UNITED STATES DEPARTMENT OF AGRICULTURE **Northeast NTC**
SOIL CONSERVATION SERVICE **CHESTER, PA 19013**

SUBJECT: Ground-Penetrating Radar (GPR) Study of Proposed Mining Site, Lynne, Oneida County, Wisconsin

DATE: 17 March 1992

To: Earl Cosby
State Conservationist
USDA-Soil Conservation Service
6515 Watts Road, Suite 200
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Purpose:
To evaluate the potential of using GPR for characterizing the morphometric features of a large peatland in Oneida County, Wisconsin.

Participants:
Jeff Anderson, Geologist, Anderson Environmental Services, Port Washington, WI
Jim Doolittle, Soil Specialist, SCS, Chester, PA
Tom Evans, Mining and Mineral Specialist, WGNHS, Madison, WI
James Garton, Remote Sensing Specialist, Donohue Engineers, Milwaukee, WI
Walter Hall, Geotechnician, WGNHS, Madison, WI
Fred Madison, Professor of Soil Science, U. of W., Madison, WI
Robert Reed, Bureau of Environmental Analysis, DNR, Madison, WI
Charles Werster, Land Use Specialist, DNR, Rhinelander, WI

Activities:
Field studies were conducted on accessible portions of a relatively large bog near Lynne, Wisconsin on 3 and 4 March 1992.

Equipment:
The ground-penetrating radar unit used in this study is the Subsurface Interface Radar (SIR) System-8 manufactured by Geophysical Survey Systems, Inc. [1]. Components of the SIR System-8 used in this study were the model 4800 control unit, ADTEK SR 8004H graphic recorder, ADTEK DT 6000 tape recorder, power distribution unit, transmission cable (30 m), and the model 3110 (120 MHz) antenna. A scanning time of 400 nanoseconds and a scanning rate of 25.6 scans/sec were used. The system was powered by a 12-volt marine battery.

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1. Use of trade names in this report is for identification purposes only and does not constitute endorsement by the author or SCS.

Discussion:
Warm weather produced unfavorable field conditions for the operation of a snow mobile, and the towing of a sled and the radar antenna. In addition, dense woody vegetation limited access in many areas of the bog.

The 120 MHz antenna with the model 705DA transceiver profiled the peat to an estimated depth of 29 feet. Based on one ground-truth observation of the depth to mineral layers and thickness of peat (13.5 feet) at an observation site, the averaged dielectric constant of the layers of wet snow and peat were estimated to be 44.

The radar provided excellent profiles of the morphometry of the peatland. Most areas of the peatland traversed with the radar were characterized as having a relatively flat, basin-like subsurface topography. However, radar traverses revealed the presence of a large kettle in one portion of the peatland. In addition, the radar was used to provide subsurface stratigraphic information of an adjoining eskers and the mineral soil materials which underlie the peatland.

All radar profiles were turned over to Dr. Madison for review and analysis.

Recommendations:
1. In the areas transected with GPR, the radar provided a wealth of subsurface information. If additional subsurface information is desired by the Wisconsin Department of Natural Resources, areas to be transected with GPR should be selected and access paths cleared for a snow mobile and sleds. Under favorable conditions (snow and 20 to 30 ^{o} F. temperatures) radar surveys can be rapidly completed along these cleared, access paths next winter.

2. Based on studies conducted over similar peat bogs in Massachusetts, the use of the model 3207 antenna (100 MHz transmitter and transceiver) is recommended. This antenna was unavailable at the time of this survey, because of recent vandalism to the vehicle while it was parked in Chester, PA. Vandals stole a BNX cables and eight assembly bolts to the model 3207 antenna which were stored in the vehicles console. These components have since been replaced.

3. This study provided detailed site information to decision makers and afforded soil scientists with an opportunity to study earthen materials beyond the traditional limits of soil survey investigations.

I once again welcomed the opportunity to work with Dr. Madison and to provide GPR assistance to Wisconsin.

With kind regards.

James A. Doolittle
Soil Specialist

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