

CONFIDENTIAL

REPORT ON LAND ACQUISITIONS FOR 3M WOODBURY SITE
WOODBURY, MINNESOTA

Introduction

In the 1960's, property in Woodbury, Minnesota, was used for disposal of 3M waste materials. The disposal resulted in the contamination of groundwater in residential wells near and beneath the site. In 1967 a remedial action program was initiated, which included a mass open burning process and the installation of barrier wells. The barrier wells remain in operation today, pumping about 3,000 gallons per minute from the lower aquifers to the Chemolite plant. About one-half of the water is used for noncontact process cooling water. The remainder is discharged directly to the Mississippi River.

The Woodbury property will continue to be controlled as a past disposal site, since the removal of contamination will require a significant number of years. In order to provide the necessary site control and minimize the potential for future liability in terms of costs and negative publicity, it is recommended to purchase additional property adjacent to the site.

This report summarizes the rationale for this recommendation.

Description of Site

A map of the Woodbury site, Figure 1, shows the location of the two disposal areas. The disposal area in the center of the property received mainly solvent contaminated waste and dry scrap. A smaller disposal area on the northern border of the site received mainly acid wastes and other miscellaneous materials. The groundwater flow in the lower aquifers is from east to west toward the center of the Twin Cities area. The barrier wells, also located on the map act to intercept the flow of contamination. It is felt this process is providing satisfactory control over the movement of the contamination in the lower groundwater aquifer.

Attached to this report is a letter from Bruce Liesch and Associates, a hydrogeology consultant. This letter includes a topographic map of the site (Figure B of the letter) and shows the flow of surface water and surficial groundwater in the shallow glacial drift. There is a noticeable topographic high in the center of the property. This high point affects the surface and surficial groundwater flow. From the main disposal area this flow would trend toward the southeast into a series of depressions (Gables Lake). The flow of water from the disposal site on the northern border would trend radially in all directions from the high point.

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**Exhibit
1318**

State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

Trial Exhibit 38

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Effect of Topographic Situation

Based on the attached letter from Bruce Liesch and Associates, there is the potential for the movement of contamination from the disposal areas in the direction of the surface water and surficial groundwater flow. Surficial wells drilled in the shallow aquifers could potentially draw or intercept this contamination flow. For example, glacial drift wells in the property southeast of the disposal site could especially be affected in this manner. Even if wells in this area were drilled to the deeper St. Peter or Jordan aquifers, the contamination would still migrate laterally and vertically through the glacial drift beneath that property and could contaminate the deeper aquifers.

In regard to the other disposal site, the contamination would similarly follow the natural surface water and surficial groundwater flow, i.e., radially in all directions.

In addition, groundwater movement can be affected by the pumping of large volumes of water from other wells. For example, irrigation wells east, south, and north of the 3M site could impact the migration of the contamination.

Recommendations

It is recommended to approve a plan for long range land acquisition adjacent to the existing Woodbury property. The land parcels are shown on Figure 2. The parcel indicated for immediate acquisition is that for which the AFE has been written. The reasons for the acquisitions are as follows:

1. Reasons for acquisition for property southeast of the Woodbury site. Presently it is being proposed to subdivide this land into residential lots.
 - a) There is a potential for migration of contamination through this property.
 - b) Shallow wells are not recommended. Thus, 3M would likely need to fund the additional depth for wells into the lower aquifers. This has already occurred for 2 wells west of the property. An expenditure of \$6,000 for each of 20 wells is the potential maximum amount.
 - c) Any real or perceived problem with the well or with the water supply of a resident would likely be assumed to be a result of the 3M remedial action program.
2. Reasons for acquisition for property west of the property. This is the property owned by Schussler, on which the original contamination was noted.
 - a) The underground flow is toward this direction.
 - b) It is likely that, if sold, this property would be subdivided and the same concerns of Item One would apply.

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3. Reason for acquisition of property north and east of the Woodbury property.

- a) The proximity of the northern disposal pits and potential for migration of the contamination.

In all cases above, these parcels of land will provide additional buffer around the disposal sites. Funds would only be requested for the purchase of these designated parcels when it appears that there is pressure for development or there is a change in current ownership. This in general will preserve 3M's control over the site and provide long term assurance of a much needed water supply for the Chemolite plant.

Summary

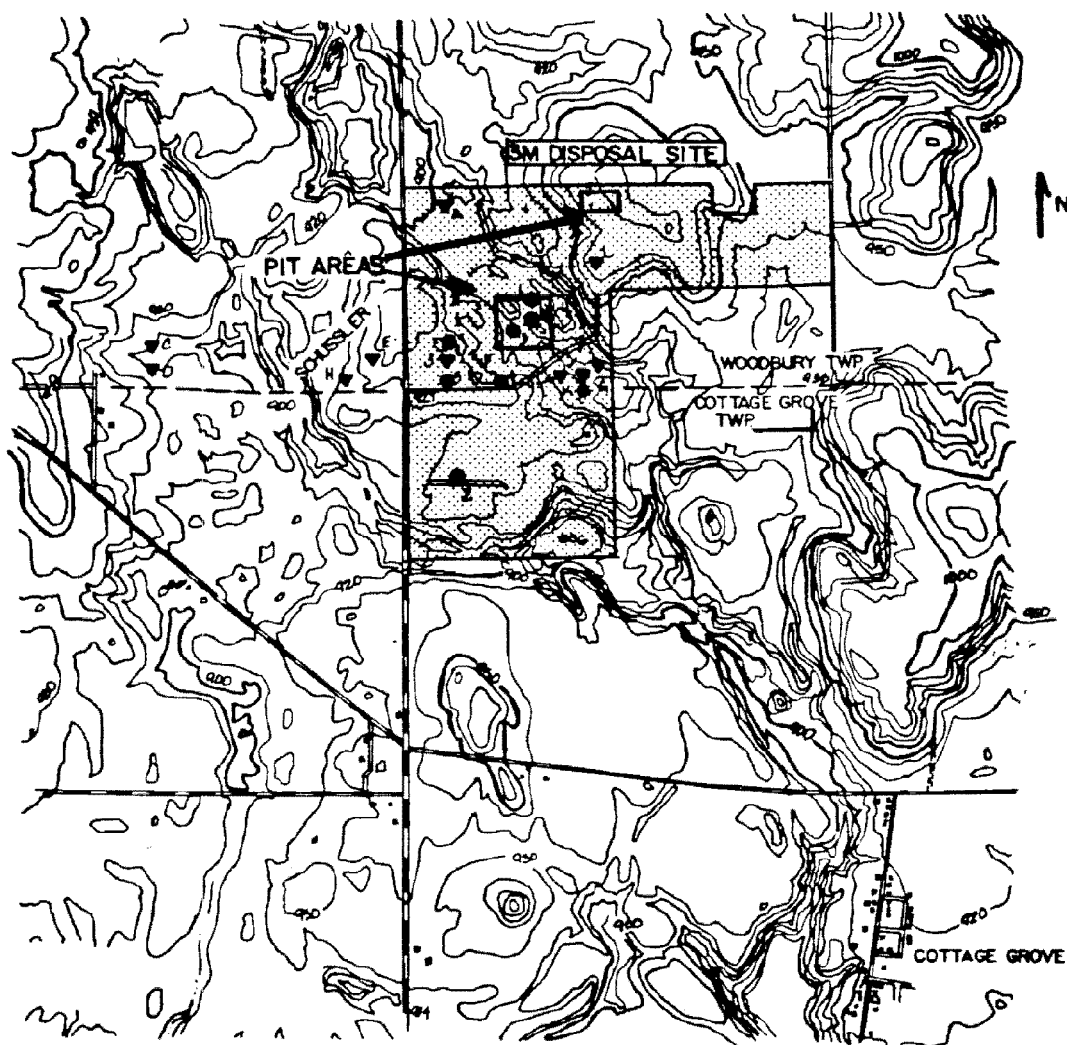
It is recommended that the long range land acquisition plan described above be approved. The timing for and amount of expenditure is indicated below.

<u>Property</u>	<u>Area</u>	<u>Cost</u>
Presently 3M owned	390 acres	
Available for purchase (see AFE)	76 acres	\$ 143,000
Recommended future acquisition:		
Gadde Property	80 acres	200,000
Butler Property	80 acres	200,000
Harting Property	160 acres	400,000
Schussler Property	40 acres	<u>100,000</u>
Total		\$1,043,000

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LEGEND

- ▼ OBSERVATION WELL
- REMOVAL WELL
- BARRIER WELL

FIGURE 1: WOODBURY SITE: LOCATION OF DISPOSAL AREAS

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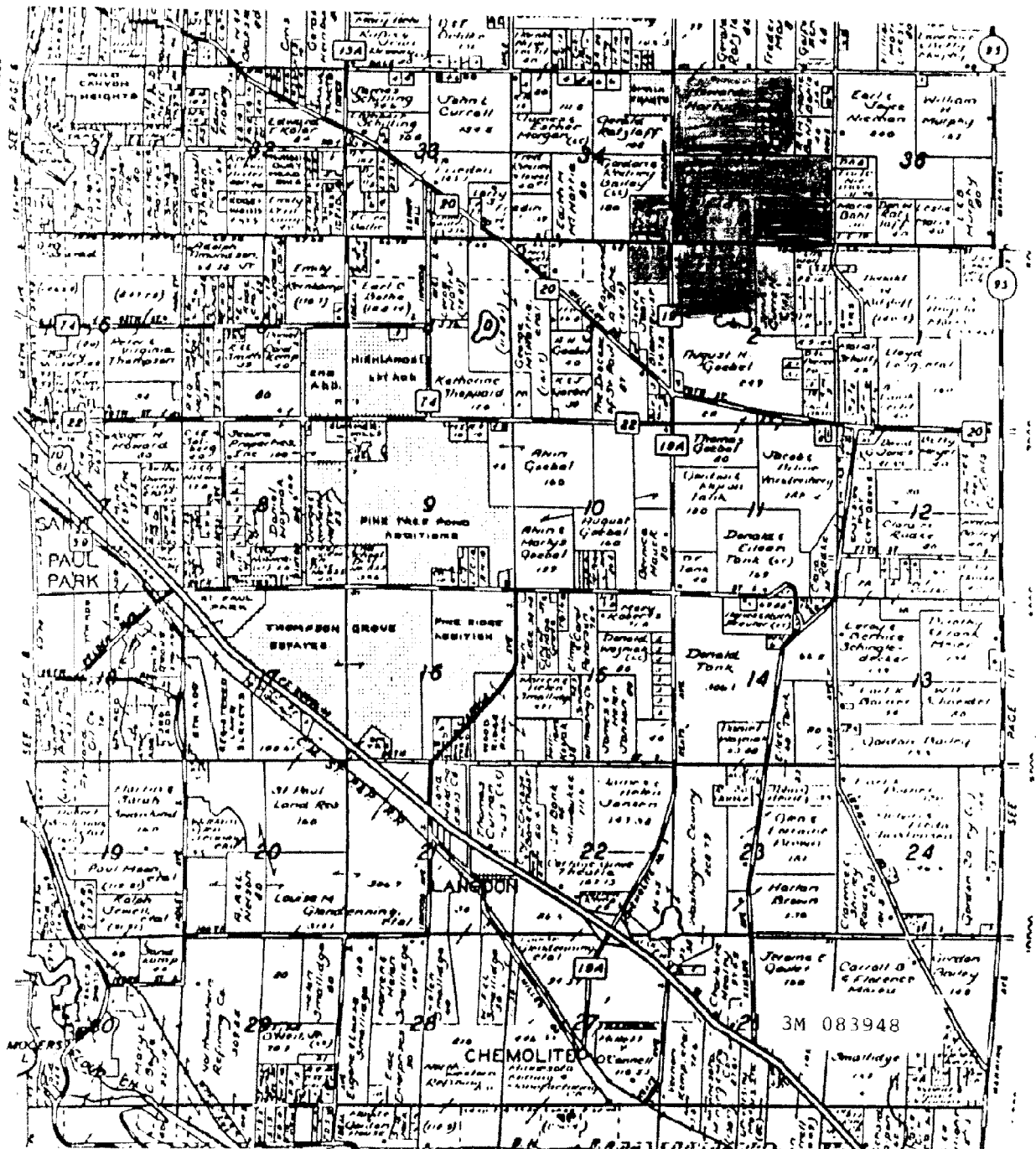
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WOODBURY PROPERTY - PRESENT AND PROPOSED

3M PROPERTY

RECOMMENDED PRESENT ACQUISITION

RECOMMENDED FUTURE ACQUISITION



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BRUCE A. LIESCH ASSOCIATES, INC.

CONSULTING HYDROLOGISTS ■ PROFESSIONAL GEOLOGISTS ■ ENVIRONMENTAL SCIENTISTS

3131 Fernbrook Lane / Minneapolis, Minnesota 55441 / 612-559-1423

January 3, 1985

Mr. M.C. Goldsmith, Chief Geologist
Real Estate and Geology Department
3M Company
P.O. Box 33331
St. Paul, MN 55133

Re: Proposed Development of property adjacent to Woodbury
Disposal Site

Dear Mr. Goldsmith:

As we discussed on the telephone recently and at our meeting at your office on January 2, 1985, I have prepared the following analysis of hydrogeologic conditions at the Woodbury Site that should be considered in decisions regarding land use in the immediate vicinity.

The proposed development sites, are identified on the attached Figures A and B. Figure A shows the parcels of land under consideration. Figure B, an enlarged copy of the St. Paul Park Quadrangle Topographical 7.5 Series, is attached to show the local topography and geomorphology of the area.

Part of the abandoned disposal site is located in a linear depression trending northwest-southeast through the southwest one-quarter of Section 35, T. 28 N., R. 21 W., and extending into the northeast one-quarter of Section 2, T. 27 N., R. 21 W. Closed depressions or "kettles" lie at each end of the depression and topographic rises lie to the southwest and northeast.

Under the control of the topography, it appears that contaminants could have migrated along the trend of the depression above the zone of saturation and beyond the control of the Barrier Well System cones of depression. The flow of groundwater recharge through unsaturated glacial deposits is controlled by the structural and stratigraphic relationships of fine (silt and clay) and coarse (sand and gravel) units rather than by natural or artificial gradients within the zone of saturation. By this mechanism, contaminants can be transported to bedrock units (St. Peter Sandstone, Shakopee-Oneota Dolomites, Jordan Sandstone) in an up-gradient direction from the Barrier Well System.

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Although the direction of flow through the unsaturated glacial deposits could occur in all directions from the original disposal pit area, the dominant flow would tend to follow the topography as indicated by the arrows on Figure B.

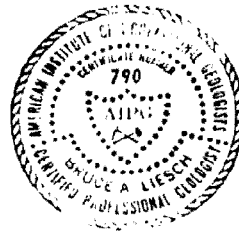
RECOMMENDATION:

1. It is recommended that residential development be discouraged in the areas designated on Figure A.
2. In the event that residential development proceeds, a central water system based upon wells completed in the Jordan aquifer would afford some protection against contamination but would fail to provide absolute assurance.

Respectfully Submitted,

Bruce A. Liesch

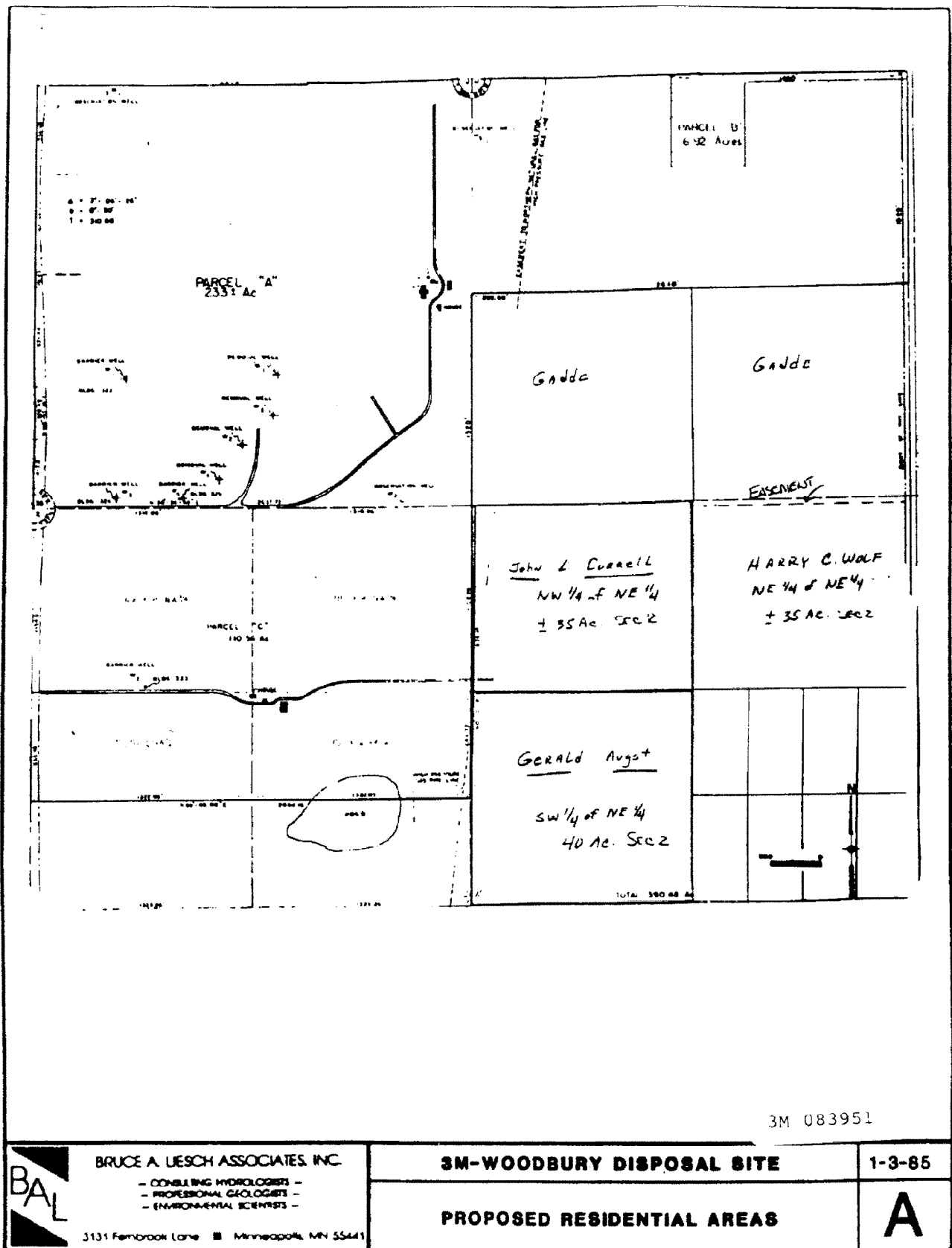
Bruce A. Liesch
Consulting Hydrogeologist



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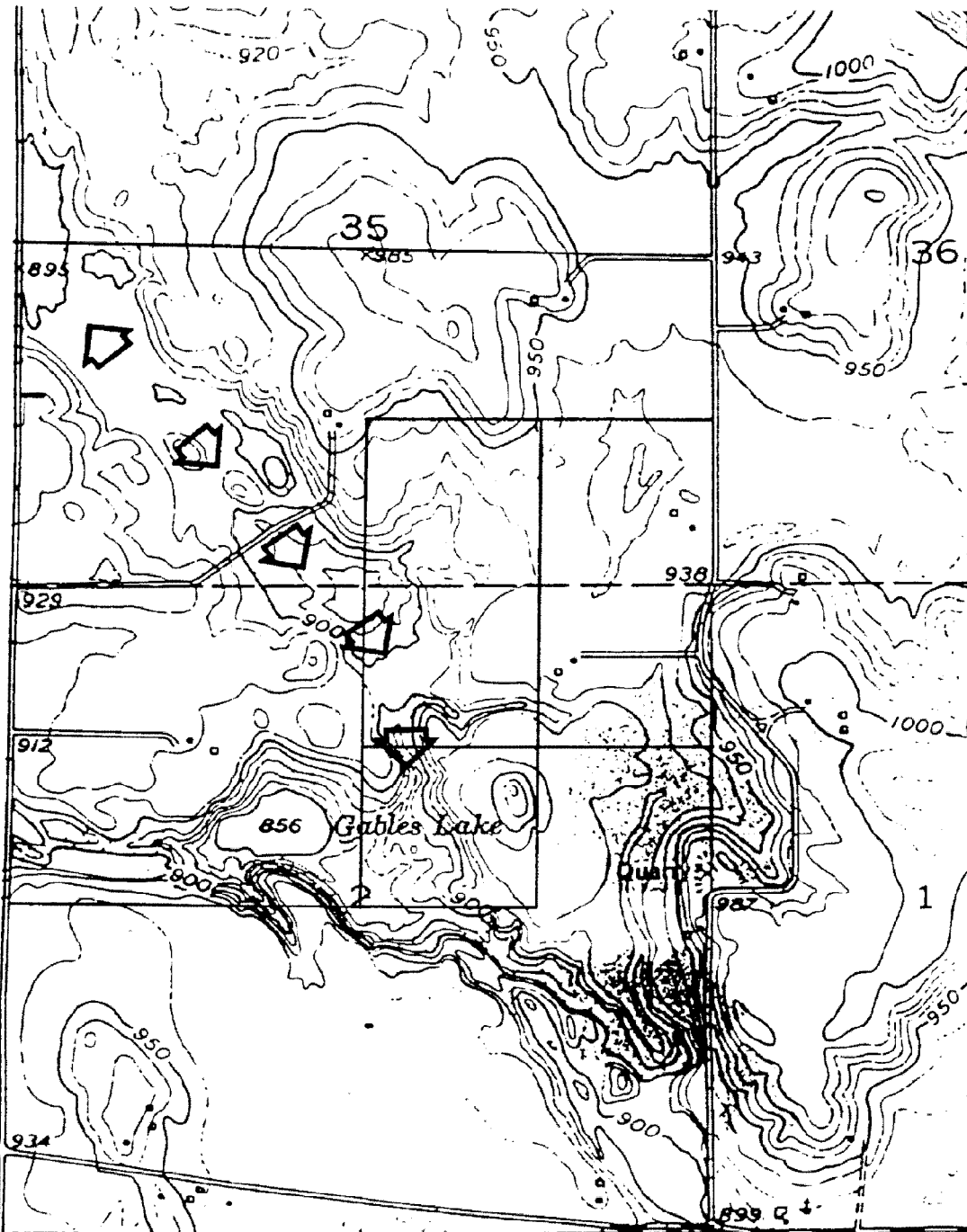
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POSSIBLE MAJOR DIRECTIONS OF FLOW THROUGH UNSATURATED GLACIAL DEPOSITS



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- PROFESSIONAL GEOLOGISTS -
- ENVIRONMENTAL SCIENTISTS -

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3M-WOODBURY DISPOSAL SITE

TOPOGRAPHIC MAP

1-3-85

B

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