NY 11040

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New Hyde Park Civic Association
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New Hyde Park, NY 11040

Rabbi Stefonsky
Lake Success Jewish Center
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Lake Success, NY 11020

Robert Zimmerman
American Jewish Conference
160 Middle Neck Road
Great Neck, NY 11021

Jane Bloom
State Superfund Management Board
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New York, NY 10019-6064

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LILCO
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Melville, NY 11747

Cumberland Farms, Inc.
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Elmont, NY 11003

Local 282 Welfare Trust Fund
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Lake Success, NY 11020

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Susan Goldman
VLS
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Manhasset, NY 11030

Tom Casey
Henderson & Casey
Manhasset Lakeville Water District
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Westbury, NY 11590

Robert J. Graziano
Superintendent
Water Authority of Great Neck North
171 Great Neck Road
Great Neck, NY 11021

Michael J. Tierney
Superintendent
Water Authority of Western Nassau County
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Floral Park, NY 11001

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Great Neck Public Schools
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Union Free School District #7
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Maggie Whitely
Editor
Nassau Illustrated
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Mineola, NY 11501

Annette Welch
Government Watch Section

H2MGROUP

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Melville, NY 11747

Interested Public

Includes all individuals who have expressed an interest, attended previous meetings, provided comments, and/or who lives within the area defined below, and as shown in Figure 1.

- within 1/2 miles to the north of the site,
- within 1/4 miles to the east and west of the site, and
- within 1/8 miles south of the site.

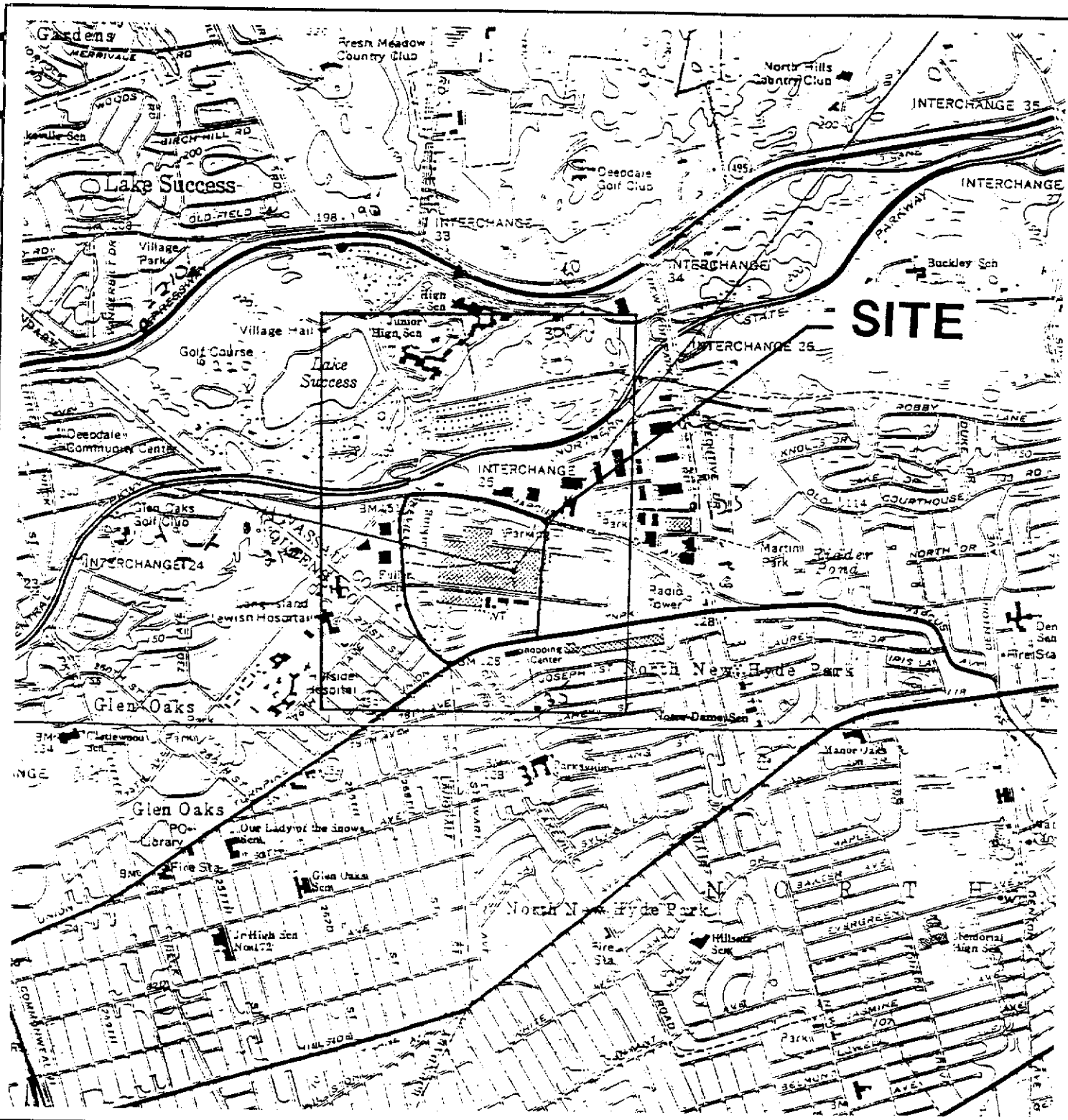

FIGURE 1
MAILING LIST AREA
LOCKHEED MARTIN
GREAT NECK, NEW YORK

SOURCE: U.S.G.S. LYNBROOK QUADRANGLE 1975

SCALE: 1" = 2000'

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