Subsurface

Consulting Ltd.

22 Curtis Avenue
New Fairfield, CT 06812

P. O. Box 455
Brewster, NY 10509

(203) 746-6570
FAX (203) 746-0438

jsmellett@mags.net

# SEDIMENTOLOGICAL SURVEY OF DELTA AT NORTH END OF BALL POND, NEW FAIRFIELD, CONNECTICUT

## PREPARED FOR THE BALL POND ADVISORY COMMITTEE NEW FAIRFILD, CONNECTICUT

**Introduction:**

Ball Pond, in New Fairfield, is one of a handful of natural lakes in western Connecticut. It was carved out during the last glacial advance, leaving a natural bowl with a clay bottom and a maximum depth of 50 feet. Over hundreds of years since European settlement, land clearing has allowed large volumes of sediment to accumulate in the lake, particularly around the edges. Recent development on and around Ball Pond has accelerated this sediment flow, particularly the installation of storm drains and catch basins around it over the past 70 years.

On the north end of the pond, a 24-inch storm drain empties into it from a surrounding small watershed and a small, sandy delta began to form. This survey was carried out in order to determine the areal extent and composition of the delta. In addition, an attempt is made to identify the source of the sediments, whether winter de-icing road sand, or sediments contained in normal runoff (Fig. 1).

A ground-penetrating radar (GPR) survey was initiated on 12 April 2008. in order to map the outline of the sand delta and to estimate thickness to the bottom muds. Scans were run with GPR equipment manufactured by Geophysical Survey Systems, Inc., of Salem, NH. Data were digitally recorded on a SIR System 2000, and subsequently printed. The 100 MHz antenna was run with a 150 ns window, allowing a penetration depth through the water column and into the sands and bottom muds. The 100 MHz antenna was towed behind an aluminum boat, but the boat grounded on the sediments close to shore, where only 3-6 inches of water covered the delta. GPR scans showed that the sand delta has topset and foreset beds. We could estimate total thickness of the sediments from the scans using an estimated dielectric for saturated freshwater sands of 25-30. Given that assumption, the sandy sediments appear to be about 2 feet thick, which agreed with the actual core thicknesses (Fig. 1).

The coring activity was run on 13 October 2008 starting at 1200 hrs. Weather was clear and dry, with ambient temperature about 70° F. A dry summer had lowered the pond level and left the delta covered with a foot or two of water, allowing easy access for the cores to be made.

**Materials and Methods:**

A coring tool was fabricated from a 6-foot long, 1-1/2 inch diameter PVC pipe. The working end of the pipe was sharpened to allow insertion into the sediments and the tube was rotated and hammered into the delta until it struck bottom muds. The tube was

removed from the delta and the subsequent core extruded using a 1-inch diameter wooden rod.

Five cores were extracted, and are listed below (refer to map):

**Core #1**- Taken 40 feet south of the shore in 1 foot of water. Core length was limited to 8 inches because the core broke up before extrusion.

**Core #2**- Taken 26 feet south of the shore in 6 inches of water. Core length was 2.5 feet.

**Core #3**- Taken 15 feet south of the shore in 1 foot of water. Core length was 18 inches.

**Core #4**- Taken 45 feet south of the shore in 1 foot of water. Core length was 24 inches.

**Core #5**- Taken 40 feet south of the shore in 1 foot of water. Core length was 18 inches.

**Results:**

The delta has a triangular shape, with a north-south extent of 60 feet, and an east-west extent of 20 feet at its narrowest, and almost 150 feet at its widest near the north shore (to be verified in Spring 2009). Fig. 1 also shows the extent of the bottomset beds, which may extend another 100 feet farther south. We did not core this area because it was in over 4 feet of water, but the GPR traces show an almost identical appearance and thickness between these sediments and the parts of the delta that were cored.

The sediments fanned out and extended to a feather edge at the north margins, but dropped abruptly near cores #1 and #4, where the topset beds drop off the edge of the delta. Any sand introduced into the lake by the storm drain was deposited, and then subsequently moved east and west by winds and weak longshore currents.

The longer cores struck mud and clay at the bottom, and this fine-grained material predates the sand, and represents the sediments that poured into the lake long after the glacier retreated, up to activity of colonists and farmers.

Gross examination of the cores initially suggested that they are almost indistinguishable in grain size and composition from road sand that was dropped on the nearby streets during the previous winters. A more detailed investigation using standard sedimentological sieves was then carried out.

The standard sieves used were the following:

| Sieve Number | Grain Size | Chart | Comment | Phi Value |
|---|---|---|---|---|
| ½" | 12.5 mm | 1 | pebble | -2.5 |
| # 5 | 4 mm | 2 | pebble | -2.0 |
| # 10 | 1 mm | 3 | coarse sand | 0 |
| # 35 | 0.5 mm | 4 | medium sand | +2 |
| # 60 | 0.25 mm | 5 | fine sand | +3 |
| # 120 | 0.125 mm | 6 | very fine sand | +4 |
| # 230 | 0.063 mm | 7 | coarse silt | +8 |
| Pan | < 0.063 mm | 8 | silt, clay | +∞ |

**Phi = -log $_2$ diameter in mm**

Thus a Phi of zero corresponds to a grain size diameter of $1 / 2^0 = 1$ mm. A phi of -2 = 4 mm; A Phi of 5 = 1/32 mm. We don't have to worry about the details; suffice to say that the Phi scale represents grain size diameters, going from coarse to fine as you go from left to right across the histograms.

**Interpretation:**

The values given for the Ball Pond North delta, and the Ball Pond Road East Sample are taken from actual sediment size measurements. Values for the Town Road Sand are taken from the road sand specifications determined by the town and by the Connecticut Department of Transportation CTDOT). The town specs use different size sieves, and are based on the amount *passing through* the sieves. The Ball Pond Delta sample values are based on ranges of material *retained* by the sieves. The result of this difference merely shifts the histograms of the delta sample slightly from the DOT specs.

Note the similarity in all the histograms, with the grain sizes from 3-5 (medium to fine sand) being the dominant classes. Note also that the histogram of Sample # 1 is almost indistinguishable from that of CTDOT Specs.

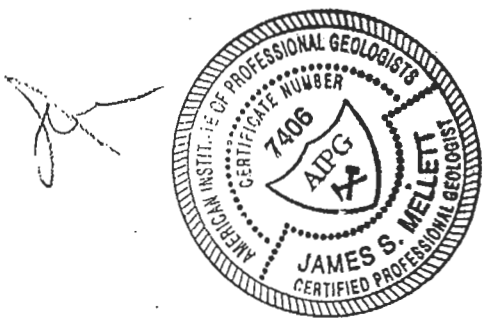
Given the GPR data and the sieved sample results, we may conclude the following:

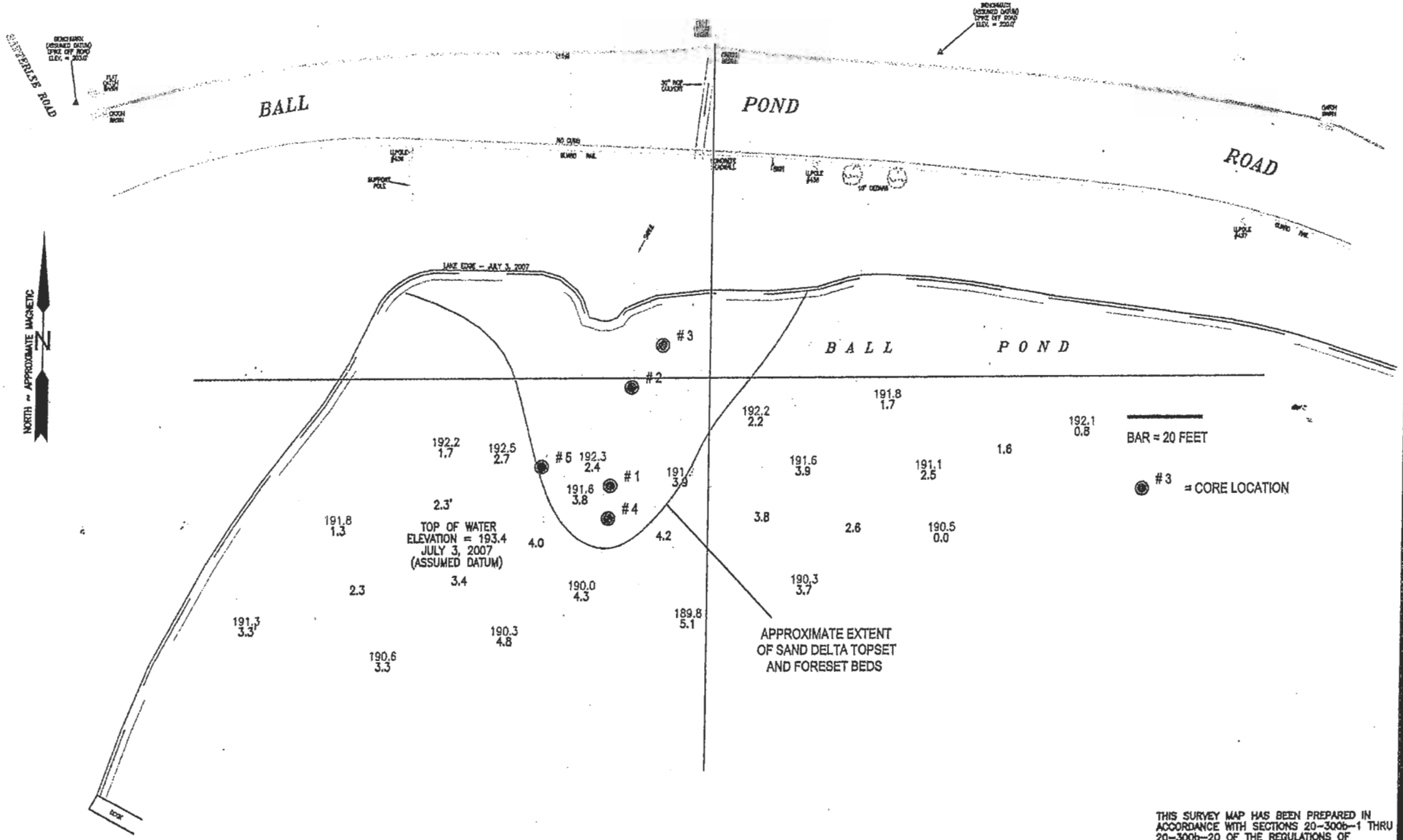
1) The bulk of the sands in the mapped delta are almost identical in composition to the road sand spread on Rt. 39 by the CTDOT. In an earlier survey of a delta on the east side of Ball pond carried out on 22 September 2005, we were able to demonstrate multiple sources for the delta, including runoff from construction spoil piles on the east side of the lake, as well as CTDOT road sand.

2) The submerged portion of the delta is quite extensive, and agrees in part with the sediment estimates carried out by Mr. Paul A. Hiro, PE in a map dated 3 July 2007. The actual sand estimates are probably higher than his results (1,358 cu yds) because his crew did not sample the sand delta close to shore, which might add another 400 cu yds to the entire amount of material that would have to be removed.

Report Submitted
10 February 2009

James S. Mellett, PhD, CPG






-4-

# SEDIMENT LOCATION PLAN

PREPARED FOR

# BALL POND ADVISORY COMMITTEE

BALL POND

TOWN OF NEW FAIRFIELD FAIRFIELD COUNTY, CT.

JULY 3, 2007 SCALE: 1" = 20'

REVISED AUG. 18, 2007 TO CORRECT TOWN NAME

LEGEND:

191.3 ——— ELEVATION AT TOP OF SEDIMENT

3.3' ——— DEPTH/THICKNESS OF SEDIMENTATION

NOTES:

1) THE LIMIT OF STUDY AS DEPICTED HEREON IS THE AREA OF SEDIMENTATION WHERE MEASUREMENTS WERE MADE AS DELINEATED BY GEORGE BENSON FOR THE TOWN OF NEW FAIRFIELD AND DOES NOT NECESSARILY REPRESENT THE EXTENT OF SEDIMENTATION.

0' 20' 40' 60'

THIS SURVEY MAP HAS BEEN PREPARED IN ACCORDANCE WITH SECTIONS 20-300b-1 THRU 20-300b-20 OF THE REGULATIONS OF CONNECTICUT STATE AGENCIES - "MINIMUM STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" EFFECTIVE 06-21-96 AS ENDORSED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC.

TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

PREPARED BY THE OFFICE OF
PAUL A. HIRO, P.C.
35 LANBURY ROAD NEW MILFORD, CT.
CT. REG. NO. 16167

JOB NO. 6350

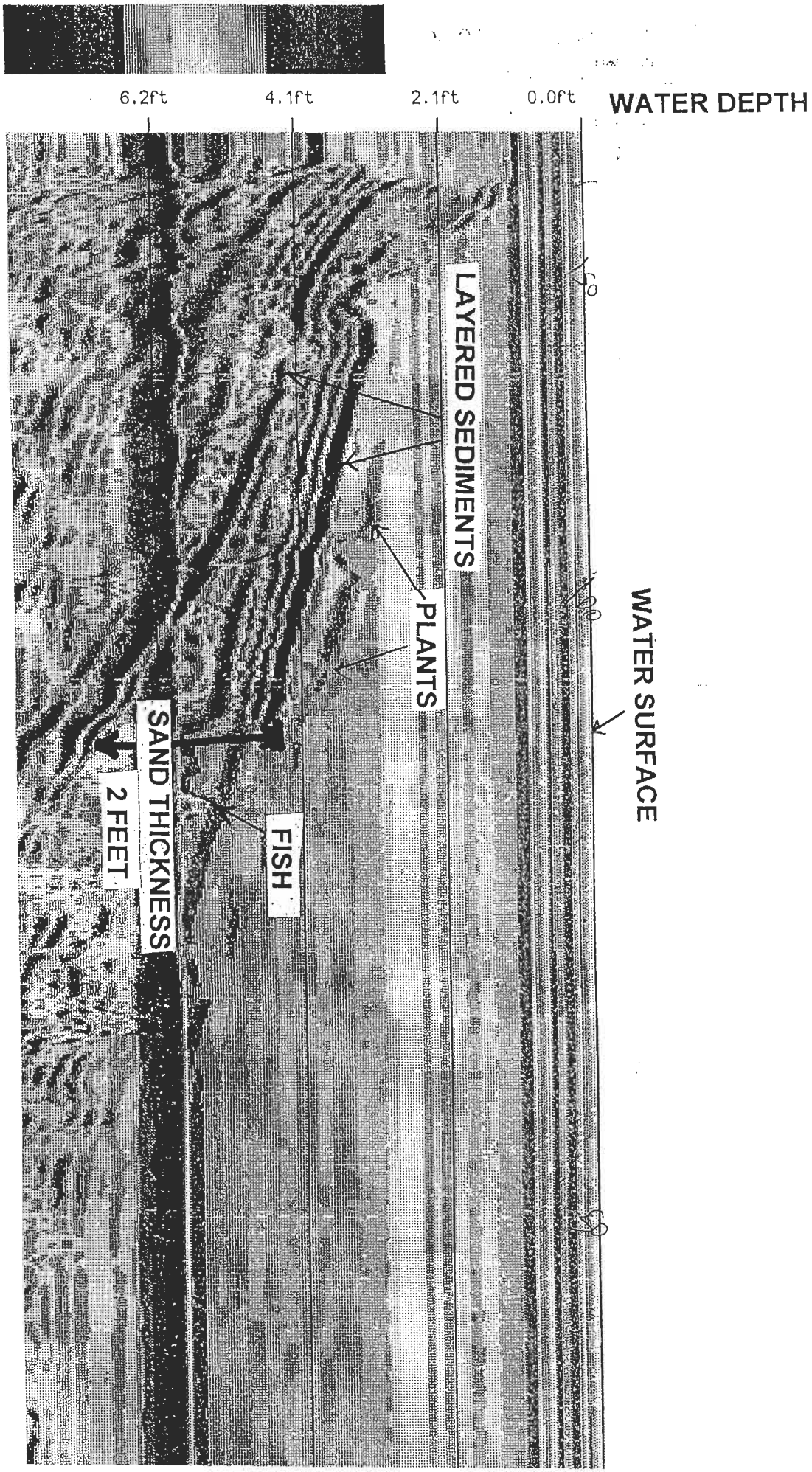
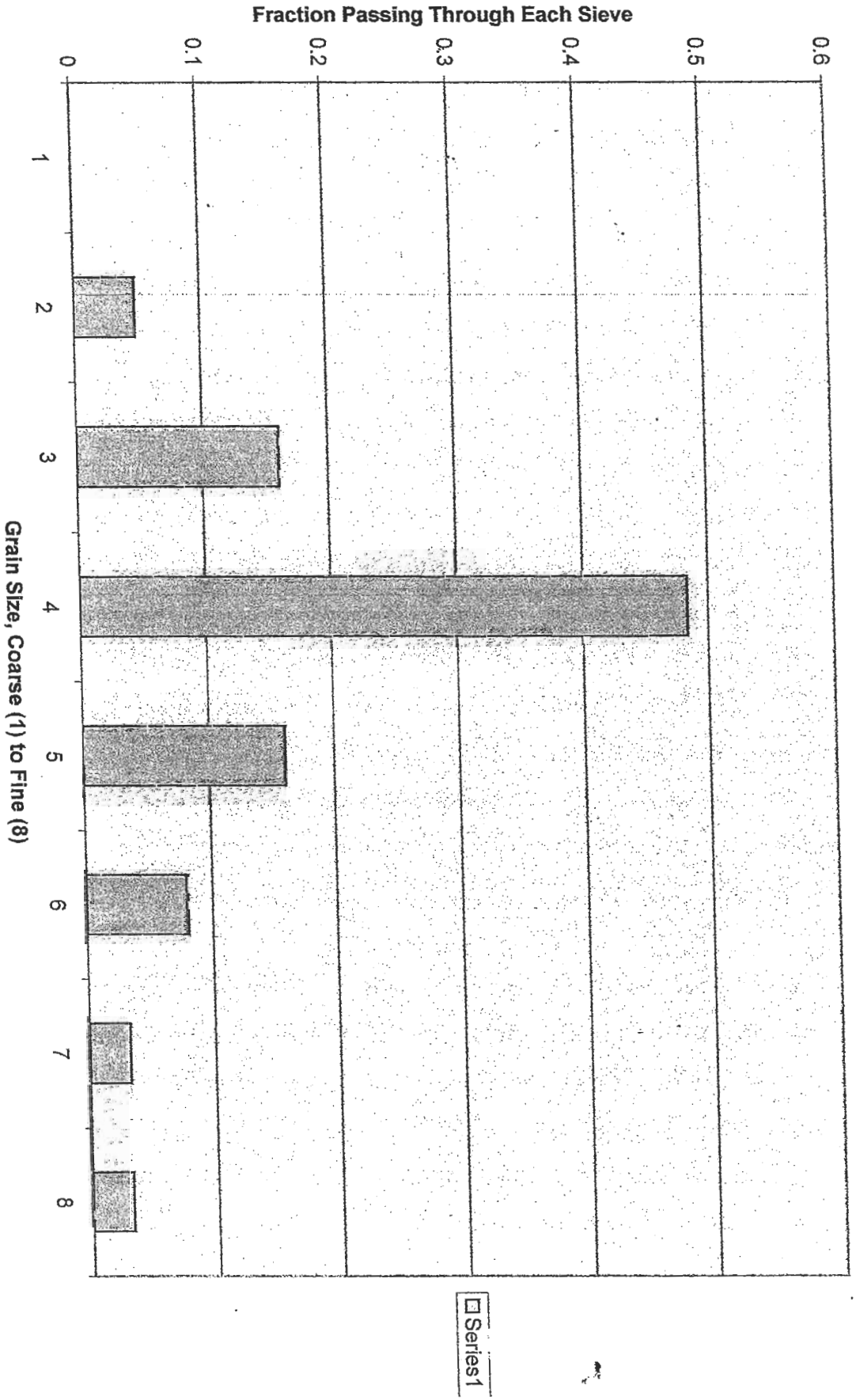
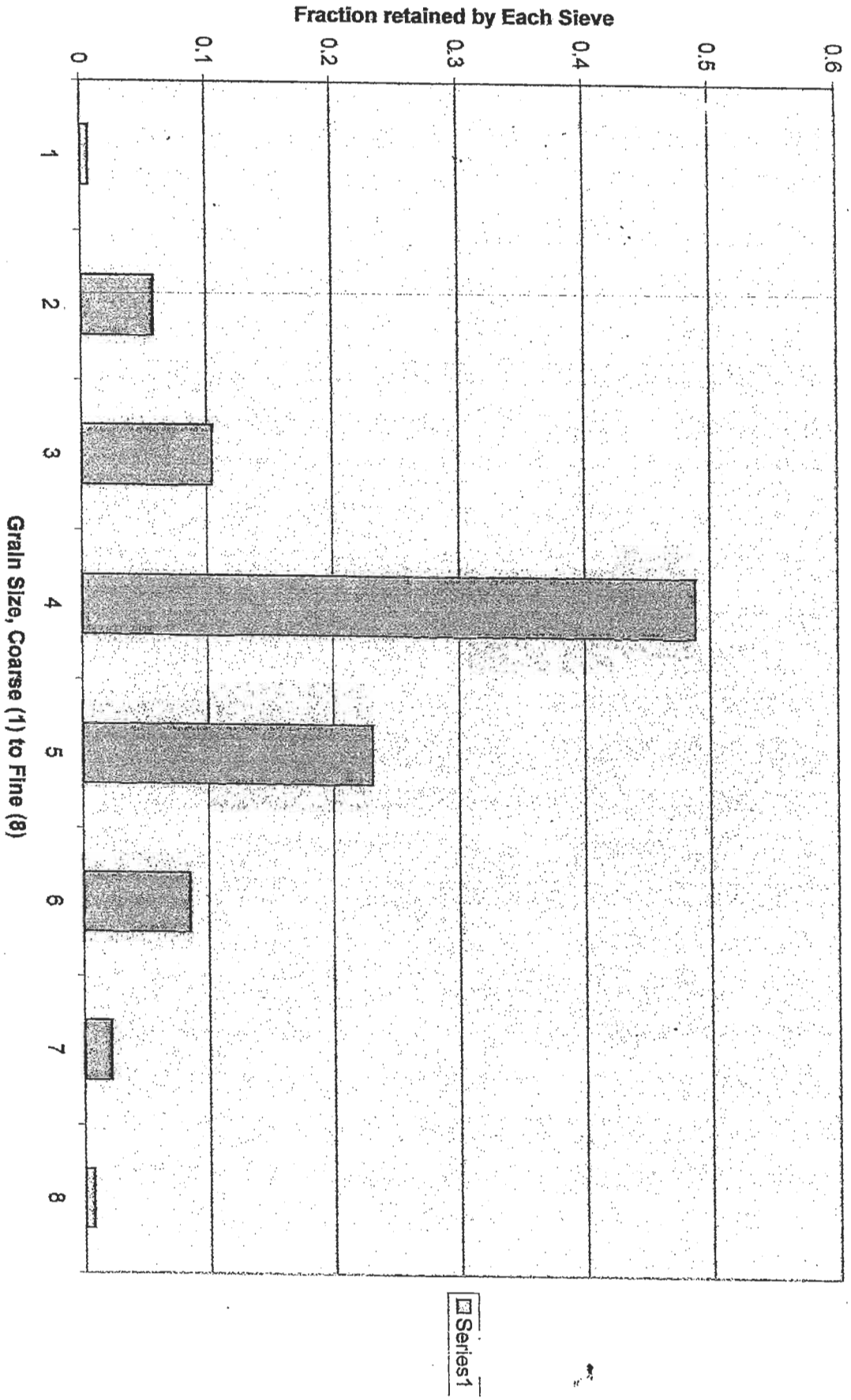
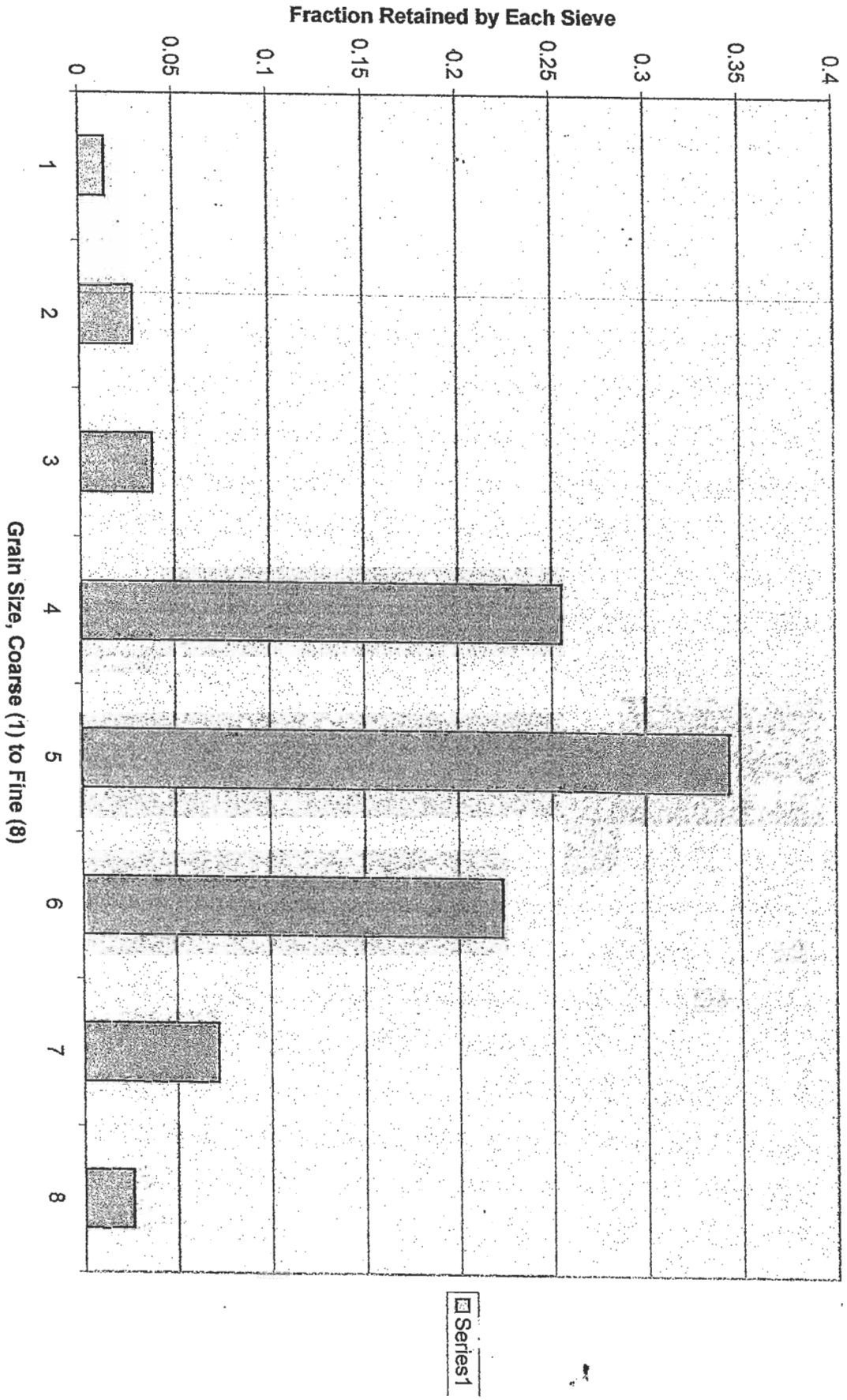



Fig. 1: 100 MHz N-S scan 50 feet east of storm drain, from topset to bottomset beds of delta. Profile spans 150 feet.

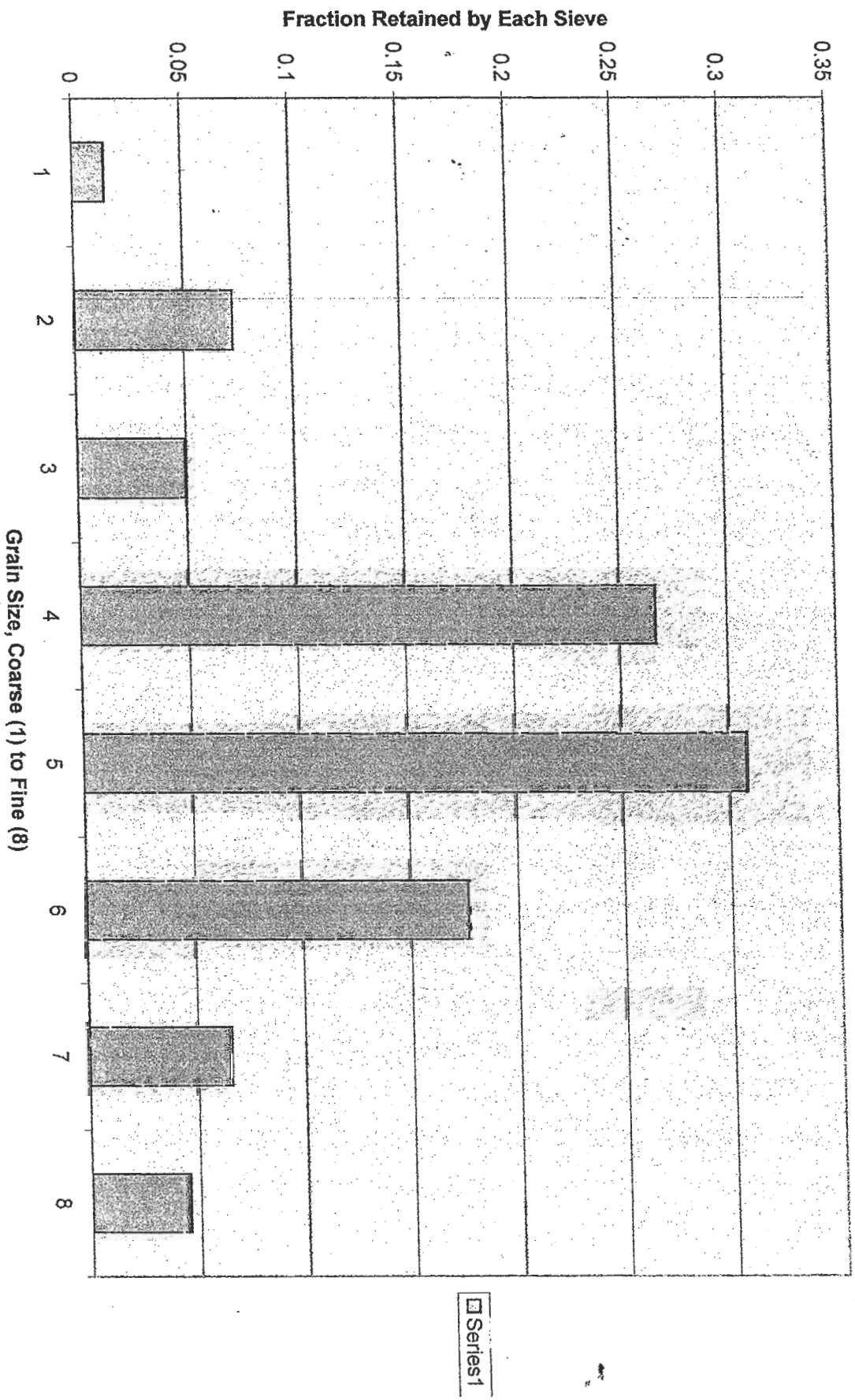

CT DOT Road Sand
Fraction Passing Through Each Sieve
0
0.1
0.2
0.3
0.4
0.5
0.6
1
2
3
4
5
6
7
8
Grain Size, Coarse (1) to Fine (8)
Series1



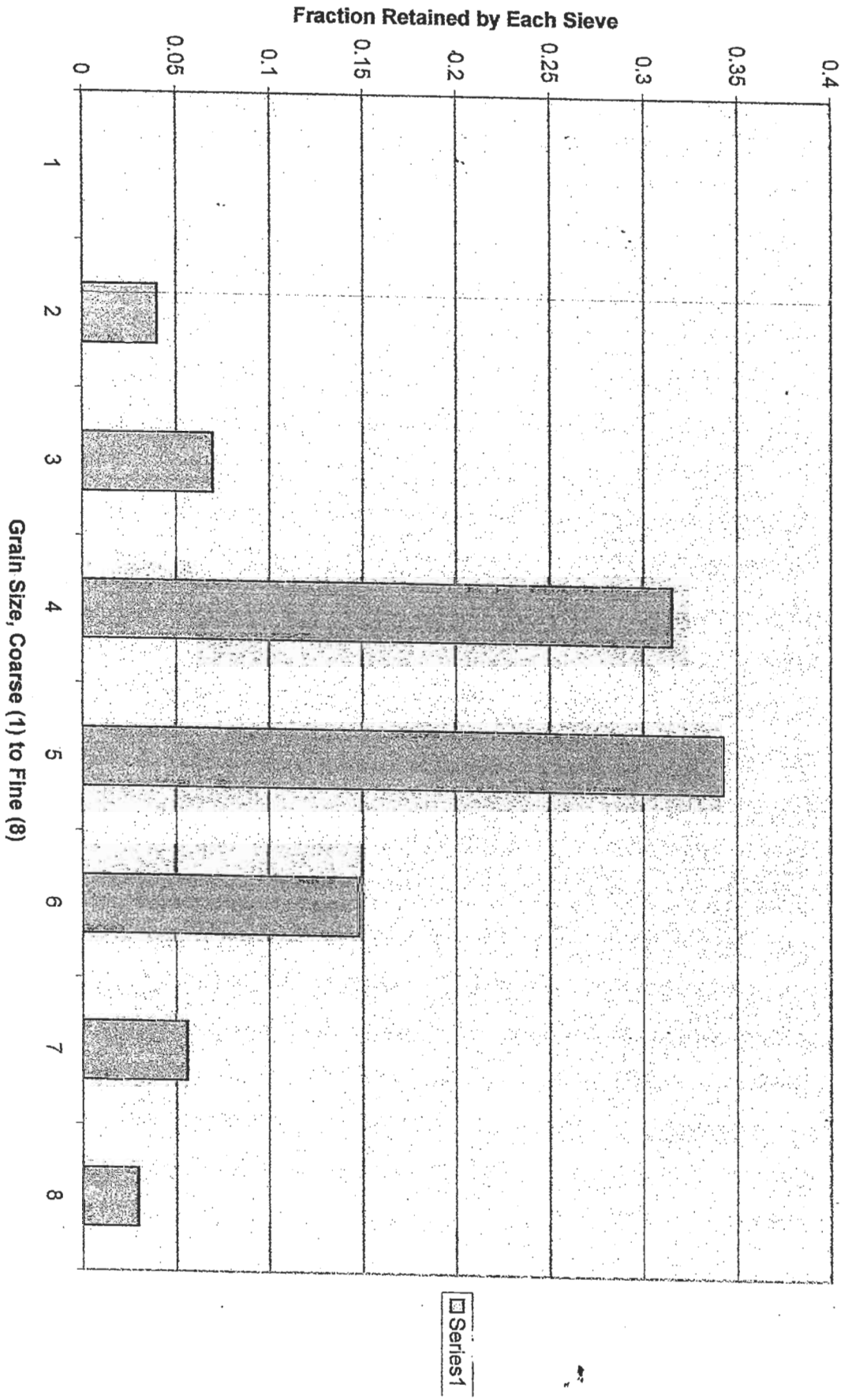

Sieved Sample # 1, Ball Pond N



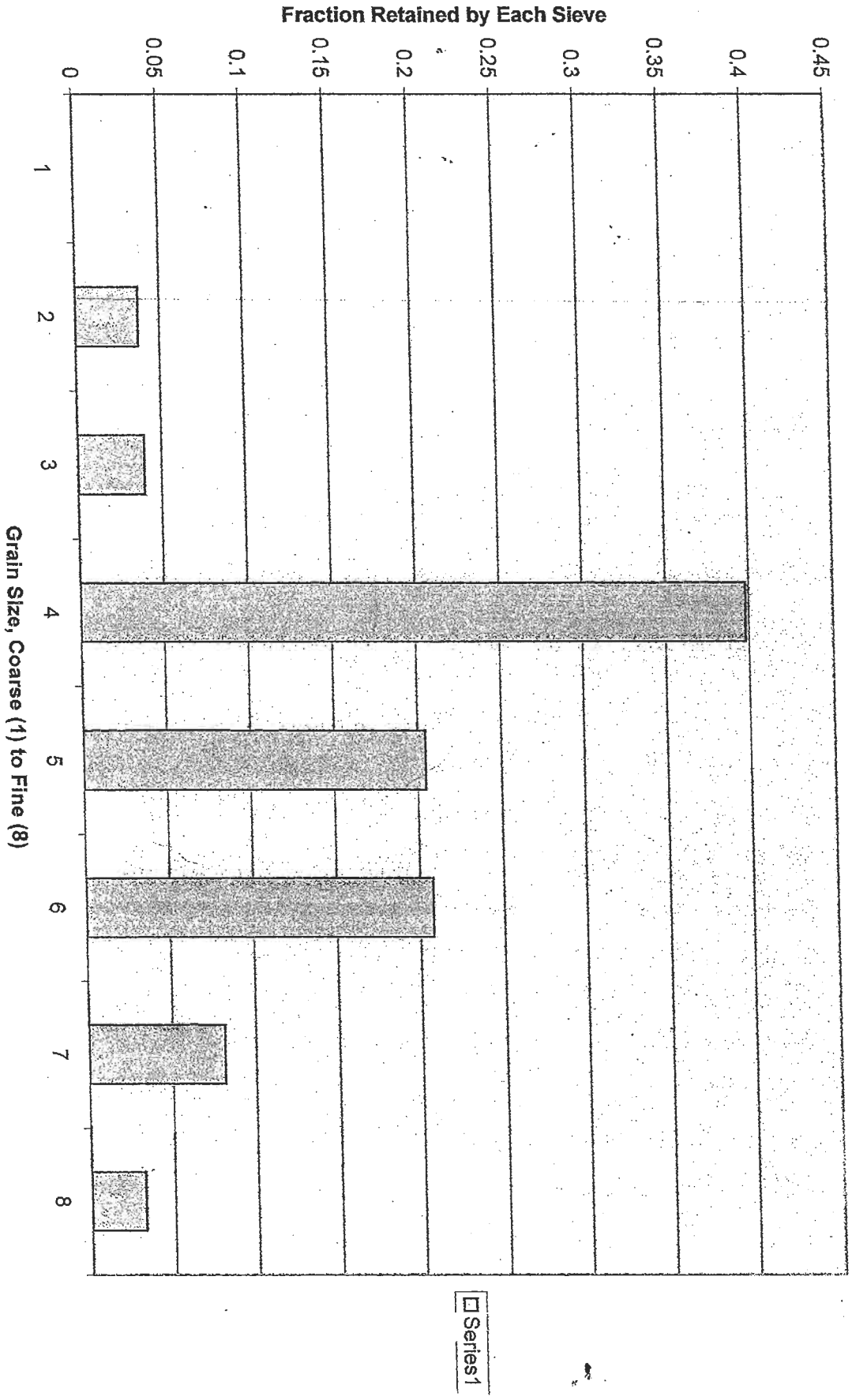

Sieved Sample # 2, Ball Pond N




Sieved Sample # 3, Ball Pond N




Sieved Sample # 4, Ball Pond N




Sieved Sample # 5, Ball Pond N