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Final Expanded Site Inspection Report
Lemieux Truck Dump/Mountain View Auto Restoration
Lyndonville, Vermont

TDD No. F1-8702-02
Reference No. $375VT10EI
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INTRODUCTION

The NUS Corporation Region I Field Investigation Team (NUS/FIT) has been directed by the Waste Management Division of the Region I U.S. Environmental Protection Agency (US EPA) to perform an Expanded Site Inspection (ESI) of the Lemieux Truck Dump and adjacent Mountain View Auto Restoration facilities in Lyndonville, Vermont. NUS/FIT investigated the two adjacent facilities as potential sources of low level volatile organic compound contamination of the Lyndonville Municipal water supply. This report presents the results of the Lemieux Truck Dump/Mountain View Auto Restoration ESI.

Sampling of the Lyndonville municipal wells by the Vermont Department of Health (VT DOH) in 1982 detected the presence of volatile organic compounds (trichloroethene, toluene, and ethyl benzene). The potential sources identified included the Lemieux Truck Dump and Mountain View Auto Restoration facilities, which are located approximately 3,400 feet south of the well field (Figure 1). The total concentration of volatile organic compounds detected in the municipal wells was 2.8 ppb. Since these levels were below 1982 Health Action Levels for the compounds detected, no immediate corrective action was required. The VT DOH sampled the municipal wells again in 1984, and analysis of these samples indicated the presence of trichloroethene and trans-1,2-dichloroethene, which is a degradation product of trichloroethene. Total volatile organic compound concentration increased to 13 ppb in samples collected in January 1985 by VT DOH. The VT DOH prepared a report that summarized sampling data, discussed available information and local hydrogeology and identified possible source areas (VT DOH, 1985).

The Lemieux Truck Dump ESI includes investigations of both Lemieux Truck Dump and Mountain View Auto Restoration because of their proximity. The facilities are located within 500 feet of each other. Field work for the study area was conducted in conjunction with the Darling Hill Dump ESI. Details of the Darling Hill Dump ESI are discussed in the Darling Hill Dump ESI Final Report (NUS/FIT, 1989). Darling Hill Dump was proposed for listing on the National Priorities List (NPL) by the US EPA in June 1988.

Both the Lemieux Truck Dump and Mountain View Auto Restoration facilities were the subjects of Preliminary Assessments conducted by NUS/FIT under TDD Nos. F1-8603-04 and F1-8608-03, respectively (NUS/FIT, 1986a and 1986b). Preliminary Assessments were also completed for several other sites located within 3,000 feet of the municipal well fields including, Darling Hill Dump (VT DEC, 1985), Caledonia County Fairgrounds (NUS/FIT, 1986d), Burke View Garage (NUS/FIT, 1986e), Towers Sludge Disposal (NUS/FIT, 1986f) and Lyndonville Town Highway Garage (NUS/FIT, 1986g).

The following report summarizes the results of the work performed to date and explains the available analytical data with regard to Lemieux Truck Dump and Mountain View Auto Restoration as potential contributors of contaminants to the Lyndonville municipal well field.

AREA DESCRIPTION AND HISTORY

The Lemieux Truck Dump and Mountain View Auto Restoration facilities are situated on the east side of Pinehurst Street in the town of Lyndon, Vermont (Figure 1). Lyndon (population 5,100) is located in northeast Vermont, and is a predominantly rural community. Land use immediately surrounding the facilities is mixed residential, agricultural and light commercial. The village of Lyndonville is located approximately 3,000 feet southwest of the facilities, and consists of residential, commercial, and industrial buildings.

Municipal water is supplied to approximately 3,200 people in the village of Lyndonville and to customers in the vicinity of the facilities. The Lyndonville well field is located in the East Branch Passumpsic River valley, and derives its water from a sand and gravel aquifer. The well field consists of four wells of which three are currently in use and one which is used as an emergency back up (NUS/FIT,1986a). Using data provided by the VT DEC, NUS/FIT identified 92 private wells within three miles of the study area.

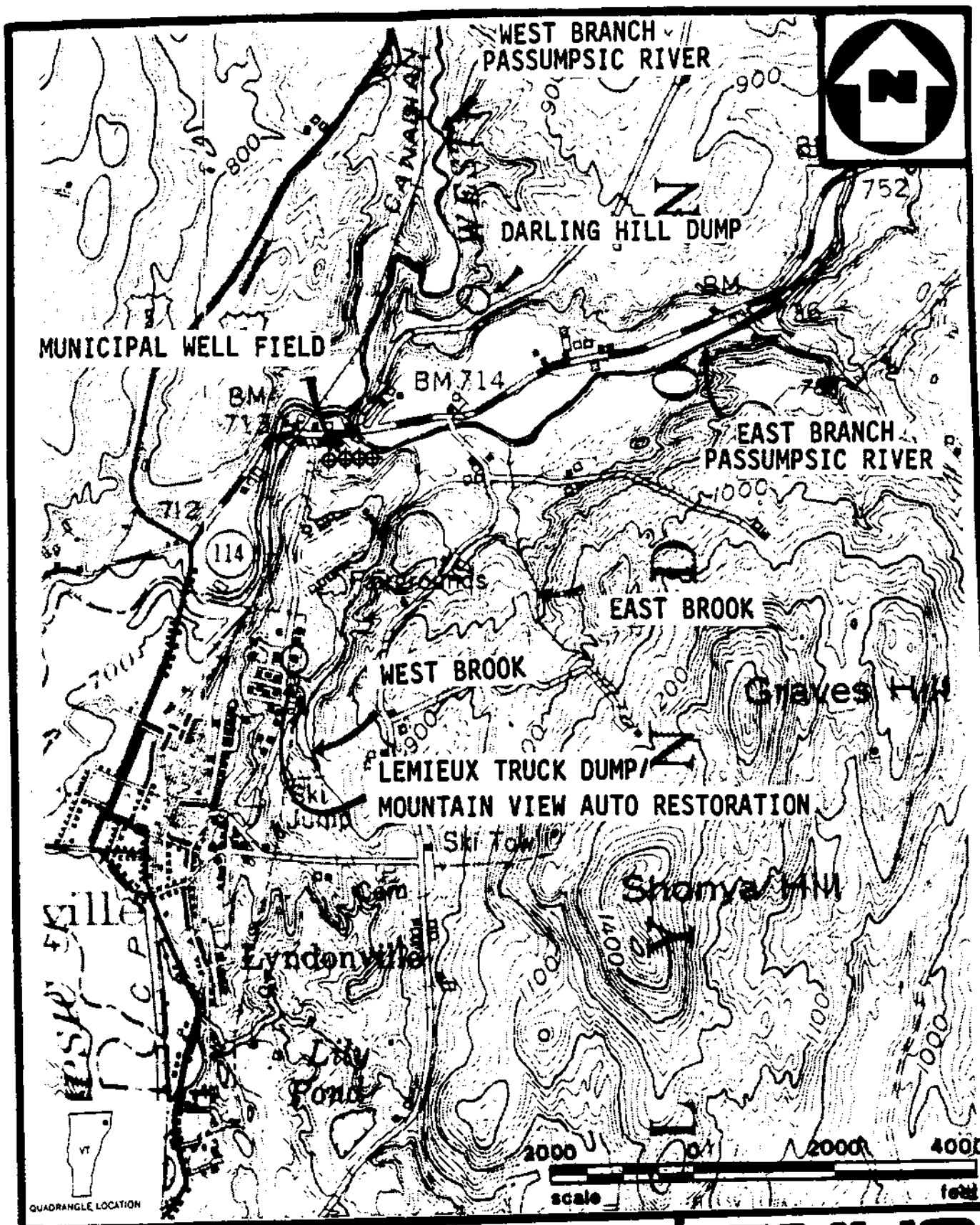
Commercial use of the Lemieux Truck Dump property as an auto salvage and parts business began around 1950. The property was sold in 1974 and was used as a foundation-pouring operation until approximately 1980. Between 1980 and about 1982, the facility was used to house a vault manufacturing business operated by an undetermined party. The property is currently owned by Joyce and John Lemieux, who use it as a maintenance area for logging equipment (NUS/FIT, 1986a).

The Mountain View Auto Restoration facility is owned by David Ainsworth, who in 1976 converted a private residential garage into the existing auto restoration and salvage operation (NUS/FIT, 1986b).

Both facilities are less than one acre in size, and each consists of a single garage building built on the western edge of a north-south oriented, 70 foot deep, "main" ravine. A small "tributary" ravine, oriented perpendicular to the main ravine, separates the two facilities and is partially filled with material including junked automobiles. No other definitive waste disposal information was available for the facilities, although the VT DOH reported that "hearsay information" indicates that liquid wastes may have been dumped onsite (VT DOH,1985).

The main ravine east, south, and upstream of the facilities contains a perennially flowing stream. This stream dries up approximately 100 feet east of the facilities. The ravine continues northward, downslope of the facilities, approximately 3,960 feet, where it intersects the East Branch of the Passumpsic River (Figure 1) (NUS/FIT,1986a). The stream, while unnamed on the United States Geological Survey (USGS) fifteen minute topographic map (Burke Quadrangle; USGS, 1951), will be referred to as West Brook.

The Passumpsic River, after forming at the confluence of the East and West branches, flows south and comes within 1,100 feet to the northwest of the facilities. Both the Passumpsic River and the West Brook were considered potential receptors of onsite contaminated surface water runoff because of their proximity to the facilities (Figure 1). The Passumpsic River is used for recreational purposes such as trout fishing, swimming, and canoeing upstream and downstream of Lemieux Truck Dump/Mountain View Auto Restoration (Connet, 1989).



LOCATION MAP

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 1

Bedrock beneath the facilities has been mapped as the Waits River Formation of lower Devonian age. It is composed primarily of impure limestone interbedded with phyllites and schists. The uplands to the east of the site are underlain by the Gile Mountain Formation, which consists of phyllite and schist of varying composition, and of amphibolite (Woodland, 1965). Outcrops are limited in the immediate vicinity of the facilities due to a relatively thick layer of overburden (greater than 185 feet in places). The Gile Mountain Formation is exposed at a number of outcrops in the topographically higher region (Shonya and Graves Hills) east of the facilities.

Surficial deposits beneath the sites have been mapped as well sorted sand with no pebbles or boulders and are interpreted as glacial lake shoreline deposits (Doll,1970). Well logs are shown in Attachment 2.

Logs for the municipal wells and the NUS/FIT wells (Figure 2) near the municipal well field (NUS/FIT, 1987a and Attachment 2) indicate that surficial material underlying the Lyndonville well field consists of alluvial deposits of sand and gravel with a zone of fine sand and silt between ten and 40 feet below ground surface. For the purpose of this study, the Lyndonville municipal wells have been designated MW-1, MW-2, MW-3 and MW- 4. MW-1 is screened in sand and gravel between 56 and 66 feet below ground surface. The other three wells are installed as open ended casings in gravel between 64 and 86 feet below ground surface (VT DOH, 1985).

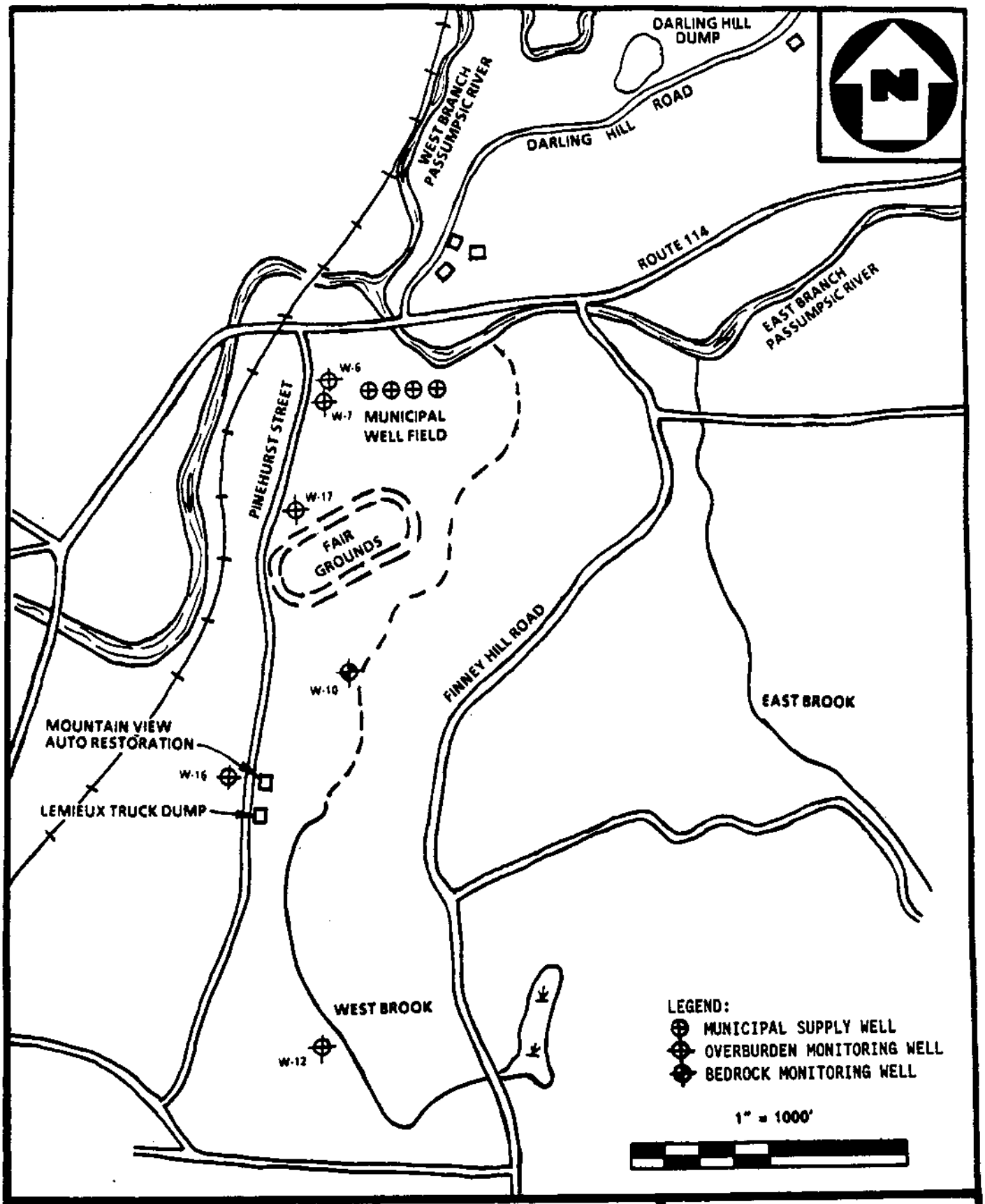
Based on pumping tests done during a hydrogeologic evaluation of the Lyndonville well field conducted by D.L. Tarbox and Associates in 1982, these deposits are highly permeable. Data for the pumping tests conducted on the municipal wells indicate that after pumping, static water levels in wells MW-1, MW-2, and MW-3, regained 82%, 92%, and 93% of their pre-pumping water levels, respectively, within 30 seconds. Since the wells are within 250 feet of the Passumpsic River East Branch (Figures 2 and 3) and the aquifer is so permeable, the aquifer draws from the river when the municipal wells are pumped (Tarbox, 1982). These tests substantiate the results and conclusions of a 1975 study by Layne-New England Company completed for the Village of Lyndonville (Layne, 1975). This study included pumping tests of MW-2 and monitoring of water levels in Lyndonville observation wells 10 and 11 (Figure 3). During pumping tests, greater drawdown was observed in observation well 10 than in 11, which is nearer to the river. The river level also fluctuated 0.8 feet. The study concluded that the river recharges the aquifer while the municipal wells are pumped, and for up to 30 hours after pumping is stopped (Layne, 1975; VT DOH, 1985).

VT DOH also conducted pumping tests of MW-1 and MW-3 in February, 1985 (Figure 3). VT DOH concluded from the tests that pumping from these wells could influence the water level 280 to 470 feet in the western direction and 250 to 300 feet in the eastern direction. The VT DOH included a summary of pumping test results in their 1985 report. The report concluded that buried eskers (elongate stratified glacial drift deposits) might strongly influence groundwater flow in the immediate vicinity of the municipal wells, and that regional groundwater flow was in a southern direction (VT DOH, 1985).

SUMMARY OF NUS/FIT INVESTIGATIONS

NUS/FIT field investigations for the facilities included the following tasks, which were conducted in conjunction with the Darling Hill Dump ESI:

* Review and compilation of background information.

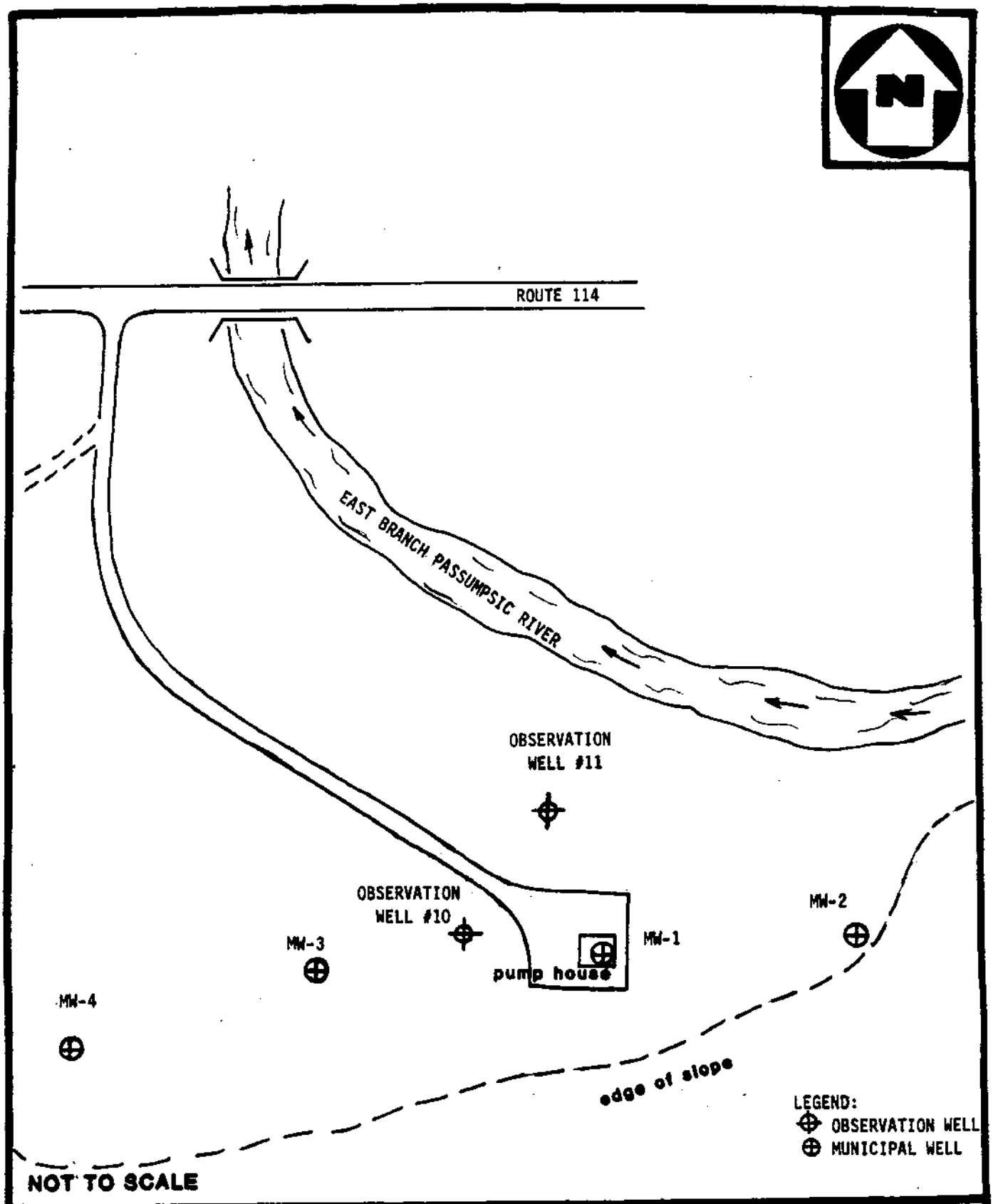


NUS/FIT MONITORING WELL LOCATIONS

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 2



WELL FIELD SITE SKETCH

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 3

* One round of groundwater, surface water and sediment sample collection, and two rounds of groundwater sampling from municipal wells and newly installed NUS/FIT monitoring wells.

* A geophysical survey including electromagnetic (EM) conductivity and resistivity and seismic refraction.

* Installation of monitoring wells.

* A ground survey of wells and other pertinent data points in the study area.

* Construction of a water table contour map.

Field tasks are discussed briefly as follows.

GEOPHYSICAL SURVEYING

During 1986, NUS/FIT conducted three types of geophysical surveying in the vicinity of the Lemieux Truck Dump/Mountain View Auto Restoration and the Darling Hill Dump -- Electromagnetic (EM) Conductivity, using a Geonics Inc. EM-34-3 unit; very low frequency (VLF) electromagnetic resistivity, using a Geonics Inc. EM-16R unit; and seismic refraction, using an ABEM Terraloc seismograph. The seismic survey provided information regarding the depth to bedrock, depth to water table and general characteristics of the overburden. The resistivity and conductivity surveys were used to locate possible groundwater contamination plumes by detecting anomalies in groundwater conductivity or resistivity. Geophysical survey results are discussed in more detail in the Geophysical Survey Trip Report and Task Report (Attachment 1).

MONITORING WELL INSTALLATION

A total of 17 groundwater monitoring wells were installed by NUS/FIT during two phases of drilling. Thirteen wells were installed near Darling Hill Dump and four wells were installed near Lemieux Truck Dump/Mountain View Auto Restoration (Figure 2).

All drilling and monitoring well installation for Lemieux Truck Dump/Mountain View Auto Restoration was completed during NUS/FIT Phase 2 drilling (Attachment 2), from March 3 to May 21, 1987. The four wells installed for Lemieux Truck Dump/Mountain View Auto Restoration provided information on soil and groundwater conditions, groundwater potentiometric surface (to determine groundwater flow direction and gradient), depth to and integrity of bedrock, and stratigraphy of the overburden deposits. The well locations are summarized in more detail below and are shown in Figure 2.

* Monitoring wells W-6 and W-7 were installed as nested wells at a location 2,500 feet north of the facilities and within 200 feet west of the municipal wells. The location was chosen to determine if contamination is present west of the municipal wells.

* Monitoring well W-10 is located 1,000 feet northeast of the facilities. The well was originally installed as a downgradient well to determine whether contaminants were migrating from Lemieux Truck Dump/Mountain View Auto Restoration to the municipal well field. However, based on water level measurements (Table 2), this well is neither directly downgradient nor directly upgradient of the facilities. It is upgradient but not directly in the flow path. For the

purposes of this report, the well be referred to as a background well. This well was screened in bedrock.

* Monitoring well W-12 is located 1,600 feet south of the sites, in the West Brook ravine. It was installed to provide data on background groundwater quality.

* Monitoring well W-16 is located just northwest of the facilities and across Pinehurst Street from Mountain View Auto Restoration. This well was installed downgradient of the facilities to detect any potential groundwater contamination migrating from the facilities.

* Monitoring well W-17 is located 2,000 feet north of the facility. It was installed to determine if contaminants are migrating from the facilities to the well field.

In-situ permeability testing was conducted in three boreholes prior to well construction. Two of the boreholes are located near Darling Hill Dump and one (well W-12) is near the study area. Results of the test for well W-12 are discussed in this report, and calculations are shown in Attachment 4.

PHASE I SAMPLING: APRIL, 1986

The NUS/FIT Phase I sampling round conducted in April 1986 consisted of the collection and analysis of groundwater samples from three Lyndonville municipal wells and surface water and sediment samples from the ravine east of Lemieux Truck Dump/Mountain View Auto Restoration and the West Brook where it was found to be flowing (Figure 4). Other surface water and sediment samples were collected from the Passumpsic River near Darling Hill Dump. A total of 28 samples were collected. Samples were analyzed by a Contract Laboratory Program (CLP) facility for Superfund List target compounds except for one surface water sample which was analyzed through NUS/FIT Laboratory Screening Program. The goal of this sampling round was to provide data regarding locations of any surface contamination and to assess potential contamination migration pathways for Lemieux Truck Dump/Mountain View Auto Restoration and Darling Hill Dump. The Phase I sampling round is described further in the Phase I Sampling Trip Report (Attachment 3).

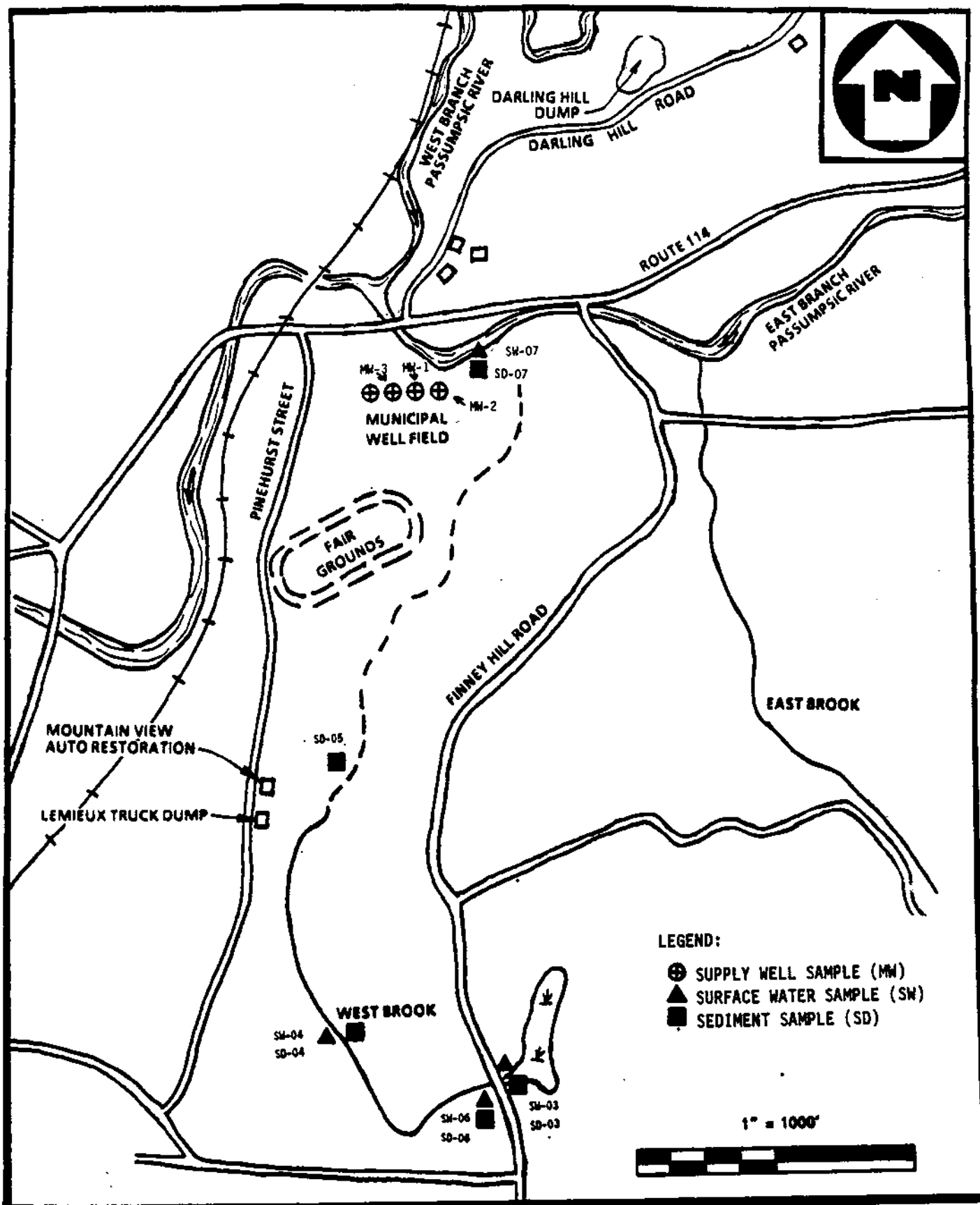
PHASE II SAMPLING: DECEMBER, 1986

The NUS/FIT Phase II sampling round, conducted on December 9 and 10, 1986, included collection and analyses of groundwater samples from three Lyndonville municipal wells, three NUS/FIT monitoring wells near Darling Hill Dump and four residential wells also located near Darling Hill Dump.

Details of this sampling round are discussed in the Darling Hill Dump Final ESI Report (NUS/FIT, 1989). Results for samples collected from the municipal wells are shown in Table 3b (Attachment 5).

PHASE III SAMPLING: JUNE, 1987

Groundwater samples were collected on June 22-26, 1987, from all 17 NUS/FIT monitoring wells, three Lyndonville municipal wells, and the four private residential wells that were sampled during the Phase II sampling round (Figure 5). Field activities for this sampling round are described in the Phase III Trip Report (Attachment 3). Analytical results for samples taken from wells near Lemieux Truck Dump/Mountain View Auto Restoration are discussed in the section entitled Analytical Results.

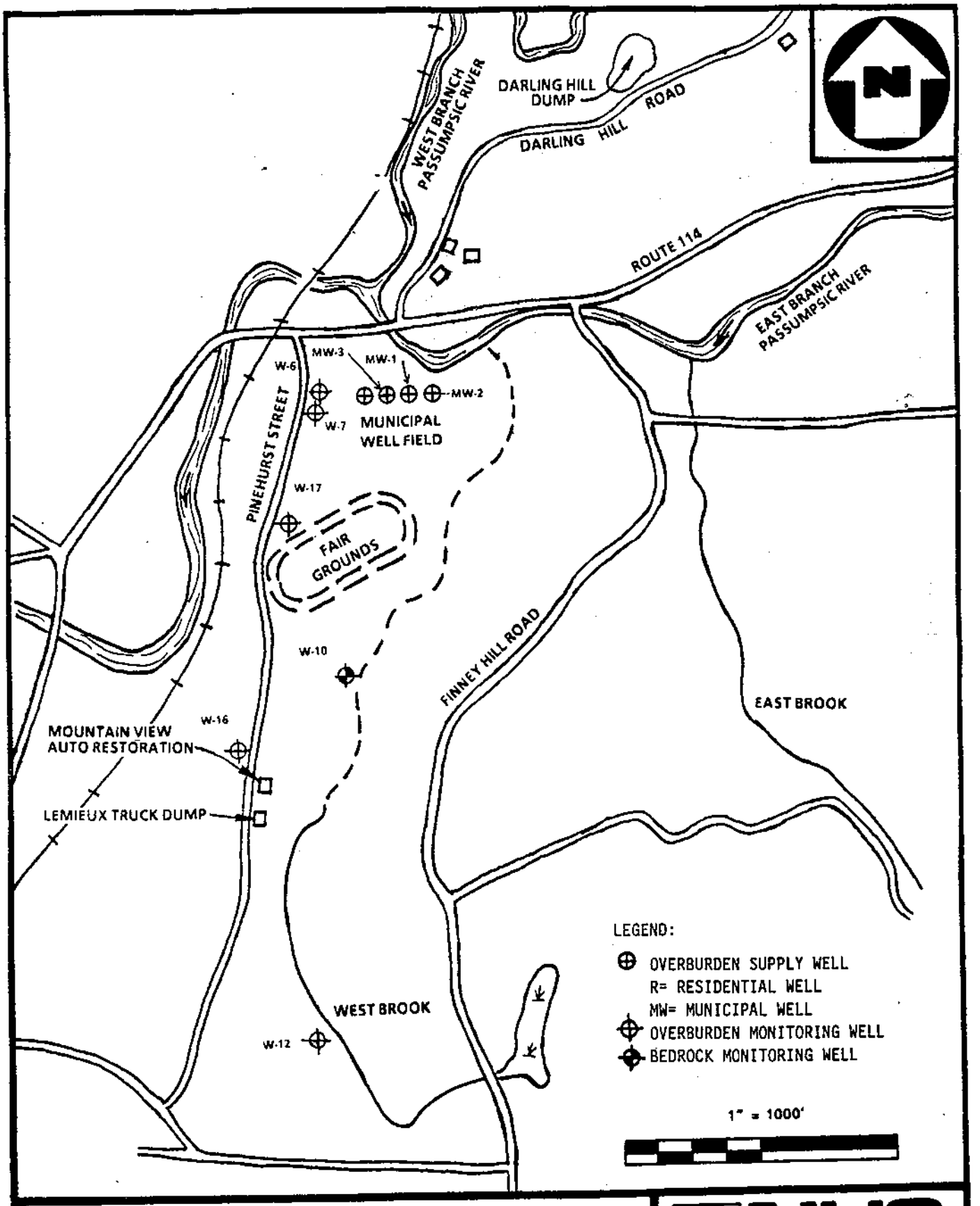


PHASE I SAMPLE LOCATIONS, APRIL 1986

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 4



PHASE III SAMPLE LOCATIONS, JUNE 1987

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 5

GROUND SURVEY

A ground survey was conducted on September 15-29, 1987 to determine the precise horizontal and vertical locations of the wells and data points for this study area and Darling Hill Dump. Surveying and water level information was used in conjunction with the USGS Topographic Maps (USGS, 1951a and 1951b) to compile a base map and groundwater contour map (Figure 8).

HYDROGEOLOGIC RESULTS

The following sections discuss the results of geophysical surveys and monitoring well installation.

Geophysical Survey Results

Data from seismic lines 2, 2N, and 3 (Figure 6) indicated that the overburden thickness could approach or exceed 200 feet and that significant glacial till, boulder pavement, or clay beds were not present in the vicinity of the facilities.

An EM resistivity and conductivity survey line (line number 8) was set up about 2,000 feet north of the study area along the northern edge of the fairgrounds (Figure 7). Data collected along this line did not indicate any anomalies which might be attributable to groundwater contamination. Details of the geophysical surveys are discussed further in the Geophysical Task Report (Attachment 1).

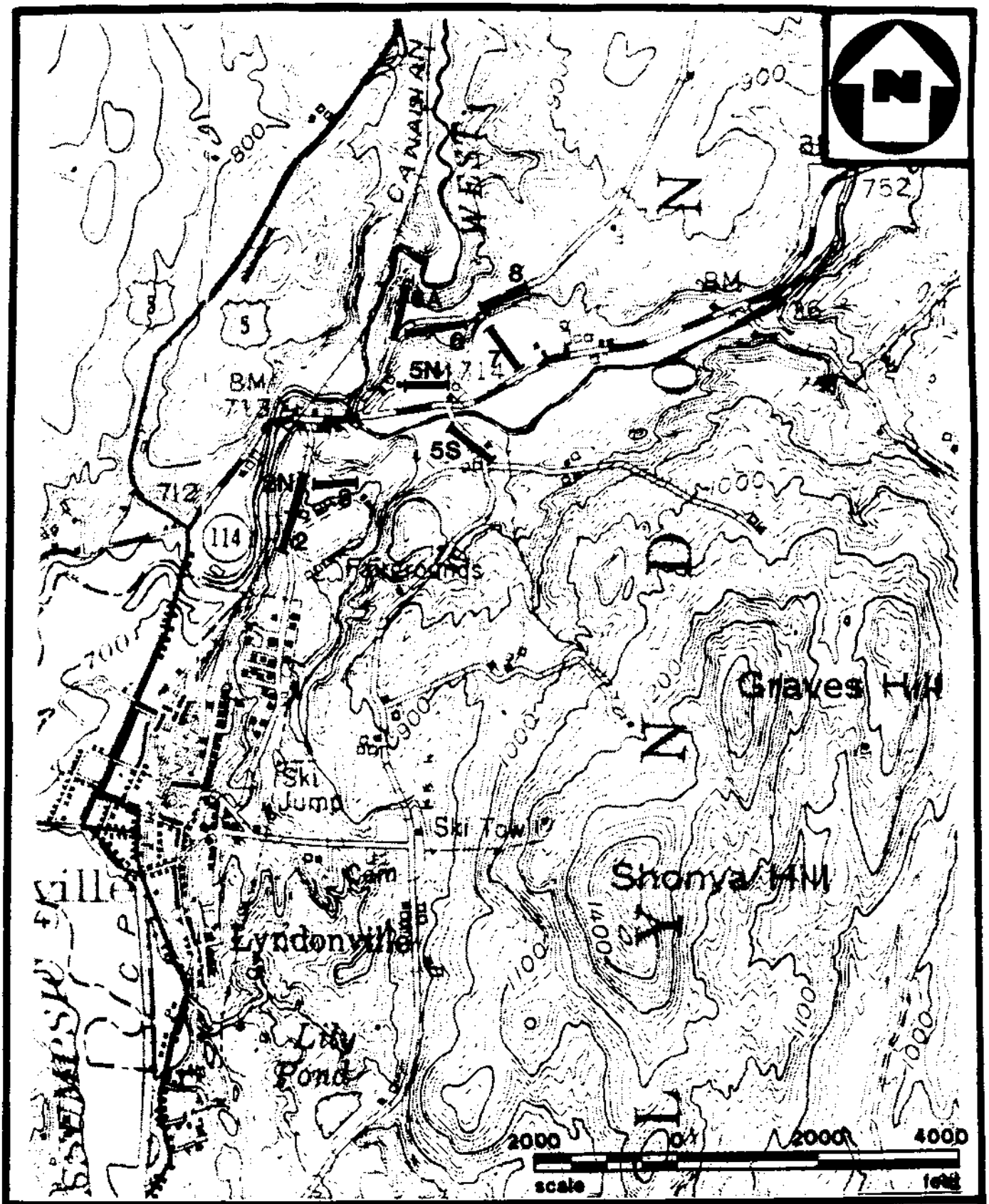
Overburden and Bedrock Geology

Logs for wells W-10, W-12, W-16, and W-17 confirm the presence of mostly fine grained sand from the ground surface to the bedrock surface. The overburden in the vicinity of the facilities varies from 27 feet thick at well W-12 to over 185 feet thick at well W-16. Depth to bedrock was not confirmed at wells W-16 and W-17, but it is over 100 feet at well location W-17 and over 185 feet at W-16. Elevation data and logs for boreholes drilled to bedrock indicate that the bedrock surface slopes to the west. Depths to bedrock are shown in Table 1 and in the well logs (Attachment 2). Topographic relief and the westward sloping bedrock may account for the large differences in overburden thickness between the areas east and west of the facilities.

Logs for NUS/FIT wells drilled to bedrock indicate that the bedrock near the facilities is a metamorphosed limestone/calcareous phyllite. Bedrock cores from the wells contain 4-5 fractures per linear foot. Since well logs for the study area indicate no confining layer between bedrock and overburden, the fractured bedrock and the overburden may act as one aquifer. Well W-10 is screened in bedrock (Attachment 2).

Hydrogeology

To provide information on the permeability of the overburden material for this study area, an in-situ permeability (slug) test was conducted in well W-12. Slug tests conducted in boreholes W-5 and W-2 are discussed in the Darling Hill Dump Final ESI Report. Permeability (hydraulic conductivity) testing measures the rate at which water can move through a geologic material. Prior to well construction and when the borehole had been drilled to a depth of 23.5 feet, a slug (falling head) permeability test was performed in the borehole. A hydraulic conductivity value was calculated using the field data and the method described by Bouwer and Rice (1975). Although the method is generally used for rising head permeability tests, the equations used are equally applicable for a falling head test (Chu, 1988). The calculated value (Attachment 4) was 1.36 x 10-3 cm/sec (3.9 feet per day) and is

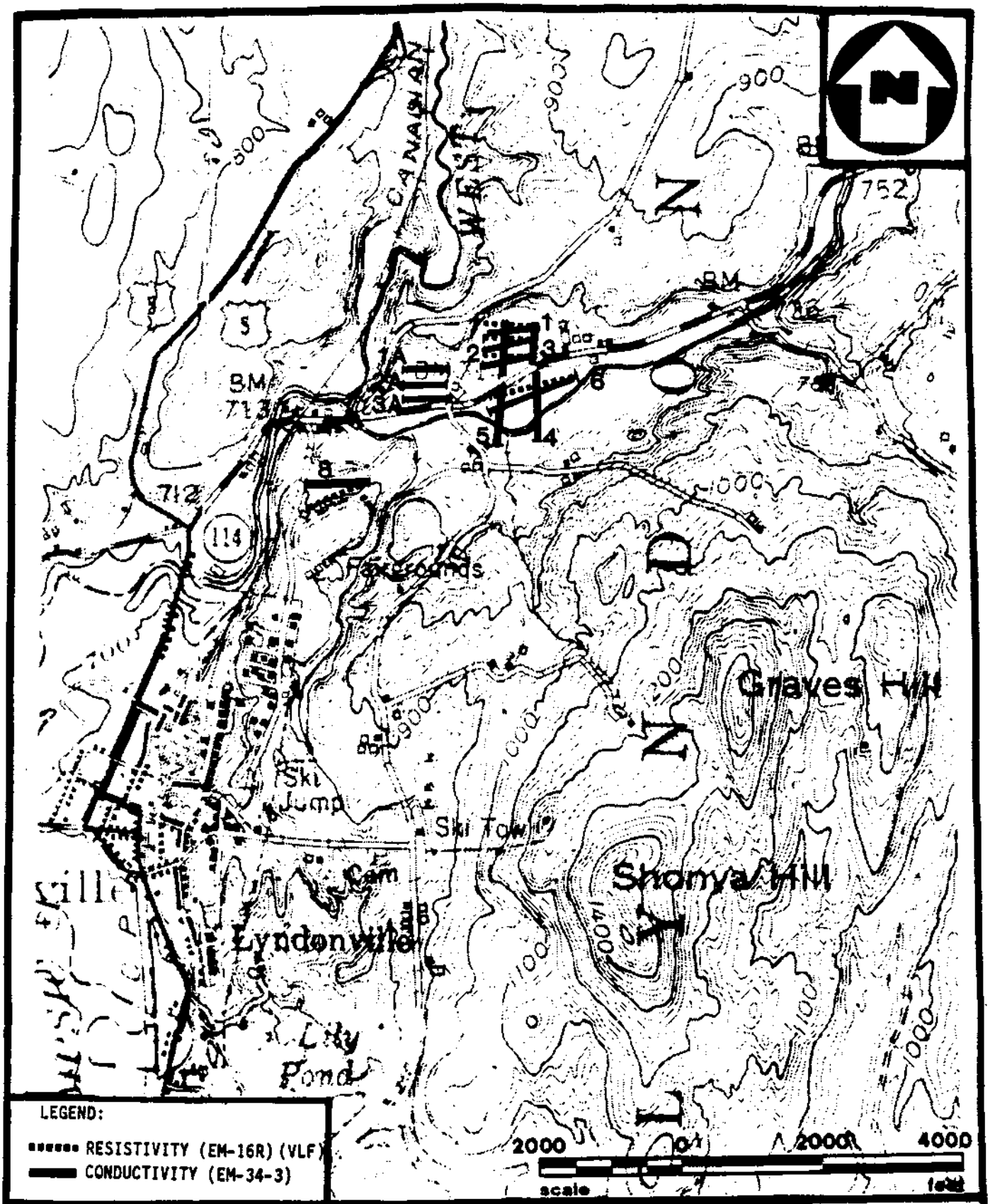


SEISMIC REFRACTION SURVEY LINES

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 6



EM RESISTIVITY & CONDUCTIVITY SURVEY LINES

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 7

TABLE 1
SUMMARY OF NUS/FIT MONITORING WELLS
LEMIEUX TRUCK DUMP/MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

WELL NUMBER	WELL ELEVATIONS (FT. ABOVE NGVD) TOP OF PVC *	GROUND SURFACE	DEPTH TO BEDROCK BGS (FT)	BEDROCK ELEVATION (FT. ABOVE NGVD)	SCREENED INTERVAL BGS (FT)
W-6D	714.19	712.21	165	547	160-110
W-7S	714.44	712.32	See W-6	See W-6	70-20
W-10	772-36	770.41	43	727	58-48
W-12	817.38	815.39	27	788	25-10
W-16	859.06	859.90	ND	ND (<675)	180-160
W-17	775.24	775.63	ND	ND (<676)	100-75

* Well elevations measured at the top of the PVC.

NGVD = National Geodetic Vertical Datum.

B.G.S. = Below Ground Surface.

S = Shallow

M = Medium Indicates relative depth of nested wells.

D = Deep

NA = Not applicable

ND = Not determined

TABLE 2
WATER TABLE ELEVATIONS
LEMIEUX TRUCK DUMP/MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

WELL NUMBER	REL. DEPTH	LOCATION	WELL ELEVATION	WATER TABLE DEPTH/ELEVATION 6/23 - 25/87	WATER TABLE DEPTH/ELEVATION 9/15/87
W-6	D	Near LMWF on possible edge of	714.19	15.5/699	13.93/700.26
W-7	S	Darling Hill Esker	714.44	15.0/699	14.31/700.13
W-10	NA	Background well Lemieux Truck Dump/MVAR	772.36	41/731	42.25/730.11
W-12	NA	Background for MVAR Lemieux Truck Dump.	817.38	5.7/812	5.68/811.70
W-16	NA	Downgradient of Lemieux Truck Dump/MVAR Site	859.06	158/701	159.10/699.96
W-17	NA	On Fair Grounds	775.24	77/698.24	75.42/699.82

S = Shallow
M = Medium Indicates relative depth of nested wells
D = Deep

LMWF = Lyndonville Municipal Well Field
MVAR = Mountain View Auto Restoration
NA = Not applicable
ND = Not determined

All elevations are in feet above National Geodetic Vertical Datum (NGVD). All depths are in feet below top of well at PVC.

considered moderately permeable and typical of sands (Freeze and Cherry, 1979). The value is probably average for most of the overburden in the study area since the well logs indicate that the dominant material in the study area is sand. However, permeability tests and calculations done for Darling Hill Dump wells indicated that the esker gravels in well W-5 found south of the dump were highly permeable and the silty sands in well W-2 were moderately to poorly permeable. The hydraulic conductivity of surficial materials found outside the areas around Lemieux Truck Dump/Mountain View Auto Restoration may vary widely (NUS/FIT, 1989).

Water level measurements (Table 2) taken in September 1987 were used to construct a water table elevation contour map (Figure 8). The dashed lines indicate where contours were projected beyond available data points. Arrows indicate the presumed horizontal direction of groundwater flow. Because water level measurements were not taken from the municipal wells, the shape of the cone of depression in their immediate vicinity was not determined.

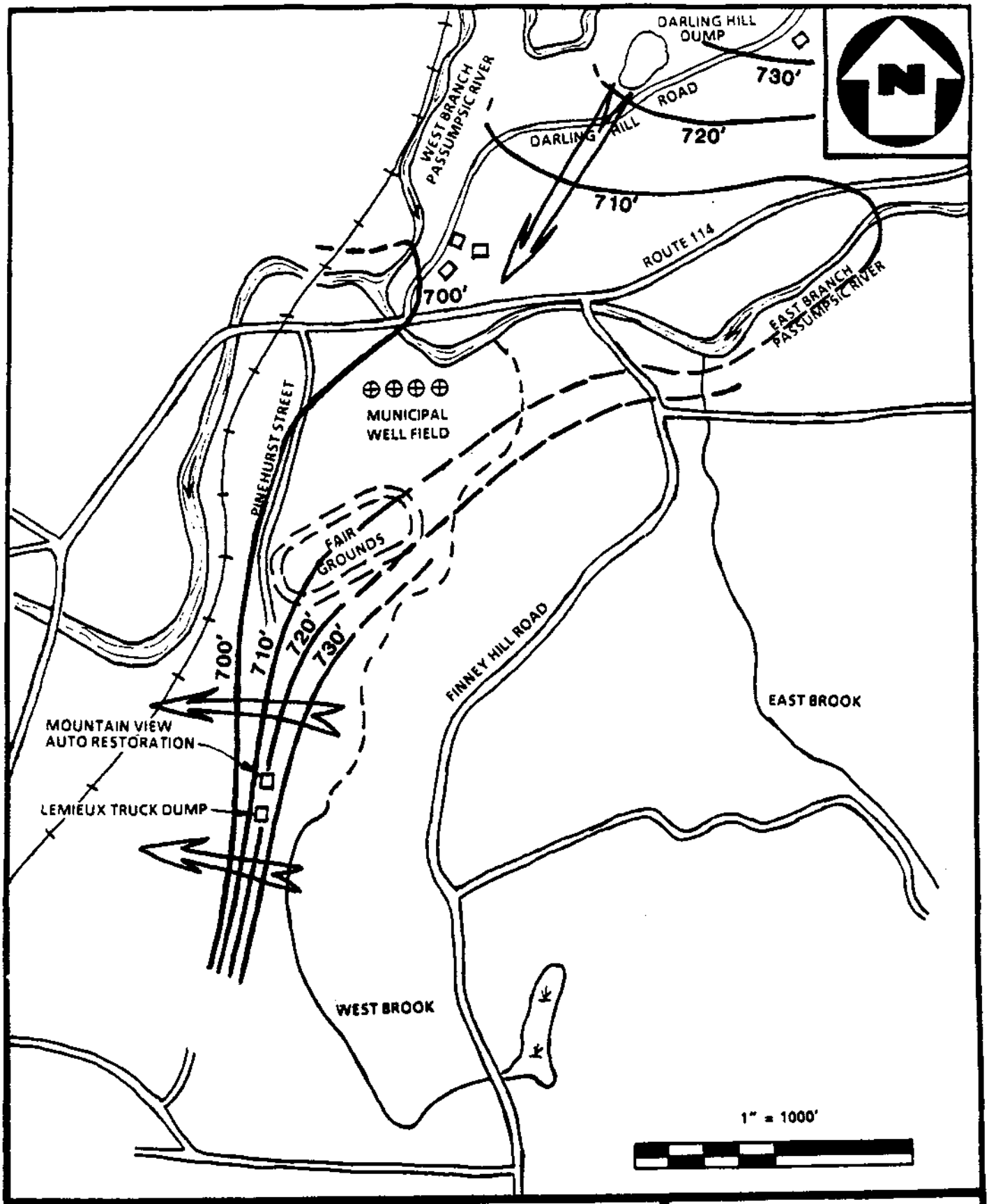
Based on water levels in W-10, W-12, and W-16, groundwater flow in the area south of the Caledonia County Fair Grounds in the vicinity of Lemieux Truck Dump/Mountain View Auto Restoration is to the west toward the Passumpsic River. A very steep gradient is indicated between W-12 and W-16. Assuming that there is hydraulic connection between the two areas, the steep gradient is thought to be a function of valley wall bedrock topography. Between W-16 and the river, the slope of the piezometric surface flattens out substantially (Figure 8). The lower water level in W-17 as compared to W-7 may indicate that W-17 is affected by pumping from the municipal wells. Well W-17 is screened in fine sands and the drawdown would be expected to be greater than the more permeable coarse sands and gravels in which wells W-6 and W-7 are screened. At location W-6 and W-7 water level measurements taken on 9/15/87 indicated that the water level was 0.13 feet higher in the deep well (W-6). This head difference may suggest a small component of upward flow.

ANALYTICAL RESULTS

The following sections summarize the analytical results from sediment, surface water, and groundwater sampling conducted in the study area. All analytical results related to Lemieux Truck Dump/Mountain View Auto Restoration can be found in Attachment 5. Sediment and surface water samples were collected during April 16-17, 1986. These samples underwent Contract Laboratory Program (CLP) volatile organic, extractable organic, and inorganic analyses as well as NUS/FIT Screening Program volatile and inorganic analyses. Results for sediment and surface water samples are presented in Tables 1a-1c and 2a-2e, respectively (Attachment 5). Groundwater samples were collected during April 16-17, 1986; December 9-10, 1986; and June 22-26, 1987. These samples also underwent CLP volatile organic, extractable organic, and inorganic analyses. Results for groundwater samples are present in Tables 3a-3c for volatile organic analysis, Tables 4a-4c for extractable organic analysis, and Tables 5a-5c for inorganic analysis. Aqueous samples collected for inorganic analysis were filtered and, therefore, represent the concentration of dissolved inorganic elements. Analytical detection limits for sediment samples are shown in Tables 6 through 8 in Attachment 5. For details regarding other sampling conducted in the vicinity during the study of Darling Hill Dump, please refer to the Darling Hill Dump Final ESI Report (NUS/FIT, 1989).

SEDIMENT ANALYTICAL RESULTS

Six sediment samples (including one duplicate sample) were collected from locations pertinent to the study of Lemieux Truck Dump/Mountain View Auto Restoration. Four of the samples (SD-03, SD-03D, SD-04, SD-06) were collected upstream of Lemieux Truck Dump/Mountain View Auto Restoration in West Brook. Two sediment samples (SD-05, SD-07) were collected from locations downstream of Lemieux Truck Dump/Mountain View Auto Restoration. The sample from location SD-05 was



GROUNDWATER CONTOURS & FLOW DIRECTIONS

LEMIEUX TRUCK DUMP/
MOUNTAIN VIEW AUTO RESTORATION
LYNDONVILLE, VERMONT

NUS CORPORATION

FIGURE 8

collected from West Brook immediately downslope and downstream of the facilities. The sample from location SD-07 was collected from the East Branch Passumpsic River, immediately downstream of where West Brook joins it (Figure 4).

Volatile and Extractable Organic Compounds

No volatile organic compounds were detected in the sediment samples (Table 1a). Sediment sample detection limits for CLP volatile organic analysis are listed in Table 6. Only three extractable organic compounds (phenol, benzoic acid, and diethylphthalate) were detected out of the eighty-one extractable organic compounds analyzed for in the sediment samples. Table 1b presents only those extractable organic compounds detected; a complete listing of all extractable organic compounds analyzed for and sample detection limits is presented in Table 7. Sediment results are reported on a dry weight basis.

Phenol was detected at only one (SD-06) of three sampling locations upstream of Lemieux Truck Dump/Mountain View Auto Restoration. It was not detected in the sediment sample from location SD-05, immediately downstream of Lemieux Truck Dump/Mountain View Auto Restoration, but was detected in a sediment sample from location SD-07, downstream of Lemieux Truck Dump/Mountain View Auto Restoration in the East Branch Passumpsic River (Figure 4). Phenol contamination of the sediments cannot, therefore, be directly attributed to the facilities. Benzoic acid was detected at only one sediment sampling location (SD-03) and, notably, not in the duplicate sample SD-03D. It is therefore an unreliable data point. Diethylphthalate was detected at four sampling locations at concentrations ranging from 44 to 83 ppb. These concentrations are below the detection limit for diethylphthalate but they were confirmed by mass spectral analysis and were therefore approximated (denoted by a "J"). Diethylphthalate was detected at two locations upstream (SD-03, SD-04) of Lemieux Truck Dump/Mountain View Auto Restoration. However, the duplicate sample SD-03D again did not contain diethylphthalate at detectable concentrations. The compound was also detected at locations downstream of Lemieux Truck Dump/Mountain View Auto Restoration (SD-05, SD-07). Because diethylphthalate was detected at locations both upstream and downstream of the facilities, its presence in the sediments cannot be directly attributable to the facilities. It should also be noted that phthalates are contaminants which are commonly introduced by laboratory and sampling procedures due to the unavoidable use of plastics.

Inorganic Elements

Inorganic elements were detected in sediment samples, as they are natural constituents of sediments (Table 1c). Sediment sample detection limits for CLP inorganic analysis are listed in Table 8. Each of the twenty four inorganic elements analyzed for were detected at similar concentrations in all samples, both upstream and downstream of Lemieux Truck Dump/Mountain View Auto Restoration, except SD-06. Additionally, the concentrations of all inorganic elements detected in the samples (except SD-06) were within reported typical background levels (Connor and Shacklette, 1975). Higher concentrations of inorganic elements were detected at sampling location SD-06, upstream of Lemieux Truck Dump/Mountain View Auto Restoration beneath a water main discharge pipe next to the West Brook. Concentrations of inorganic elements downstream of this location (SD-04) are similar to concentrations found elsewhere in the study area, including concentrations found at the location (SD-03) just upstream of the discharge pipe. The higher concentrations of inorganic elements found at sampling location SD-06 are therefore a localized event and are not attributable to the facilities.

SURFACE WATER ANALYTICAL RESULTS

Six surface water samples (including two blank samples) were collected from locations applicable to the study of Lemieux Truck Dump/Mountain View Auto Restoration. Three of the samples (SW-03, SW-04, SW-06) were collected upstream of Lemieux Truck Dump/Mountain View Auto Restoration in West Brook. One surface water sample (SW-07) was collected downstream of Lemieux Truck Dump/Mountain View Auto Restoration, from the East Branch Passumpsic River, immediately downstream of where the West Brook ravine joins it (Figure 4). The sample from location SW-06 was analyzed under the NUS/FIT screening program for certain volatile organic compounds and inorganic elements; all other samples underwent CLP volatile organic, extractable organic, and inorganic element analyses.

Volatile and Extractable Organic Compounds

No volatile organic compounds were detected in the surface water samples analyzed by CLP laboratories (Table 2a). Except for unidentified peaks, which elute early in the chromatographic analysis, no volatile organic compounds were detected in samples from location SW-06 (Table 2b), analyzed by NUS/FIT. No extractable organic compounds were detected in surface water samples collected from sample locations upstream and downstream of the facilities (Table 2c). Sample detection limits and a complete listing of extractable organic compounds analyzed for are listed in Table 9.

Inorganic Elements

Varying concentrations of inorganic elements were detected in surface water samples, as they are natural constituents of surface water (Table 2d). The concentrations of inorganic elements, except those in the sample from location SW-06, were consistent among both upstream and downstream samples. Higher concentrations of iron (2,000 ppb) were detected in the sample (SW-06) from West Brook, upstream of Lemieux Truck Dump/Mountain View Auto Restoration near the discharge pipe (Table 2e). Higher concentrations of inorganic elements were also seen in the sediment sampling results from this location. The presence of the inorganic elements in the surface water cannot, therefore, be attributed to the facilities.

GROUNDWATER ANALYTICAL RESULTS

Volatile and Extractable Organic Compounds

Low levels (<10ppb) of the volatile organic compounds trans-1,2-dichloroethene (t-1,2-DCE) and trichloroethene (TCE) were detected in samples collected from the municipal wells MW-1 and MW-3 in April and December 1986 (Tables 3a and 3b). These compounds were not detected in later samples collected from MW-1 and MW-3 in June 1987; however, the presence of slightly higher detection limits in the June sampling round would have masked the detection of such low levels (Table 3c). Volatile organic contamination of groundwater by t-1,2- DCE and TCE was also detected in NUS/FIT wells W-6 and W-7 (Table 3c). Samples from well W-7 contained t-1,2-DCE, and TCE was detected in samples collected from well W-6; both wells are located west of and close to the well field. In addition, one volatile organic compound, chlorobenzene, was detected in groundwater at 2 ppb in the sample from well W-16, located immediately downgradient of Lemieux Truck Dump/Mountain View Auto Restoration. No other volatile organic compounds were detected in groundwater (Tables 3a-3c).

The trans-1,2-dichloroethene contamination in a sample from well W-7 may be attributable to Darling Hill Dump. Contaminated groundwater from the presumed Darling Hill Dump source may continue to migrate west or southwest past the municipal wells toward well W-7. Another possible explanation is that this well is screened in permeable gravel which may be part of an esker (winding ridges of stratified drift), which could provide a preferred pathway for groundwater contaminants from Darling Hill Dump southward (VT DOH, 1985). However, volatile organic compound contamination was not detected in wells installed in the gravel closer to the Darling Hill Dump to support that explanation. Further details are available in the Darling Hill Dump Final ESI report (NUS/FIT, 1989).

Only one extractable organic compound (bis(2-ethylhexyl)phthalate) was detected out of the eighty-one extractable organic compounds analyzed for in groundwater samples. Tables 4a-4c present only those extractable organic compounds detected in the study area; a complete listing of all extractable organic compounds analyzed for and sample detection limits is presented in Table 9. Bis(2-ethylhexyl)phthalate was detected in samples collected from two of the nine wells located throughout the study area. It was detected in a sample collected from monitoring well W-16 (21 ppb) located downgradient of the facilities, and in a sample from the background well W-10 (750 ppb). It was not detected in the second background well W-12. Because neither of the background wells are located directly upgradient of Lemieux Truck Dump/Mountain View Auto Restoration, the presence of the phthalate in monitoring well W-16 cannot be definitively attributed to the facilities. As mentioned earlier, phthalates are contaminants that are commonly introduced by the laboratory or sampling procedure because of the unavoidable use of plastics. Note that bis(2-ethylhexyl)phthalate was identified as a blank contaminant in three samples and was approximated in the remaining samples (in which it was detected) due to blank contamination. Since this contaminant has never been identified in samples collected from the municipal wells, and because it was detected in both a background sample and a sample from a monitoring well downgradient of the facilities, it is likely that it was introduced into the samples through the sampling or laboratory procedure. Excluding the presence of bis(2-ethylhexyl)phthalate, there is no contamination of groundwater in the study area by CLP extractable organic compounds.

Inorganic Elements and Cyanide

Varying concentrations of inorganic elements were detected in groundwater samples collected from well locations throughout the study area (Tables 5a-5c). Concentrations of the inorganic elements did not exceed the Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs) in samples collected from the municipal wells MW-1, MW-2, and MW-3 or from any NUS/FIT monitoring wells. Those inorganic elements which have established MCLs include: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Cyanide was not detected in any groundwater samples collected during the June 1987 sampling round (Table 5c). Analytical results for cyanide analysis from the December 1986 sampling round had been rejected due to laboratory quality control problems.

Most levels of inorganic elements detected in groundwater were similar to or below those levels detected in samples collected from background well locations W-10 and W-12 (Table 5c). A sample from the well located immediately downgradient of Lemieux Truck Dump/Mountain View Auto Restoration, W-16, contained levels of iron (2,160J ppb), aluminum (898 ppb), and sodium (22,600 ppb) greater than three times those present in samples from the background wells. In samples collected from wells located downgradient (W-7) from and near (W-17) the municipal wellfield, aluminum and iron were also detected at concentrations greater than three times those in the background samples. However, the concentrations of aluminum in the W-16 and W-7 samples, while higher than background levels, were within typical ranges reported for groundwater (Fuller and

Warrick, 1985). The higher levels of sodium in the sample from monitoring well W-16 may be due to the common use of de-icing salt on the nearby road.

CONCLUSIONS

Analytical results for all phases of sampling indicate that Lemieux Truck Dump/Mountain View Auto Restoration are not likely sources of the volatile organic compound contamination found in the Lyndonville municipal wells. Based on analytical data from NUS/FIT (Attachment 5) and the VT DOH (VT DOH, 1985) sampling rounds, the Lyndonville municipal wells are contaminated with trans-1,2-dichloroethene and trichloroethene. Of these two compounds, only the former was detected in the wells installed for this study area. It was detected in monitoring well W-7, located near the municipal wells. The only other volatile organic compound detected in groundwater samples from wells for this study area was chlorobenzene in well W-16 (Table 3c). Since groundwater flow is to the west in the vicinity of Lemieux Truck Dump/Mountain View Auto Restoration (NUS/FIT, 1987b), the chlorobenzene detected in W-16 may be attributable to either Lemieux Truck Dump or Mountain View Auto Restoration (Figures 1 and 8). However, additional sampling would be required to confirm the presence of this compound in groundwater at well W-16. A site specific hydrogeologic evaluation would be required to determine if it is attributable to the facilities. Because of the westward flow of groundwater in the study area, it is unlikely that the trans-1,2-dichloroethene in well W-7 and the elevated levels of inorganic elements present in well W-17 are attributable to the facilities.

The analytical results of surface water and sediment sampling indicate that the facilities are not contributing to contamination of the municipal wells by surface water (and subsequent sediment) contamination.

In summary, based on the available analytical and hydrogrologic data, Lemieux Truck Dump/Mountain View Auto Restoration do not appear to be likely sources of contaminants found in the Lyndonville municipal wells.

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