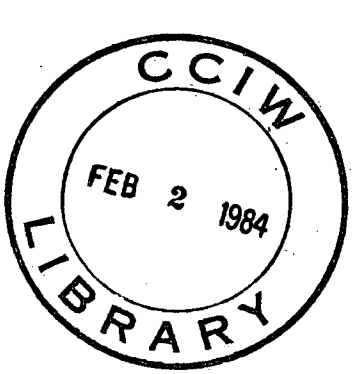
HYDRAULICS DIVISION
TECHNICAL NOTE



DATE: January 1984 **REPORT NO:** 84-01

TITLE: Particle Size Data Report - Churchill Harbour

AUTHOR: G.A. Duncan

REASON FOR REPORT: This report responds to a request for particle size data from D. McCarthy, A/Director of Engineering, Ports Canada, Ottawa.

CORRESPONDENCE FILE NO: 1200-1
Study 83-302

1.0 INTRODUCTION

This report provides the results of particle size analyses on sediments submitted to the Laboratory by D. McCarthy, Ports Canada, Ottawa.

Ninty eight samples from Churchill Harbour, Part 3 of a five year sedimentation study, were analyzed for gravel, sand, silt and clay.

Forty nine samples were analyzed by sieve, forty samples using the sieve settling tube and short pipette method, and nine samples have comments only as there was insufficient material to run a size analysis.

The unused samples will be stored at CCIW until the completion of the 5-year study.

2.0 PROCEDURES

1) Sieve analysis which provides gravel, sand and silt/clay percentages was used to analyze 49 samples. Briefly the procedure consists of:

1. Splitting the sample to 100-200 g.
2. Sieving the split at 1/2 or 1/4 PHI intervals.
3. Processing the results with SIZDIST: a FORTRAN IV computer program (Sandilands and Duncan, 1980).

2) The Sieve, Short Pipette and Settling Tube Analysis, which provides gravel, sand, silt and clay percentages with 1/2 PHI resolution of the sand by the settling tube procedure was performed on 40 samples:

1. Splitting the sample to 20g.
2. Sieving the split at -0.5 PHI (1.41 mm).

3. Dispersing sample in 50 ml of Calgon solution (50 g/l) and mixing it for 15 minutes.
4. Recovering two pipette aliquots of 25 ml for sand, silt and clay percentages.
5. wet sieving the remaining suspension at 4.5 PHI (0.044 mm).
6. resolving the sand residue with settling tube analysis.
7. processing the results with SIZDIST: A FORTRAN IV computer program (Sandilands and Duncan, 1980).

3.0 RESULTS

1) For the Sieve Method, the output consists of:
   1. A histogram of the frequency distribution.
   2. The percentage and cumulative percentage of the material occurring within 1/2 PHI unit.
   3. Moment measures (Krumbein and Pettijohn, 1938) and graphic (Folk and Ward, 1957) statistics.
   4. Percentiles.
   5. Percent gravel, sand and silt/clay.
   6. Ratios used to plot Folk's Ternary Classification.
   7. Shepard (1954) and Fold (1974) Ternary Classification.

2) For the Sieve, Short Pipette and Sedigraph analysis, the output consists of:
   a) A histograph of the frequency distribution.
   b) The percentage and cumulative percentage of the material occurring within each 1/2 PHI unit.
   c) Moment measure statistics (Krumbein & Pettijohn, 1938) and graphic (Folk and Ward, 1957) statistics.
   d) Percentiles.
   e) Percent gravel, sand, silt and clay.
   f) Ratios used to plot Folk's Ternary Classification.
   g) Shepard (1954) and Folk (1968) Ternary Classification.

PHI CONVERSION

The results of samples analyzed in the Sedimentology Lab are presented using the PHI scale (Krumbein, 1934). The conversion from this PHI equation, $\phi = -\log_2 \xi$ (where ξ is the diameter in millimeters) to the Wentworth scale is listed below.

PHI (ϕ)	Millimeters	Microns	Wentworth Size Class
-5.0	32		
-4.5	24		
-4.0	16		Pebble (-2 to -6ϕ)
-3.5	12		
-3.0	8		
-2.5	6		
-2.0	4		
-1.5	2.83		Granule
-1.0	2.00		
-0.5	1.41		Very coarse sand
0.0	1.00		
0.5	0.71		Coarse sand
1.0	0.51	500	
1.5	0.35	350	Medium sand
2.0	0.25	250	
2.5	0.177	177	Fine sand
3.0	0.125	125	
3.5	0.088	88	Very fine sand
4.0	0.0625	62.5	
8.0	0.0039	3.9	Silt↑ Clay↓

4.0 REFERENCES

Duncan, G.A. and LaHaie, G.G. 1979. Size Analysis Procedures used in the Sedimentology Laboratory, NWRI. NWRI, CCIW, Hydraulics Division Manual, September 1979.

Folk, R.L. 1968. Petrology of Sedimentary Rocks. Hemphill Publishing Co., Austin, Texas, 182 p.

Folk, R.L. and Ward W.C. 1957. Brazos River Bar: A Study in the Significance of Grain Size Parameters. Jour. Sed. Petrology, V. 27, pp 3-26.

Krumbein, W.C. and Pettijohn, F.J. 1938. Manual of Sedimentary Petrography. Appleton-Century-Crofts, New York, 549 p.

Sandilands, R.G. and Duncan, G.A. 1980. SIZDIST - A Computer Program for Size Analysis. NWRI, CCIW, Hydraulics Division Technical Note, Report No. 80-08.

Shepard, F.P. 1954. Nomenclature Based on Sand-Silt Ratios. Jour. Sed. Petrology, V. 24, pp. 151-158.

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APPENDIX 1

SIZDIST OUTPUT