NATIONAL WATER RESEARCH INSTITUTE

INSTITUT NATIONAL de RECHERCHE sur les EAUX



# ST. CLAIR RIVER/LONG POINT

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NWRI Technical Note No. AERB-TN-95-32

# St.Clair River/Long Point

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Requested by:

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# DETERMINATION OF PARTICLE SIZE DISTRIBUTION IN SEDIMENTS

## 1.0 INTRODUCTION

Particle size analysis of sediments is performed by the procedure outlined below. The Sieve and Sedigraph method used in the procedure provides information on the content of gravel, sand, silt and clay in tested sediments. Details of the procedure are given in a report by Duncan and LaHaie (1979).

## 2.0 PROCEDURE

The procedure consists of the following steps:

1. Splitting the sample to obtain a representative subsample (approximately 5 to 8 g of the sediment). Recording the weight of the subsample to two decimal places.

2. Dispersing the sample in sodium metaphosphate with subsequent mixing for 15 minutes.

3. Sieving the wet sample through a sieve with 0.063 mm openings (4.0 PHI).

4. Drying the material left on the sieve and recording its weight to calculate the content of gravel and sand in the sample.

5. Analyzing suspension which passed the 0.063 mm-size sieve by the Sedigraph analyzer.

6. Calculating the particle size distribution using PC software SIZMERGE (Frazer, 1990; Rukavina, 1993) or SIZDIST (Sandilands and Duncan, 1980).

## 3.0 REFERENCES

Duncan, G.A. and LaHaie, G.G. 1979. Size analysis procedures used in the Sedimentology Laboratory. Manual, Hydraulics Division, National Water Research Institute, Burlington, Ontario.

Frazer, G.W. 1990. Merge: A computer program designed to calculate particle-size frequency statistics. Report, Hydraulics Division, National Water Research Institute, Burlington, Ontario.

Rukavina, N.A. 1993.(In press): SIZEMERGE. A new computer program designed to calculate and archive grain-size statistics.

Sandilands, R.G. and Duncan, G.A. 1980. SIZDIST - a computer program for size analysis. Technical Note No. 80-80, Hydraulics Division, National Water Research Institute, Burlington, Ontario.

# NWRI SEDIMENTOLOGY LABORATORY

## SAMPLE INFORMATION

Sample ID: **Long Point**
Analysis Type: Sieve, Sedigraph
Date: 09-01-1995 Time: 13:29:09
Sample Weight (G): 3.9829

## PARTICLE-SIZE DISTRIBUTION

| Phi | Microns | Class Freq.(%) | Cum.(%) Coarser | Histogram (*) and Cumulative Frequency Curve (+) |
|---|---|---|---|---|
| 0.00 | 1000.00 | 0.06 | 0.06 | + |
| 0.50 | 707.11 | 0.02 | 0.08 | + |
| 1.00 | 500.00 | 0.06 | 0.13 | + |
| 1.50 | 353.55 | 0.10 | 0.23 | + |
| 2.00 | 250.00 | 0.19 | 0.42 | + |
| 2.50 | 176.78 | 0.43 | 0.85 | + |
| 3.00 | 125.00 | 1.07 | 1.93 | * + |
| 3.50 | 88.39 | 1.57 | 3.49 | ** + |
| 4.00 | 62.50 | 4.40 | 7.89 | **** + |
| 4.50 | 44.19 | 12.90 | 20.79 | ********** + |
| 5.00 | 31.25 | 27.73 | 48.52 | ********** + |
| 5.50 | 22.10 | 23.42 | 71.95 | ********** + |
| 6.00 | 15.63 | 10.08 | 82.02 | ********** + |
| 6.50 | 11.05 | 3.72 | 85.74 | **** + |
| 7.00 | 7.81 | 2.43 | 88.17 | ** + |
| 7.50 | 5.52 | 1.76 | 89.93 | ** + |
| 8.00 | 3.91 | 1.35 | 91.28 | * + |
| 8.50 | 2.76 | 0.73 | 92.01 | * + |
| 9.00 | 1.95 | 0.71 | 92.72 | * + |
| 9.50 | 1.38 | 0.55 | 93.27 | * + |
| 10.00 | 0.98 | 0.35 | 93.62 | + |
| 10.50 | 0.69 | 0.54 | 94.16 | * + |
| 11.00 | 0.49 | 0.47 | 94.63 | + |
| 11.50 | 0.35 | 0.05 | 94.69 | + |
| 12.00 | 0.24 | 0.70 | 95.39 | * + |

% Gravel = 0.00 % Sand = 7.89 % Silt = 83.39 % Clay = 8.72

Gravel+Sand= 7.89 Silt/(Silt+Clay)= 0.91 Grav+Sand/Silt+Clay= 0.09

Folk: -GMS -SCS SILT Shepard SILT

## SUMMARY STATISTICS

| | Percentiles 5 | 16 | 25 | 50 | 75 | 84 | 95 |
|---|---|---|---|---|---|---|---|
| **Phi** | 3.67 | 4.31 | 4.58 | 5.03 | 5.65 | 6.27 | 11.72 |
| **Microns** | 78.50 | 50.27 | 41.93 | 30.57 | 19.89 | 12.99 | 0.30 |

| | Mean Phi | Mean Microns | Std. Dev. Phi | Skewness | Kurtosis |
|---|---|---|---|---|---|
| **Moment** | 5.21 | 27.10 | 1.34 | 0.95 | 6.73 |
| **Folk(Inclusive)** | 5.20 | 27.13 | 1.71 | 0.46 | 3.07 |

Folk Interpretation - POORLY SORTED, STRONGLY FINE-SKEWED EXTREMELY LEPTOKURTIC.

Comments - abundant organic matter/fibres

# NWRI SEDIMENTOLOGY LABORATORY

## SAMPLE INFORMATION

Sample ID: **Offshore**
Analysis Type: Sieve
Date: 09-01-1995 Time: 13:29:09
Sample Weight (G): 7.9960

## PARTICLE-SIZE DISTRIBUTION

| Phi | Microns | Class Freq.(%) | Cum.(%) Coarser | Histogram (*) and Cumulative Frequency Curve (+) |
|---|---|---|---|---|
| -2.00 | 4000.00 | 3.51 | 3.51 | ****+ |
| -1.50 | 2828.43 | 0.92 | 4.43 | * + |
| -1.00 | 2000.00 | 1.54 | 5.97 | ** + |
| -0.50 | 1414.21 | 0.28 | 6.25 | + |
| 0.00 | 1000.00 | 0.88 | 7.13 | * + |
| 0.50 | 707.11 | 1.19 | 8.32 | * + |
| 1.00 | 500.00 | 2.27 | 10.59 | ** + |
| 1.50 | 353.55 | 10.61 | 21.20 | ********** + |
| 2.00 | 250.00 | 26.76 | 47.96 | ********** + |
| 2.50 | 176.78 | 29.28 | 77.24 | ********** + |
| 3.00 | 125.00 | 13.63 | 90.87 | ********** + |
| 3.50 | 88.39 | 5.54 | 96.41 | ****** + |
| 4.00 | 62.50 | 2.24 | 98.65 | ** |

% Gravel = 5.97 % Sand = 92.69 % (Silt + Clay) = 1.35

Gravel+Sand= 98.65 Gravel+Sand/Silt+Clay= 73.11

Folk: -GMS GRAVELLY SAND -SCS

## SUMMARY STATISTICS

| | Percentiles 5 | 16 | 25 | 50 | 75 | 84 | 95 |
|---|---|---|---|---|---|---|---|
| **Phi** | -1.31 | 1.25 | 1.57 | 2.03 | 2.46 | 2.75 | 3.37 |
| **Microns** | 2486.87 | 419.05 | 336.59 | 244.05 | 181.53 | 148.86 | 96.54 |

| | Mean Phi | Mean Microns | Std. Dev. Phi | Skewness | Kurtosis |
|---|---|---|---|---|---|
| **Moment** | 1.82 | 282.32 | 1.17 | -0.94 | 4.26 |
| **Folk(Inclusive)** | 2.01 | 247.84 | 1.08 | -0.24 | 2.16 |

Folk Interpretation - POORLY SORTED, COARSE-SKEWED VERY LEPTOKURTIC.

Comments - gravel and coarse sands

# NWRI SEDIMENTOLOGY LABORATORY

## SAMPLE INFORMATION

Sample ID: **Nearshore**
Analysis Type: Sieve
Date: 09-01-1995 Time: 13:29:10
Sample Weight (G): 7.9859

## PARTICLE-SIZE DISTRIBUTION

| Phi | Microns | Class Freq.(%) | Cum.(%) Coarser | Histogram (*) and Cumulative Frequency Curve (+) |
|---|---|---|---|---|
| -2.00 | 4000.00 | 4.13 | 4.13 | ****+ |
| -1.50 | 2828.43 | 3.01 | 7.15 | *** + |
| -1.00 | 2000.00 | 2.38 | 9.53 | ** + |
| -0.50 | 1414.21 | 7.49 | 17.02 | ******* + |
| 0.00 | 1000.00 | 4.63 | 21.65 | ***** + |
| 0.50 | 707.11 | 7.02 | 28.68 | ******* + |
| 1.00 | 500.00 | 10.31 | 38.99 | ********** + |
| 1.50 | 353.55 | 17.69 | 56.68 | ********** + |
| 2.00 | 250.00 | 20.24 | 76.92 | ********** + |
| 2.50 | 176.78 | 11.15 | 88.07 | ********** + |
| 3.00 | 125.00 | 5.27 | 93.33 | ***** + |
| 3.50 | 88.39 | 3.23 | 96.56 | *** + |
| 4.00 | 62.50 | 2.04 | 98.61 | ** |

% Gravel = 9.53 % Sand = 89.08 % (Silt + Clay) = 1.39

Gravel+Sand= 98.61 Gravel+Sand/Silt+Clay= 70.75

Folk: -GMS GRAVELLY SAND -SCS

## SUMMARY STATISTICS

| | Percentiles 5 | 16 | 25 | 50 | 75 | 84 | 95 |
|---|---|---|---|---|---|---|---|
| **Phi** | -1.86 | -0.57 | 0.24 | 1.31 | 1.95 | 2.32 | 3.26 |
| **Microns** | 3621.06 | 1482.79 | 847.77 | 402.99 | 258.34 | 200.59 | 104.53 |

| | Mean Phi | Mean Microns | Std. Dev. Phi | Skewness | Kurtosis |
|---|---|---|---|---|---|
| **Moment** | 1.02 | 493.68 | 1.39 | -0.29 | -0.10 |
| **Folk(Inclusive)** | 1.02 | 493.05 | 1.50 | -0.27 | 1.22 |

Folk Interpretation - POORLY SORTED, COARSE-SKEWED LEPTOKURTIC.

Comments - gravel and coarse sands

**ORGANIC CONTENT** (BY LOSS ON IGNITION METHOD)

The organic content analysis was done using a muffle furnace.

**Procedure**

Briefly, the procedure for organic content consists of:

1. Splitting the sample to approximately 2 grams, then oven drying sample for 2 hours.
2. Burning the sample at 500° Celsius for 2 hours.
3. Weighing the ash and calculating percent loss of sample.

St. Clair River
B.F.Scott
August 29, 1995

LOSS ON IGNITION

| SAMPLE NAME | TARE + SAMPL | TARE Wt | TARE + ASH | SAMPL Wt | ASH Wt | PERCE NT LOSS |
|---|---|---|---|---|---|---|
| Long Pt. | 3.0010 | 0.9998 | 2.9064 | 2.0012 | 1.9066 | 4.73 |
| Offshore | 3.0018 | 1.0015 | 2.9607 | 2.0003 | 1.9592 | 2.05 |
| Nearshor | 2.9995 | 0.9974 | 2.9607 | 2.0021 | 1.9633 | 1.94 |

## 1.0 INTRODUCTION

The LECO-12 Carbon Determinator is the instrument used to analyze organic and inorganic carbon content in sediment samples. The carbon analysis are performed using a two temperature dry combustion method outlined below.

## 2.0 PROCEDURES

2.1 The procedure for analysing organic and inorganic carbon consists of:

1. Drying the sample in the oven for a minimun of 2 hours.

2. Weighing approximately 0.1000 grams of sample into a ceramic crucible. *Note: This sample is used for both the organic and inorganic carbon analysis, thus two seperate weighed samples are not needed.

3. For organic carbon, the temperature of the CR-12 is set at 575°C (1067°F), with a burn time of 250 seconds, after which a carbon percentage is given. The samples used for organic carbon are then set aside and used for the inorganic analysis.

4. For inorganic carbon, the temperature is raised to 1371°C (2500°F), with a burn time of 60 seconds. Again, the percentage is recorded, and the entire analysis completed.

5. When total carbon analysis is required, the values obtained from the organic and inorganic analysis are simply added together for a total carbon percentage.

CARBON ANALYSIS (LECO-12)
B.F.Scott
St .Clair River
August 29, 1995

| Sample # | Organic carbon% | Inorganic Carbon% | Total Carbon% |
|---|---|---|---|
| Long Pt. | 3.742 | 5.498 | 9.240 |
| Offshore | 0.432 | 2.857 | 3.289 |
| Nearshor | 0.481 | 3.693 | 4.174 |

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