

SEDIMENT ACCUMULATION IN LAKE ROAMING ROCK, ASHTABULA COUNTY, OHIO

Lake Roaming Rock is located Southeast of the town of Rock Creek, Ashtabula County, Ohio. The lake was formed in 1967 by impounding Rock Creek, a tributary of the Grand River. The 464 acre lake has a drainage area of approximately 44,160 acres.

On August 22, 1991, a detailed reconnaissance sedimentation survey was performed at the lake. The results of this survey show that since 1967, the lake has lost approximately 5.8 percent of its original volume to sediment. This is an annual rate of 0.2 percent (see attached data sheets). This rate is relatively low compared to other lakes in Ohio. The publication "Impact of Nonpoint Pollution on Lakes in Ohio" shows a typical range of annual volume loss in impounded reservoirs of 0.0 to 1.0. This publication is enclosed.

The attached average depth and average sediment thickness profiles for the main lake and its two major tributary arms show the relationship between the average original bottom, average sediment surface, and the water surface (see attached survey map). The sediment surface has been projected 25 years and 50 years into the future to aid in lake management decisions. Individual probe readings for each range are enclosed. The total depth and water depth on the readings have been increased by one foot to adjust the water surface to the principal spillway crest elevation.

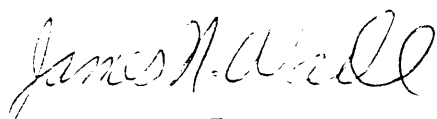
Secchi disc measurements were taken and are included in the "Notes on the Lake" section of the survey data. In general, the disc readings indicate that the lake was eutrophic above range H-H' at the time of the survey. Since most of the lake tributaries were dry as a result of extremely droughty conditions, lake turbidity was probably not a function of suspended sediment.

On August 23, 1991, I made the following observations of the hydrologic conditions within the upstream watershed:

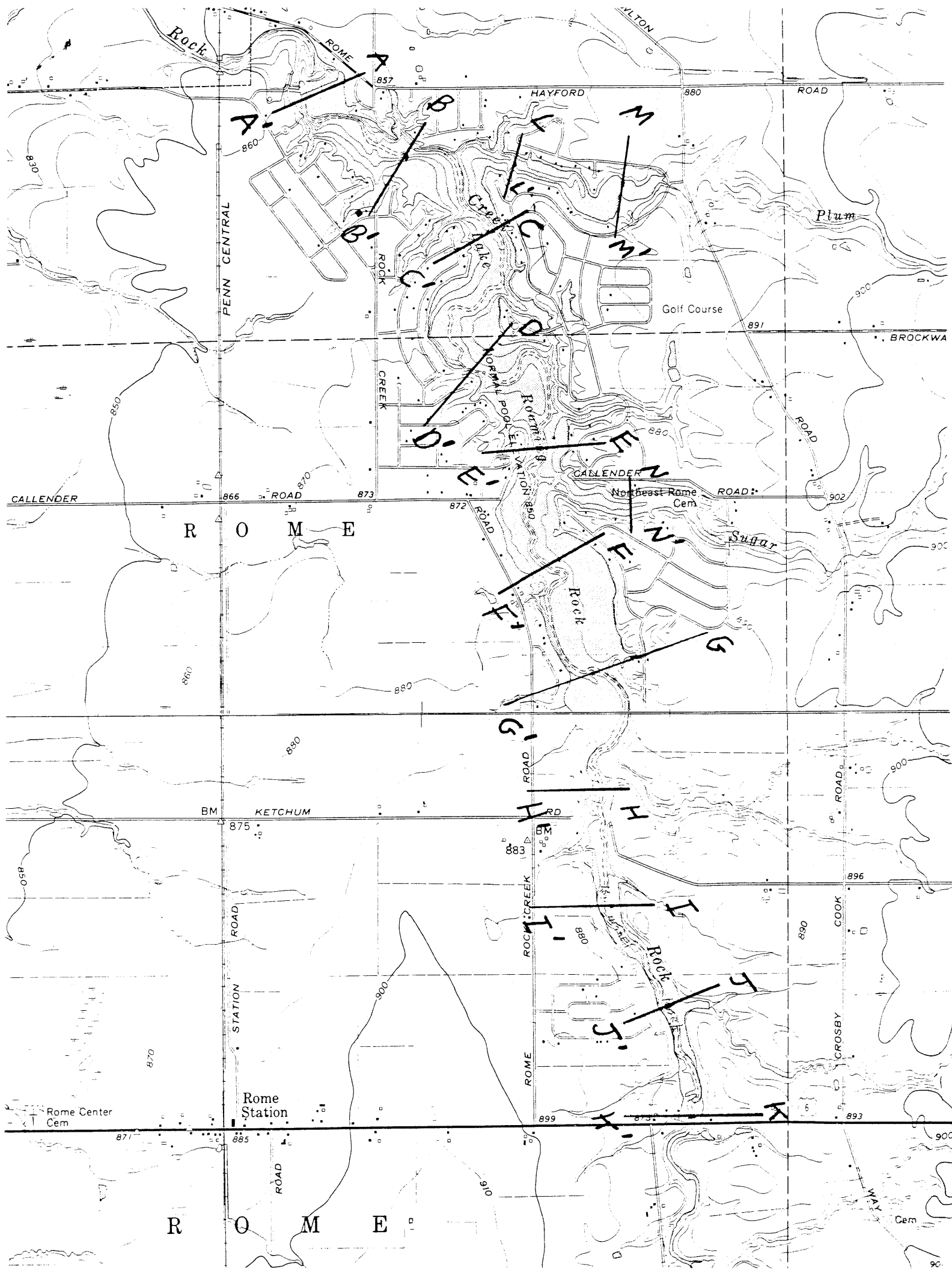
The land use is predominantly woodland, hayland, idle, and pastureland, with less than 20 percent of the area devoted to row crops. Major sediment source areas appear to be plowed cropland adjacent to tributary streams and intermittent streambank erosion along primary tributaries. Trapping of incoming sediment occurs in numerous wetlands that border sections of most tributaries. Overall, the hydrologic condition is good from an erosion and sedimentation standpoint.

Tons of sediment per acre per year delivered from the watershed is calculated to be 0.7 based on a sediment density of 65 pounds per cubic foot. This value will be refined pending laboratory analysis of core samples. This information along with physical and chemical characteristics of the sediment will be forwarded at a later date.

Shoreline erosion has been controlled fairly well by mechanical stabilization measures and is of local significance only in a few isolated areas. This sediment source does not pose a threat to the longevity of the lake.



JAMES N. WADE
Geologist



Lake I.D. : LAKE ROAMING ROCK, Ashtabula County, Surveyed 8/20/91
 Date : 8/22/1991

***** Global Values *****

Surface Area: 464.0 Ac. (6.2 sq mi)
 Watershed Area: 44160.0 Ac.
 Weight of Sediment: 65.0 Lbs./cu.ft.
 Weight of Sediment was: Estimated
 Year Lake Operations Began...: 1967.0 Years
 Survey Year For This Data...: 1991.0 Years
 Dredged Sediment Volume: 0.0 Ac.Ft.
 Lake Trap Efficiency (dec.): 0.8700

***** Calculated Values *****

Acre-Ft. of Sediment in Lake.....: 471.7
 Acre-Ft. of Water in Lake.....: 7669.7
 Acre-Ft. of Original Volume in Lake...: 8141.4
 Percent Loss of Volume in Lake.....: 5.8 %
 Percent Loss of Volume per Year.....: 0.2 %
 Cubic Yds. of Sediment in Lake.....: 761048.1
 Cu.Yds. of Sediment into Lake per Yr...: 31710.3
 Tons of Sediment in Lake.....: 667819.7
 Tons of Sediment into Lake per Year....: 27825.8
 Tons/Ac/Yr. Delivered From Watershed...: 0.7
 Tons/SqMi/Yr. Delivered From Watershed: 463.5

Range Name : K-K1 Range Length : 400 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 6.0 | 7.0 | 1.0 |
| 2 | 5.0 | 8.2 | 3.2 |
| 3 | 7.0 | 9.3 | 2.3 |
| 4 | 6.0 | 8.9 | 2.9 |
| ----- | | | |
| Avg. Depth = | 6.0 | 8.3 | 2.3 |

Range Name : J-J1 Range Length : 400 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 4.5 | 5.8 | 1.3 |
| 2 | 4.7 | 5.1 | 0.4 |
| 3 | 5.0 | 5.7 | 0.7 |
| 4 | 6.0 | 7.1 | 1.1 |
| 5 | 9.3 | 11.0 | 1.7 |
| ----- | | | |
| Avg. Depth = | 5.9 | 6.9 | 1.0 |

Ashtabula County
 Lake Roaming Rock
 Surveyed 8/20/91
 Date 8/22/1991

Lake I.D. : LAKE ROAMING ROCK, Ashtabula County, Surveyed 8/20/91
 Date : 8/22/1991

Range Name : I-I1 Range Length : 400 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 6.3 | 6.3 | 0.0 |
| 2 | 6.8 | 6.8 | 0.0 |
| 3 | 9.3 | 12.0 | 2.7 |
| 4 | 9.0 | 11.5 | 2.5 |
| 5 | 11.0 | 12.9 | 1.9 |
| ----- | | | |
| Avg. Depth = | 8.5 | 9.9 | 1.4 |

Range Name : H-H1 Range Length : 500 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 6.5 | 7.0 | 0.5 |
| 2 | 6.0 | 6.0 | 0.0 |
| 3 | 10.5 | 10.5 | 0.0 |
| 4 | 12.5 | 14.1 | 1.6 |
| 5 | 12.5 | 16.0 | 3.5 |
| 6 | 10.0 | 11.0 | 1.0 |
| ----- | | | |
| Avg. Depth = | 9.7 | 10.8 | 1.1 |

Range Name : G-G1 Range Length : 800 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 18.0 | 18.0 | 0.0 |
| 2 | 15.5 | 16.1 | 0.6 |
| 3 | 15.5 | 16.0 | 0.5 |
| 4 | 15.5 | 16.0 | 0.5 |
| 5 | 14.5 | 16.0 | 1.5 |
| 6 | 15.0 | 16.9 | 1.9 |
| 7 | 7.0 | 7.9 | 0.9 |
| ----- | | | |
| Avg. Depth = | 14.4 | 15.3 | 0.8 |

Lake I.D. : LAKE ROAMING ROCK, Ashtabula County, Surveyed 8/20/91
 Date : 8/22/1991

Range Name : F-F1 Range Length : 1100 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 14.5 | 16.4 | 1.9 |
| 2 | 13.5 | 13.9 | 0.4 |
| 3 | 15.5 | 15.6 | 0.1 |
| 4 | 18.5 | 19.0 | 0.5 |
| 5 | 18.0 | 22.6 | 4.6 |
| 6 | 22.8 | 23.7 | 0.9 |
| 7 | 16.5 | 19.0 | 2.5 |
| 8 | 13.8 | 15.4 | 1.6 |
| Avg. Depth = | 16.6 | 18.2 | 1.6 |

Range Name : N1-N Range Length : 300 Profile Length : 0

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 12.2 | 12.5 | 0.3 |
| 2 | 16.0 | 18.0 | 2.0 |
| 3 | 9.0 | 9.7 | 0.7 |
| 4 | 7.0 | 7.7 | 0.7 |
| 5 | 6.3 | 6.8 | 0.5 |
| 6 | 7.0 | 8.0 | 1.0 |
| 7 | 9.0 | 10.6 | 1.6 |
| Avg. Depth = | 9.5 | 10.5 | 1.0 |

Range Name : E-E1 Range Length : 700 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 19.5 | 20.0 | 0.5 |
| 2 | 20.5 | 21.0 | 0.5 |
| 3 | 22.0 | 22.2 | 0.2 |
| 4 | 23.5 | 24.0 | 0.5 |
| 5 | 23.5 | 24.0 | 0.5 |
| Avg. Depth = | 21.8 | 22.2 | 0.4 |

Lake I.D. : LAKE ROAMING ROCK, Ashtabula County, Surveyed 8/20/91
 Date : 8/22/1991

Range Name : D-D1 Range Length : 700 Profile Length : 4000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 15.1 | 15.7 | 0.6 |
| 2 | 16.0 | 16.1 | 0.1 |
| 3 | 25.0 | 26.0 | 1.0 |
| 4 | 26.7 | 27.0 | 0.3 |
| 5 | 25.0 | 26.0 | 1.0 |
| ----- | | | |
| Avg. Depth = | 21.6 | 22.2 | 0.6 |

Range Name : L1-L Range Length : 300 Profile Length : 0

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 20.0 | 20.5 | 0.5 |
| 2 | 22.0 | 22.2 | 0.2 |
| 3 | 22.7 | 23.0 | 0.3 |
| 4 | 24.5 | 25.5 | 1.0 |
| 5 | 23.8 | 24.6 | 0.8 |
| ----- | | | |
| Avg. Depth = | 22.6 | 23.2 | 0.6 |

Range Name : M1-M Range Length : 200 Profile Length : 0

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 9.3 | 10.0 | 0.7 |
| 2 | 8.5 | 10.0 | 1.5 |
| 3 | 8.0 | 9.0 | 1.0 |
| 4 | 6.8 | 7.9 | 1.1 |
| 5 | 4.0 | 4.1 | 0.1 |
| ----- | | | |
| Avg. Depth = | 7.3 | 8.2 | 0.9 |

Range Name : B-B1 Range Length : 800 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 24.0 | 25.0 | 1.0 |
| 2 | 36.2 | 37.2 | 1.0 |
| 3 | 34.8 | 35.0 | 0.2 |
| 4 | 29.0 | 29.2 | 0.2 |
| ----- | | | |
| Avg. Depth = | 31.0 | 31.6 | 0.6 |

Lake I.D. : LAKE ROAMING ROCK, Ashtabula County, Surveyed 8/20/91
 Date : 8/22/1991

Range Name : DAM Range Length : 1 Profile Length : 0

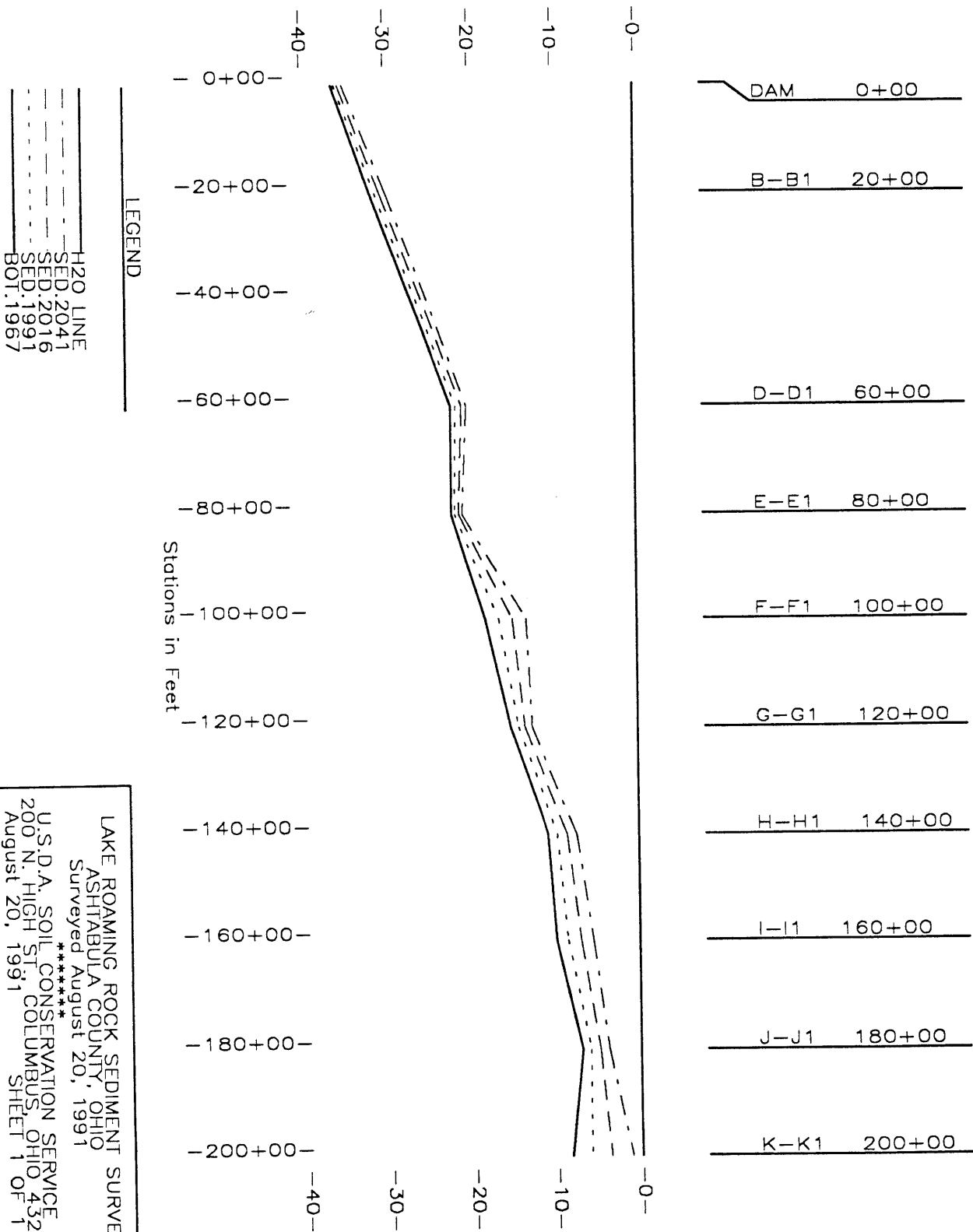
| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 35.7 | 36.1 | 0.4 |
| Avg. Depth = | 35.7 | 36.1 | 0.4 |

***** Statistical Averages *****

| Range Name | Range Length | Length Factor | Average H2O | Increment. H2O | Average Sediment | Increment. Sediment |
|---------------|-----------------|------------------|----------------|-------------------|---------------------|------------------------|
| K-K1 | 400 | 0.061 | 6.0 | 0.364 | 2.3 | 0.142 |
| J-J1 | 400 | 0.061 | 5.9 | 0.358 | 1.0 | 0.063 |
| I-I1 | 400 | 0.061 | 8.5 | 0.514 | 1.4 | 0.086 |
| H-H1 | 500 | 0.076 | 9.7 | 0.732 | 1.1 | 0.083 |
| G-G1 | 800 | 0.121 | 14.4 | 1.749 | 0.8 | 0.102 |
| F-F1 | 1100 | 0.167 | 16.6 | 2.772 | 1.6 | 0.260 |
| N1-N1 | 300 | 0.045 | 9.5 | 0.432 | 1.0 | 0.044 |
| E-E1 | 700 | 0.106 | 21.8 | 2.312 | 0.4 | 0.047 |
| D-D1 | 700 | 0.106 | 21.6 | 2.286 | 0.6 | 0.064 |
| L1-L1 | 300 | 0.045 | 22.6 | 1.027 | 0.6 | 0.025 |
| M1-M1 | 200 | 0.030 | 7.3 | 0.222 | 0.9 | 0.027 |
| B-B1 | 800 | 0.121 | 31.0 | 3.757 | 0.6 | 0.073 |
| DAM | 1 | 0.000 | 35.7 | 0.005 | 0.4 | 0.000 |
| Total= | 6601 | 1.0 | | 16.53 | | 1.02 |

***** Notes On The Lake: *****

Secchi disk readings: 21" @ K-K1, 33.5" @ I-I1, 45" @ G-G1, 77" @ D-D1. Lake is approx. 20,500 ft. long, on Rock Creek, tributary to the Grand River.



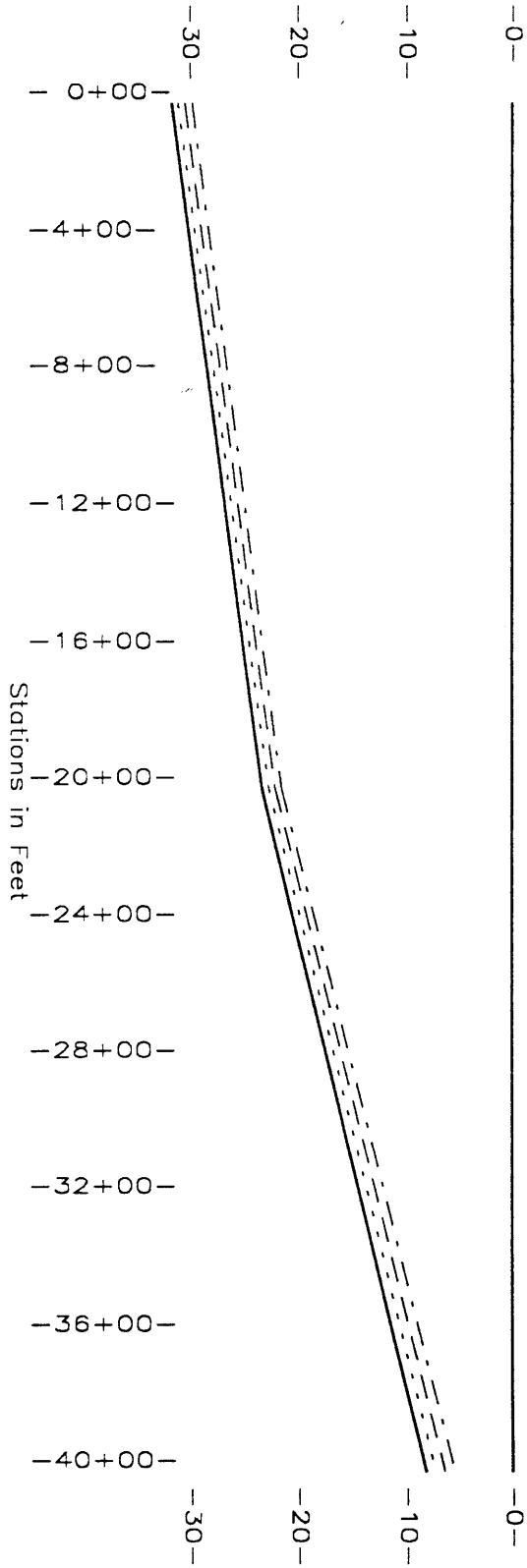
LAKE ROAMING ROCK SEDIMENT SURVEY
 ASHTABULA COUNTY, OHIO
 Surveyed August 20, 1991

 U.S.D.A. SOIL CONSERVATION SERVICE
 200 N. HIGH ST. COLUMBUS, OHIO 43215
 August 20, 1991 SHEET 1 OF 1

B-B1 0+00

L1-L 20+00

M1-M 40+00



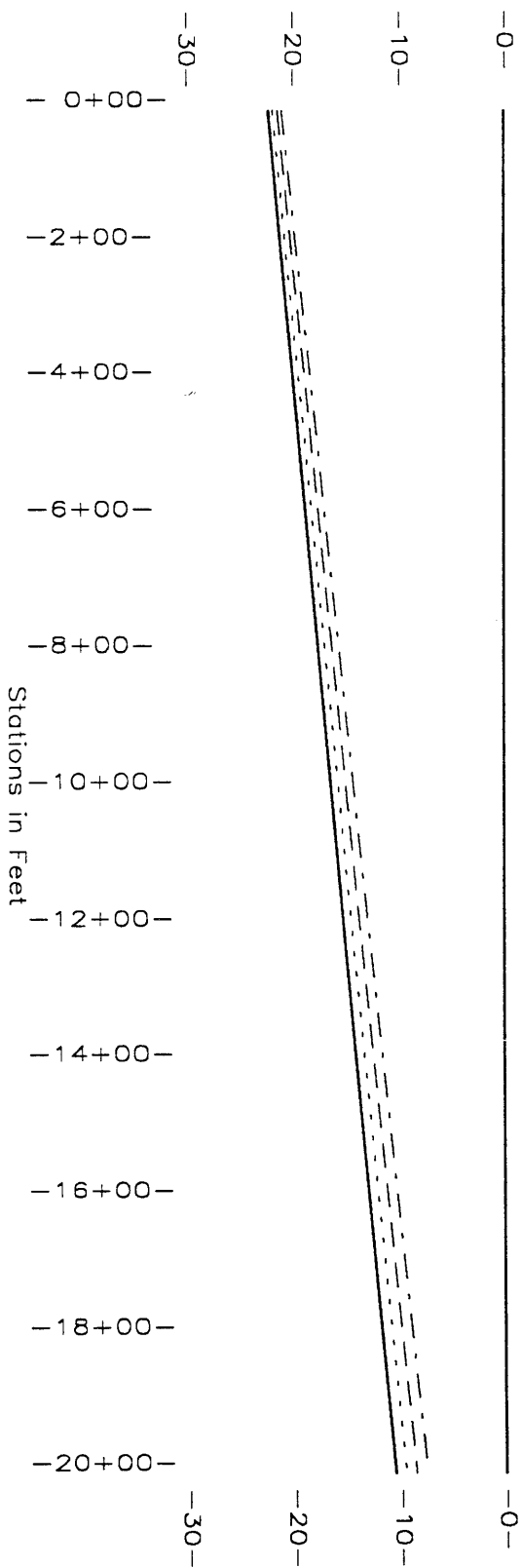
LEGEND

H2O LINE
SED.2041
SED.2016
SED.1991
BOT.1967

LAKE ROAMING ROCK SEDIMENT SURVEY
ASHTABULA COUNTY, OHIO
Surveyed August 20, 1991
PLUM CREEK TRIB.
U.S.D.A. SOIL CONSERVATION SERVICE
200 N. HIGH ST. COLUMBUS, OHIO 43215
August 20, 1991
SHEET 1 OF 1

E-E1 0+00

N1-N 20+00



LEGEND

H2O LINE
SED. 2041
SED. 2016
SED. 1991
BOT. 1967

LAKE ROAMING ROCK SEDIMENT SURVEY
ASHTABULA COUNTY, OHIO
Surveyed August 20, 1991
SUGAR CREEK TRIB.
U.S.D.A. SOIL CONSERVATION SERVICE
200 N. HIGH ST., COLUMBUS, OHIO 43215
August 20, 1991
SHEET 1 OF 1



United States
Department of
Agriculture

Soil
Conservation
Service

200 North High Street
Room 522
Columbus, Ohio 43215

OCT 23 1991

Subject: WQP - Technical Assistance -
Lake Roaming Rock, Ashtabula County

Date: October 22, 1991

To: Andrew R. Bayham
District Conservationist
Soil Conservation Service
Jefferson, Ohio

File Code: 460-5

Enclosed are the following items on Lake Roaming Rock:

1. Excerpt from Cooperative Extension Service Bulletin 598 "Ohio Guide for Land Application of Sewage Sludge."
2. Revised sediment survey data sheet.
3. Chemical analysis data sheets for sediment samples.
4. Soil mechanics laboratory report for sediment samples.
5. Photographs of extruded sediment samples.

I previously field estimated the density of sediment to be 65 pounds per cubic foot and the laboratory average was 56 pounds per cubic foot. This changed the average sediment delivery per acre of watershed from 0.7 tons per year to 0.6 tons per year (see sediment survey data sheet).

Sample number one shows a cadmium concentration of 1.17 mg/kg or 1.17 ppm. This equates to 2.34 pounds per acre ($\text{ppm} \times 2 = \text{lb/acre}$). This could be a problem if the sediment would be removed and applied to cropland on an annual basis, especially so because of the low Ph of the sediment (see Bulletin 598).

Please forward this information to Monroe Frados and the Lake Association.

JAMES N. WADE
Geologist

Enclosures

cc:

R. Burris, WR Planning Staff Leader, SCS, Columbus, Ohio
E. Wright, Area Conservationist, SCS, Medina, Ohio



The Soil Conservation Service
is an agency of the
Department of Agriculture

United States
Department of
Agriculture

Soil
Conservation
Service

Midwest National Technical Center
Soil Mechanics Laboratory
512 South 7th Street
Lincoln, NE 68508-2919

OCT 26 1991


Subj: ENG - Soil Mechanics - Ohio (RB-09)
Lake Roaming Rock - Ashtabula Co.

Date: September 24, 1991

To: Arthur M. Brate
State Conservation Engineer
SCS, Columbus, OH

File Code: 210-22

The soil mechanics tests requested on Form SCS-ENG-356 for the two samples submitted from this site have been completed and the test results summarized on the attached SML reporting form SCS-ENG-354.


PHILLIP N. JONES, P.E.
Head, Soil Mechanics Laboratory

Attachments:

Form SCS-ENG-354, Soil Mechanics Laboratory Test Data, 1 sheet
"In" Tube Density Worksheet and Sample Description, 2 sheets
Photos (to State Conservation Engineer only)

cc: w/att.

Arthur M. Brate (Original + 1 copies)

James N. Wade, Geologist, SCS, Columbus, OH

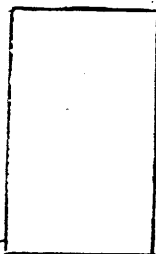
Michael C. Schendel, Head, Engineering Staff, MNTC, SCS, Lincoln, NE

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Soil Mechanics Laboratory

Worksheet for In Tube Density Test

Watershed or County: OHIO Site No. or Name: SPL #1
Project: WF-08 CO-01 PL-06 RCD-11 LR-14 Date: 9/11/91
Sample No. 91-1153 Depth: _____ Sample Location: PAINTING ROCK

1. Weight of tube and sample 426.24 ~~lbs.~~ gms.
2. Weight of tube 207.63 ~~lbs.~~ gms.
3. Weight of moist sample = (1) - (2) 218.61 ✓ ~~lbs.~~ gms.
4. Length of sample 10 ³/₈ - 10.375 ~~in.~~ in.
5. Area of sample * 1.050 = I.D. .8659 ✓ sq. in.
6. Volume of sample = length (4) x area (5) 8.9837 ✓ cu. in. 147.216
7. Moist density = weight (3) ÷ volume (6) 1.4850 ✓ gm/cc ~~lbs./cu. ft.~~
8. Moisture content of sample 88.02 ✓ %
9. Dry density = (7) ÷ 1 + % moisture (8) _____ lbs./cu. ft.
10. Dry density in grams per cubic centimeter 0.7898 ✓ g/cc



ORGANIC, DARK GREY, SATURATED, MEDIUM
PLASTICITY ML. LOWER 6" APPEARS MORE
ORGANIC THAN TOP.

MAX MOISTURE TAKEN FROM CENTER
OF SAMPLE

0.79

*Inside diameter of 3 inch Shelby tube = 2.875 inches
Inside diameter of 5 inch Shelby tube = 4.875 inches 0.40625 ft.
Inside area of 3 inch Shelby tube = 6.49 sq. in.
Inside area of 5 inch Shelby tube = 18.67 sq. in. 0.1296 sq. ft.

| CAN NO. | WET WEIGHT | DRY WEIGHT | WEIGHT OF CAN | DRY WEIGHT OF SOIL | WEIGHT OF MOISTURE | % MOISTURE |
|---------|------------|------------|---------------|--------------------|--------------------|------------|
| 264 | 159.18 | 110.18 | 54.51 | 55.67 | 49.00 | 88.02 |
| | | | | | | |
| | | | | | | |

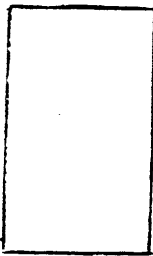
SAVE DRY SOIL

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Soil Mechanics Laboratory

Worksheet for In Tube Density Test

Watershed or County: OHIO Site No. or Name: SPL # 2 I-I
Project: WF-08 ____ CO-01 ____ PL-06 ____ RCD-11 ____ LR-14 ____ Date: 9/11/91
Sample No. 91-1154 Depth: ____ Sample Location: ROCKING ROCK

1. Weight of tube and sample 412.53 lbs. 9ms
2. Weight of tube 211.57 lbs. 9ms
3. Weight of moist sample = (1) - (2) 201.01 ✓ lbs. 9ms
4. Length of sample 9 1/8 ft. in.
5. Area of sample* I.D. = 1.050 sq. ft. sq. in.
6. Volume of sample = length (4) x area (5) 7.901351 cu. ft. 129.48 ✓
7. Moist density = weight (3) ÷ volume (6) 1.5524 ✓ gm/cc
lbs./cu. ft.
8. Moisture content of sample 55.23 %
9. Dry density = (7) ÷ 1 + % moisture (8) ____ lbs./cu. ft.
10. Dry density in grams per cubic centimeter 1.00 ✓ g/cc



VERY UNIFORM, SATURATED, dk. BROWN GRAY,
MEDIUM PLASTICITY CL.

MOISTURE & WA TAKEN FROM CENTER
OF SAMPLE

*Inside diameter of 3 inch Shelby tube = 2.875 inches
Inside diameter of 5 inch Shelby tube = 4.875 inches 0.40625 ft.
Inside area of 3 inch Shelby tube = 6.49 sq. in.
Inside area of 5 inch Shelby tube = 18.67 sq. in. 0.1296 sq. ft.

| CAN NO. | WET WEIGHT | DRY WEIGHT | WEIGHT OF CAN | DRY WEIGHT OF SOIL | WEIGHT OF MOISTURE | % MOISTURE |
|---------|------------|------------|---------------|--------------------|--------------------|------------|
| 230 | 156.85 | 119.84 | 52.83 | 67.01 | 37.01 | 55.23 |
| | | | | | | |
| | | | | | | |

SAVE DRY SOIL

CLC PK

LAB NUMBER 26274
REFER TO LAB NUMBER TO IDENTIFY
SAMPLE IN FUTURE CORRESPONDENCE.
SOIL BAG NUMBER 1L91277

K-K' - R1.6
Bridle

The Ohio State University
Research-Extension Analytical Lab
The Ohio Agricultural Research and Development Center
Wooster, Ohio 44691

LIME AND FERTILIZER RECOMMENDATIONS

ANNUAL RECOMMENDATION

YOUR SAMPLE ID LRR1
ACRES REPRESENTED 0
YIELD LINE NITROGEN PHOSPHATE POTASH COMMENTS
GOAL T/A N LB/A P2O5 LB/A K2O LB/A SEE BELOW
YEAR CROP
LAST NO CROP GIVEN
1992 NO CROP GIVEN

SINCE THE CROP FOR THIS YEAR WAS NOT GIVEN, A FERTILIZER RECOMMENDATION CAN NOT BE MADE,
AND ONLY THE FOLLOWING GENERAL LINE RECOMMENDATION CAN BE GIVEN--
FOR A DESIRED PH OF 6.5, ADD 1.0 TONS OF LIME PER ACRE,
FOR A DESIRED PH OF 6.0, ADD 1.0 TONS OF LIME PER ACRE.

| | | | | | | | | | | | | | | | | | | | |
|---|---------------------------------|-----------------------|-----------------|-------------|-------------------|------------------|--------------------|-----------|-----------------|----|-----|--------------------|--------------|--------------|----------------|--------------|---------------------|------------------|------------------------------|
| JAMES N MADE 200 H HIGH ROOM 522 COLUMBUS OHIO 43215 COUNTY FRANKLIN | | | | | | | | | | | | | | | | | | | |
| RECEIVED SAMPLE 9/26/91 DATE PRINTED FRI. OCT 4, 1991 PLAN | | | | | | | | | | | | | | | | | | | |
| SAMPLE INFORMATION | | STANDARD TEST RESULTS | | | | | | | | | | | | | | | | | |
| PLOW DEPTH INCHES | LIME APPLIED IN LAST 2 YRS. T/A | pH | LIME TEST INDEX | PHOS-P lb/A | POTAS-SIUM K lb/A | CALCIUM Co. lb/A | MAG-NESIUM Mg lb/A | ZINC 100g | BASE SATURATION | | | MANGA-NESE Mn lb/A | IRON Fe lb/A | ZINC Zn lb/A | COPPER Cu lb/A | BORON B lb/A | NITRATES NO3-N lb/A | ORGANIC MATTER % | SOLUBI LITY X10 ⁵ |
| | | | | | | | | | % | % | % | | | | | | | | |
| 0 | 0 | 5.7 | 68 | 34 | 127 | 2050 | 306 | 9 | 57 | 14 | 1.8 | 195 | | 54.5 | | 1.5 | | 4.1 | |
| THIS FUND REPORT INCLUDES RESULTS FOR ALL STANDARD AND SPECIAL TESTS | | | | | | | | | | | | | | | | | | | |
| LEAD 26 MG/KG NICKEL 22 MG/KG COPPER 21 MG/KG CADMIUM 1.17 MG/KG CHROMIUM 20 MG/KG ZINC 45 MG/KG | | | | | | | | | | | | | | | | | | | |
| GROWER COPY | | | | | | | | | | | | | | | | | | | |

LAB NUMBER 26235
REFER TO LAB NUMBER TO IDENTIFY
SAMPLE IN FUTURE CORRESPONDENCE.
SOIL BKG NUMBER 1L91278

Handwritten: I to EBERHART
MR. EBERHART
SPRING 1978
MINER

The Ohio State University
Research-Extension Analytical Lab
The Ohio Agricultural Research and Development Center
Wooster, Ohio 44691

LIME AND FERTILIZER RECOMMENDATIONS

ANNUAL RECOMMENDATION

YOUR SAMPLE ID LRR2

ACRES REPRESENTED 0

YEAR CROP

| YIELD | LIME | NITROGEN | PHOSPHATE | POTASSIUM | COMMENTS |
|-------|------|----------|-----------|-----------|-----------|
| GOAL | T/A | N LB/A | P2O5 LB/A | K2O LB/A | SEE BELOW |

LAST NO CROP GIVEN
1992 NO CROP GIVEN

SINCE THE CROP FOR THIS YEAR WAS NOT GIVEN, A FERTILIZER RECOMMENDATION CAN NOT BE MADE.
AND ONLY THE FOLLOWING GENERAL LIME RECOMMENDATION CAN BE GIVEN:
FOR A DESIRED PH OF 6.5, ADD 5.5 TONS OF LIME PER ACRE,
FOR A DESIRED PH OF 6.0, ADD 4.5 TONS OF LIME PER ACRE.

JAMES N MADE
200 H HIGH ROOM 522
COLUMBUS OHIO 43215
COUNTY FRANKLIN

RECEIVED SAMPLE

9/26/91

DATE PRINTED

FRI, OCT 4, 1991

PLAN

SAMPLE INFORMATION

| | |
|-------------------|---------------------------------|
| FLOW DEPTH INCHES | LIME APPLIED IN LAST 2 YRS. T/A |
| 0 | 0 |

STANDARD TEST RESULTS

| | | | | | | |
|-----|-----------------|---------|----------|-------------|----------|------------------------|
| pH | LIME TEST INDEX | PHOS. P | POTAS. K | CALCIUM Ca. | MAG. Mg | SOIL NO. 3003 meq/100g |
| 5.3 | 63 | 18 lb/A | 197 lb/A | 1600 lb/A | 226 lb/A | 14 |

BASE SATURATION

| | | |
|-------|------|-----|
| % Ca. | % Mg | % K |
| 29 | 7 | 1.8 |

SPECIAL TESTS RESULTS

| | | | | | | | |
|-----------|---------|-----------|-----------|----------|------------------|------------------|---------------------------------|
| MANGA. Mn | IRON Fe | ZINC Zn | COPPER Cu | BORON B | NITRATES NO3 - N | ORGANIC MATTER % | SOLUBLE SALTS X10 ⁻³ |
| 366 lb/A | lb/A | 35.4 lb/A | lb/A | 1.7 lb/A | lb/A | 6.2 | 10.0 |

THIS FINAL REPORT INCLUDES RESULTS FOR ALL STANDARD AND SPECIAL TESTS

LEAD 37 MG/KG NICKEL 25 MG/KG COPPER 2.0 MG/KG
CADMIUM .57 MG/KG CHROMIUM 27 MG/KG ZINC 92 MG/KG

GROWER COPY

Lake I.D. : LAKE ROAMING ROCK, Ashtabula County, Surveyed 8/20/91
 Date : 9/26/1991

OCT 28 1991

***** Global Values *****

Surface Area: 464.0 Ac.
 Watershed Area: 44160.0 Ac.
 Weight of Sediment: 56.0 Lbs./cu.ft.
 Weight of Sediment was: Measured
 Year Lake Operations Began.: 1967.0 Years
 Survey Year For This Data.: 1991.0 Years
 Dredged Sediment Volume: 0.0 Ac.Ft.
 Lake Trap Efficiency (dec.): 0.8700

***** Calculated Values *****

Acre-Ft. of Sediment in Lake.....: 471.7
 Acre-Ft. of Water in Lake.....: 7669.7
 Acre-Ft. of Original Volume in Lake...: 8141.4
 Percent Loss of Volume in Lake.....: 5.8 %
 Percent Loss of Volume per Year.....: 0.2 %
 Cubic Yds. of Sediment in Lake.....: 761048.1
 Cu.Yds. of Sediment into Lake per Yr...: 31710.3
 Tons of Sediment in Lake.....: 575352.4
 Tons of Sediment Into Lake per Year....: 23973.0
 Tons/Ac/Yr. Delivered From Watershed...: 0.6
 Tons/SqMi/Yr. Delivered From Watershed: 399.4

Range Name : K-K1 Range Length : 400 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 6.0 | 7.0 | 1.0 |
| 2 | 5.0 | 8.2 | 3.2 |
| 3 | 7.0 | 9.3 | 2.3 |
| 4 | 6.0 | 8.9 | 2.9 |
| ----- | | | |
| Avg. Depth = | 6.0 | 8.3 | 2.3 |

Range Name : J-J1 Range Length : 400 Profile Length : 2000

| Measurement Number | Water Depth(ft.) | Total Depth(ft.) | Sediment Depth(ft.) |
|-----------------------|---------------------|---------------------|------------------------|
| 1 | 4.5 | 5.8 | 1.3 |
| 2 | 4.7 | 5.1 | 0.4 |
| 3 | 5.0 | 5.7 | 0.7 |
| 4 | 6.0 | 7.1 | 1.1 |
| 5 | 9.3 | 11.0 | 1.7 |
| ----- | | | |
| Avg. Depth = | 5.9 | 6.9 | 1.0 |

SEDIMENT PHYSICAL AND CHEMICAL CHARACTERIZATION

1. Historical Overview and Ecological Evaluation

Lake Roaming Rock is a 540 acre man-made lake on Rock Creek near Rome, Ashtabula County. It has a watershed of 70 square miles, receiving water primarily from Rock Creek at its south end and ephemeral amounts from Sugar Creek in its mid-section and Plum Creek near the dam at its northern extension. Water depths range from about 3' in the southern area to about 30' near the dam. The lake and some adjacent recreational areas are privately owned by the Roaming Rock Association. Individual private residences completely surround the lake and all its tributaries. A municipal water supply is located near the dam and the wastewater treatment plant discharges on the downstream side of the dam. The watershed is mostly rural farmland. A water quality study about 10 years ago involving Secchi disk, algae, and nutrient measurements indicated eutrophication of the lake.

2. Sediment Physical Characterization

An estimate of the volume of sediment to be dredged will be made by poling the surficial sediments. Ten transects across the major section of the lake (see map) and 3 transects across each of 10 tributary channels will be made. Periodically along each transect the sediment thickness will be determined by poling. Also along each transect the bottom topography will be determined with a depth sounder. Cores will be collected for physical and chemical characterization at five of the transects. Two of the cores will be collected along the main body of the lake: one in the area proposed to be dredged near the south entrance of the lake and one near the dam. Cores will also be collected in the Sugar Creek, Plum Creek, and Browning Point tributary channels. Water content and sediment size will be determined on surficial samples of the two cores collected from the main body of the lake. Water contents will be determined by weighing wet and air dried sediments. Sediment grain size will be determined by wet sieving for grain sizes greater than 62 microns and by Sedigraph analysis for grain sizes between 1 and 62 microns.

3. Sediment Analysis

Chemical analysis will be performed on all five cores. Sediment subsamples from each core top and core bottom (0.5-1 meter depth) will be subjected to an elutriate extraction and analyzed for Cd, Hg, Cr, Pb, As, Ni, Cu, and Ba. The sediment samples also will be analyzed for COD, TOC, TKN, NO_3 , NH_3 , and P_T .

The two cores from the main body of the lake will receive additional analyses. Sediment subsamples from the core top and the core bottom will be analyzed for priority pollutants (pesticides, PCB's, phenols, methoxychlor, and diazinon) by gas chromatography and for Cd, Hg, Cr, Pb, As, Ni, Cu, and Ba in air dried bulk samples. The pore waters will be extracted from sediment subsamples and analyzed for Cd, Hg, Cr, Pb, As, Ni, Cu, Ba, COD, TOC, TKN, NO_3 , NH_3 , and P_T . Finally, the overlying water at the two core sites also will be analyzed for priority pollutants, Cd, Hg, Cr, Pb, As, Ni, Cu, Ba, COD, TOC, TKN, NO_3 , NH_3 , and P_T .

4. Dredging Monitoring

Water quality in the lake near the dredge will be monitored during the dredging procedure. Water quality also will be monitored in the water surface from the solids.

Field and Chemical Plans

I. Topographic and Sediment Thickness Surveys

- * Sediment thickness determined by poling
- * Bottom topography determined with a depth sounder
- * 10 Transects across the major section of the lake (see map)
- * 30 Transects across tributary channels (see map)

II. Physical Analyses

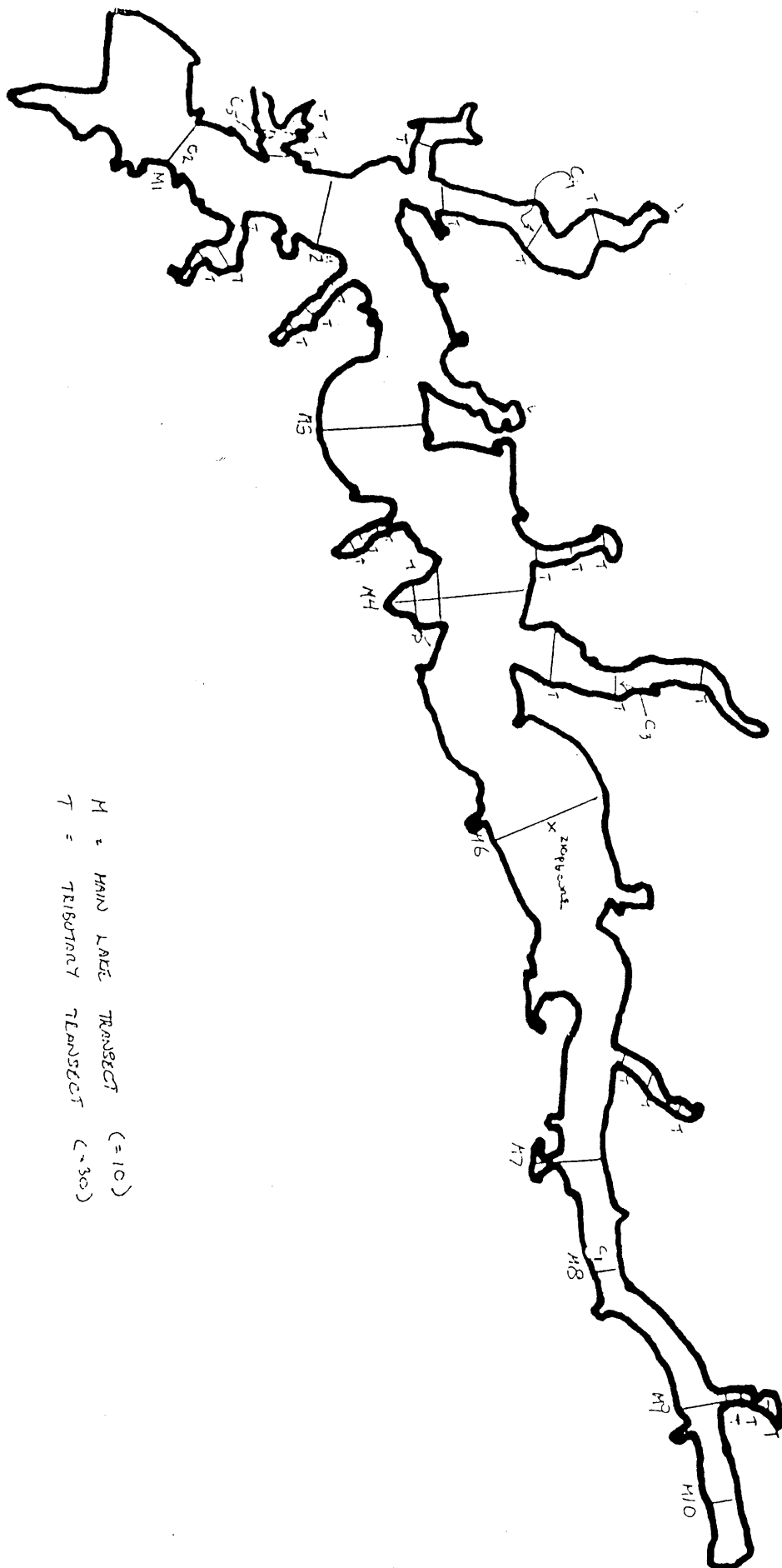
- * Cores C1 and C2
 - Sed Top & Bottom: Water content
 - Grain size distribution

IV. Chemical Analyses

- * Cores C1 and C2
 - Overlying Water: Metals (Cd, Hg, Cr, Pb, As, Ni, Cu, and Ba)
 - Nutrients (TKN, NO_3 , NH_3 , and P_T)
 - TOC, COD
 - Priority pollutants (pesticides, PCB's, phenols, methoxychlor, and diazinon)
 - Sed Top & Bottom: Elutriate extraction
 - Metals (Cd, Hg, Cr, Pb, As, Ni, Cu, and Ba)
 - Bulk metals (Cd, Hg, Cr, Pb, As, Ni, Cu, and Ba)
 - Nutrients (TKN, NO_3 , NH_3 , and P_T)
 - TOC, COD
 - Priority pollutants (pesticides, PCB's, phenols, methoxychlor, and diazinon)
 - Pore Water
 - Metals (Cd, Hg, Cr, Pb, As, Ni, Cu, and Ba)
 - Nutrients (TKN, NO_3 , NH_3 , and P_T)
 - TOC, COD
- * Cores C3, C4, and C5
 - Sed Top & Bottom: Elutriate extraction
 - Metals (Cd, Hg, Cr, Pb, As, Ni, Cu, and Ba)
 - Nutrients (TKN, NO_3 , NH_3 , and P_T)
 - TOC, COD

Roaming Rock Shores Sediment Study

| | | | |
|------|--|---------------|---------------|
| I. | Topographic and Sediment Thickness Surveys (10 major transects + 30 tributary transects) | 150 Hours | \$7500 |
| II. | Laboratory Preparation and Analyses (Core collection and preparation, water content and grain size, chemical preparation and lab work) | 88 | 4400 |
| III. | Data Analysis and Report Writing | 60 | 3000 |
| IV. | Chemical Analyses (10 Elutriate extractions, 20 EP toxicity metals, 6 GC priority pollutant scans, 16 nutrient series + 16 TOC, COD) | Subcontracted | 7320 |
| | | Subtotal | <u>22,220</u> |
| V. | 210Pb Sedimentation Rate | 40 | 2000 |
| | | Total | <u>24,220</u> |
| VI. | Dredging Monitoring (Phase III) | ? | ? |



M = MAIN LAKE TRANSECT (=10)
 T = TRIBUTARY TRANSECT (~30)

C = CORE (=5)