#### 8.1.2.4 OPERABLE UNIT IV

The OU IV area contains two significant source areas, the 1977 fuel oil/solvent spill site (AOC 5) and the Building 650 Sump Outfall area (AOC 6).

##### 8.1.2.4.1 1977 OIL-SOLVENT SPILL SITE AND DOWNGRADIENT AREAS

In 1977, a 87,000 to 95,000 liter (23,000 to 25,000 gallons) mixture of Number 6 fuel oil and mineral spirits was released from a ruptured pipe used to transfer the contents from an underground storage tank to aboveground storage tanks at the CSF. In addition, several small spills of Number 6 fuel oil from the CSF fuel unloading area were documented between 1988 and 1993, and it is suspected that small volumes of solvents, such as PCE, have been released to the ground in the vicinity of the CSF. Eighteen wells are used to monitor this area. VOC contamination originating from the CSF area is currently monitored under two programs: the OU IV 1977 spill area cleanup program (AOC 5); and the OU I/IV Program which monitors the downgradient (south of Brookhaven Avenue) component of the OU IV plume.

The primary chemical contaminants found in the OU IV plume near the 1977 spill site are TCA, PCE, DCE, TCE, toluene, ethylbenzene, and xylenes. However, monitoring data suggest that there may have been additional historical solvent spills in the vicinity of the CSF (primarily PCE). The toluene/ethylbenzene/xylene component of the plume is highly localized to the 1977 spill area, and DCE is not prevalent in monitoring wells north of the Middle Road area. The OU IV plume extends from the 1977 Waste Oil Solvent Spill area in the north to an offsite area between the southern site boundary and Carleton Drive (a total distance of approximately 2,290 meters [7,500 feet]). The areal extent of the VOC plume is depicted on Figure 8-12. The plume is approximately 275 meters (900 feet) in width, as defined by the 5-µg/L contour. The width of the higher concentration segments of the plume (>50 µg/L) is approximately 700 feet. The area of the plume containing the highest VOC concentrations is in the 122 grid at the southern site boundary (consisting primarily TCA, DCE and TCE with TVOC concentrations up to 254 µg/L). The vertical distribution of VOC contamination is shown on Figure 8-18. In general, VOCs are present in the shallow Upper Glacial aquifer near the source area and in the deep portion of the Upper Glacial aquifer at the southern site boundary and just offsite. In addition, TVOC concentrations were 32 µg/L in upper Magothy aquifer Well 106-19. This deep contamination will be addressed as part of the additional characterization planned for the Magothy aquifer during 2000.

An air sparging/soil vapor extraction (AS/SVE) remediation system has been in operation since November 1997, to remediate VOC and semi-VOC contamination of soils and groundwater near the spill site (see Section 8.1.2.7). During 1998, significant decreases in VOC concentrations were observed wells located near the 1977 spill site. For example, TVOC concentrations in Well 76-04 declined from >1,000 µg/L in the first quarter to non-detectable levels during the fourth quarter of 1998 (see Figure 8-19). However, at this time it is not clear whether the reduction in VOC concentrations is due to the AS/SVE System, shifting of the plume due to AS operation or a combination of both.

The effectiveness of the OU III southern boundary extraction system is demonstrated by the reduction in TVOC concentrations in southern boundary Wells 122-04, 122-19 and 122-22 (Figure 8-19). The continued elevated concentrations detected in south boundary Well 114-07 will be addressed by the installation of a seventh remediation well located east of the existing six OU III, south boundary, extraction wells during 1999.

##### 8.1.2.4.2 BUILDING 650 SUMP OUTFALL

Soil and groundwater contamination at the Building 650 Sump Outfall is due to the historical discharge of radionuclides to the Building 650 sump. Historically, strontium-90 has been detected at concentrations above the DWS in a number of the wells located downgradient of the Building 650 Sump Outfall. The strontium-90 plume distribution, based on October-November 1998 data, is shown on Figure 8-20. During 1998, strontium-90 was detected at concentrations exceeding the DWS in Wells 76-13, 76-24, 76-168 and 076-169, with concentrations ranging between 9 pCi/L (0.3 Bq/L) and 27 pCi/L (1 Bq/L).

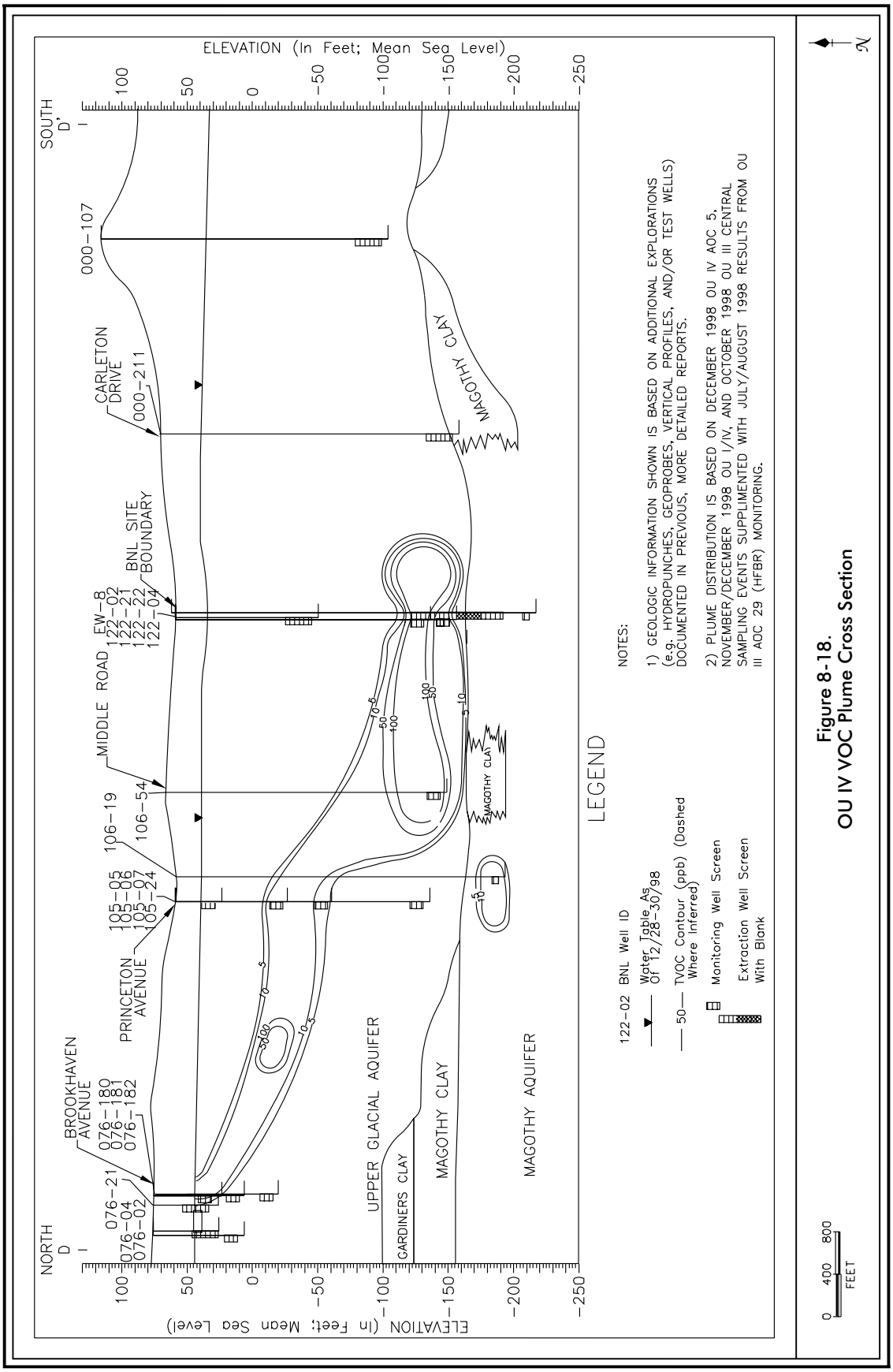


**Figure 8-18.**
**OU IV VOC Plume Cross Section**

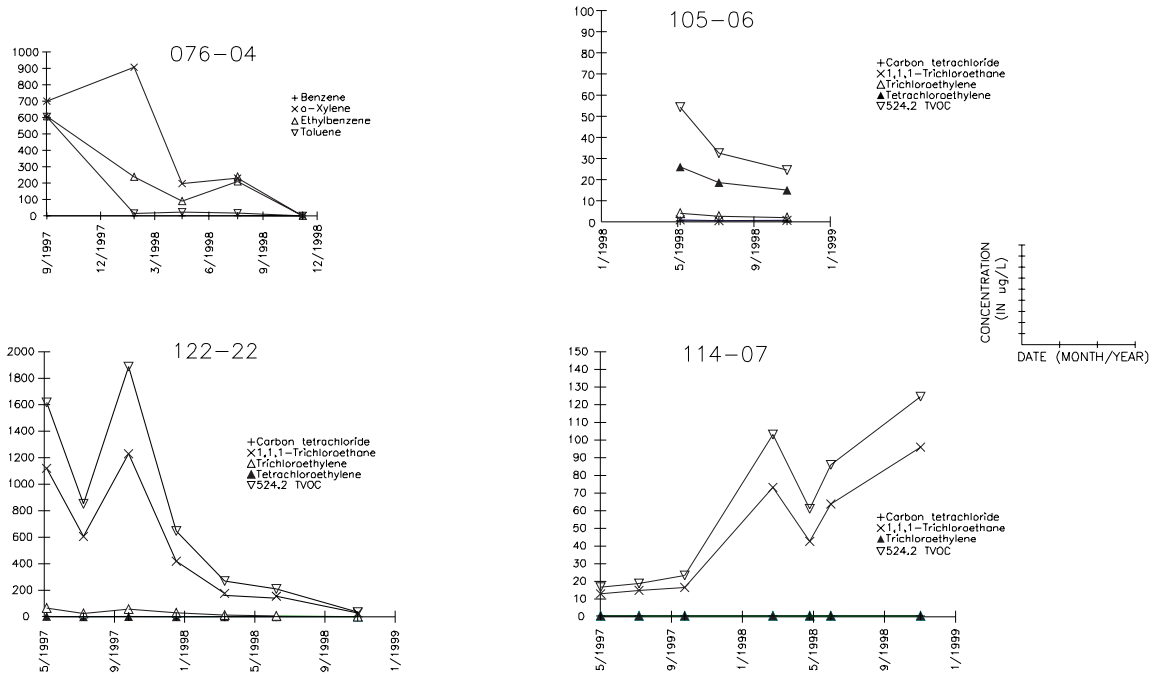


Figure 8-19. Time-vs.-VOC concentration trend plots for key wells in the OU IV VOC Plume: Well 76-04 located near the 1977 oil/solvent spill area; Well 105-06 located on East Princeton Avenue; and Wells 122-22 and 114-07 located along the southern boundary.

### 8.1.2.5 OPERABLE UNIT V

#### 8.1.2.5.1 EASTERN PLUME

The OU V monitoring program uses 34 monitoring wells located downgradient of the STP. These wells monitor VOC and tritium contamination resulting from historical releases at the STP. Surveillance of present groundwater quality at the STP is performed as part of the BNL Environmental Monitoring Program (see Section 8.1.3.2.1).

Volatile Organic Compounds, Metals and Pesticides: The primary chemical contaminants that are found in the STP plume are TCE and TCA. The STP VOC plume (as defined by the 5 µg/L contour) extends from an area approximately 460 meters (1,500 feet) downgradient of the STP to the Long Island Expressway (LIE) offsite, a distance of approximately 2,290 meters (7,500 feet) (Figure 8-21). The plume is approximately 600 meters (2,000 feet) in width. Maximum VOC concentrations (approximately 30 µg/L) are observed in wells located at the site boundary, in the vicinity of North Street. The vertical distribution of VOCs is shown on Figure 8-22. VOCs are present in the deep Upper Glacial aquifer near the southeastern site boundary and offsite in the vicinity of the LIE. VOC concentration trend plots for key wells are also shown on Figure 8-21.

A number of key OU V wells were also analyzed for metals during 1998. None of the inorganic contaminants of concern identified in soils and sediments during the OU V RI/FS, including mercury and hexavalent chromium, were detected in groundwater samples. In addition, offsite wells were sampled and analyzed for pesticides and PCBs. Analytical data indicate the presence of 4,4''-DDD (dichlorodiphenyldichloroethane) and 4,4''-DDT (Dichlorodiphenyltrichloroethane) in Well 600-19 at concentrations of 0.043 and 0.06 µg/L, respectively. 4,4''-DDT was also detected in well 600-21 at a concentration of 0.013 µg/L. The NYS AWQS for these compounds is non-detect.

Radionuclides: Detectable, but below NYS DWS levels of tritium were found in site boundary Wells 50-02 and 61-05, with maximum observed concentrations of 3,079 p Ci/L (114 Bq/L) and 2,185 pCi/L (81 Bq/L), respectively. Tritium concentration trends for Wells 50-02, 61-05, 000-123, and 600-015 are provided on Figure 8-23. Tritium was not detected in any of the STP offsite monitoring wells during 1998.

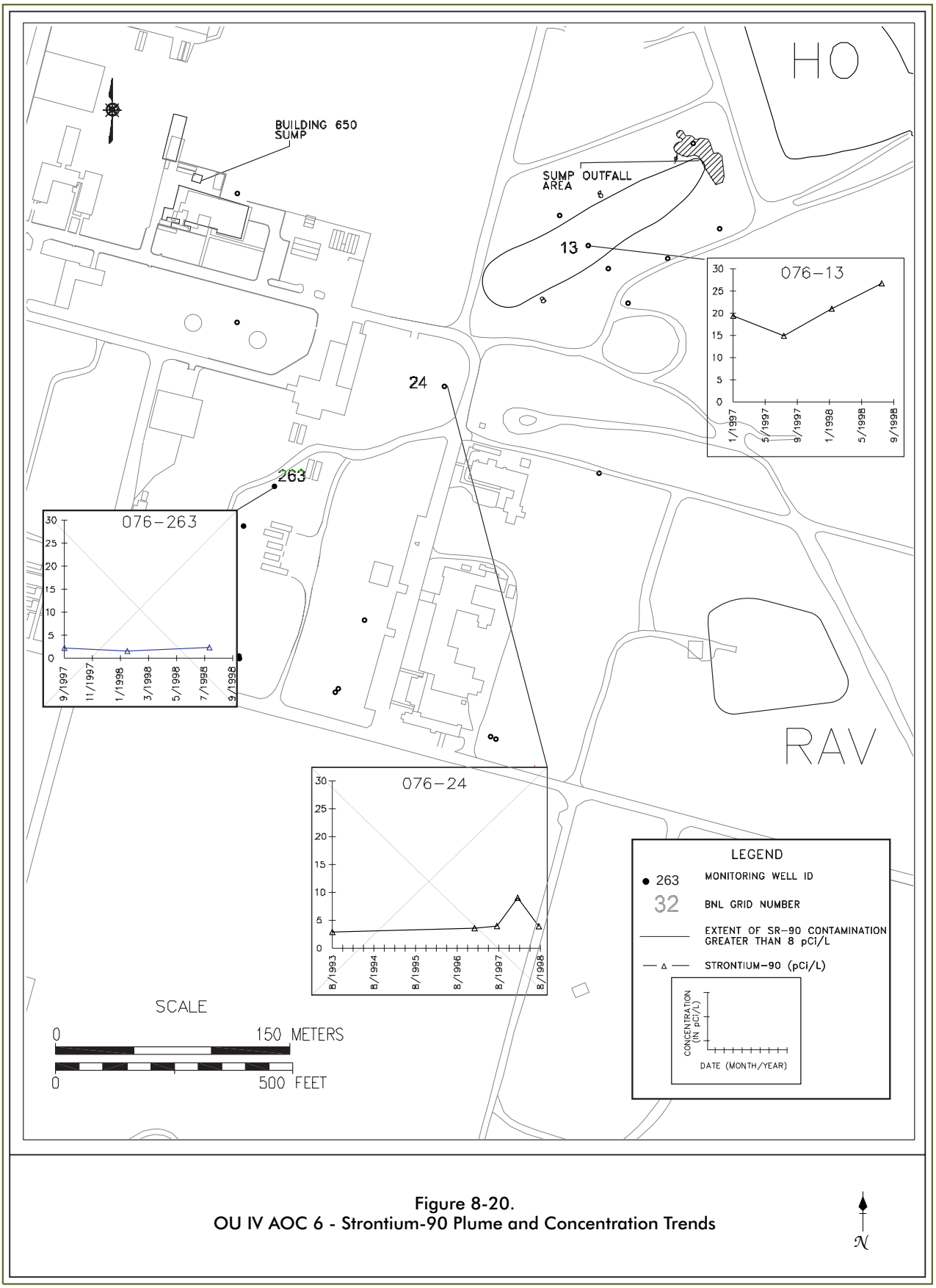


Figure 8-20.
OU IV AOC 6 - Strontium-90 Plume and Concentration Trends

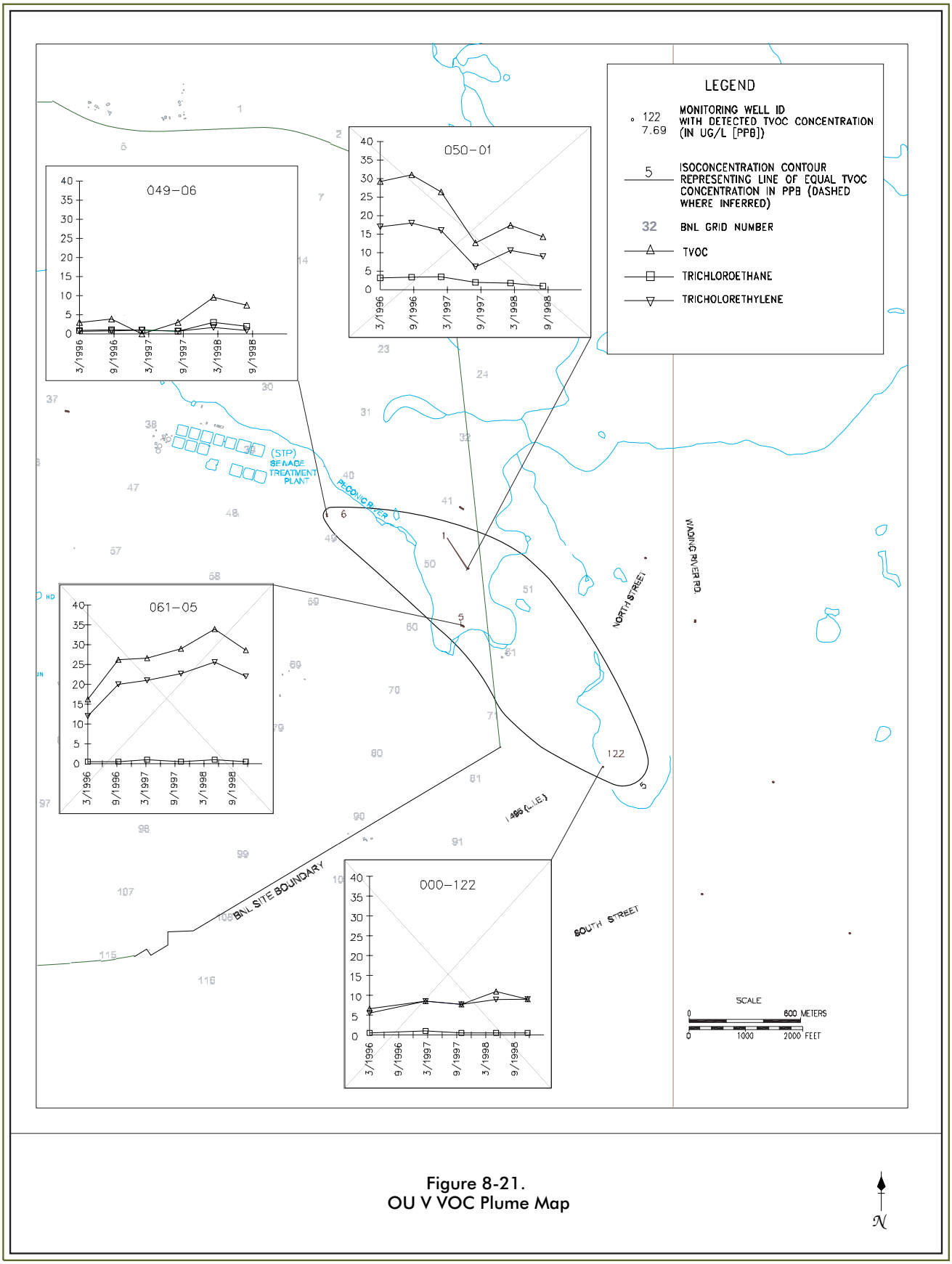


Figure 8-21.
OU V VOC Plume Map

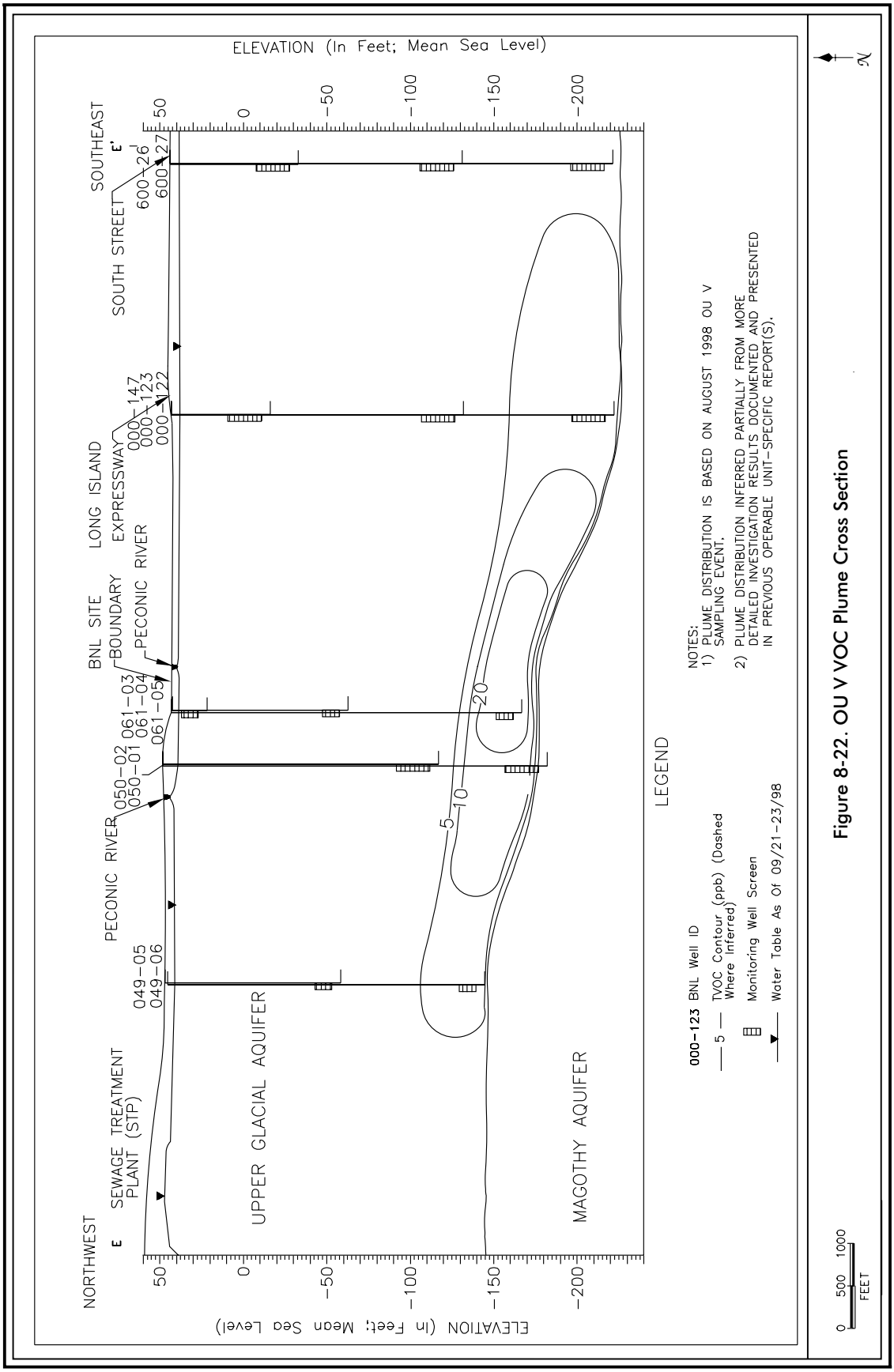


**Figure 8-22. OU V VOC Plume Cross Section**

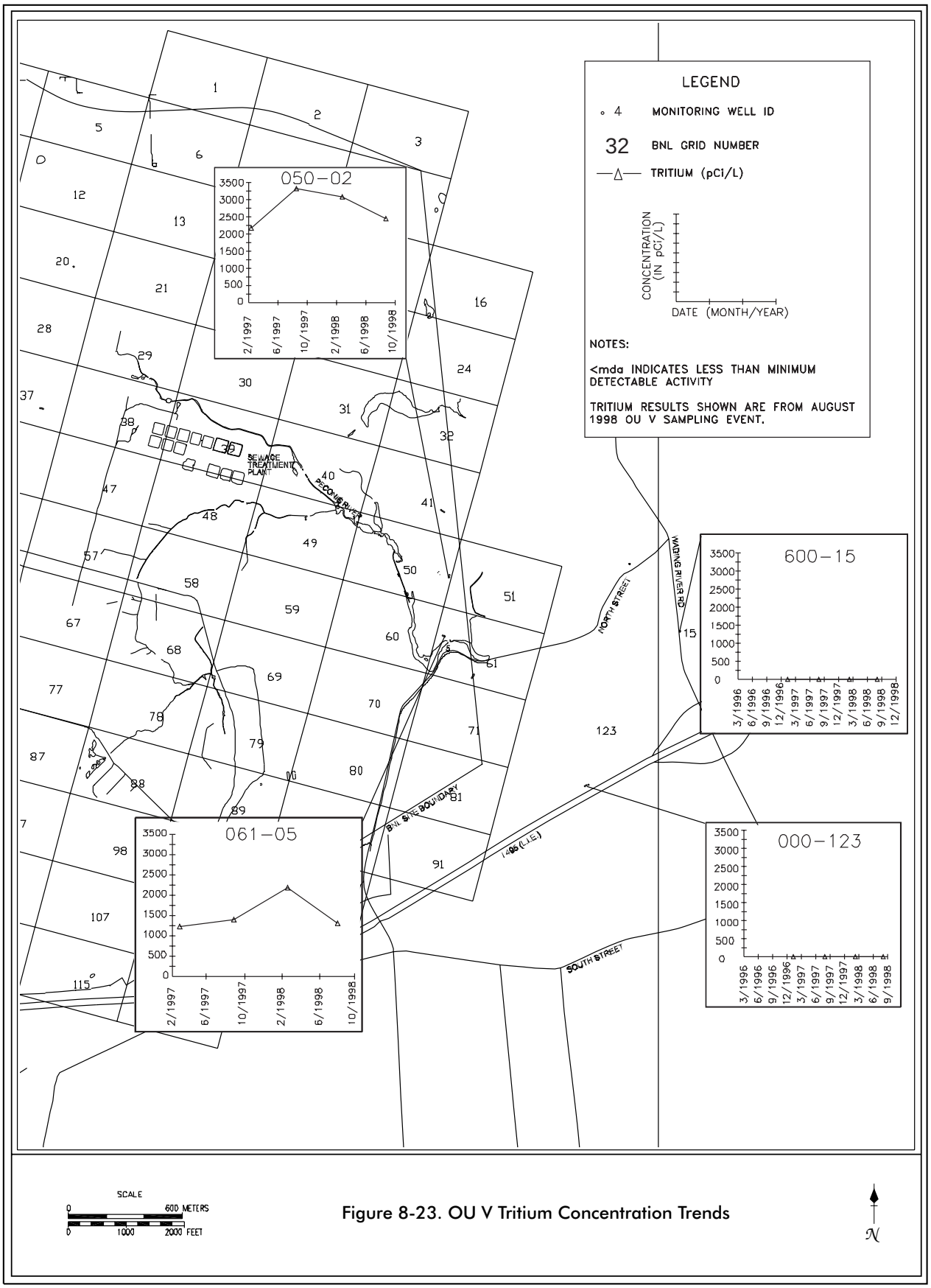


Figure 8-23. OU V Tritium Concentration Trends

### 8.1.2.6 OPERABLE UNIT VI

#### 8.1.2.6.1 BIOLOGY FIELDS

Ethylene dibromide (EDB) was used as a fumigant in the BNL Biology Department's agricultural fields located in the southeast portion of the site. Available records indicate that the application of EDB in this area took place in the 1970s. An EDB contaminant plume (as defined by the 0.05 µg/L contour, which is the NYS DWS) extends from BNL's southeastern site boundary to south of North Street, a distance of approximately 1,160 meters (3,800 feet) (Figure 8-24). The highest EDB concentration was observed in offsite Well 000-175 (4.4 µg/L), which is located south of North Street. At its widest point, the plume is approximately 305 meters (1,000 feet) wide. The vertical distribution of EDB is shown on Figure 8-25. Additional offsite characterization work undertaken by BNL during 1998 resulted in the detection of EDB further downgradient than previously identified during the OU VI Focused FS. The additional characterization work resulted in defining the leading edge of the plume, and allowed for the installation of outpost wells positioned downgradient of the plume's leading edge (Well 000-178).

### 8.1.2.7 GROUNDWATER TREATMENT SYSTEMS

The primary mission of BNL's ER Program is remediating soil and groundwater contamination and preventing additional contamination from migrating off the BNL site. To that end, four groundwater treatment systems are operating at BNL, and a fifth system will be operational in 1999. Figure 8-26 shows the locations of these four systems. The following is a brief description of the groundwater treatment systems that were operational during 1998 and a summary of their performance:

South Boundary Remediation System for OU III: Construction of the OU III pump-and-treat system was completed in June 1997. The system uses six wells to extract VOC contaminated groundwater that originated from a number of sources located in the developed central portion of the BNL site. The water is pumped approximately 1.6 km (one mile) north to an air-stripping tower located near the Medical Department complex (Figure 8-26), where air from a powerful blower separates the VOCs from the water. The removal efficiency is close to 100 percent (see Table 8-4). No VOCs were detected above the MDL in treated water samples. The clean water is discharged to a nearby recharge basin, and the VOCs stripped from the water are released into the air at concentrations below state and federal emissions standards. The system processes approximately 2,270 liters (600 gallons) of water per minute.

During 1998, approximately 405 pounds of VOCs were removed from the groundwater, and 1,268,000,000 liters (335,000,000 gallons) of treated groundwater was returned to the aquifer.

South Boundary Remediation System for OU I (RA V): This pump-and-treat system was completed in December 1996. The system uses two extraction wells to remove contaminated groundwater that originated from the Current Landfill (now closed and capped) and the former HWMF. The water is pumped approximately 1.6 km (one mile) north to an air stripper system (Figure 8-26). This system processes more than 2,650 liters (700 gallons) of water per minute. Like the OU III treatment system, the RA V system removes close to 100 percent of the chemical contamination (Table 8-5). No VOCs were detected above the MDL in treated water samples. The clean water is discharged to a nearby recharge basin, and the VOCs stripped from the water are released into the air at concentrations below state and federal emissions standards.

During 1998, approximately 46 pounds of VOCs were removed from the groundwater, and 1,294,000,000 liters (342,000,000 gallons) of treated groundwater returned to the aquifer.

HFBR Tritium Plume Remediation System (OU III): This groundwater pump and recharge system was constructed as an interim remedial action after the HFBR tritium plume was discovered, and has operated since May 1997. Three groundwater extraction wells were installed approximately 3,500 feet south of the HFBR. For most of 1998, the tritiated groundwater (generally <2,000 pCi/L) was pumped from the aquifer at a rate of about 450 liters (120 gallons) per minute and piped north to a treatment facility adjacent to the RA V treatment system (see Figure 8-26). However, by the fourth quarter of 1998 BNL received regulatory approval to reduce the pumping rate to 190 liters (50 gallons) per minute in an effort to optimize the remediation system. Because the tritiated water also contains VOCs that origi-

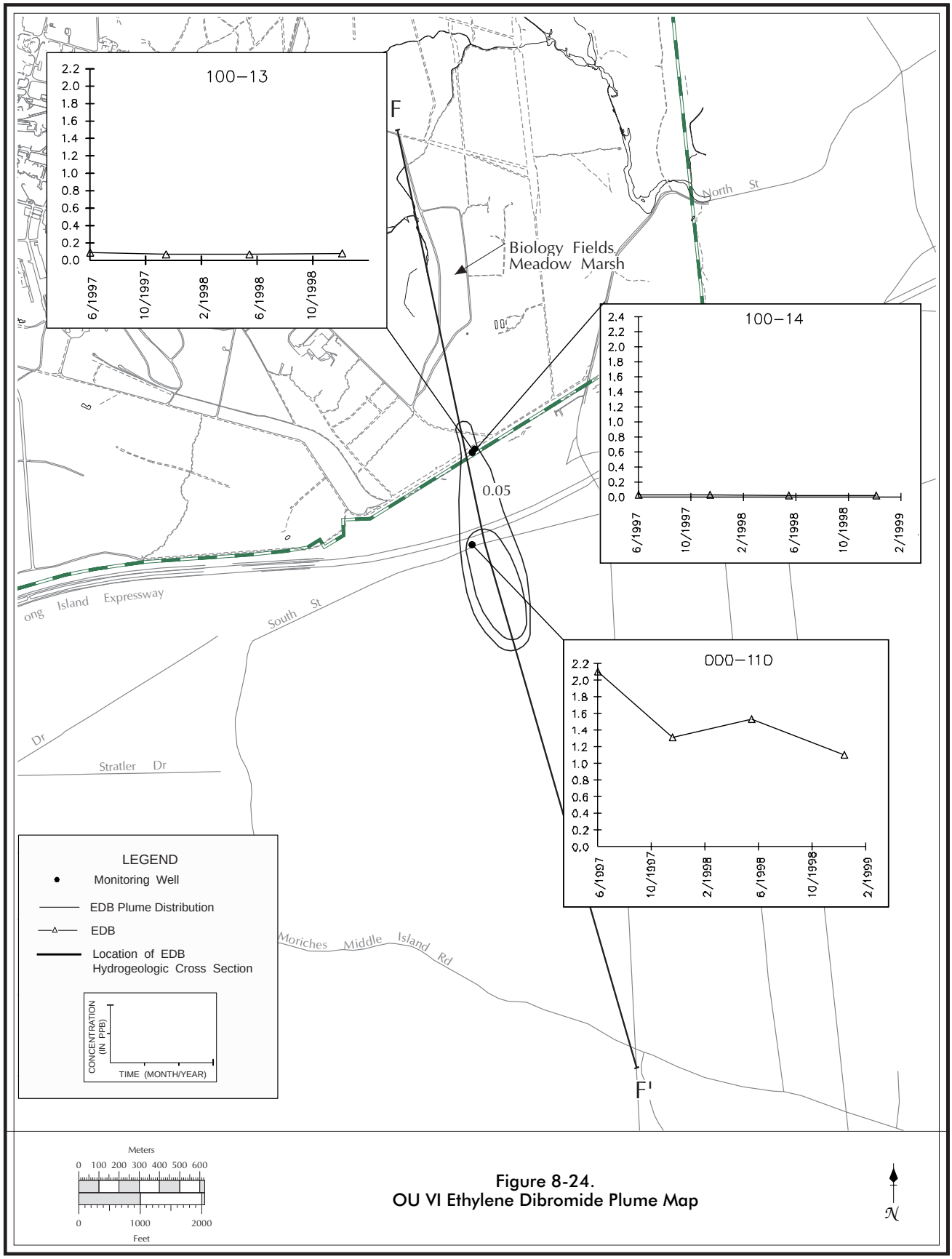


Figure 8-24.
OU VI Ethylene Dibromide Plume Map

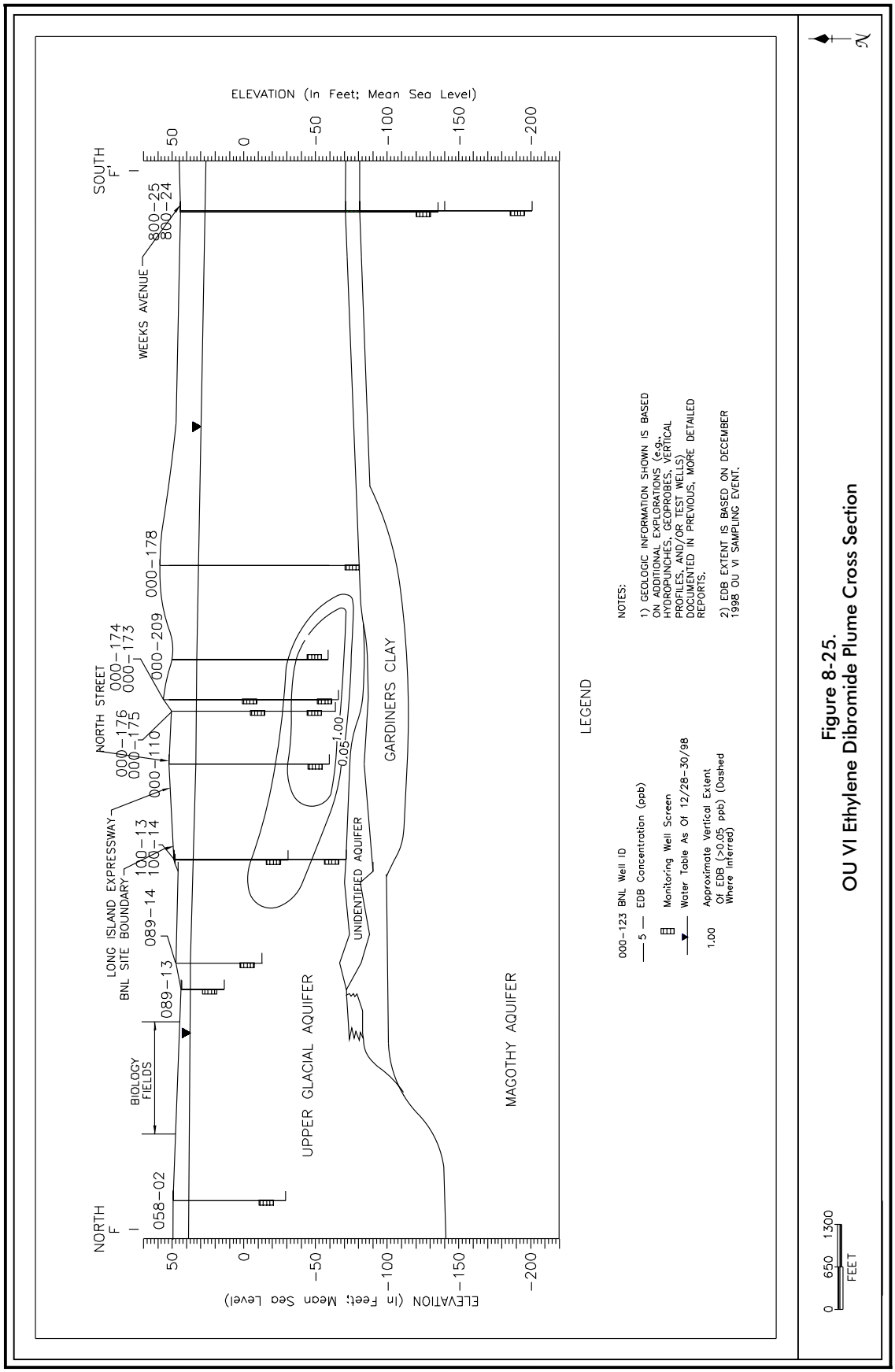


**Figure 8-25.**
**OU VI Ethylene Dibromide Plume Cross Section**