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SITE ID 209: LOCKHEED MARTIN'S and GENERAL ELECTRIC'S ELECTRONICS PARK FACILITY

SITE SUMMARY REPORT

Onondaga Lake Project
Task 5: 104(e) Review

Site No. 734030-002
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1.0 SITE DESCRIPTION

In general, the information referenced in this report was obtained from the 104(e) responses of both Lockheed Martin Corporation (Company ID 2002, formerly Martin Marietta Corp.) and General Electric Company (Company ID 2003). Information obtained from other sources is noted, as necessary.

1.1 Location

The Electronics Park (EP) facility is located on Electronics Parkway in the Town of Salina, Onondaga County, New York. Figure 1 shows the location of the EP facility in relation to Onondaga Lake. Figure 2 shows a site/building plan of the EP facility (Blasland, Bouck & Lee, September 1994). The site is bound by the New York State Thruway on the southwest, Vine Street to the northwest, Henry Clay Boulevard to the north, and Seventh North Street and Electronics Parkway to the east. The facility consists of 17 separate buildings with a gross floor-space area of 1.9 million square feet situated on a 183-acre site.

1.2 Geology

The surficial geology of the Syracuse area was strongly influenced by the most recent glacial advance (Wisconsin age, 12,000 to 14,500 years ago). Syracuse occupies a region that was covered by Lake Iroquois, a large glacial lake situated in front of the ice margin. The broad flat-lying plains situated from Syracuse north to Lake Ontario were formed beneath Lake Iroquois and are characterized by lacustrine fine sand and silt deposits. Additional glacial features which are common to the region are moraines, drumlins, U-shaped valleys and meltwater channels. The last of these features is important in

understanding the geology at the site. Onondaga Lake and all its major tributaries lie within glacial meltwater channels. These features originally were conduits carrying meltwater away from the glacier. They typically transmitted large volumes of water at high velocities. Sediment types characteristically found in meltwater channels are sands and gravels. In the Syracuse region, these relict features form important water bearing and transmitting units which lie in an irregularly branching, net-like pattern throughout the area.

The bedrock geology of the greater Syracuse area includes Lower to Middle Paleozoic age sedimentary rocks predominated by carbonate (dolostone and limestone) and shale and containing some sandstone, siltstone and evaporites. Bedrock directly beneath the site (as well as underneath Onondaga Lake) is the Silurian Vernon Shale (Rickard and Fischer, 1970) which has low permeability, but does possess secondary porosity due to fractures.

1.3 Hydrogeology

In 1990, Malcolm Pirnie, Inc., for General Electric, investigated general groundwater conditions beneath the EP site. Borings and monitoring wells were installed. The unconsolidated deposits beneath the site consist of glaciolacustrine silty sands, glacial lodgement till, and silty sand and gravel deposits; the permeable deposits range in thickness from 10 to 35 feet (Malcolm Pirnie, July 1990). Additional groundwater investigations included in the responses were performed by Law Environmental for General Electric (August 1991), and Blasland & Bouck/Blasland, Bouck & Lee for General Electric (February 1992) and Martin Marietta (April 1993, October 1993, and September 1994).

Based on these studies, it was shown that groundwater flow beneath the EP site is in a southerly direction towards Onondaga Lake. Hydraulic conductivity near Building EP-7 ranged from 5×10^{-5} cm/sec to 1×10^{-5} cm/sec (Malcolm Pirnie, July 1990). The low permeability of the glacial till unit, which exists below the sand and gravel deposits, results in horizontal flow of shallow groundwater through the surficial soils with a flow velocity of about 0.03 to 0.05 feet per day (Blasland, Bouck & Lee, March 1995, p. 101635).

The foundation drains and sumps that exist throughout the EP site have been used to collect and control groundwater in and around subgrade structures at the facility, including utility tunnels and basements. The artesian well (installed in the shale bedrock beneath the facility) which discharges to the building EP-5 sump was installed to relieve groundwater pressure on the building EP-5 foundation and to supply non-contact cooling water. Groundwater levels immediately below the EP site have been significantly influenced by the numerous sumps throughout the site. The sump at building EP-7 causes the most significant drawdown in local groundwater levels. Site elevations range from about 400 to 410 feet NGVD. As shown in the various groundwater contour maps from May through October 1993 (Blasland, Bouck & Lee, October 1993, pp. 101203 - 101208), groundwater elevations ranged from a maximum of about 397 feet on the north-central (near building EP-10) and southeastern (near EP-17) portions of the site and to a minimum of about 389 feet near the EP-7 sump. Thus, overburden groundwater beneath the central portion of the EP site converges toward the EP-7 sump. As discussed later, this water is currently collected and pumped (at about 30 to 50 gpm) to an on-site treatment system and discharged to the West Branch of Bloody Brook. Also, overburden groundwater is not present in the western portion of the site beneath the "Former Drum Storage Area" (Blasland, Bouck & Lee, March 1995, p. 101625).

1.4 Surface Water Hydrology

A storm sewer system conveys stormwater and groundwater collected from foundation drains and building sumps from the EP site to both the West and Middle Branches of Bloody Brook (see Figure 2). Flow from the eastern portion of the system discharges to the Middle Branch of Bloody Brook and flow from the western portion of the site discharges to the West Branch of Bloody Brook. The surface elevation of the pond on the southeastern portion of the EP site, which drains into the Middle Branch of Bloody Brook, is approximately 395 feet NGVD. In addition, water from the EP-5 artesian well and effluent from the groundwater treatment system is discharged to the storm sewer system. These discharges are regulated under a SPDES permit for the EP facility. As shown in Figure 1 (from TAMS' Onondaga Lake GIS developed from PTI's hydrologic coverage), the two branches of Bloody Brook converge about one-half mile downstream of the site and south of the Thruway and discharge to Onondaga Lake (elevation 363 feet) about one mile downstream of the site.

2.0 SITE HISTORY

2.1 Owners/Operators

According to documentation provided by Martin Marietta, the General Electric (GE) Electronics Park (EP) facility (EPA Facility ID NYD059385120) was constructed in the mid-1940s. Operations were transferred from GE's Aerospace business to Martin Marietta Corporation (MMC) on April 2, 1993. In 1995, MMC and Lockheed Corporation merged, forming a new parent company, Lockheed Martin Corporation (LMC). MMC is a wholly-owned subsidiary of LMC and continues as owner and operator of the Syracuse facilities, including EP (LMC, Mailing No. 3, p. 000275).

2.2 Site Operations

The following is an excerpt from the Blasland & Bouck reports:

The EP facility consists of four buildings that currently or formerly contained manufacturing operations (Buildings EP-5, EP-6, EP-7, and EP-15); an electronics laboratory (EP-3); and several buildings used for administrative and support activities (EP-1, 2, 4, 8, 9, 10, and 17) (see Site Plan, Figure 2). Various electronics components were manufactured at the facility, including receivers in Building EP-5, specialty products and television tubes in EP-6, transmitters and semi-conductors in EP-7, and television tubes in EP-15. Currently, sonar and radar systems are manufactured in EP-5, and projectors are manufactured in a portion of EP-7 (Blasland and Bouck, October 1993, p. 101152). In addition, electronics research is conducted at the EP facility primarily for U.S. defense purposes.

From approximately 1965 to 1980, GE operated a drum-storage facility in the western portion of the EP site adjacent to Vine Street near buildings EP-11 and EP-12 which were demolished in 1988. The 55-gallon drums contained chemical wastes including spent halogenated and non-halogenated solvents (Blasland and Bouck, September 1994, p. 101555). Also, from 1972 to the present, approximately 1.6 acres of land on the northern corner of the site near building EP-5 have been used as a "compost and debris area" for composting landscaping debris and excavated soils and for disposing building construction materials (p.101555). A portion of building EP-7A ("Chem Annex") was used as a hazardous waste storage area and was undergoing closure in 1993.

2.3 Generation and Disposal of Wastes

A description of the wastes generated at the EP facility as well as the reported disposal practices for these wastes are presented below.

2.3.1 General Electric Operations

PCBs

PCBs were used at the EP facility in power transformers and capacitors, lighting fixture ballasts, and electronic equipment. A 1979 tabulation listed the following disposal sites and time periods: Town of Salina Landfill on 7th North Street and NYS Thruway (1970-74), Town of Onondaga Landfill (1977-1979), Rock Cut Road (1974-77), Model City Landfill (1973-79), and Chemical Distributors, Buffalo (1973-79). According to a footnote on the tabulation, details for pre-1970 disposal locations are not readily available (GE, Mailing No. 2, p. 001022). Quantities generated and disposed prior to 1979 were not provided by either GE or MMC/LMC.

Annual PCB inventories from 1988 through 1990 were provided by GE as well as copies of hazardous waste manifests. Limited manifests were also provided for 1984 through 1987. In 1990, nearly 52,000 kg of PCBs were removed from the site for final disposal (GE, Mailing No. 2, p. 001024). According to the manifests, PCB-containing wastes were shipped to Clean Harbors of Massachusetts or to the GE Buffalo Service Center in Tonawanda, NY for decommissioning and storage prior to final disposal at out-of-state landfills and/or incinerators. The manifests provided by GE were limited to PCB-containing wastes ("waste material profile sheets" and "waste product records" were provided for other hazardous wastes). According to a 1985 Industrial Chemical Survey, 20,000 pounds of PCBs used for dielectric fluid were stored or used on site (GE, Mailing No. 2, p. 000811).

Other Hazardous Substances

Trichloroethylene (TCE), considered a halogenated solvent, was utilized in the television tube operations in building EP-6 through 1982 and in the semiconductor operations in building EP-7 until 1978 (Malcolm Pirnie, July 1990, p. 001752).

As identified in a 1980 Industrial Chemical Survey form submitted to the Onondaga County Department of Drainage and Sanitation (OCDDS) (GE, Mailing No. 2, p. 000762), the following chemicals were listed as "substances of concern":

Name of Substance	Avg. Annual Usage (Gal,G or Lbs,#)	Purpose of Use
Trichloroethylene (TCE)	36,200 G	Degreasing, parts cleaning
Toluene	6,155 G	Process cleaning, process thinner, plastic solvent
1,1,1 Trichloroethane (TCA)	1,980 G	Cleaning and drying
Tetrachloroethylene (PCE)	880 G	Cleaning and drying
Xylene	110 G	Cleaning and drying
Freon (TF and TMS)	1,375 G	Cleaning and drying
Hardeners and Resins	35,300 #	Blended, implosion protection
Grit Powder (1/3 Lead)	161,918 #	Process bonding agent
GE Thinner (1/3 Toluene)	55 G	Thinner
Methylene Chloride	3 G	Solvent
Sodium Cyanide	30 # (175 # on hand)	Plating
Cadmium	10 # (200 # on hand)	Plating
Copper	51 # (126 # on hand)	Copper wire conductor
Lead	1 # (20 # on hand)	Plating
Mercury	0 (5# on hand)	Plating
Nickel	10.5 #	Plating
Zinc Oxide	8,000 #	Electric component mfg.

In addition, according to a 1985 Industrial Chemical Survey, average annual usages of substances of concern consisted of 130,000 pounds of lead for ceramic sonar cylinders, 140 pounds of arsenic for semiconductor crystals, 4,900 pounds of cadmium for electron shields, and 2,600 pounds of beryllium for coating semiconductor chips (GE, Mailing No.

2, p. 000811). Quantities of other chemicals identified in the 1985 survey were relatively consistent with the quantities in the above tabulation of 1980 data.

According to a 1977 NY State Hazardous Waste Survey, waste streams were generated from manufacturing of color television picture tubes (process no. 1) and manufacturing of semiconductor products (process no. 2). The wastes streams have historically been discharged to the Onondaga County municipal sewer system or disposed by Frontier Chemical Waste Process, Inc. in Buffalo, New York (GE, Mailing No. 2, pp. 000790 - 000799). Other disposal sites identified by GE include Seneca County Facility in Seneca Falls, NY, Solvent Savers in DeRuyter, NY, SCA Chemical Services in Model City, NY, and Chemical Distributors in Buffalo, NY (GE, Mailing No. 2, pp. 000836 - 000837). It is also noted that wastes generated at GE's Court Street and Farrell Road plants were transported to the EP facility for centralized pick-up by the disposal contractor (GE, Mailing No. 2, p. 000834).

2.3.2 Martin Marietta/Lockheed Martin Corp. Operations

Hazardous Wastes

According to MMC's initial response, hazardous wastes, hazardous substances, and industrial wastes have been transported and disposed of legally during their period of operation (April 1993 to present) (MMC, Mailing No. 1, p. 000007). Laidlaw Environmental Services is the hazardous waste transporter/disposal contractor for MMC. MMC's review of manifests after April 1, 1993 indicated that all shipments were properly disposed of at facilities outside Onondaga County and thus outside the basin.

Martin Marietta provided a copy of the Hazardous Waste Reduction Plan for the EP facility and the Tarbell Road (Court Street Building 8) plant which stated that approximately 146 tons of hazardous wastes were generated at the EP facility in 1992 consisting of approximately 66 tons of process wastes (MMC, Mailing No. 1, pp. 000115 - 000116). Wastes generated from remedial and renovation activities accounted for the difference in tonnage. The major waste streams consisted of non-chlorinated solvents, lab-packed chemicals, flammable solid debris, oily debris and waste oil, lead-contaminated solids and powder, paint and thinners, epoxy resin packs, and chlorinated solvents, primarily TCA and some TCE (p. 000117). Incineration and landfilling were identified as the disposal methods for these wastes (p. 000159). As listed in the Annual Hazardous Waste Report (pp. 000168 - 000171), nearly 56 tons of PCB-contaminated wastes and 0.5 tons of "mercury debris" were generated in 1992.

Industrial Wastes

Wastes considered non-hazardous have also been handled by Laidlaw. Approximately 4.23 tons of non-hazardous soil ("special waste") was transported from EP to a landfill in Seneca Meadows, outside Onondaga County. Also, scrap metal including copper and steel has been transported for recycling and/or resale to Matlow facilities on Bridge Street in Solvay and to Roth Steel in Syracuse. Laidlaw has transported nearly 67 tons of scrap metal from EP from April 1993 to August 1994 (MMC, Mailing No. 1, p. 000008). In addition, waste paper from MMC's Syracuse facilities, including EP, is recycled at Laidlaw's facilities in Liverpool.

3.0 POTENTIAL PATHWAYS FOR RELEASE OF HAZARDOUS SUBSTANCES TO THE LAKE SYSTEM

3.1 Soil

Soil on the EP site can be contaminated directly from release of manufacturing wastes to the drain system or through the basement/foundation sumps. In addition, underground storage tanks and spill tanks in the vicinity of buildings EP-7 and EP-9 are also potential sources of contamination to the soil as well as spills from the former drum-storage area on the western portion of the site or from the compost and debris area on the northern portion of the site. The extent of soil contamination is described in Section 4.

3.2 Surface Water

The direct discharge of wastewater and stormwater and the migration of contaminated groundwater are significant potential pathways of contamination to the branches of Bloody Brook which converge downstream of the site and discharge to Onondaga Lake. Martin Marietta's current NY SPDES permit (NY-0002101) allows for discharge of cooling tower water, non-contact cooling water, air stripper effluent, artesian well water, basement sump water (buildings EP-4 and EP-15) and stormwater to the West Branch of Bloody Brook (Outfalls 001, 002, 003, 007) and to the Middle Branch of Bloody Brook (Outfalls 004, 005, and 006). An outfall location diagram is provided in Figure 3.

The air stripper treatment system receives water from building EP-5 artesian and office sumps, buildings EP-6 and EP-7 sumps, building EP-10 foundation drains, monitoring well development water, and VOC-contaminated groundwater collected during storm sewer rehabilitation. The treatment system, adjacent to building EP-10, consists of a pair

of air stripper towers each with a capacity of about 400 gpm (BB&L, March 1995, p. 101630). The effluent is discharged to the West Branch of Bloody Brook. Discharge (flow) limitations for each of the outfalls are not identified in the current permit. According to GE's 1991 Application for Permit Renewal and Modification, the total flow discharged to Bloody Brook is approximately 1.2 MGD, consisting of 0.62 MGD to the Middle Branch of Bloody Brook and 0.58 MGD to the West Branch of Bloody Brook (Martin Marietta, Mailing No. 1, p. 100018). The extent of surface water contamination as well as effluent quality data are described in Section 4.

3.3 Groundwater

Groundwater on and near the EP site can be contaminated directly from release of manufacturing wastes to the drain system and basement sumps and from leaching of contaminants from soil. In addition, the underground storage tanks and spill tanks are also potential sources of contamination to the groundwater as well as the former drum-storage area on the western portion of the site. The extent of groundwater contamination is described in Section 4.

3.4 Air

Numerous state-permitted air emission points throughout the EP site (buildings EP-3, 5, 6, 7, and 10) were identified by GE in the 1991 SPDES Renewal/Modification application submitted to NYSDEC and USEPA (MMC, Mailing No. 1, pp. 100050-100053). No data or emission quantities were provided by either GE or MMC/LMC. Based on operations conducted at the site, the migration of contaminants from the EP facility to the Onondaga Lake system via an air pathway is not expected to be significant.

3.5 County Sewer System

Sanitary and process wastewaters have been discharged into the municipal sewer system with final treatment at either the Ley Creek Municipal Sewage Treatment Facility or the Syracuse Metro plant. Both treatment facilities discharged to the upstream end of Onondaga Lake. According to the Onondaga County Department of Drainage and Sanitation (OCDDS) Industrial Wastewater Discharge Permit Number 6 for the EP facility issued in 1993, the following discharges are permitted to the County sewer system: sanitary wastewater; boiler blowdown water; buildings EP-9 basement and EP-10 outdoor sumps water discharged from the building EP-10 oil/water separator; filtered process wastewater fom the Transducer Products Operations in building EP-5; wastewater generated from the fabrication of semiconductors and parts cleaning in buildings EP-3 and EP-7; wastewater from the photographic laboratory; wastewater from the Projection Display Products Operations in building EP-7; wastewater from building EP-5 operations; and building EP-6 sump water contaminated with low levels of TCE (discharge prohibited after May 1993) (Martin Marietta, Mailing No. 1, p. 100303).

According to a 1991 Industrial Waste Questionnaire submitted to the OCDSS, the sanitary sewer discharge consists of approximately 186,000 gpd of process wastewater, 50,000 gpd of non-contact cooling water, and 123,000 gpd of sanitary wastewater for over 2,000 employees (LMC, Mailing No. 3, p. 101395).

According to a March 1992 request by GE to NYSDEC for an Emergency Authorization to Discharge Wastewater, the EP-7 tunnel sump discharged approximately 40,000 gpd of sump water contaminated with VOCs (including TCE and associated breakdown products such as 1,2-dichloroethene and vinyl chloride) to the county sewer. Prior to 1983 and the discovery of elevated levels of TCE in the surface water discharge, this sump discharged

under the SPDES permit to Bloody Brook. The water was then released to the county sewer system from 1983 to 1992. The discharge was rerouted in 1992 from the sewer to the air stripping unit for final discharge under the SPDES permit back to Bloody Brook (Martin Marietta, Mailing No. 1, p. 100283).

A review of the analytical data associated with the sewer discharge submitted by GE and MMC is provided in Section 4.

4.0 LIKELIHOOD OF RELEASE OF HAZARDOUS SUBSTANCES TO THE LAKE SYSTEM

4.1 Documented Releases

Historical Releases

TCE contamination in groundwater at the EP facility was first identified in 1982 during SPDES monitoring of the discharge to Bloody Brook. GE's sampling of the surface water on the West Branch of Bloody Brook (former discharge 002 near the site boundary at NYS Thruway, downstream of storm sewer discharge points) from 1980 to 1983 revealed elevated concentrations of TCE ranging from 5 μg/L to 721 μg/L with an average of about 170 μg/L (n=54) (tabulated in Malcolm Pirnie, July 1990, pp. 001777-001778). Elevated levels of TCE were also detected by GE from 1980 to 1983 in the main sanitary discharge line to the county sewer with an average concentration of 200 μg/L (n=41) and a maximum of 650 μg/L. According to the Phase I groundwater investigation, sampling of building sumps revealed that the source of TCE was the basement sump in building EP-7 which was pumping contaminated groundwater to the storm sewer system. TCE was also detected in the dip-room sump in the southern portion of building EP-7 (Malcolm Pirnie, July 1990, p. 001752). A description of the extent of contamination is included in Section 4.2.

Ongoing/Recent Releases

Martin Marietta provided a tabulation of spills at the EP facility from April 1993 to September 1994, including spills of hydraulic, fuel, and/or transformer oil (less than 1 pint

to 4 gallons per release), gasoline (minor amounts), and mercury (2 ounce release to floor drain in building EP-2/EP-3 tunnel).

Additional ongoing releases include discharge of process and sanitary wastewater to the county sewer system as well as the discharge of treated groundwater and stormwater to the two branches of Bloody Brook.

4.2 Threat of Release to the Lake System

4.2.1 Extent of Site Contamination

Numerous groundwater investigations have been conducted for GE and MMC from 1990 to 1994, including a Phase I study by Malcolm Pirnie, Phase II study by Law Environmental, and Phase III studies by Blasland, Bouck & Lee.

Phase I Investigation

In the Malcolm Pirnie investigation, monitoring wells were installed and sampled as well as building sumps and storm sewer drains. Groundwater in the vicinity of the spill-containment tanks near building EP-7 (well MW-2) contained elevated levels (about 20 μg/L) of 1,1,1 trichloroethane (TCA) and 1,1 dichloroethane. Storm sewer and sump samples collected near building EP-7 contained elevated concentrations of TCE (less than 10 to 6,100 μg/L). TCA was detected in the basement and outdoor sumps associated with building EP-10 (boiler house area) at concentrations ranging from 50 to 320 μg/L. BTX compounds (benzene, toluene, xylene) were detected in the sumps/drains around buildings EP-7 and EP-9 where petroleum products were used for equipment maintenance (Malcolm Pirnie, July 1990, pp. 001768 - 001772). In addition, two 3,000 gallon underground

storage tanks used for gasoline and diesel fuel can be found near building EP-9. This preliminary study concluded, based on data from monitoring wells along the downstream perimeter of the site, that there was no off-site migration of VOCs via groundwater. PCB analyses were not conducted on any of the groundwater, sump/drain, or surface water samples collected in this investigation.

Phase II Investigation

The Phase II groundwater investigation performed in 1991 included field surveys of the sumps and storm sewers and additional water quality analyses. A flow analysis of the artesian well sump in building EP-5 indicated that the sump discharges approximately 50 gpm to the drain system which in turn discharges to the on-site pond on the Middle Branch of Bloody Brook. TCE was detected at 15 μg/L in the artesian well and at about 100 μg/L in the 6-inch diameter foundation drain flowing into the sump, suggesting the presence of a shallow source and not the artesian well (Law, August 1991, p. 100410). The flow in the building EP-5 office sump was measured at 10 gpm with elevated concentrations of VOCs, including 850 μg/L of chloroform, 120 μg/L of 1,1-dichloroethane, 160 μg/L of chloromethane, and 60 μg/L of chloroethane. At the time of the study, this flow discharged into the West Branch of Bloody Brook.

The flow in the building EP-7 upper/lower sump included about 50 gpm of groundwater and 10 gpm of condensate and chiller water generated within the building basement. After six analyses of water from this sump, the range of TCE concentrations was 1,600 to 7,390 μg/L (excluding an "anomalous concentration" of 160,000 μg/L). The foundation drain discharging to the sump contained 2,000 to 6,000 μg/L of TCE, indicating a groundwater source. Pesticides and PCBs were not detected in the EP-7 sump sample (detection limit of 1 to 2 μg/L per PCB Aroclor). At the time of the Phase II study, this sump's discharge

was to the county sewer system. Analyses of the dip-tank sump in building EP-7 revealed concentrations of TCE of 270,000 μg/L before clean-out (March 1991) and 330,000 μg/L after clean-out (June 1991), indicating a nearby concentrated source of TCE.

The discharge from the sumps at buildings EP-9 and EP-10 was estimated to be about 30 to 40 gpm to the sanitary sewer system. Low concentrations of halogenated VOCs were detected as well as low concentrations of BTX and total petroleum hydrocarbons. Other than the EP-7 sump sample, PCB analyses were not performed on the samples collected during the Phase II investigation. Recommendations were made to install a down-gradient monitoring well network to assess off-site migration of contamination.

Phase III Investigation

Phase III investigations at the EP facility were performed by Blasland, Bouck & Lee (BB&L). A review of the previous investigations and a description of the current status of the sump system and extent of contamination was provided by BB&L. According to BB&L, the flow rate of the EP-7 sump system was approximately 100 to 130 gpm during high groundwater conditions in April 1993 compared to the average flow of about 30 to 50 gpm. The foundation drains at the EP-7 upper/lower sump were the likely primary sources of VOCs in the previous investigations (BB&L, April 1993, p. 100574). The EP-7 dip-tank sump was no longer actively pumped or discharged to the storm or sanitary sewers. Also, the current flow rates in the artesian well sump system was measured at 10 to 25 gpm from the artesian well and 60 to 80 gpm from the foundation drains. Based on a review of the historic data, BB&L identified four areas of potential concern with respect to contamination in the EP storm sewer system: areas north of EP-10, east of EP-6, west of EP-7, and the West Branch of Bloody Brook near EP-15 (BB&L, April 1993, p.

100576). TCE and other VOCs likely originated from groundwater infiltration into the storm pipes.

As part of the Phase III investigation, BB&L conducted a site-wide soil vapor survey and installed soil borings and additional monitoring wells in 1992. Groundwater in wells installed along the southern and western perimeter of the site adjacent to the NY State Thruway and Electronics Parkway did not contain detectable levels of VOCs. BTEX compounds (petroleum-based VOCs) were once again detected in wells adjacent to the former underground storage tanks near building EP-9. Detected concentrations of BTEX exceeded NY State groundwater standards. TCE and TCE/TCA degradation products were once again detected at elevated concentrations throughout the site. Highest concentrations were reported in the wells around buildings EP-6 and EP-7. Except for a well (MW-7) in the western portion of the site, detected concentrations of TCE, 1,2-DCE, and vinyl chloride also exceeded the groundwater standards (5 μg/L groundwater standard for TCE). Other VOCs such as chlorobenzene, 1,1-DCA, and TCA and semivolatile organic compounds such as bis(2-ethylhexyl)phthalate, dichlorobenzenes, naphthalenes, and phenol compounds were also detected at concentrations above the standard or guidance value.

PCBs were detected in groundwater from well MW-15, just north of building EP-15 adjacent to the West Branch of Bloody Brook, in both February (0.07 μg/L Aroclor 1242) and March (0.35 μg/L Aroclor 1260 exceeding 0.1 μg/L standard for sum of PCB Aroclors) 1993. Inorganics, including lead and mercury, were also detected in groundwater during the Phase III investigation. Some of the inorganic compounds were also detected in upgradient wells suggesting either naturally-occurring elements or a source of contamination in groundwater upgradient of the EP site (BB&L, April 1993, pp.

100600 - 100601). BB&L concluded that there are distinct areas of groundwater contamination at the EP facility without off-site migration (p. 100601).

In the Supplemental Phase III investigation (BB&L, October 1993), an additional downgradient perimeter monitoring well was installed and sampled in the southwestern corner of the site. VOCs, semi-VOCs, and PCBs were not detected at this location (MW-19). Additional analyses were performed at existing wells throughout the site with similar results as compared to previous investigations. Fifteen soil borings were installed in June 1993 in the area north of building EP-5 where VOCs were detected in soil vapor samples collected during the Phase III investigation. No significant VOC contamination was found in five soil samples, collected two to four feet below the ground surface. In addition, ten borings and five temporary wells were installed near the former UST area near building EP-9. Petroleum-related VOCs, including BTEX compounds, were detected in unsaturated soil samples in this area. Sampling of the wells revealed that the BTEX plume was migrating towards the south from the former building EP-9 tank area (towards the influence of the EP-7 sump system which controls groundwater flow in the area). Also, according to flow-net calculations performed by BB&L, an estimate of the range of groundwater flows toward the EP-7 sum were 18 gpm during low water-table conditions (August 1993) and 86 gpm during high water-table conditions (April 1993). These calculations confirmed the previous flow estimates.

A supplemental Phase III groundwater investigation was performed in the western portion of the EP site in 1994 (BB&L, September 1994). Sampling of soil in the vicinity of the former EP-11/EP-12 drum storage area revealed isolated surficial areas (within 4 feet of the surface) contaminated with VOCs greater than NYSDEC's soil-cleanup objectives. Elevated concentrations of total VOCs (428 mg/kg or ppm) and tetrachloroethene (PCE) (270 mg/kg) were detected in this area in unsaturated soil samples. Overburden

groundwater was not detected in 32 soil borings in this area. An investigation in the Compost and Debris Area, northwest of building EP-5, revealed that groundwater was at 2 to 6.5 feet below grade and did not contain significant amounts of VOCs. Groundwater from a newly-installed (July 1994) monitoring well (MW-23) in this area did not contain detectable levels of VOCs, semi-VOCs, pesticides, or PCBs. In addition, no significant amounts of VOCs, semi-VOCs, pesticides, or PCBs were detected in two newly-installed bedrock monitoring wells (one along the southern fence line and one in the former drum storage area). The bedrock was classified as highly fractured with a relatively low permeability (BB&L, September 1994, p. 101571). Dissolved metals were detected at concentrations below NY State groundwater standards. PCBs were not detected in the two bedrock groundwater samples. Semi-VOCs, pesticides, and PCBs were not detected in the soil samples collected on site.

Sewer Discharges

As stated in Section 4.1, elevated concentrations of TCE (650 μg/L maximum) were detected in samples of wastewater discharging to the sanitary sewer system from 1980 to 1983. Limited samples collected from 1987 to 1989 also revealed elevated levels of TCE (79 to 450 μg/L). Additional sewer data were included in the "Due Diligence Summary Report " document number 192 (LMC, Mailing No. 3, pp. 101412 - 101431). Samples collected in 1990 and 1991 also revealed elevated levels of TCE in the sewer discharge with concentrations ranging from 83 to 270 μg/L.

Surface Water (SPDES) Discharges

As stated in Section 4.1, elevated levels of TCE were detected in the West Branch of Bloody Brook from 1980 to 1990 with detected concentrations of TCE ranging from 2 to

721 μg/L (Malcolm Pirnie, July 1990, pp. 001777 - 001778). General Electric submitted an application for renewal and modification of their SPDES permit to NYSDEC in 1991. The modification was requested, in part, to permit the rerouting of the discharge of contaminated groundwater from the sanitary system to the on-site treatment system for final discharge to Bloody Brook. Monthly outfall flow data from July 1990 to June 1991 ranged from 0.132 MGD to 0.491 MGD at former Outfall 001 (Middle Branch) and from 0.008 MGD to 0.481 MGD at former Outfall 002 (West Branch) (MMC, Mailing No. 1, p. 100143). The flows reported were calculated by subtracting the measured flows at the upstream limits of the site on the two branches of Bloody Brook from the measured flows at the downstream limits of the site. Ranges of total flows at the downstream limits of the site near the NY State Thruway were 0.186 MGD to 2.172 MGD on the Middle Branch ("001 OUT") and 0.140 MGD to 1.295 MGD on the West Branch ("002 OUT").

Limited discharge monitoring data were provided. Average detected TCE concentrations in surface water samples of the two branches of Bloody Brook at the downstream limit of the site collected from June 1990 to May 1991 were about 10 μg/L (pp. 100147-100148). PCB Aroclors were not detected in the May 1991 stream samples.

According to the application package, the maximum daily effluent limitation for TCE at former Outfall 001 (Middle Branch) was 12 μg/L (0.051 lbs/day) and the long-term average limit was 4.9 μg/L (0.025 lbs/day). Limitations at former Outfall 002 (West Branch) were slightly higher.

4.2.2 Migration Potential of Contaminants

As concluded by BB&L, due to the pumping at the building EP-7 sump system, groundwater impacts from the EP facility are limited to areas within the perimeter of the

facility (BB&L, October 1993, p. 101174). In addition, "VOC impacts to groundwater at the EP facility are limited to the overburden, primarily the silt, sand, and gravel unit above the till, which behaves as a hydraulic confining layer above the Vernon Shale bedrock" (BB&L, September 1994, p. 101567). Thus, it is unlikely that VOC contamination in groundwater within the influence of the sump system has or will migrate to groundwater off-site (groundwater contamination outside the influence of the sump system can migrate downgradient towards Onondaga Lake). However, migration of contaminants from groundwater to surface water (via the storm sewer system) and to the sanitary sewer system has likely occurred.

Blasland, Bouck & Lee recently completed a site-wide corrective measures study for the Electronics Park facility (BB&L, March 1995). Remedial measures performed include the construction of the Long-Term Treatment System consisting of pumping systems in the buildings EP-5, 6, 7, and 10 sumps and a pair of 400 gpm-capacity air stripper towers for treating contaminated water prior to discharge to the West Branch of Bloody Brook. Also, liner systems were installed in critical sections of storm sewer piping to prevent continued infiltration of VOC-contaminated groundwater. In addition, approximately 260 cubic yards of soil near the gasoline storage tank area near building EP-9 was excavated and disposed at an off-site location. In-situ bioremediation of impacted soils in this area was planned, including bioventing bench-scale and pilot studies in support of final design.

Based on the Phase III data, no remedial activities are planned for the Compost and Debris Area in the northern portion of the site. For the VOC contamination of unsaturated soils in the Former Drum Storage Area in the western portion of the EP site, BB&L recommended installation of an in-situ soil vapor extraction system to remove VOCs from the soil by enhancing volatilization of contaminants into the soil vapor and then extracting the vapor to a carbon adsorption system, if necessary, prior to release to the atmosphere.

A final, important remedial measure includes continued periodic monitoring of on-site and perimeter wells.

5.0 POTENTIAL FOR ADVERSE IMPACTS TO LAKE SYSTEM DUE TO A RELEASE OR THREAT OF A RELEASE

5.1 Hazardous Substance Characteristics

Based on past operations at the site and elevated concentrations in groundwater and surface water, trichloroethylene (trichloroethene, TCE) is considered the primary substance of concern at the Electronics Park site. Other VOCs and TCE degradation products as well as PCBs have been detected at a lesser extent. TCE is thus considered the indicator of VOC contamination at the site and will be discussed herein.

Standards/Criteria

According to NYSDEC's Technical and Operational Guidance Series, the state ambient water quality standard for TCE in Class GA groundwater is 5 μg/L with surface water guidance values of 3 μg/L for water supply sources (Class A, AA) and 11 μg/L for other classes (NYSDEC, TOGS 1.1.1, October 1993). The New York State effluent standard for TCE is 10 μg/L for discharge to class GA groundwater (6 NYCRR 703.6). The federal maximum contaminant level (MCL) in drinking water for TCE is 5 μg/L (40 CFR 141.6). Groundwater concentrations of TCE at the EP site were detected above the 5 μg/L standard. Also, TCE concentrations in surface water were detected above the 11 μg/L guidance value for Class C waters.

Mobility

TCE rapidly volatilizes into the atmosphere to produce hydrochloric acid, carbon monoxide, carbon dioxide, and carboxylic acid. Volatilization is considered the most

important fate and transport process of TCE in surface water and in surficial soil. Most importantly, TCE is highly mobile in soil and leaches into the groundwater fairly readily and its movement in groundwater is generally not severely retarded.

Toxicity

TCE was found to be carcinogenic to mice after oral administration, however, it was not found to cause reproductive toxicity. Chronic inhalation exposure to elevated concentrations of TCE caused liver, kidney, and neural damage and dermatological reactions in animals. Limited data are available on toxicity of TCE to aquatic organisms. The acute toxicity LC_{50} concentration for freshwater species was estimated to be about 50 mg/L in water (USEPA, September 1985).

Persistence

The relative short half-life of TCE in the atmosphere (high vapor pressure) indicates that it is not a persistent atmospheric compound. As stated above, TCE in surface waters or surficial soils will predominantly volatilize into the atmosphere and is thus not persistent. In subsurface soils where volatilization cannot occur, TCE may be relatively persistent since it is slowly degraded (US DOH&HS, October 1991).

Bioaccumulation

Based on TCE's log octanol/water partition coefficient (log K_{ow}) of 2.29, potential for weak to moderate bioaccumulation of TCE exists, however, no evidence of biomagnification has been found (USEPA, December 1979).

5.2 Quantity of Substance

Estimates of the mass of contaminants released to the soil and groundwater were not provided by either GE or MMC/LMC. Estimates of the mass of contaminants released to Bloody Brook and the County sewer system, based on the data collected, is provided below.

As stated in Section 3.2, approximately 1.2 MGD of wastewater, groundwater and stormwater was released to the two branches of Bloody Brook from the EP site. The total combined flow of the branches downstream of the site was about 3 MGD. At an average stream TCE concentration of about 200 μg/L from 1980 to 1983 and about 10 μg/L from 1990 to 1991 (see Section 4.2.1), an estimate of the range of average TCE loadings to Bloody Brook at a stream flow of 3 MGD is less than 1 lb/day to about 5 lb/day.

As stated in Section 3.5, approximately 0.4 MGD of wastewater was discharged to the County sanitary sewer system. At an average TCE concentration of 200 μg/L (see Section 4.1), an estimate of the average TCE loading to the sewer system is about 1 lb/day. This loading of TCE is likely partially removed by the aeration systems at the county sewage treatment plants prior to release to Onondaga Lake.

5.3 Levels of Contaminants

The extent of on-site contamination was discussed in Section 4.2. Elevated levels of TCE were detected in sumps, groundwater, and Bloody Brook surface water on the EP site. TCE analyses were not performed on surface water samples in the branches of Bloody Brook downstream of the site (south of the NY State Thruway).

5.4 Impacts on Special Status Areas

The Electronics Park site is not situated in an area where direct future adverse impact to protected habitats or streams is likely to occur. Bloody Brook near the site is currently a Class C (formerly Class D) stream and is thus not considered a "protected stream" in New York State. Bloody Brook is a Class B stream downstream of the site from the point where the two branches converge to Onondaga Lake. The nearest State Freshwater Wetland is approximately one-half mile west of the site along the southern side of the NY State Thruway.

6.0 SUMMARY OF CONCERNS

Based on the data and information provided by both companies, the following concerns are identified:

- Contaminated groundwater at the EP facility situated outside of the influence of the sump system can possibly migrate towards Bloody Brook or off-site towards Onondaga Lake;

- Continued release of contaminants to Bloody Brook and the County sewer system;

- Possible migration of PCBs towards the West Branch of Bloody Brook, as evidenced by detected concentrations in well MW-15, situated approximately 100 feet from the stream; and

- Potential for PCB contamination based on past usage records and existence of sump and storm sewer system; only limited PCB analyses conducted.

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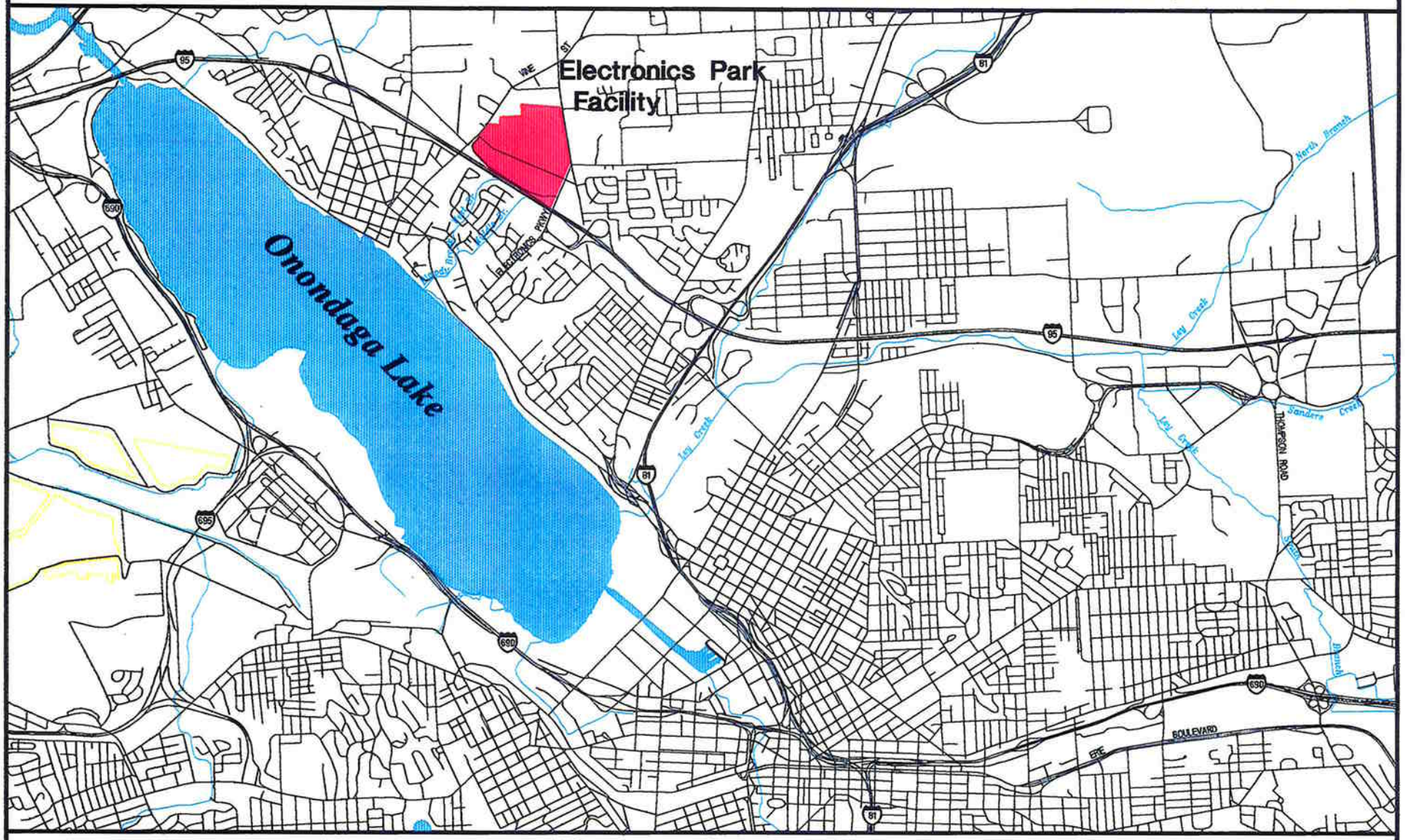
Site Location: Lockheed Martin Electronics Park Facility



Site Location

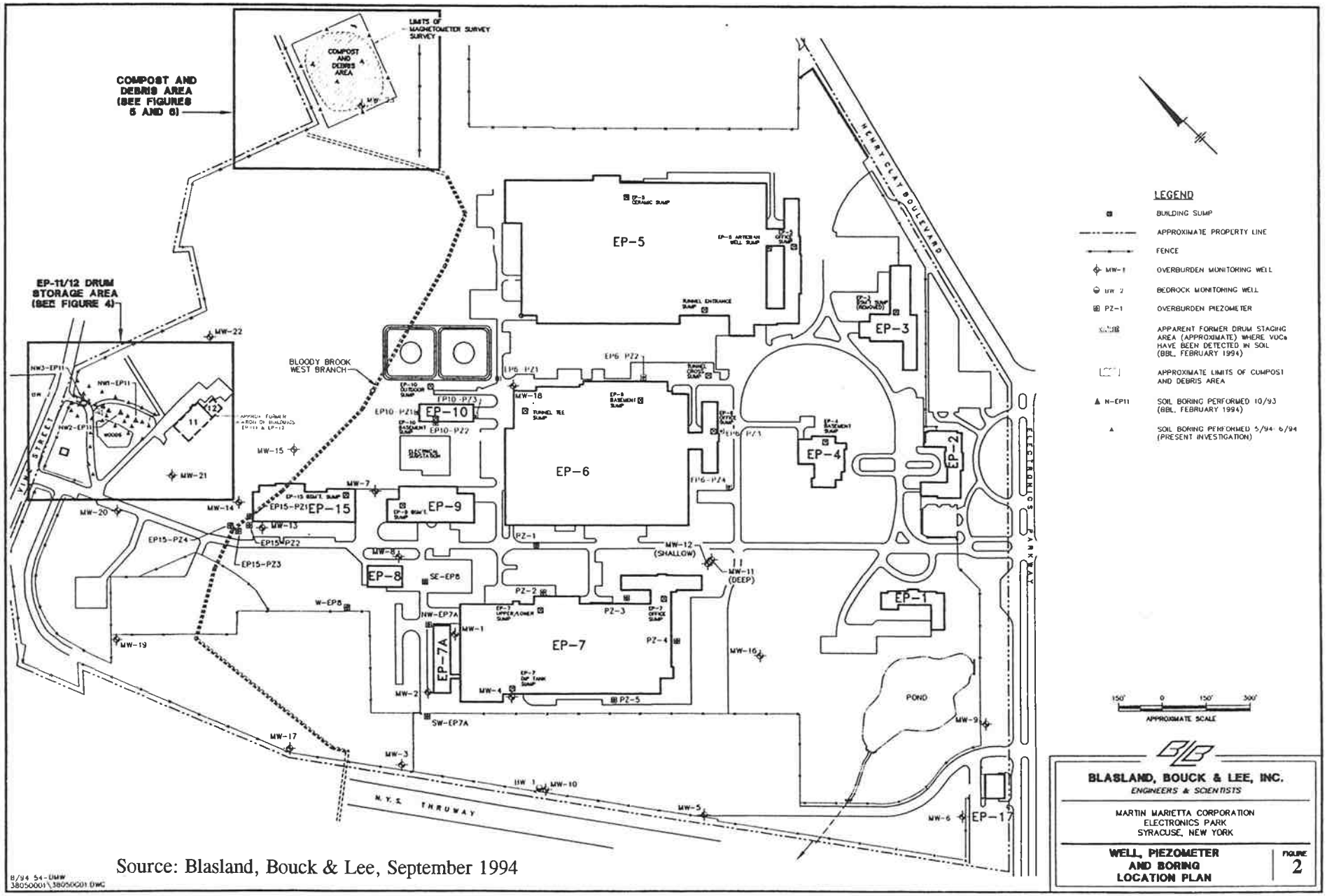
5000 0 5000
Scale in Feet

1500 0 1500
Scale in Meters

N

TAMS

Figure 1



Source: Blasland, Bouck & Lee, September 1994

101606

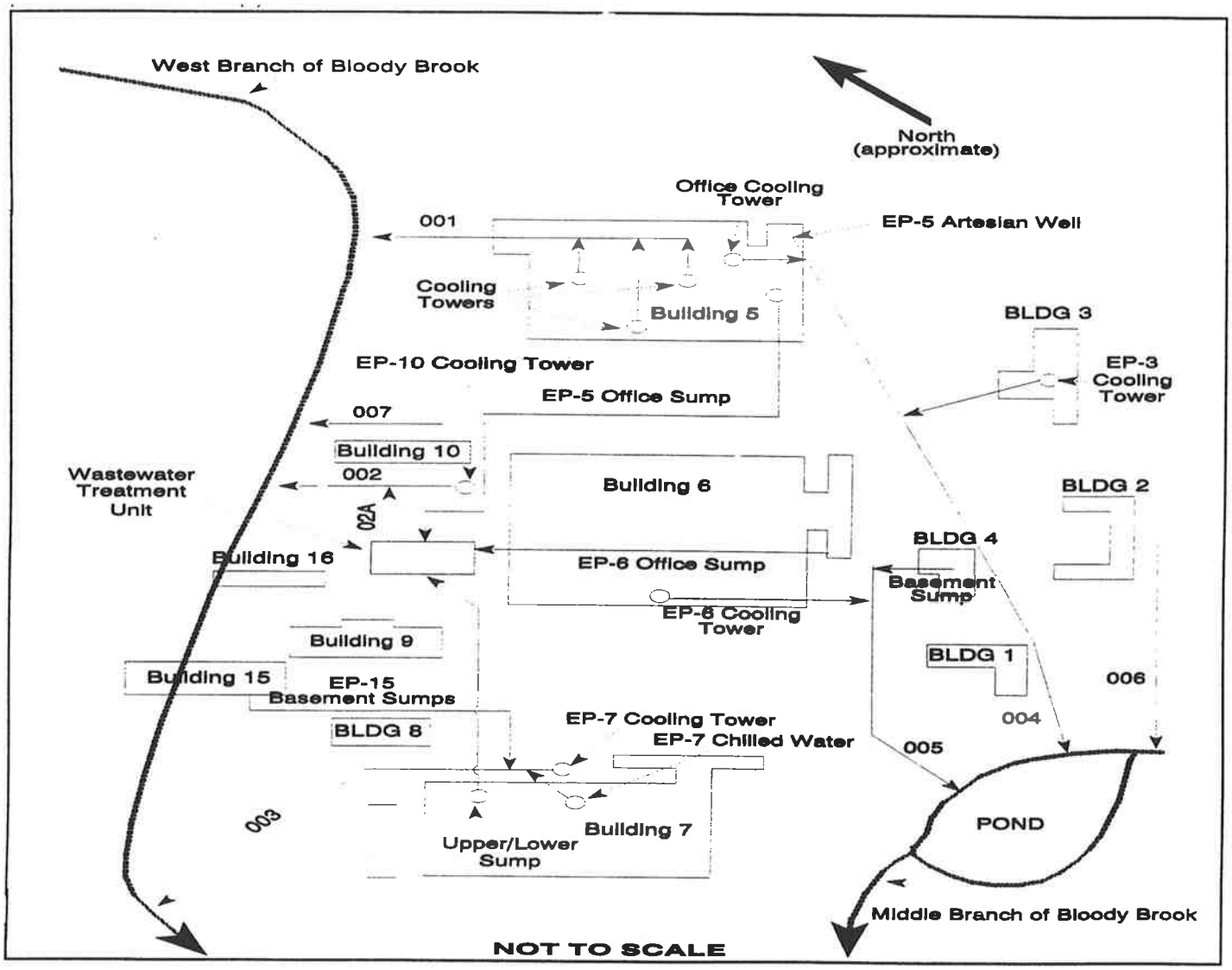


FIGURE 3

ELECTRONICS PARK FACILITY
SPDES OUTFALL LOCATIONS

Source: SPDES Permit No. NY-0002101