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RECENT SEDIMENTS OF
BOLINAS BAY
CALIFORNIA
PART A. INTRODUCTION AND
GRAIN SIZE ANALYSIS

by

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HYDRAULIC ENGINEERING LABORATORY
COLLEGE OF ENGINEERING



UNIVERSITY OF CALIFORNIA
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RECENT MARINE SEDIMENTS OF BOLINAS BAY, CALIFORNIA

Part A -- Introduction and Grain Size Analysis

by

C. Isselhardt, L. Osuch, and P. Wilde

Berkeley, California
November 1968

INTRODUCTION

The following work is part of a long term study of sediment transport on the Continental Shelf of Central California. In particular, it is hoped that the data presented here will be useful also to the general study of the factors that influence the natural environment of Bolinas Lagoon now being conducted as a cooperative effort involving the University of California, Berkeley; the U. S. Corps of Engineers; the U.S. Geological Survey; the Department of Agriculture, Soil Conservation Service; and consultants for the Bolinas Harbor District.

The analyses of the marine sediments of Bolinas Bay were done at the University of California, Berkeley, utilizing the facilities of the Departments of Civil Engineering and Geology and the Institute of Marine Resources. The results of the marine study will be presented in three separate volumes:

Part A -- Introduction and Grain Size Data

Part B -- Mineralogical Data

Part C -- Interpretation and Summary of Results

Sample Collection

Three types of samples are examined in this report: (a) 6 rock samples from the cliffs on the north shore of Bolinas Bay, (b) 12 beach samples, and (c) 44 marine rock and sediment samples from Bolinas Bay. Rock samples are from surface out crops. Beach samples were scooped from the surface at low tide. Marine samples were obtained on 26 - 27 March 1968 from the converted fishing boat San Michele. Bottom

samples were obtained by an orange-peel grab and thus were representative of approximately the upper 15 centimeters of sediment. About one liter by volume of sample was saved from each station, placed in a polyethylene bag, and stored until treatment in a one quart cardboard container.

Figure 1 shows the marine station locations which were obtained by radar bearings on shore landmarks. Station depths were obtained by echo sounding with a Raytheon fathometer. The bathymetric base map used in this study was contoured by C. Isselhardt from original U.S. Coast and Geodetic Survey sounding sheets. Participants in the marine sampling were Ralf Carter, Courtney Isselhardt, Eugene Silva, and Pat Wilde.

Sample Treatment

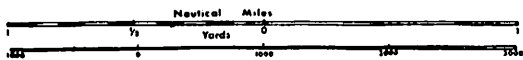
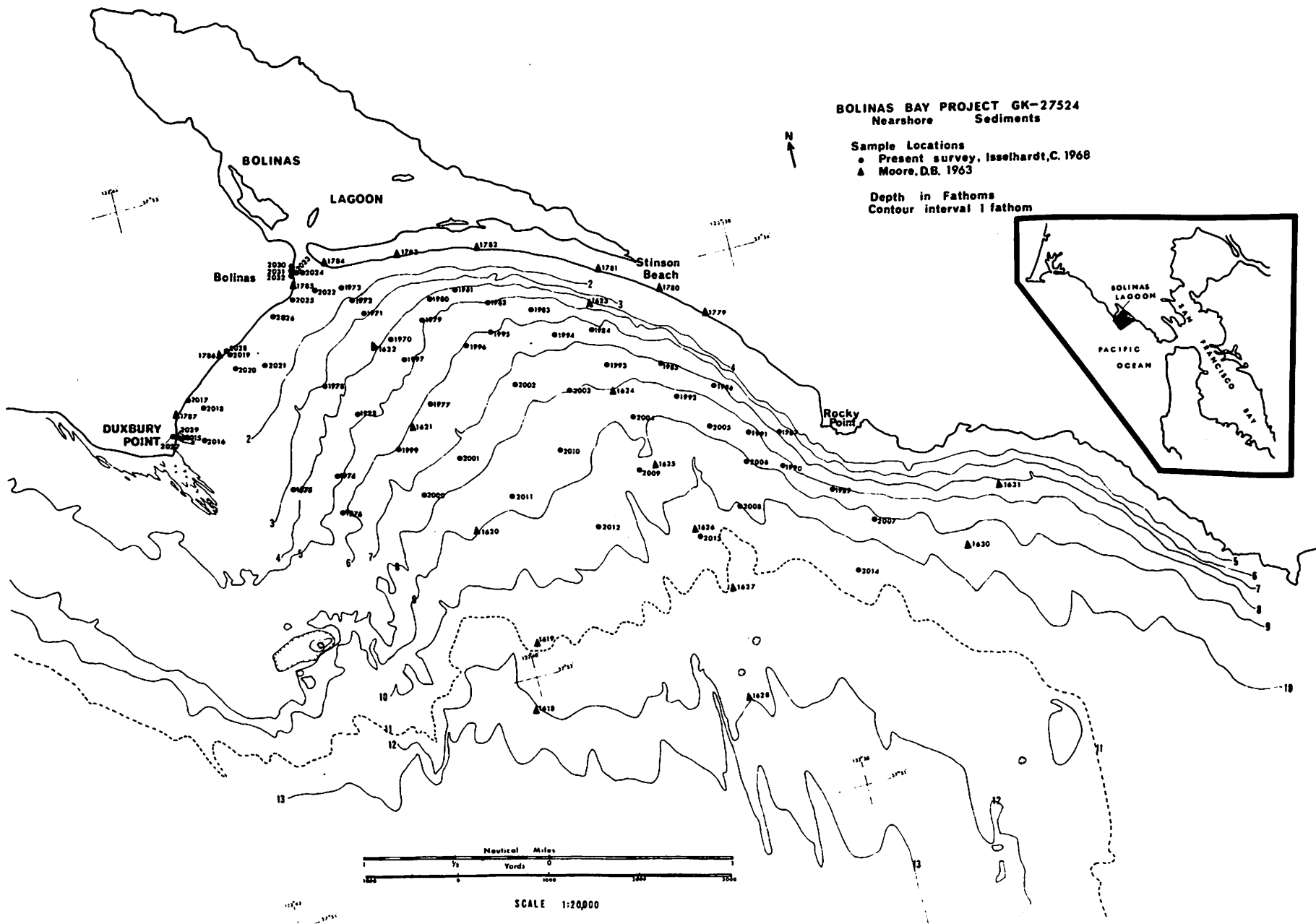
Initially all samples were washed with fresh water to eliminate dried sea salt and then were placed in a drying oven at 100° C until dry. The dry sample was split in a Jones sample splitter into four fractions:

- (1) weighed and sieved for mineralogical analysis
- (2) to John Holden for paleontological analysis
- (3) archive
- (4) reserve

BOLINAS BAY PROJECT GK-27524
Nearshore Sediments

Sample Locations
● Present survey, Isseihardt, C. 1968
▲ Moore, D.B. 1963

Depth in Fathoms
Contour interval 1 fathom



SCALE 1:20,000

GRAIN SIZE ANALYSIS

The sample was size separated in a Ro-Tap using nine sieves:

<u>U.S. Standard Mesh Number</u>	<u>Nominal Opening</u>	<u>PHI Units</u>
5	4.000 mm	- 2.0
10	1.981 mm	- 1.0
18	0.991 mm	0
35	0.495 mm	+ 1.0
45	0.351 mm	+ 1.5
60	0.246 mm	+ 2.0
80	0.175 mm	+ 2.5
120	0.124 mm	+ 3.0
170	0.088 mm	+ 3.5
230	0.061 mm	+ 4.0

The intervals from medium sand to very fine sand (0.500 - 0.062 mm) were monitored at half PHI intervals as the primary mode of most of the samples is in that size interval.

After sieving, each size fraction was weighed on an analytical balance to 0.001 grams and a weight percent value calculated for each fraction.

Data Format

The grain size information for each sample is presented in the following pages graphically as (1) a histogram where the width of each bar represents the size range considered and the height of the bar represents the weight percent of that size range; and (2) a cumulative

frequency curve, which is a smooth curve drawn between points determined by adding weight percent values in successively smaller grain size classes. Points connected by dashed lines are symmetrically extrapolated values and do not represent measured values.

Modes, or the order of frequency, are determined visually from the histogram, with the first mode being the size class with largest weight percent value.

Quartile and percentile values or grain size values at a given weight percent are determined visually from the cumulative curves and are used for calculating statistical measures below. The percentile and quartile subscripts given here indicate the percentage of the distribution coarser than the corresponding grain size value. For example, P_{10} refers to the grain size at which 10% of the distribution is coarser. This procedure does not conform to standard statistical usage but is less ambiguous for grain size work where by convention the cumulative curve is plotted in order of decreasing grain size, which is the reverse of statistical practice.

Graphically Determined

<u>Parameter</u>	<u>Grain Size at</u>
P_{10}	10 th percentile
Q_{25}	25 th percentile (3 rd quartile)
Q_{50}	50 th percentile (2 nd quartile)
	MEDIAN
Q_{75}	75 th percentile (1 st quartile)
P_{90}	90 th percentile

Calculated

$$S_0 = \sqrt{Q_{25}/Q_{75}}$$

SORTING COEFFICIENT:
(Trask, 1932)
Degree of Scatter

$$S_k = \frac{Q_{25} Q_{75}}{(Q_{50})^2}$$

QUARTILE SKEWNESS:
(Trask, 1932)
Symmetry of Distribution

$$K = \frac{Q_{25} - Q_{75}}{2(P_{10} - P_{90})}$$

KURTOSIS:
(Krumbein and Pettijohn, 1938, p. 238)
Comparison of Central Portion of
Curve to Spread of Whole Curve

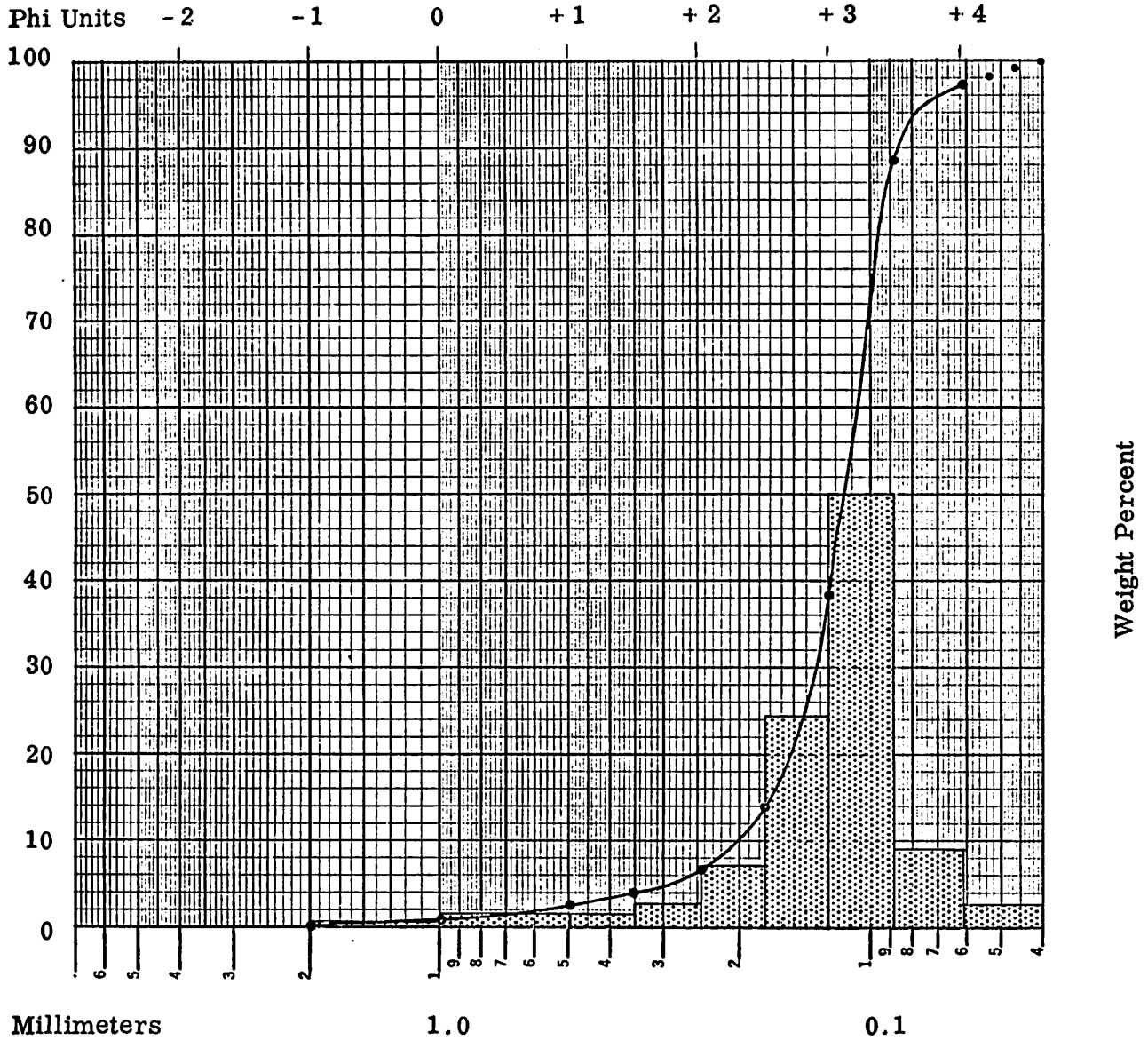
REFERENCES

- Krumbein, W. C. and Pettijohn, F. J., 1938, Manual of Sedimentary Petrography: New York, Appleton-Century-Crofts, 549 p.
- Trask, P. D., 1932, Origin and Environment of Source Sediments of Petroleum: Houston, Gulf Publishing Co., 67 p.

SIZE ANALYSIS

Sample 1970
 Lat. 37°53'53" Long. 122°40'27"
 Depth 4.16 Fathoms
7.62 Meters
25.00 Feet

Sample description Very fine, gray sand with 5% shell fragments and a few small dark pebbles
 Sample Weight 123.88 gms



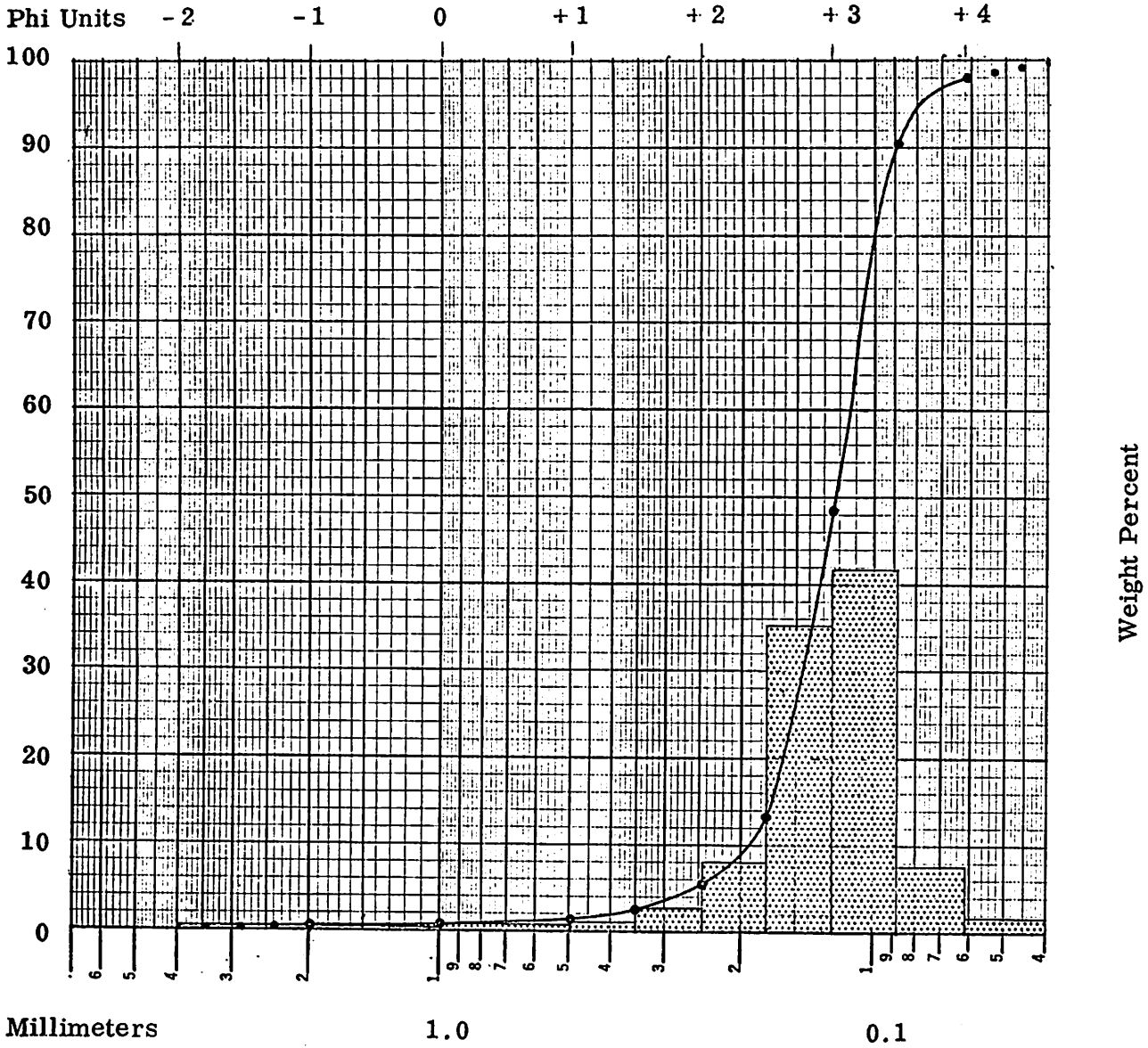
SIZE PARAMETERS

1st Mode <u>0.124-0.088 mm</u>	Q ₂₅ <u>0.14 mm</u>	Sorting Coef. <u>1.18</u>
2nd Mode _____	Median: Q ₅₀ <u>0.11 mm</u>	Skewness <u>1.15</u>
3rd Mode _____	Q ₇₅ <u>0.10 mm</u>	Kurtosis <u>0.17</u>

SIZE ANALYSIS

Sample 1971
 Lat. 37°54' Long. 122°40'31"
 Depth 2.83 Fathoms
5.28 Meters
17.00 Feet

Sample description Very fine, gray sand with 10% shell fragments
 Sample Weight 228.34 gms



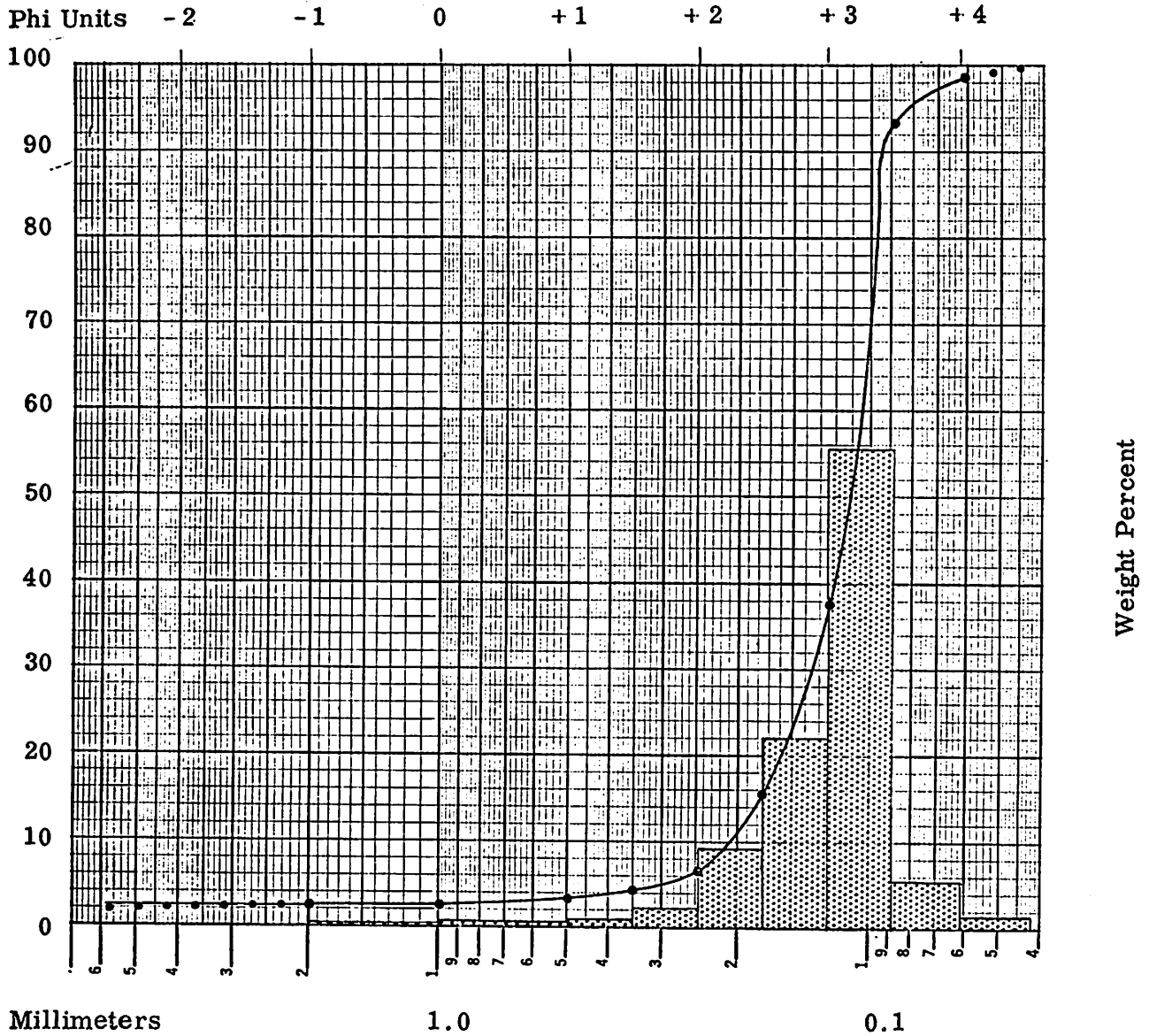
SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.15 mm Sorting Coef. 1.17
 2nd Mode _____ Median: Q_{50} 0.12 mm Skewness 1.06
 3rd Mode _____ Q_{75} 0.11 mm Kurtosis 0.19

SIZE ANALYSIS

Sample 1972
 Lat. 37°54'6" Long. 122°40'34"
 Depth 2.33 Fathoms
4.27 Meters
14.00 Feet

Sample description Very fine, gray
sand with 5-10% shell fragments
and a few small dark pebbles
 Sample Weight 223.82 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.15 mm Sorting Coef. 1.17
 2nd Mode _____ Median: Q_{50} 0.11 mm Skewness 1.18
 3rd Mode _____ Q_{75} 0.10 mm Kurtosis 0.18

SIZE ANALYSIS

Sample 1973

Sample description Fine, gray sand

Lat. 37°54'11" Long. 122°40'38"

with some very coarse pebbles and

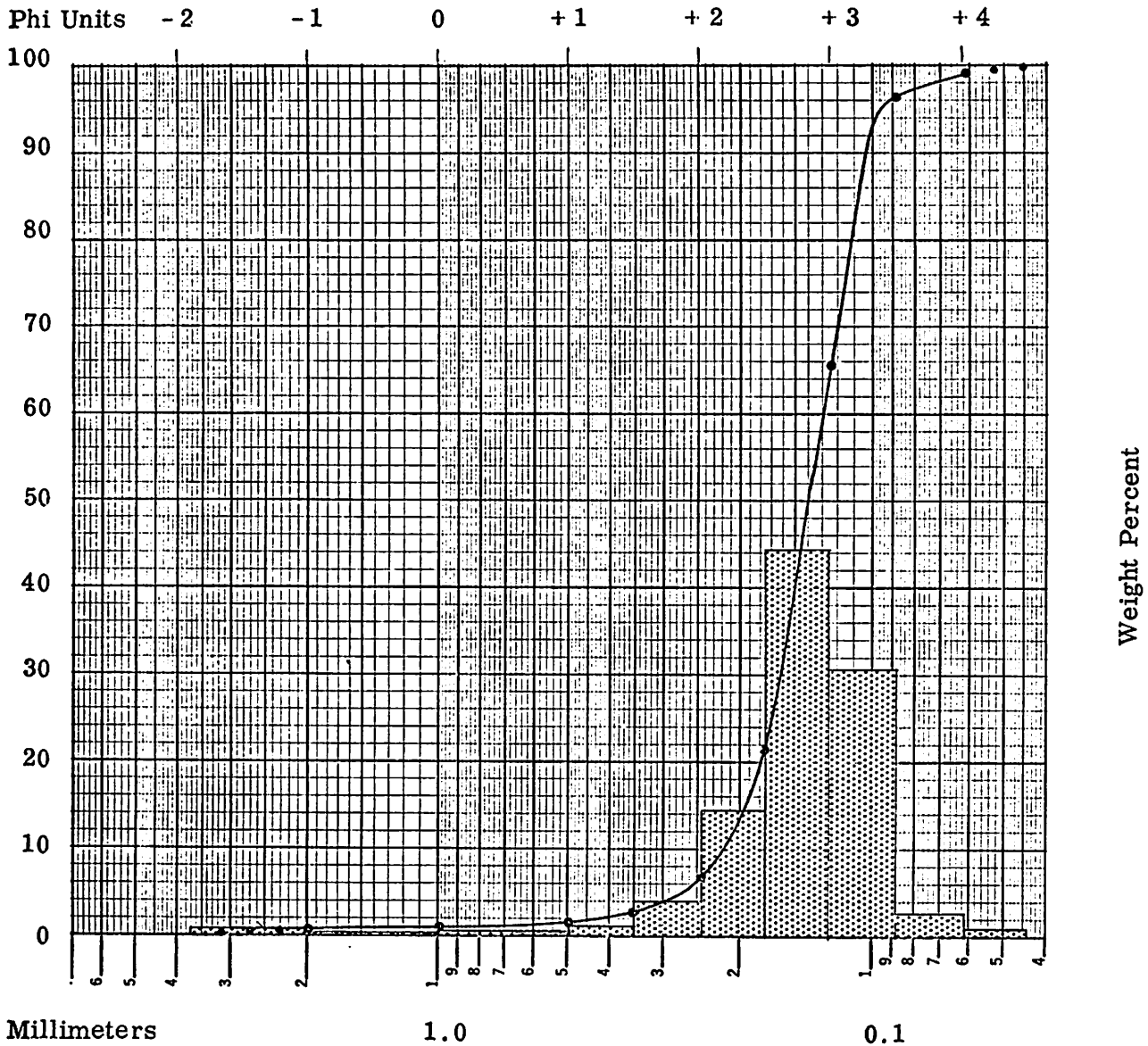
Depth 2.00 Fathoms

5% shell fragments

3.66 Meters

12.00 Feet

Sample Weight 295.87 gms



SIZE PARAMETERS

1st Mode <u>0.175 - 0.124</u> mm	Q ₂₅ <u>0.17</u> mm	Sorting Coef. <u>1.20</u>
2nd Mode <u>>1.981 - 1.981</u> mm	Median: Q ₅₀ <u>0.14</u> mm	Skewness <u>0.99</u>
3rd Mode _____	Q ₇₅ <u>0.12</u> mm	Kurtosis <u>0.22</u>

Sample 1978

Sample description Very fine, gray

Lat. 37°53'45" Long. 122°40'55"

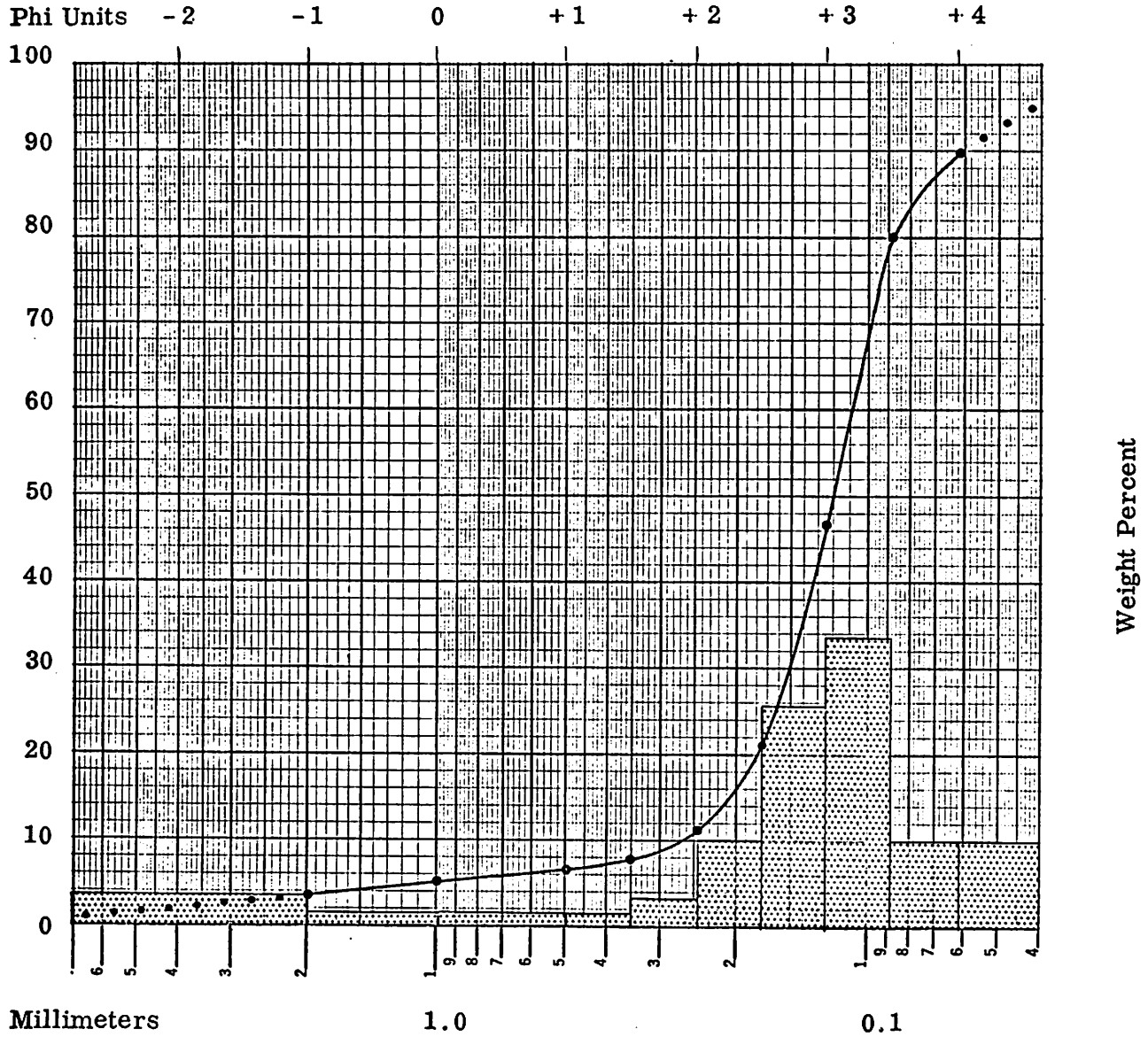
silty sand with some coarse pebbles and 5-10% shell fragments

Depth 3.17 Fathoms

5.79 Meters

19.00 Feet

Sample Weight 189.87 gms



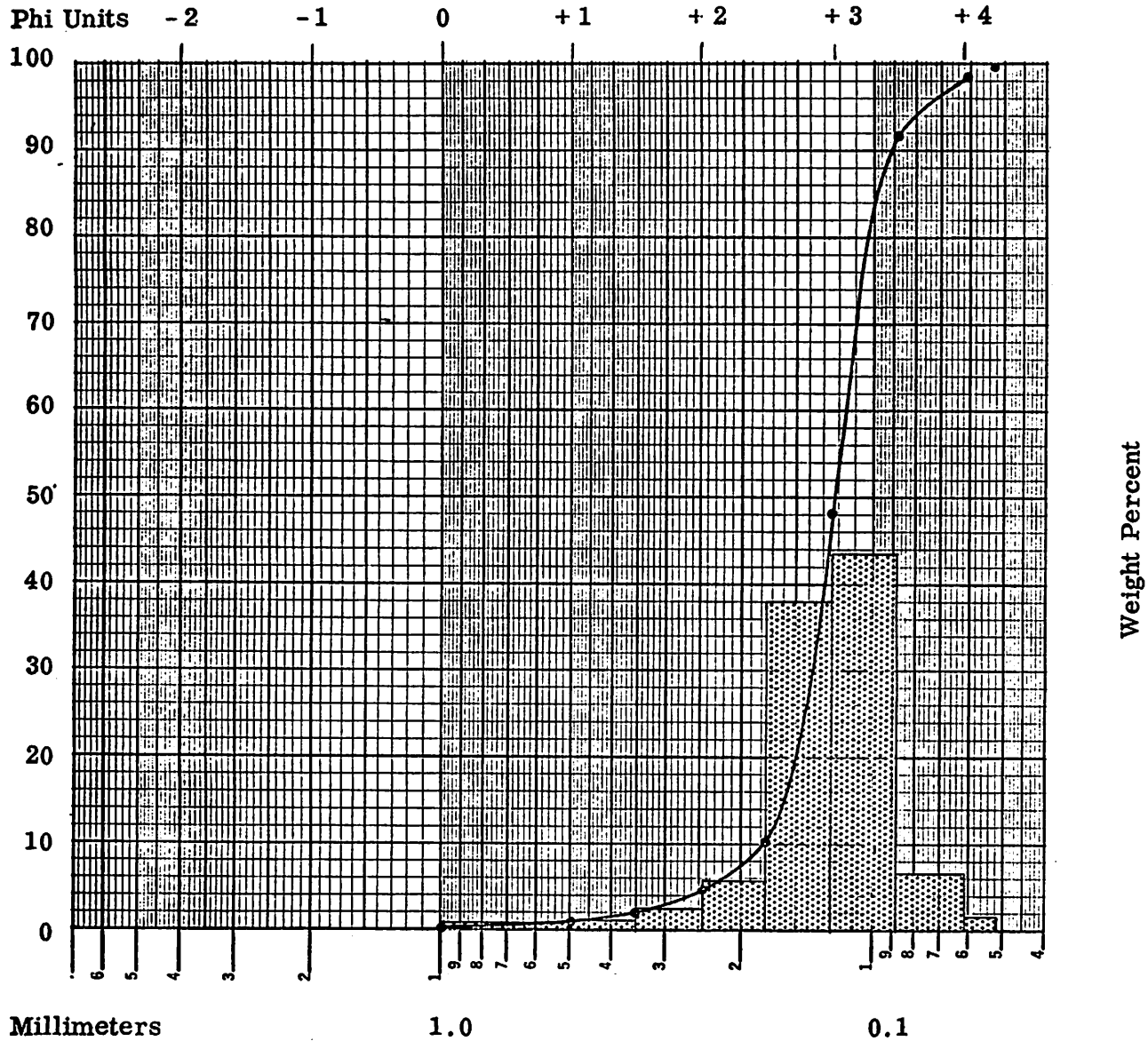
SIZE PARAMETERS

1st Mode <u>0.124 - 0.088 mm</u>	Q ₂₅ <u>0.16 mm</u>	Sorting Coef. <u>1.28</u>
2nd Mode <u>>1.981 - 1.981 mm</u>	Median:Q ₅₀ <u>0.12 mm</u>	Skewness <u>1.04</u>
3rd Mode _____	Q ₇₅ <u>0.10 mm</u>	Kurtosis <u>0.15</u>

SIZE ANALYSIS

Sample 1979
 Lat. 37°53'57" Long. 122°40'9"
 Depth 3.83 Fathoms
6.00 Meters
23.00 Feet

Sample description Very fine, gray
tan sand with 5% shell fragments
 Sample Weight 164.40 gms



SIZE PARAMETERS.

1st Mode <u>0.124 - 0.088</u> mm	Q ₂₅ <u>0.14</u> mm	Sorting Coef. <u>1.16</u>
2nd Mode _____	Median: Q ₅₀ <u>0.12</u> mm	Skewness <u>0.95</u>
3rd Mode _____	Q ₇₅ <u>0.10</u> mm	Kurtosis <u>0.19</u>

SIZE ANALYSIS

Sample 1980

Sample description Very fine, gray

Lat. 37°54'2" Long. 122°40'6"

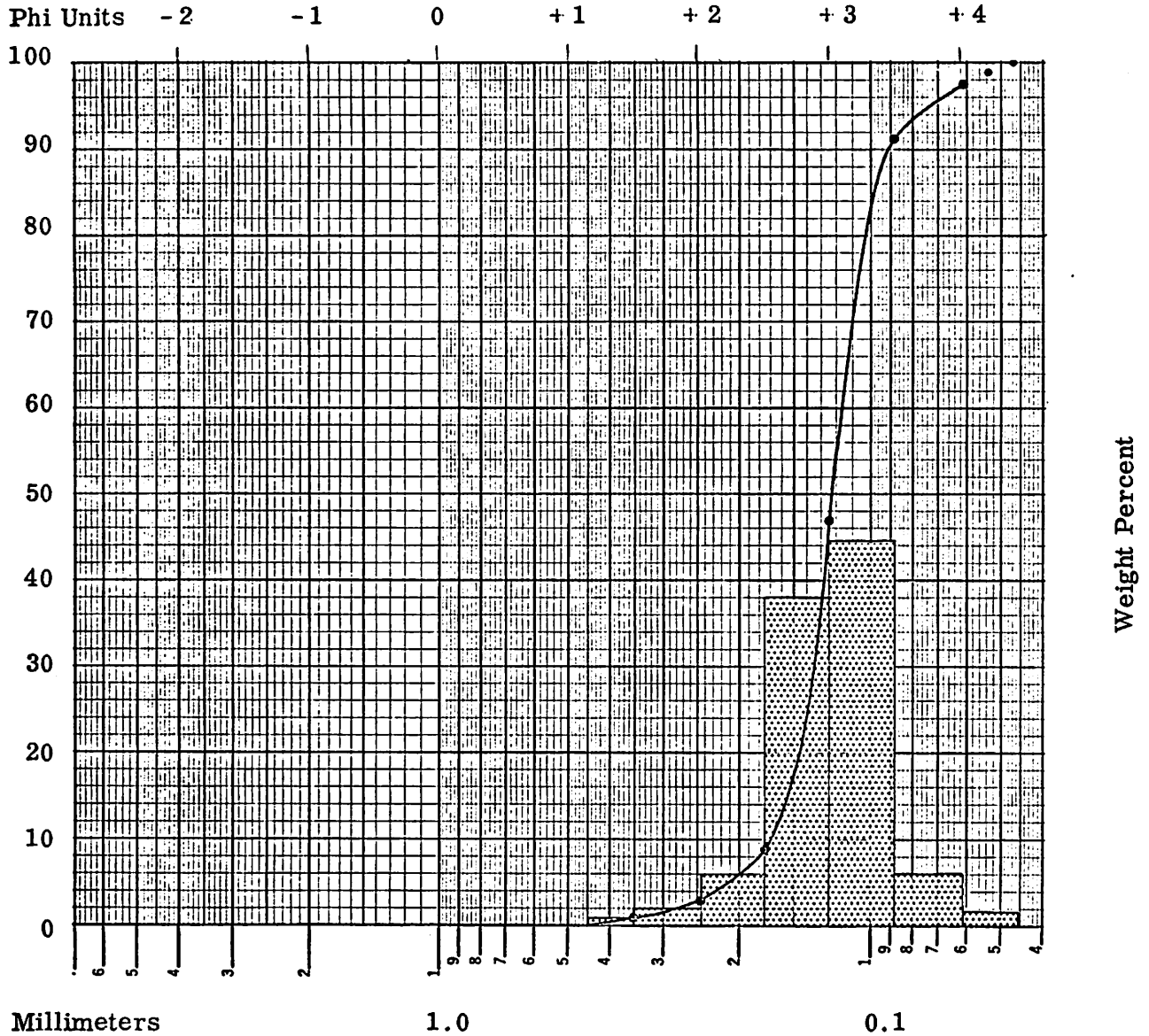
sand with <5% shell fragments

Depth 3.67 Fathoms

6.71 Meters

22.00 Feet

Sample Weight 263.24 gms



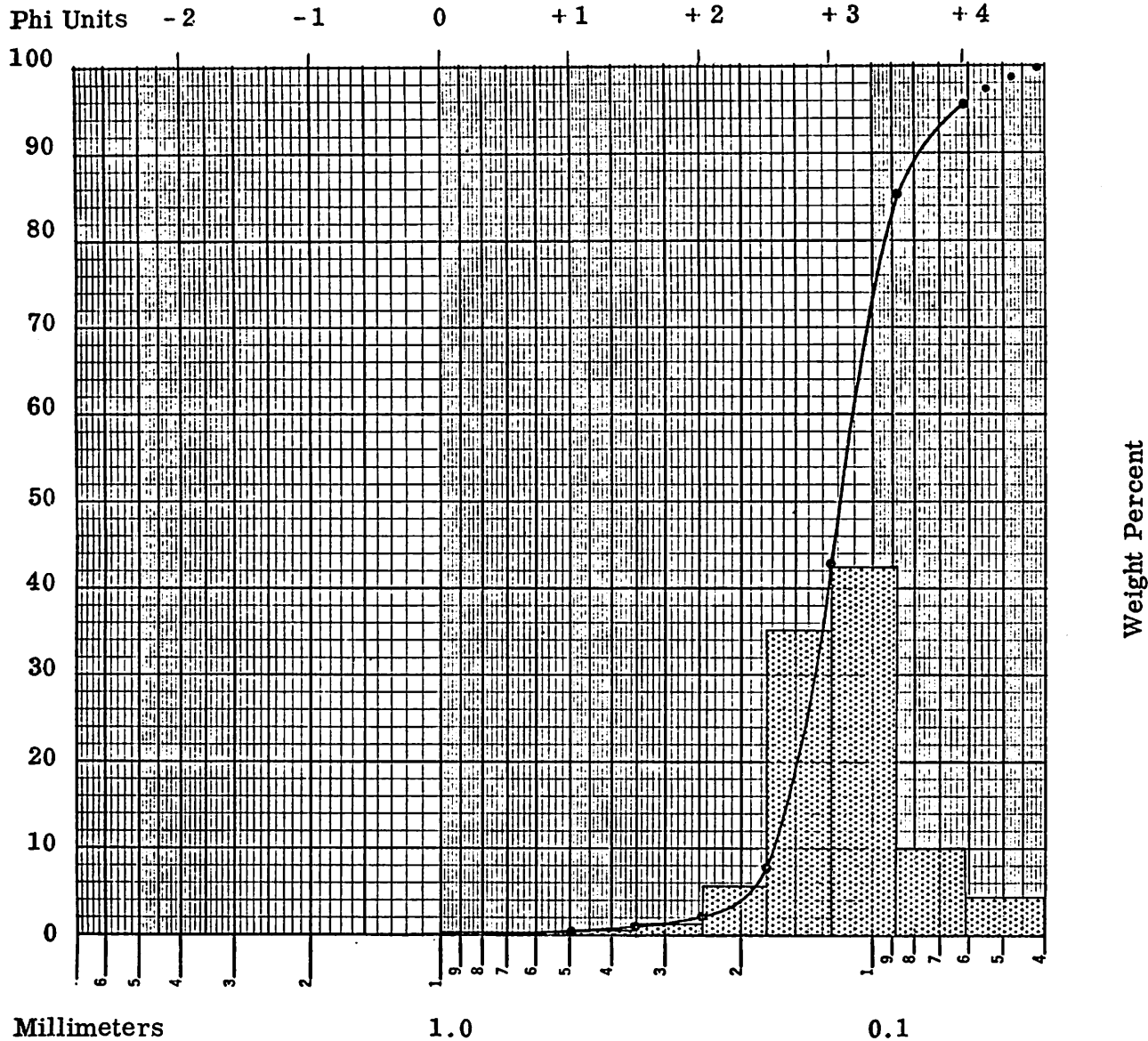
SIZE PARAMETERS

1st Mode <u>0.124 - 0.088 mm</u>	Q ₂₅ <u>0.14 mm</u>	Sorting Coef. <u>1.12</u>
2nd Mode _____	Median: Q ₅₀ <u>0.12 mm</u>	Skewness <u>0.99</u>
3rd Mode _____	Q ₇₅ <u>0.11 mm</u>	Kurtosis <u>0.18</u>

SIZE ANALYSIS

Sample 1981
 Lat. 37°54'7" Long. 122°39'56"
 Depth 4.17 Fathoms
7.62 Meters
25.00 Feet

Sample description Very fine, gray brown sand with 5-10% shell fragments
 Sample Weight 157.08 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.14 mm Sorting Coef. 1.18
 2nd Mode _____ Median: Q_{50} 0.12 mm Skewness 0.96
 3rd Mode _____ Q_{75} 0.10 mm Kurtosis 0.22

Sample 1982

Sample description Very fine, gray

Lat. 37°54' Long. 122°39'43"

brown silty sand with 5% shell

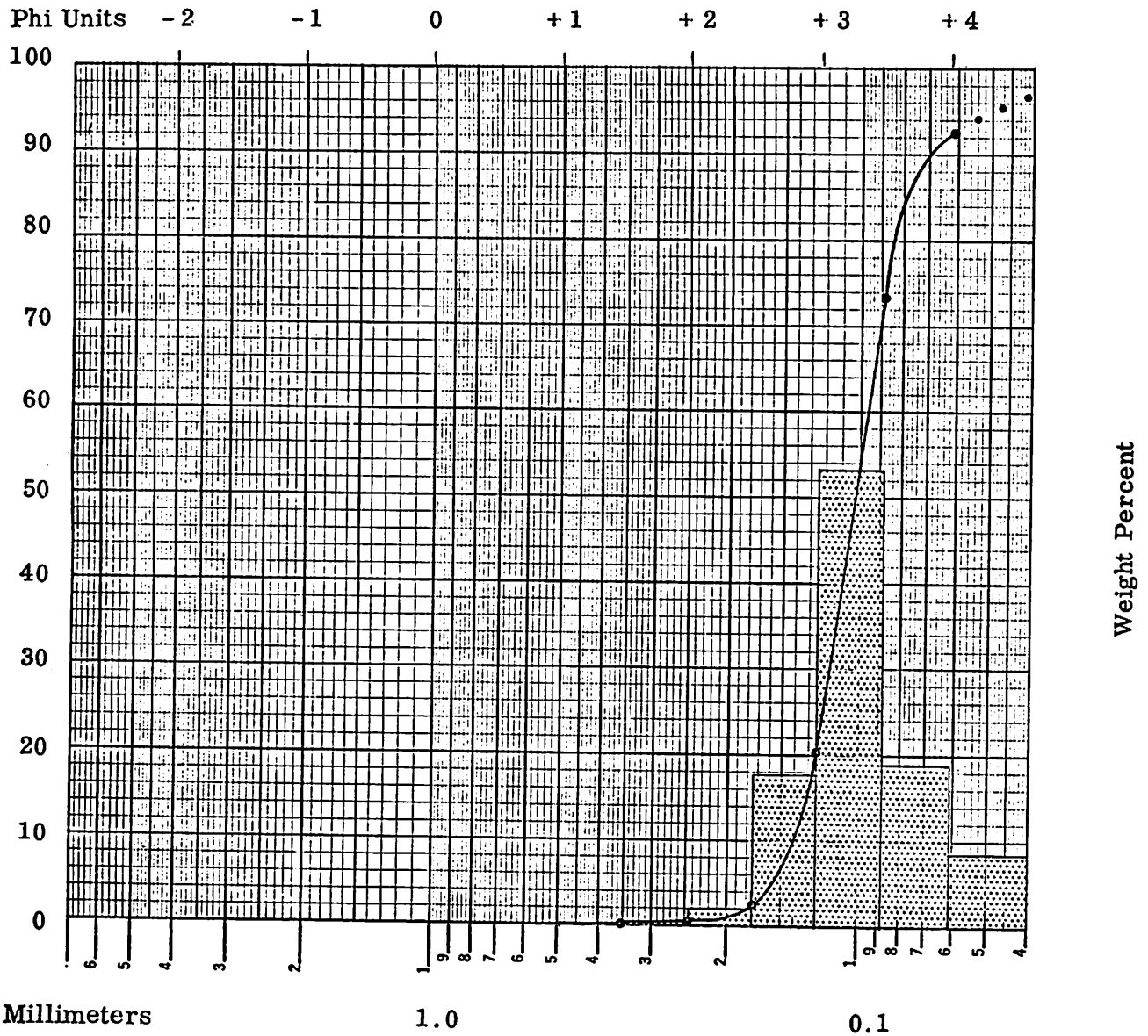
Depth 4.83 Fathoms

fragments

8.84 Meters

29.00 Feet

Sample Weight 196.92 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.18
 2nd Mode _____ Median: Q_{50} 0.10 mm Skewness 1.00
 3rd Mode _____ Q_{75} 0.09 mm Kurtosis 0.25

SIZE ANALYSIS

Sample 1983

Sample description Very fine, gray

Lat. 37°53'51" Long. 122°39'25"

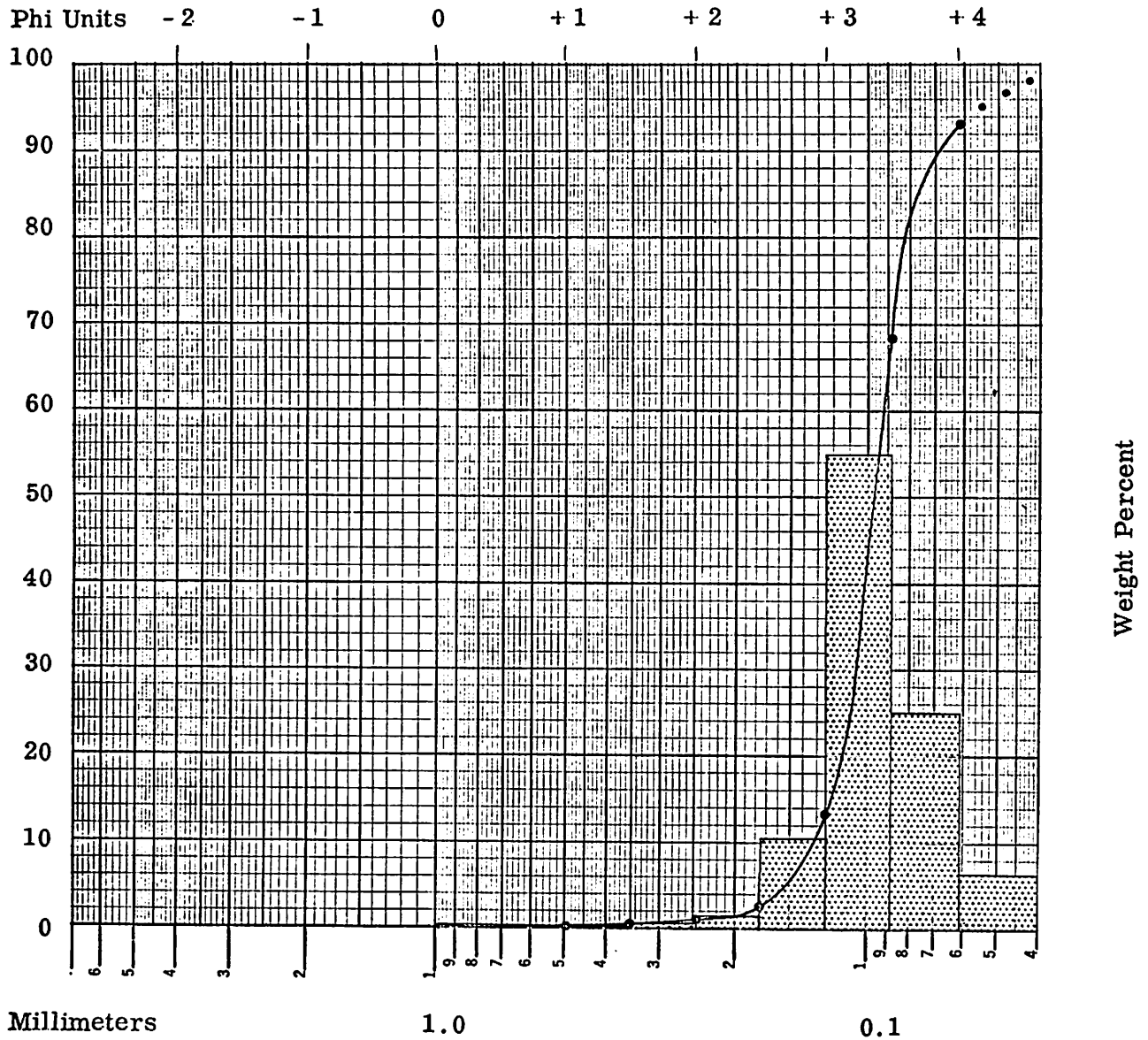
silty sand, few shell fragments

Depth 5.33 Fathoms

9.75 Meters

32.00 Feet

Sample Weight 94.07 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.11 mm Sorting Coef. 1.15
 2nd Mode _____ Median: Q_{50} 0.10 mm Skewness 0.93
 3rd Mode _____ Q_{75} 0.08 mm Kurtosis 0.21

SIZE ANALYSIS

Sample 1984

Sample description Very fine, gray

Lat. 37°53'42" Long. 122°39'3"

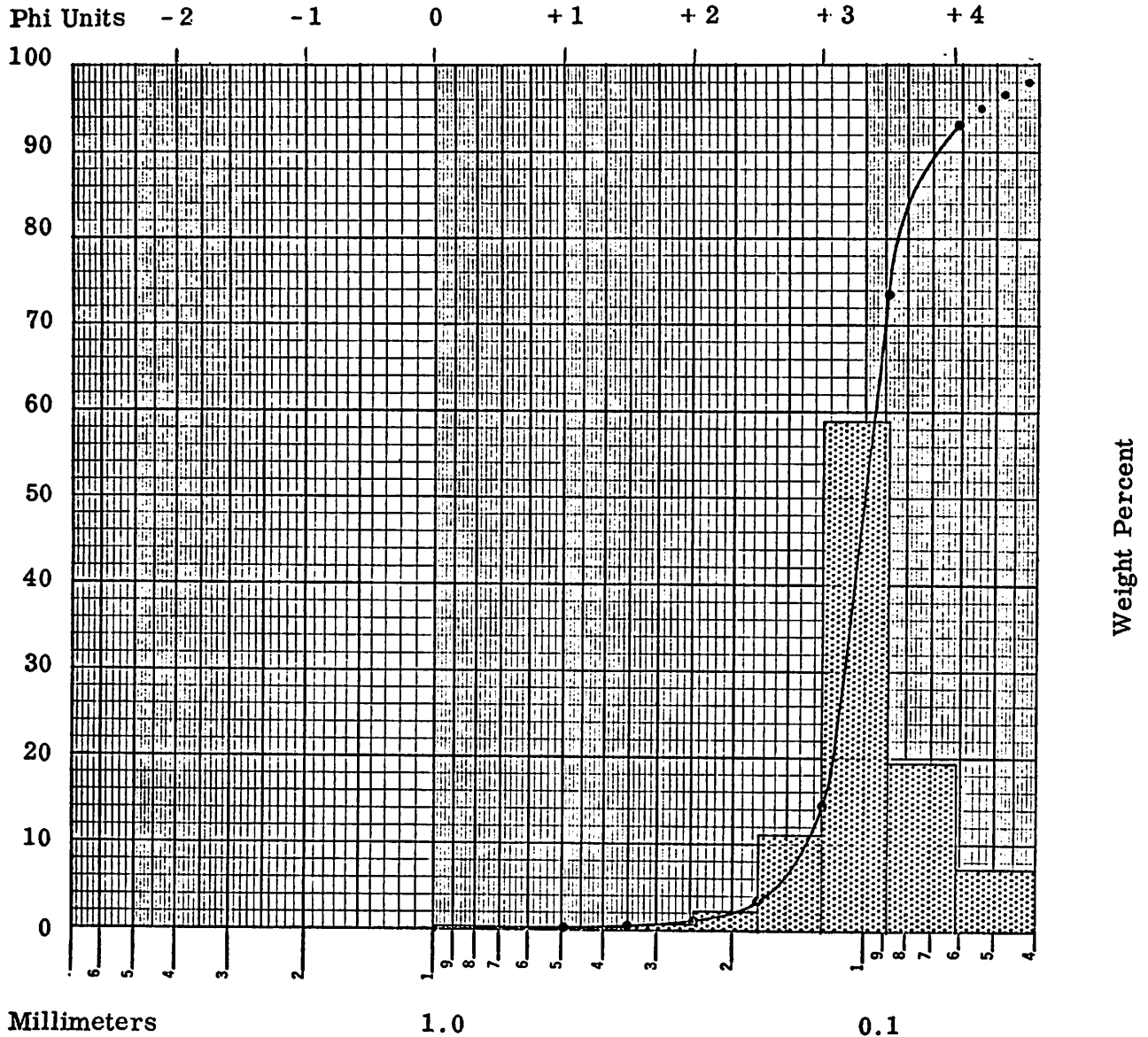
brown silty sand

Depth 6.33 Fathoms

11.58 Meters

38.00 Feet

Sample Weight 114.88 gms



SIZE PARAMETERS

1st Mode <u>0.124 - 0.088</u>	Q ₂₅ <u>0.11 mm</u>	Sorting Coef. <u>1.14</u>
2nd Mode _____	Median: Q ₅₀ <u>0.10 mm</u>	Skewness <u>0.93</u>
3rd Mode _____	Q ₇₅ <u>0.09 mm</u>	Kurtosis <u>0.19</u>

Sample 1985

Sample description Very fine, gray-tan silty sand

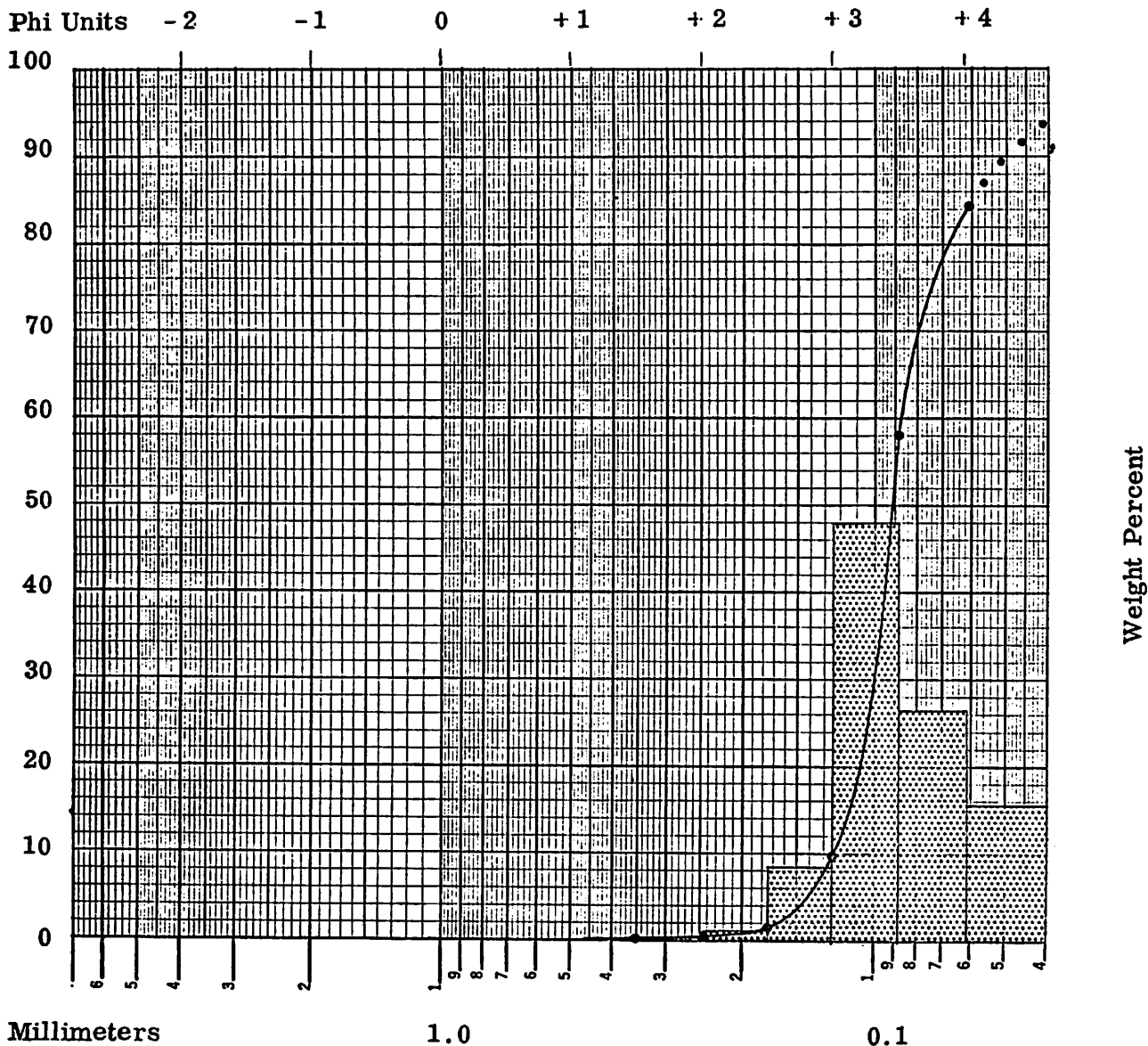
Lat. 37°53'25" Long. 122°38'44"

Depth 7.00 Fathoms

12.80 Meters

42.00 Feet

Sample Weight 70.01 gms



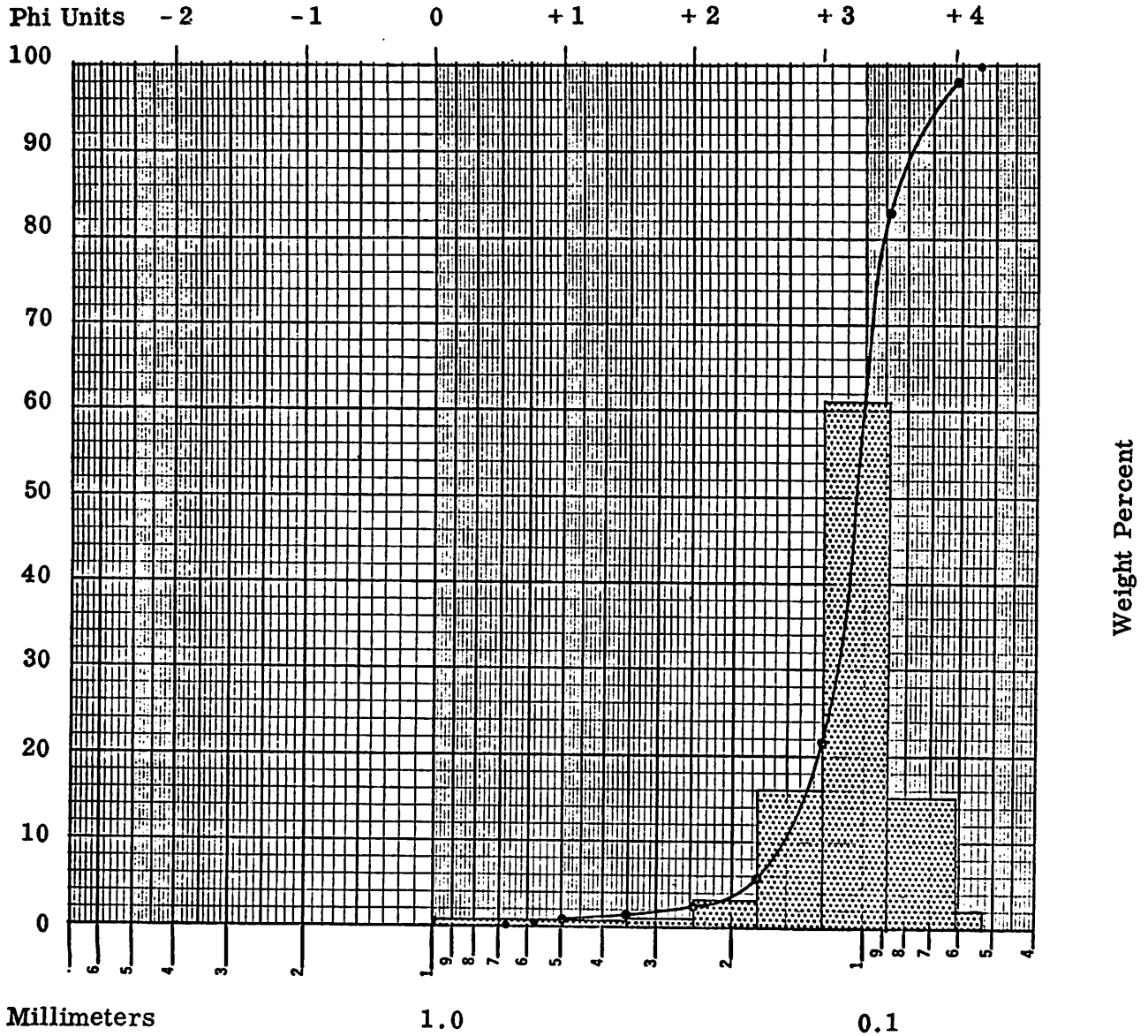
SIZE PARAMETERS

1st Mode <u>0.124 - 0.088 mm</u>	Q ₂₅ <u>0.10 mm</u>	Sorting Coef. <u>1.19</u>
2nd Mode _____	Median: Q ₅₀ <u>0.09 mm</u>	Skewness <u>0.87</u>
3rd Mode _____	Q ₇₅ <u>0.07 mm</u>	Kurtosis <u>0.20</u>

SIZE ANALYSIS

Sample 1986
 Lat. 37°53'10" Long. 122°38'13"
 Depth 7.00 Fathoms
12.80 Meters
42.00 Feet

Sample description Very fine, gray
sand
 Sample Weight 24.73 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.13
 2nd Mode _____ Median: Q_{50} 0.11 mm Skewness 1.01
 3rd Mode _____ Q_{75} 0.09 mm Kurtosis 0.19

Sample 1987

Sample description Very fine, gray

Lat. 37°52'58" Long. 122°37'58"

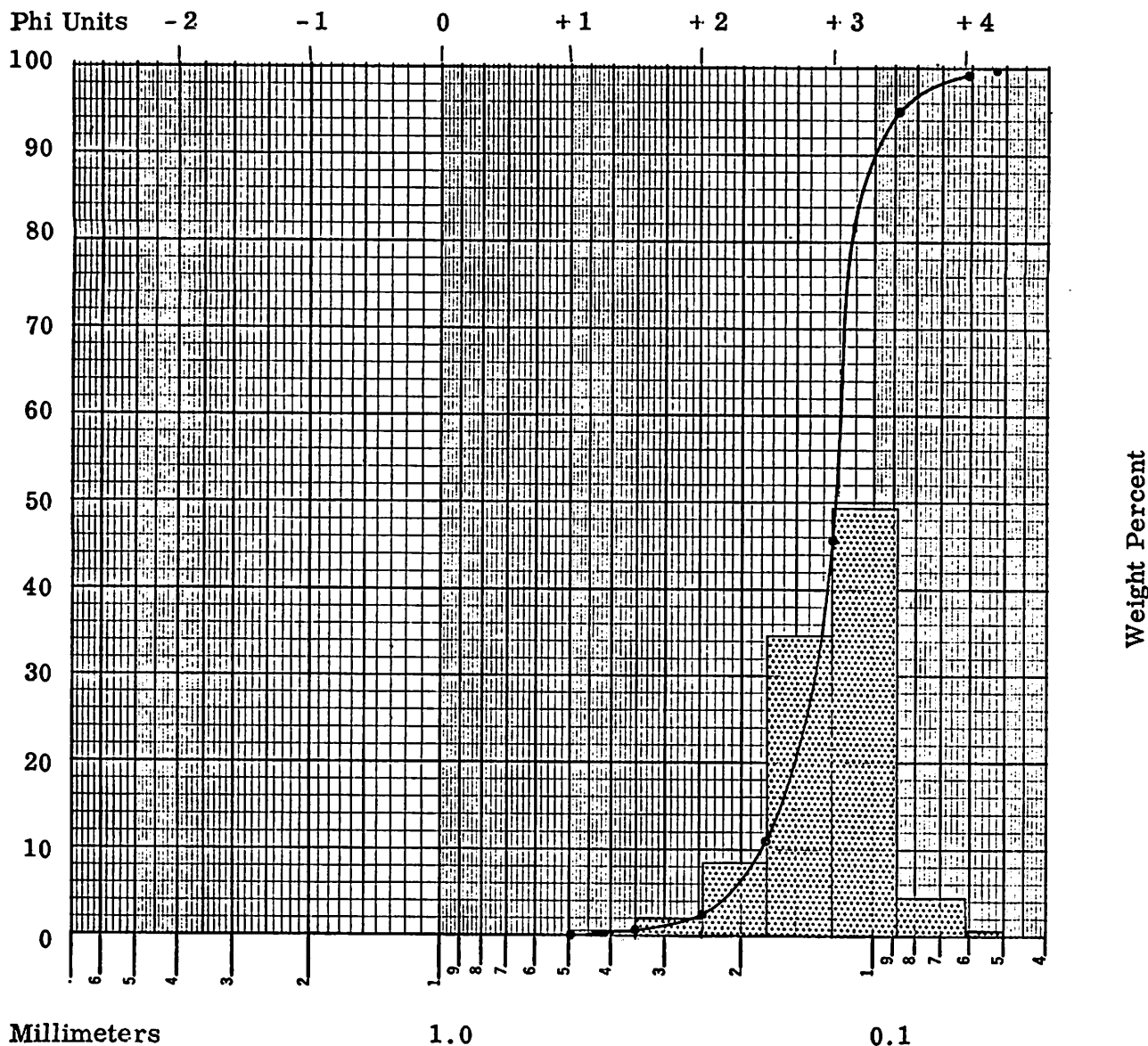
sand, with 5-10% shell fragments

Depth 6.83 Fathoms

12.50 Meters

41.00 Feet

Sample Weight 82.71 gms



SIZE PARAMETERS

1st Mode <u>0.124 - 0.088</u> mm	Q ₂₅ <u>0.14</u> mm	Sorting Coef. <u>1.10</u>
2nd Mode _____	Median: Q ₅₀ <u>0.12</u> mm	Skewness <u>1.06</u>
3rd Mode _____	Q ₇₅ <u>0.12</u> mm	Kurtosis <u>0.16</u>

SIZE ANALYSIS

Sample 1989

Sample description Fine, light gray-

Lat. 37°52'33" Long. 122°37'44"

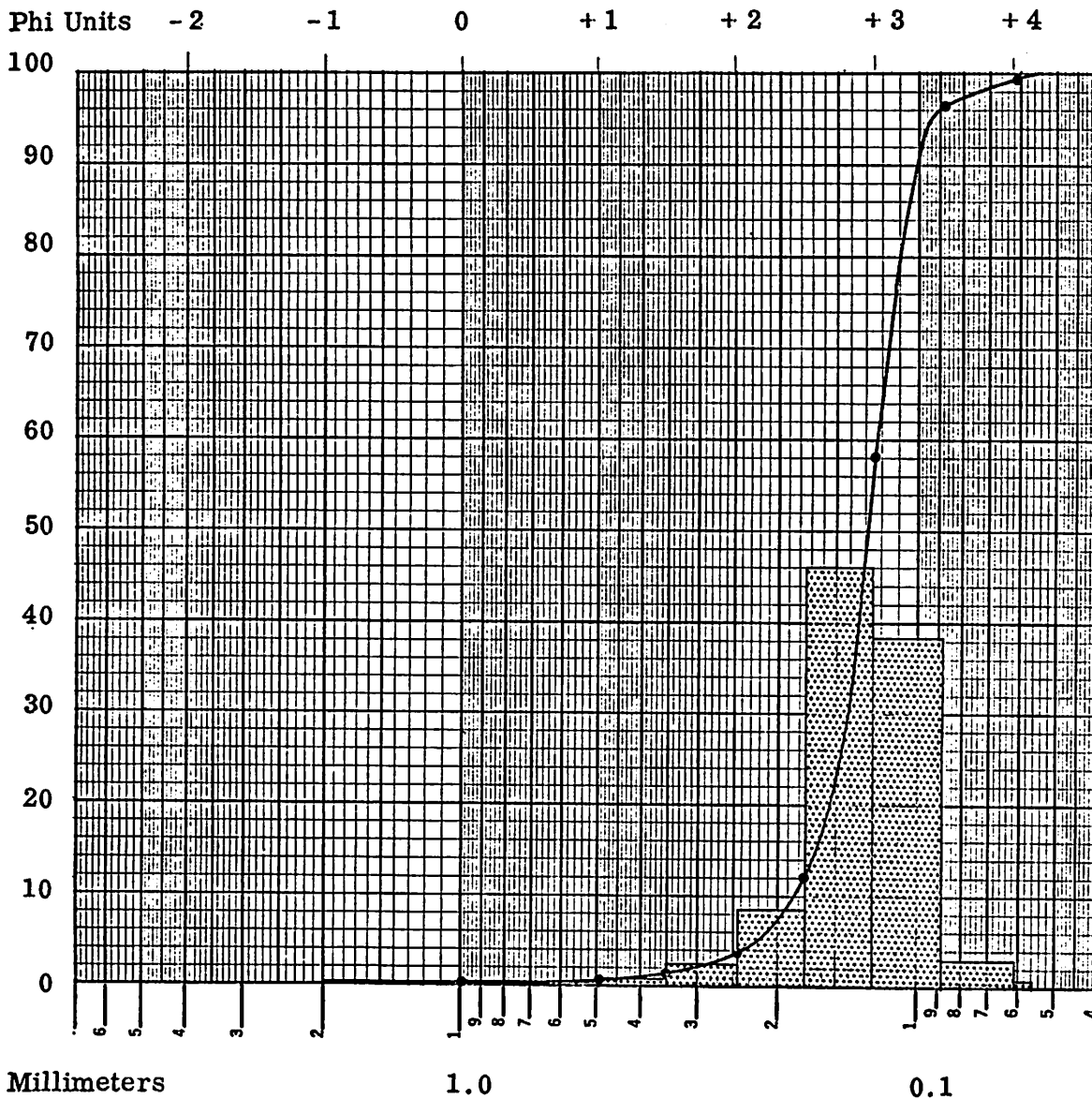
tan sand with 5-10% shell fragments

Depth 8.50 Fathoms

15.53 Meters

51.00 Feet

Sample Weight 148.36 gms

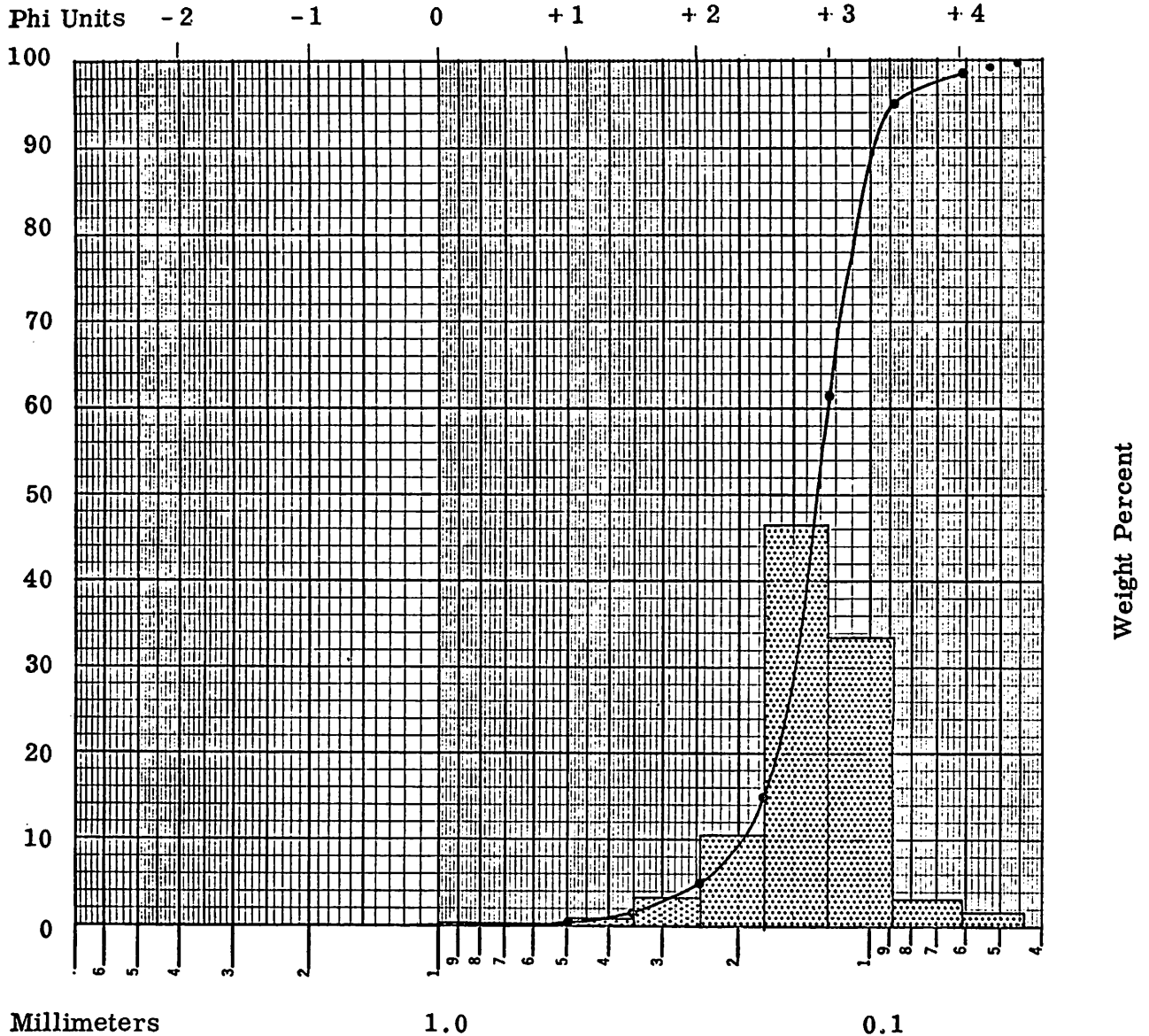


SIZE PARAMETERS

1st Mode	<u>0.175 - 0.124 mm</u>	Q ₂₅	<u>0.15 mm</u>	Sorting Coef.	<u>1.13</u>
2nd Mode	<u> </u>	Median: Q ₅₀	<u>0.13 mm</u>	Skewness	<u>1.03</u>
3rd Mode	<u> </u>	Q ₇₅	<u>0.11 mm</u>	Kurtosis	<u>0.19</u>

Sample 1990
 Lat. 37°52'45" Long. 122°37'57"
 Depth 8.33 Fathoms
15.22 Meters
50.00 Feet

Sample description Fine, gray sand
with 5-10% shell fragments
 Sample Weight 140.29 gms



SIZE PARAMETERS

1st Mode 0.175 - 0.124 mm Q_{25} 0.15 mm Sorting Coef. 1.15
 2nd Mode _____ Median: Q_{50} 0.13 mm Skewness 1.01
 3rd Mode _____ Q_{75} 0.11 mm Kurtosis 0.18

Sample 1991

Sample description Very fine gray-

Lat. 37°53' Long. 122°38'12"

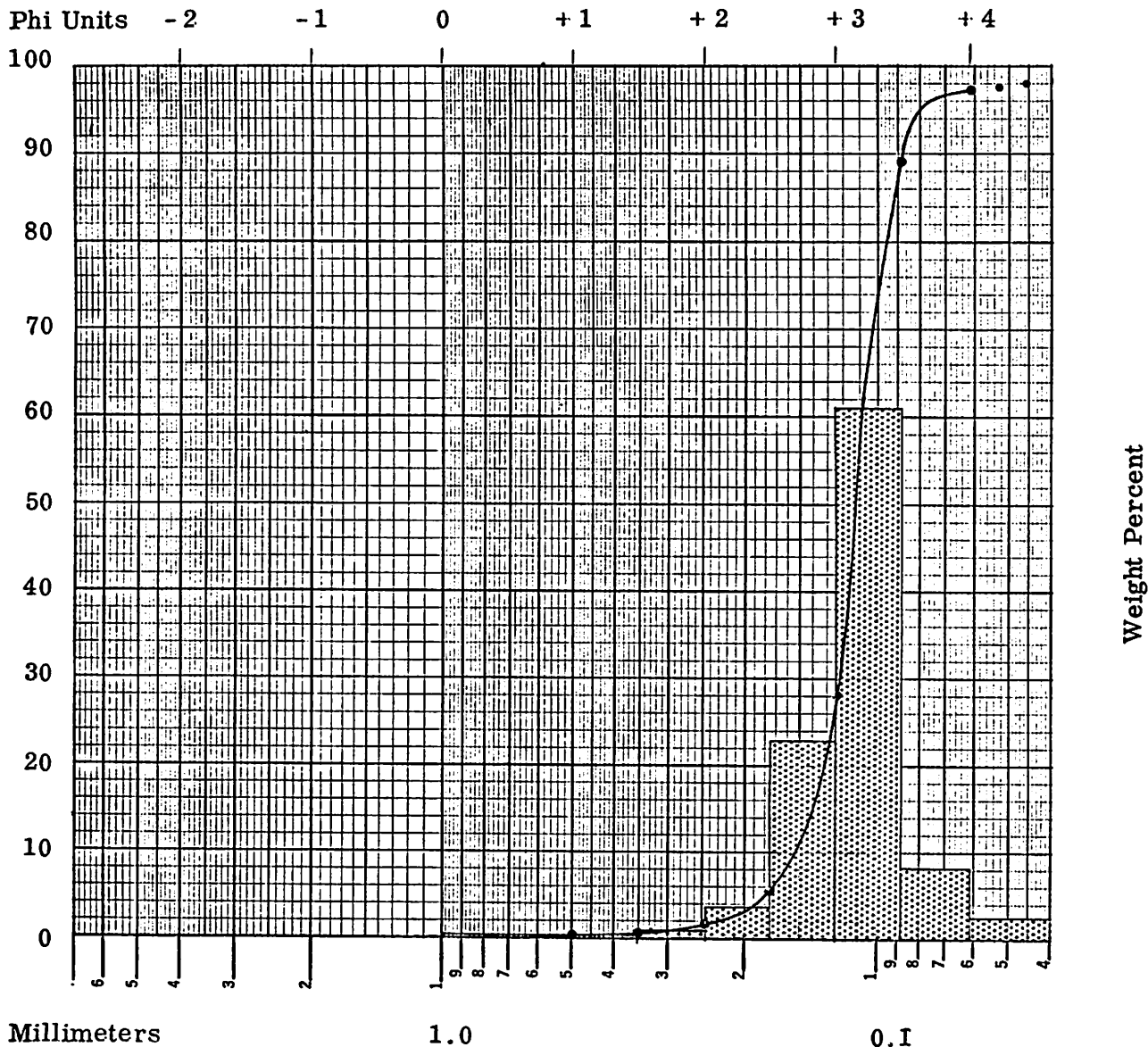
brown sand

Depth 8.33 Fathoms

15.22 Meters

50.00 Feet

Sample Weight 98.59 gms



SIZE PARAMETERS

1st Mode <u>0.124 - 0.088 mm</u>	Q ₂₅ <u>0.13 mm</u>	Sorting Coef. <u>1.16</u>
2nd Mode _____	Median: Q ₅₀ <u>0.11 mm</u>	Skewness <u>1.02</u>
3rd Mode _____	Q ₇₅ <u>0.10 mm</u>	Kurtosis <u>0.24</u>

Sample 1992

Sample description Very fine, dark gray silty sand

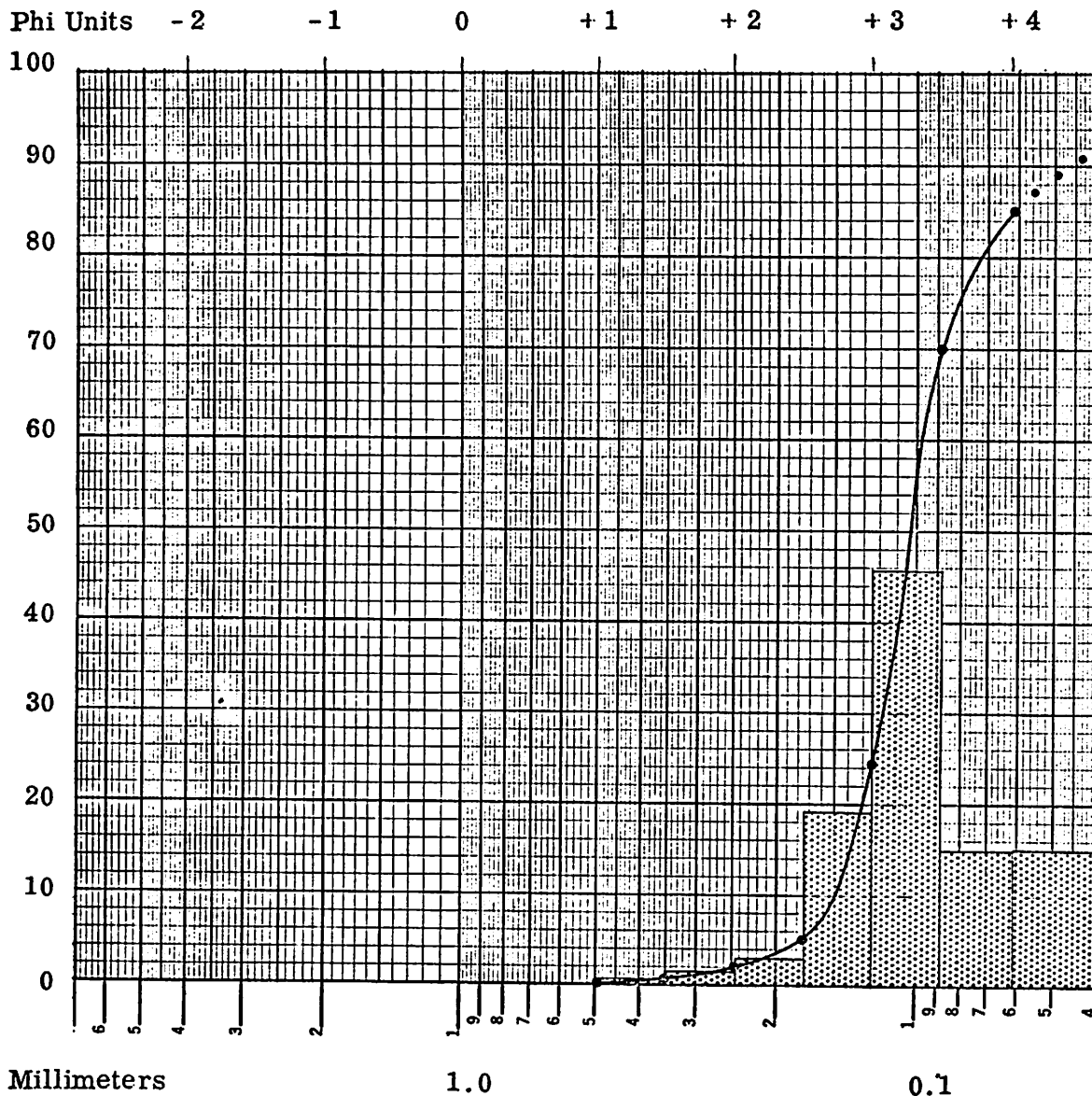
Lat. 37°53'12" Long. 122°38'31"

Depth 8.17 Fathoms

14.93 Meters

49.00 Feet

Sample Weight 167.27 gms



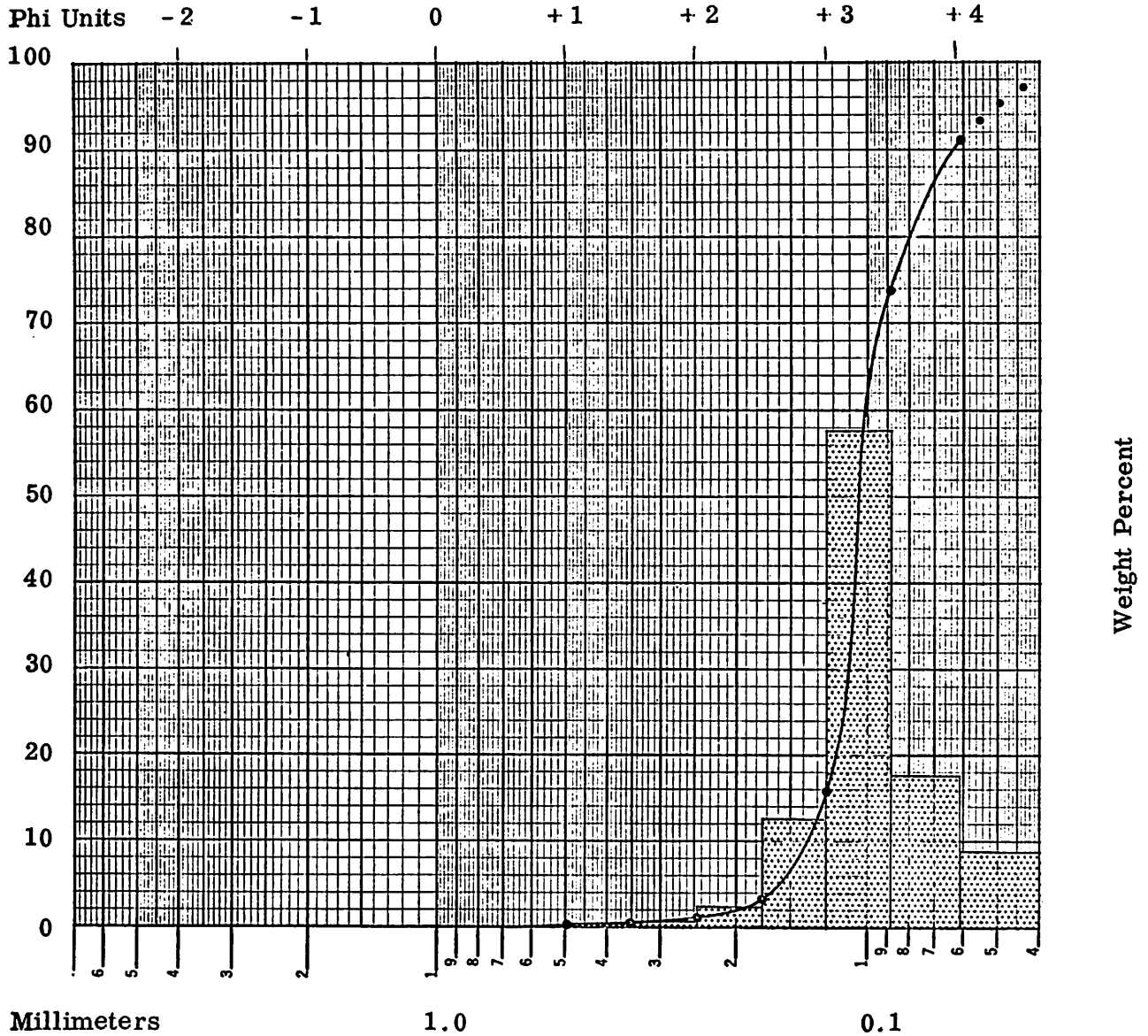
SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.17
 2nd Mode _____ Median: Q_{50} 0.11 mm Skewness 1.02
 3rd Mode _____ Q_{75} 0.09 mm Kurtosis 0.16

SIZE ANALYSIS

Sample 1993
 Lat. 37°53'29" Long. 122°39'
 Depth 7.33 Fathoms
13.41 Meters
44.00 Feet

Sample description Very fine, silty
dark gray sand
 Sample Weight 100.40 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q₂₅ 0.11 mm Sorting Coef. 1.15
 2nd Mode _____ Median: Q₅₀ 0.10 mm Skewness 0.91
 3rd Mode _____ Q₇₅ 0.09 mm Kurtosis 0.19

Sample 1994

Sample description Very fine, gray

Lat. 37°53'41" Long. 122°39'21"

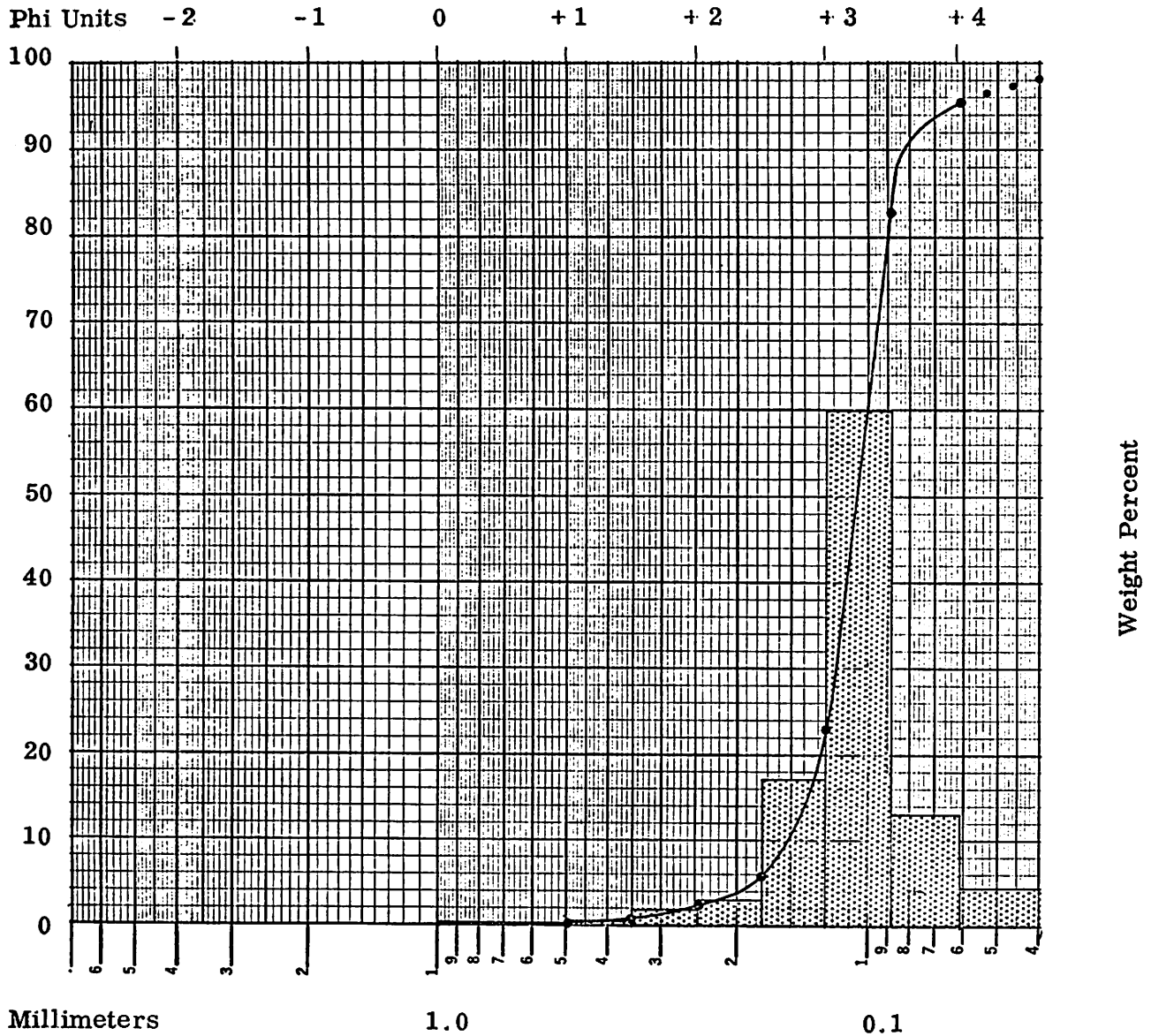
sand

Depth 6.50 Fathoms

11.88 Meters

39.00 Feet

Sample Weight 235.11 gms



SIZE PARAMETERS

1st Mode <u>0.124 - 0.088 mm</u>	Q_{25} <u>0.12 mm</u>	Sorting Coef. <u>1.15</u>
2nd Mode _____	Median: Q_{50} <u>0.11 mm</u>	Skewness <u>1.00</u>
3rd Mode _____	Q_{75} <u>0.09 mm</u>	Kurtosis <u>0.21</u>

SIZE ANALYSIS

Sample 1995

Sample description Very fine, silty

Lat. 37°53'47" Long. 122°39'41"

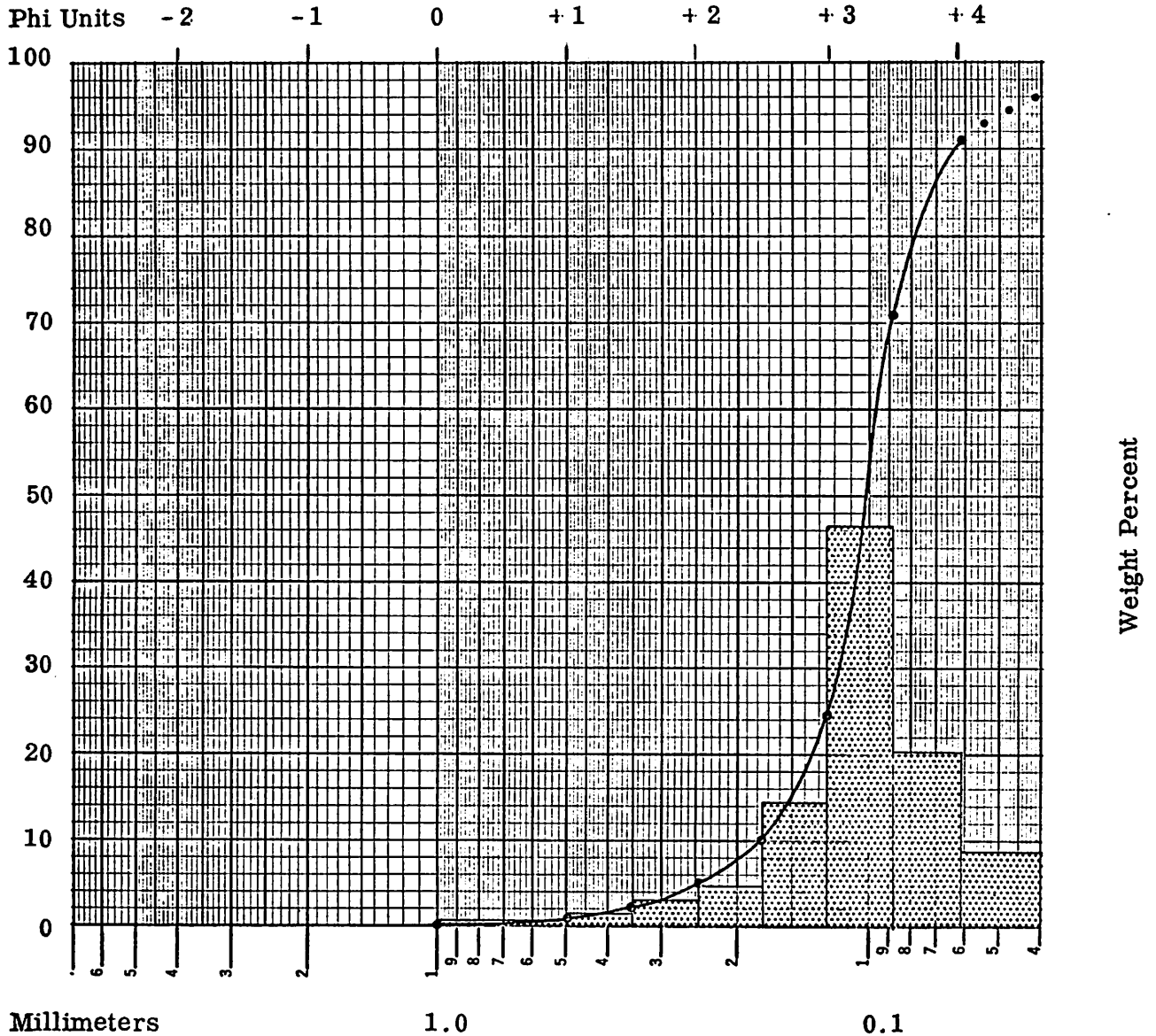
gray sand with 10% shell fragments

Depth 6.00 Fathoms

10.98 Meters

36.00 Feet

Sample Weight 146.81 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.19
 2nd Mode _____ Median: Q_{50} 0.10 mm Skewness 1.09
 3rd Mode _____ Q_{75} 0.09 mm Kurtosis 0.16

SIZE ANALYSIS

Sample 1996

Sample description Very fine gray sand with 5% shell fragments

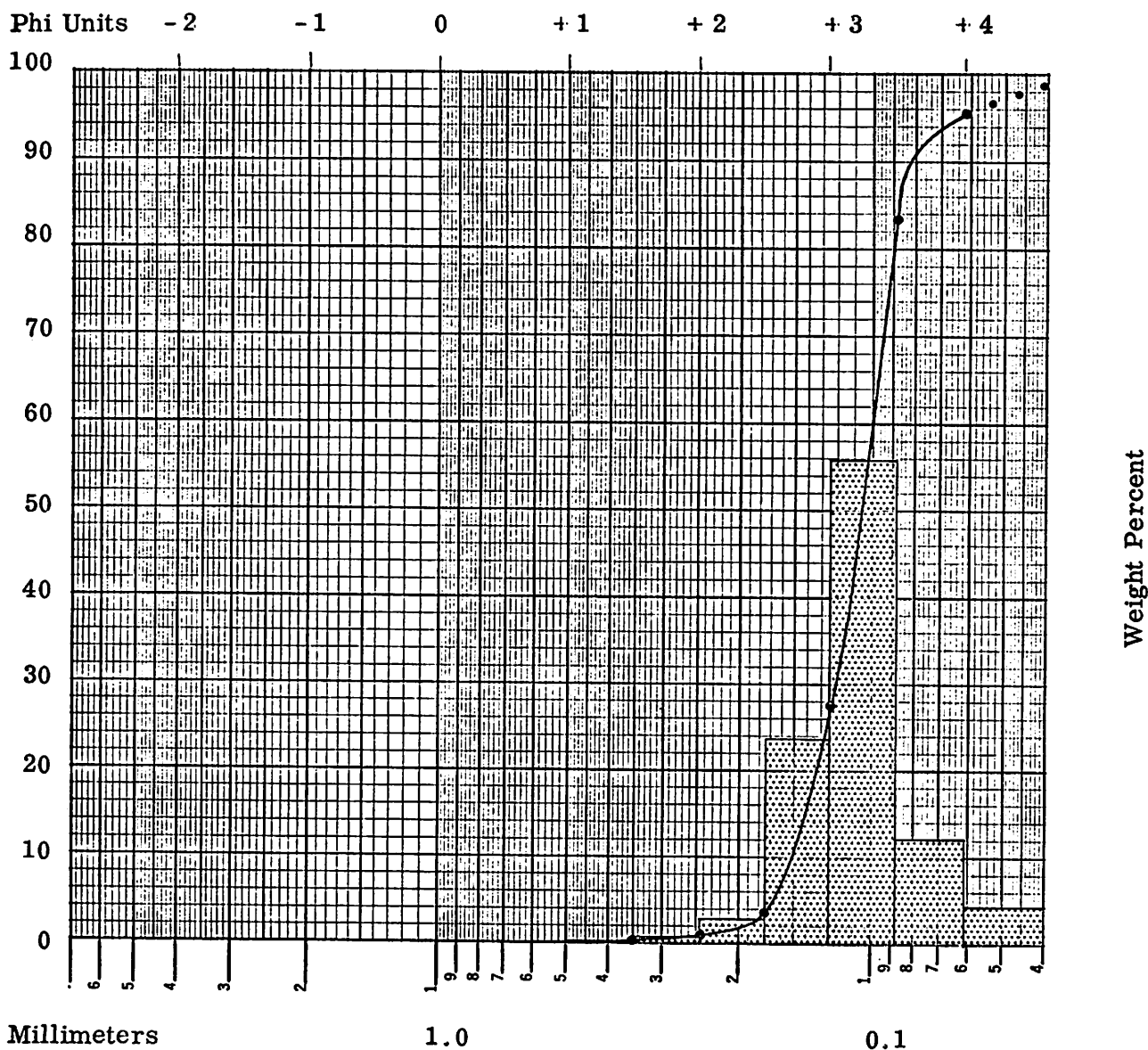
Lat. 37°53'44" Long. 122°39'53"

Depth 6.00 Fathoms

10.98 Meters

36.00 Feet

Sample Weight 260.99 gms



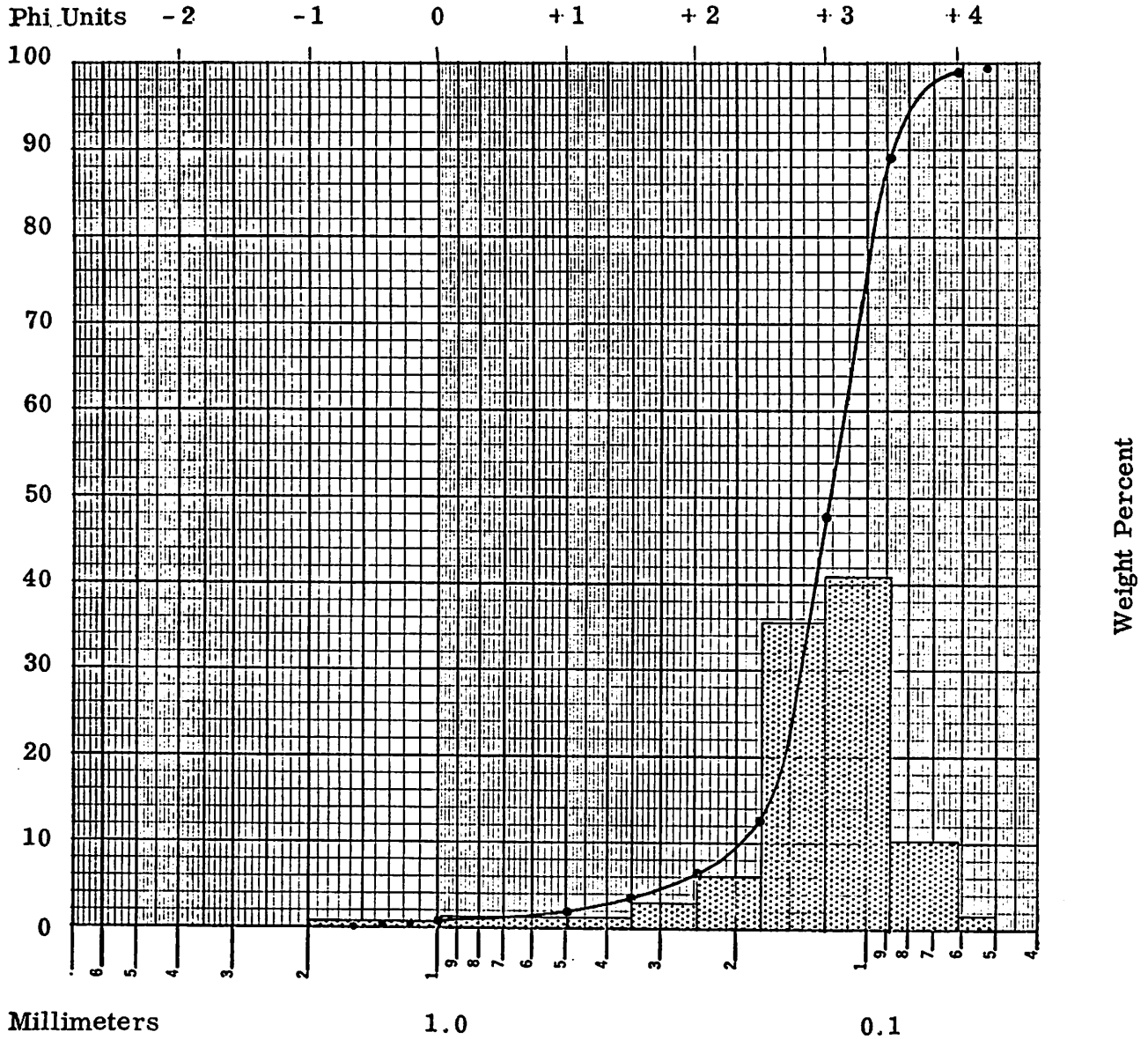
SIZE PARAMETERS

1st Mode <u>0.124 - 0.088 mm</u>	Q ₂₅ <u>0.13 mm</u>	Sorting Coef. <u>1.17</u>
2nd Mode _____	Median: Q ₅₀ <u>0.11 mm</u>	Skewness <u>0.99</u>
3rd Mode _____	Q ₇₅ <u>0.09 mm</u>	Kurtosis <u>0.25</u>

SIZE ANALYSIS

Sample 1997
 Lat. 37°53'45" Long. 122°40'20"
 Depth 4.33 Fathoms
7.93 Meters
26.00 Feet

Sample description Very fine gray-
tan sand with small dark pebbles
and 10% shell fragments
 Sample Weight 144.97 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q₂₅ 0.14 mm Sorting Coef. 1.17
 2nd Mode _____ Median: Q₅₀ 0.12 mm Skewness 0.99
 3rd Mode _____ Q₇₅ 0.10 mm Kurtosis 0.17

Sample 1999

Sample description Very fine, silty gray-tan sand with a few pebbles

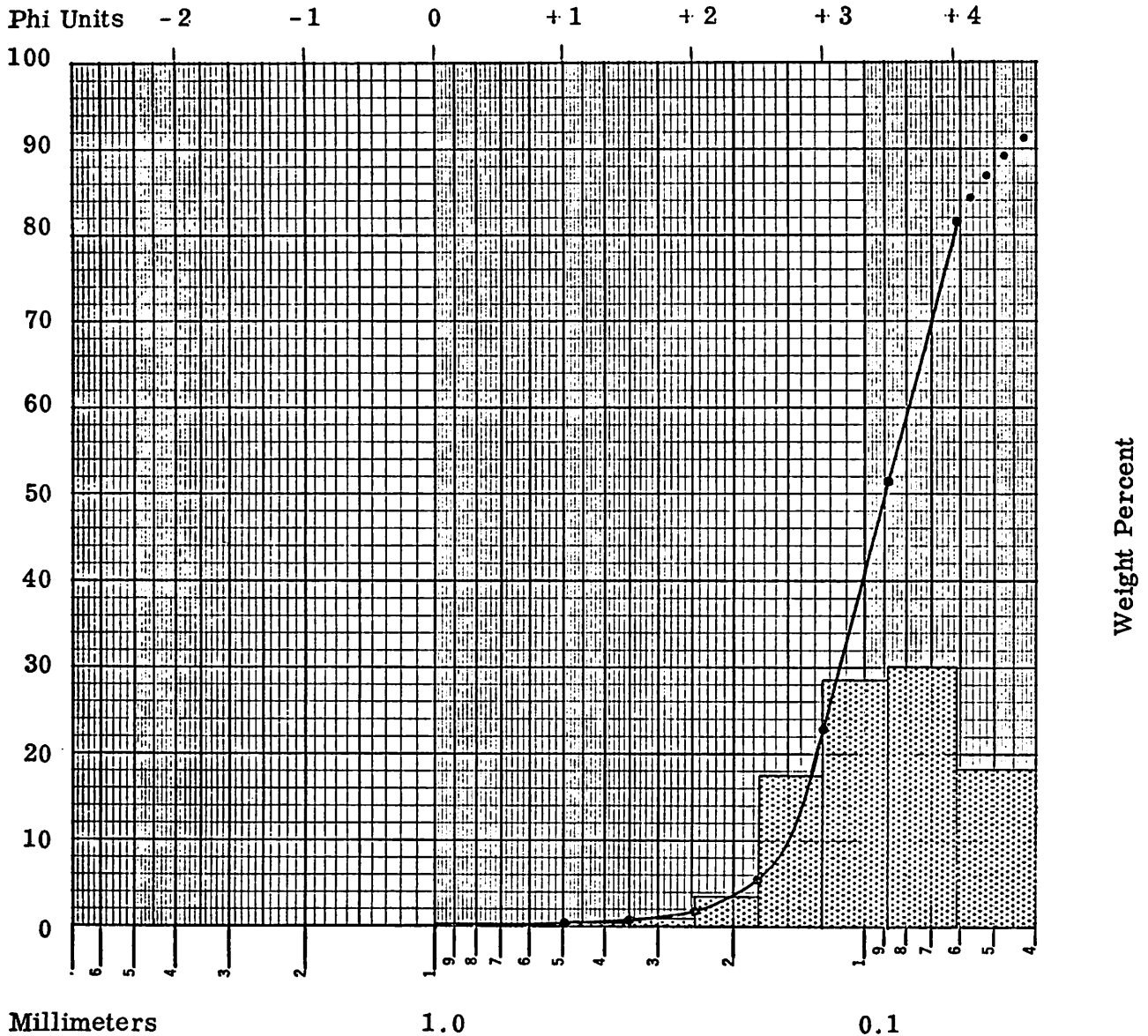
Lat. 37°53'19" Long. 122°40'32"

Depth 6.00 Fathoms

10.98 Meters

36.00 Feet

Sample Weight 98.48 gms



SIZE PARAMETERS

1st Mode 0.088 - 0.061 mm Q₂₅ 0.12 mm Sorting Coef. 1.37
 2nd Mode _____ Median: Q₅₀ 0.09 mm Skewness 1.00
 3rd Mode _____ Q₇₅ 0.07 mm Kurtosis 0.26

Sample 2001

Sample description Very fine, silty

Lat. 37°53'13" Long. 122°40'8"

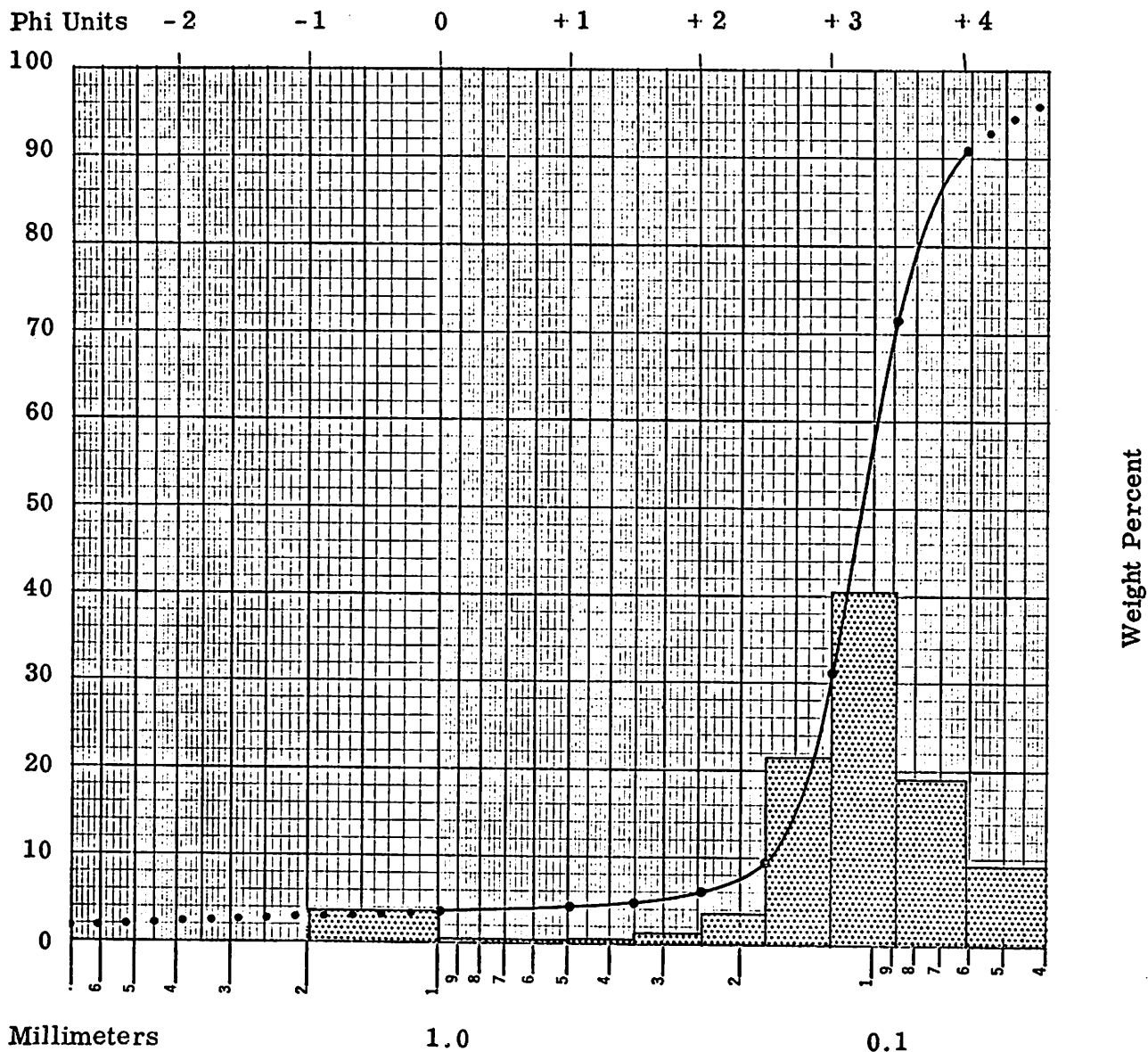
gray sand with a few pebbles

Depth 7.33 Fathoms

13.41 Meters

44.00 Feet

Sample Weight 256.28 gms



SIZE PARAMETERS

1st Mode	<u>0.124 - 0.088 mm</u>	Q ₂₅	<u>0.13 mm</u>	Sorting Coef.	<u>1.25</u>
2nd Mode	<u>>1.981 - 1.981 mm</u>	Median: Q ₅₀	<u>0.11 mm</u>	Skewness	<u>0.98</u>
3rd Mode	<u></u>	Q ₇₅	<u>0.09 mm</u>	Kurtosis	<u>0.22</u>

Sample 2002

Sample description Very fine, silty

Lat. 37°53'31" Long. 122°39'39"

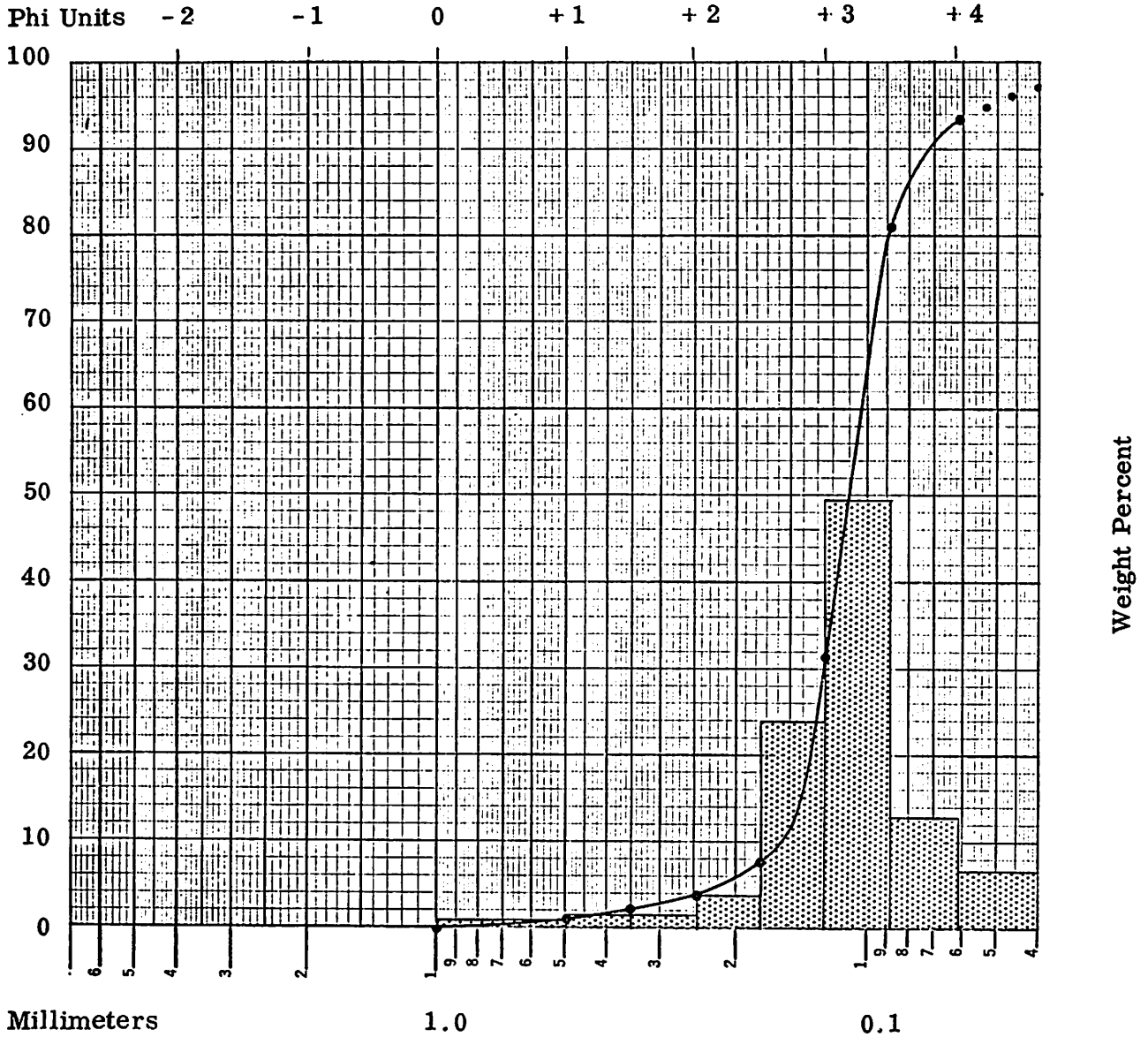
gray-brown sand, <5% shell frag-
ments

Depth 6.67 Fathoms

12.20 Meters

40.00 Feet

Sample Weight 238.41 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.13 mm Sorting Coef. 1.20
 2nd Mode _____ Median: Q_{50} 0.11 mm Skewness 1.05
 3rd Mode _____ Q_{75} 0.09 mm Kurtosis 0.22

SIZE ANALYSIS

Sample 2003

Sample description Very fine, silty

Lat. 37°53'25" Long. 122°39'18"

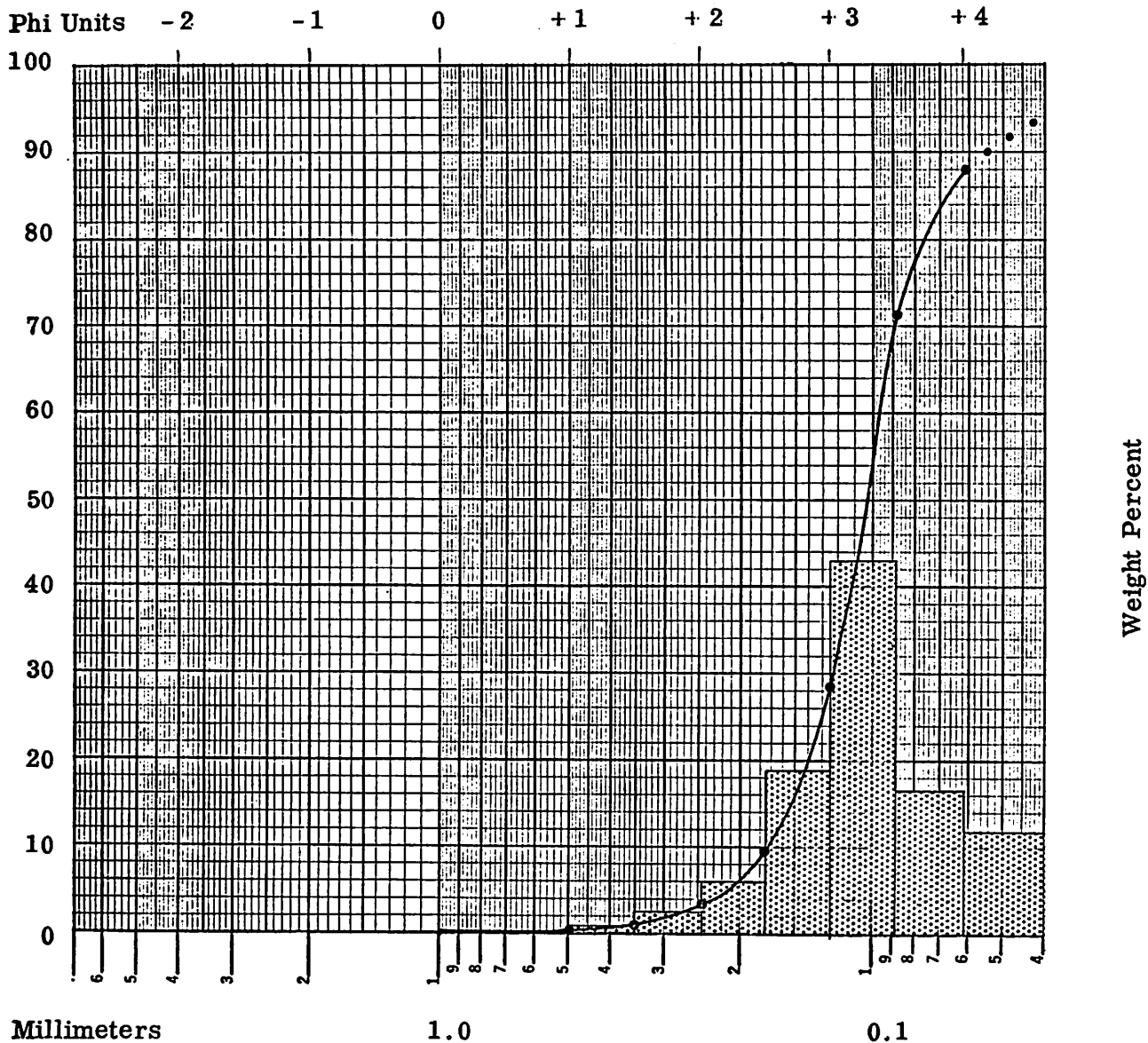
gray sand

Depth 7.50 Fathoms

13.72 Meters

45.00 Feet

Sample Weight 219.76 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm

Q₂₅ 0.13 mm

Sorting Coef. 1.24

2nd Mode _____

Median: Q₅₀ 0.10 mm

Skewness 1.11

3rd Mode _____

Q₇₅ 0.09 mm

Kurtosis 0.18

Sample 2004

Sample description Very fine, silty gray sand

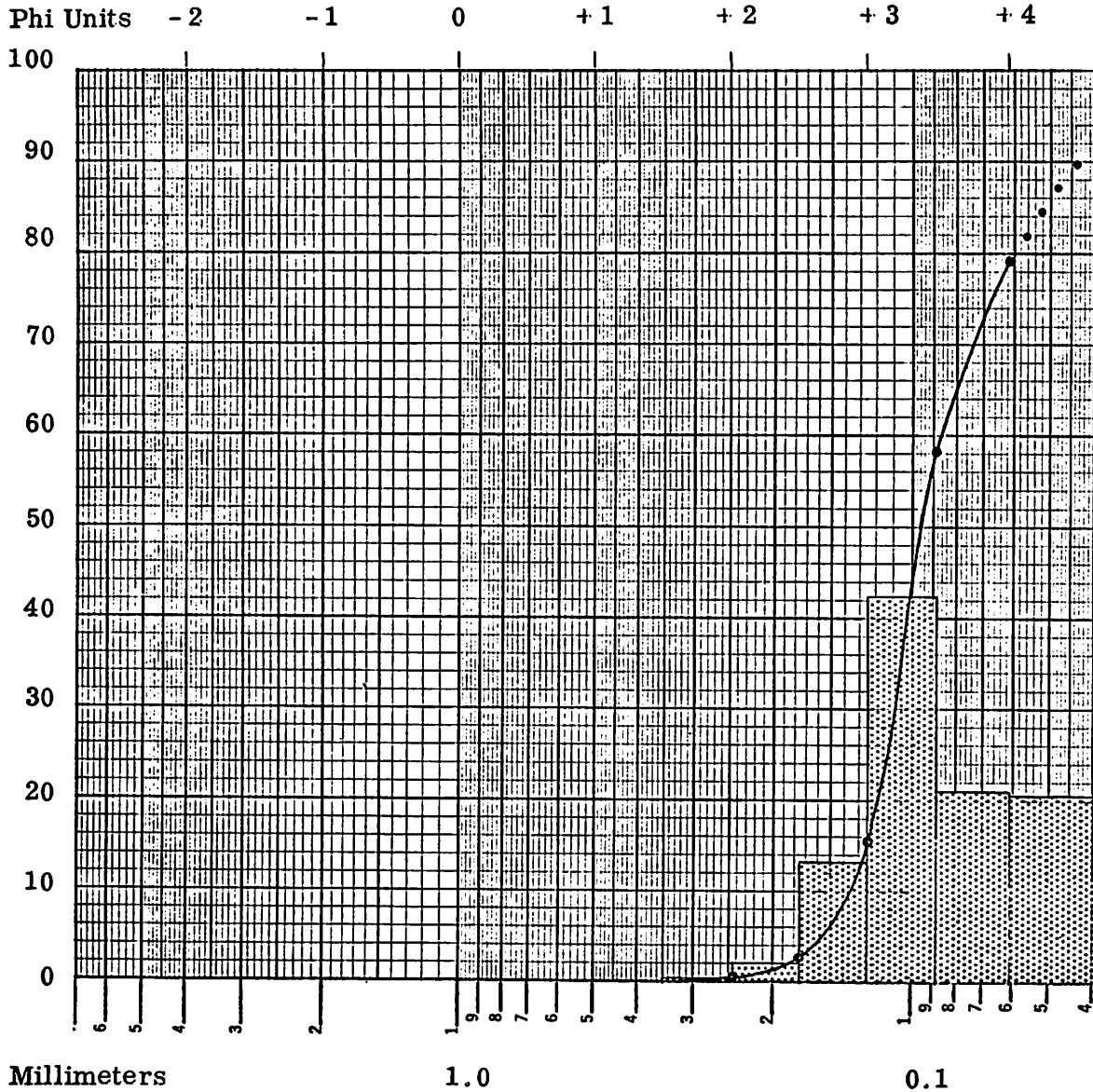
Lat. 37°53'13" Long. 122°38'55"

Depth 8.00 Fathoms

14.64 Meters

48.00 Feet

Sample Weight 223.01 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q₂₅ 0.11 mm Sorting Coef. 1.29
 2nd Mode _____ Median: Q₅₀ 0.10 mm Skewness 0.83
 3rd Mode _____ Q₇₅ 0.07 mm Kurtosis 0.24

Sample 2005

Sample description Very fine, silty gray sand

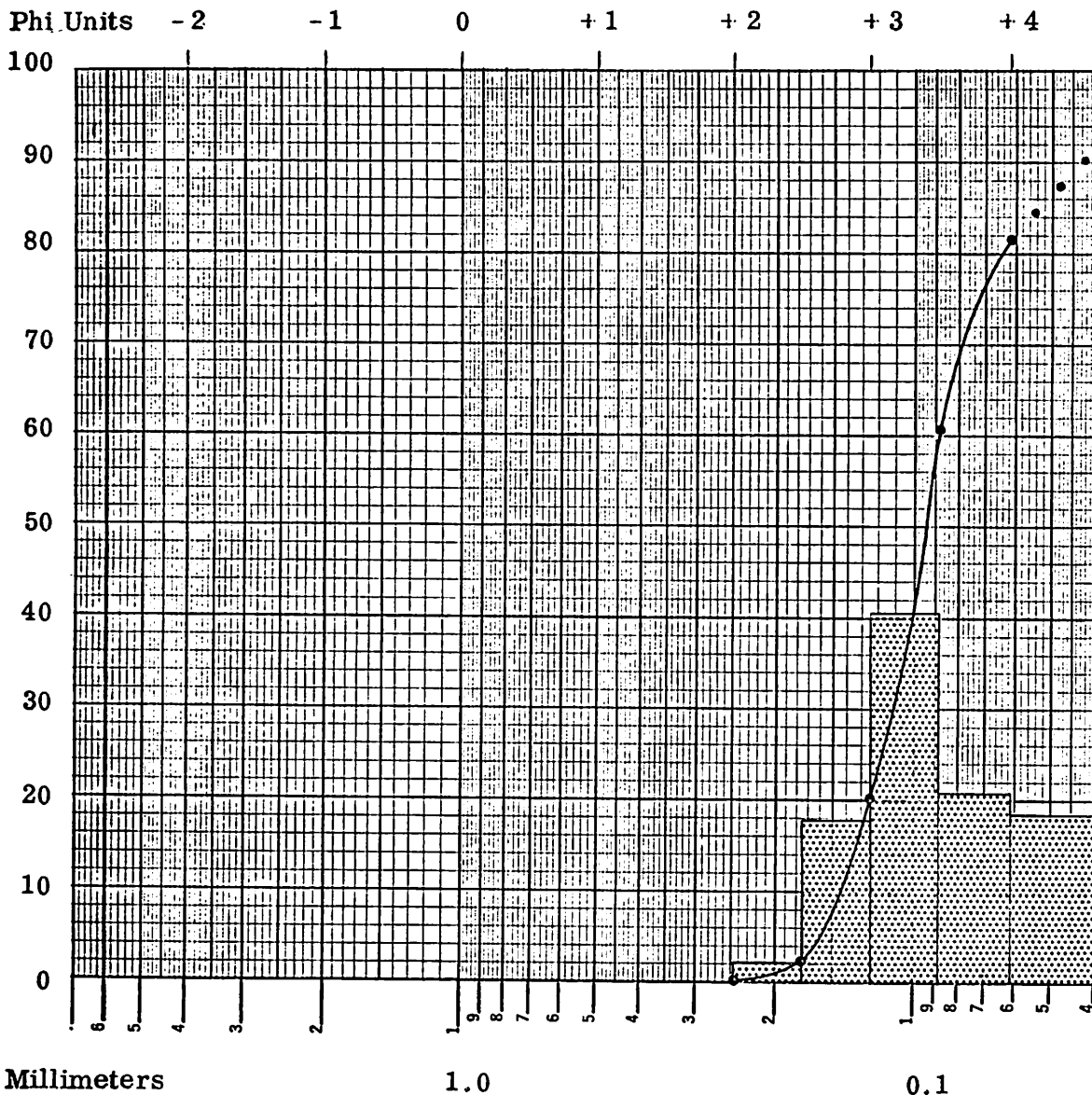
Lat. 37°53'2" Long. 122°38'27"

Depth 8.67 Fathoms

15.86 Meters

52.00 Feet

Sample Weight 206.01 gms



Weight Percent

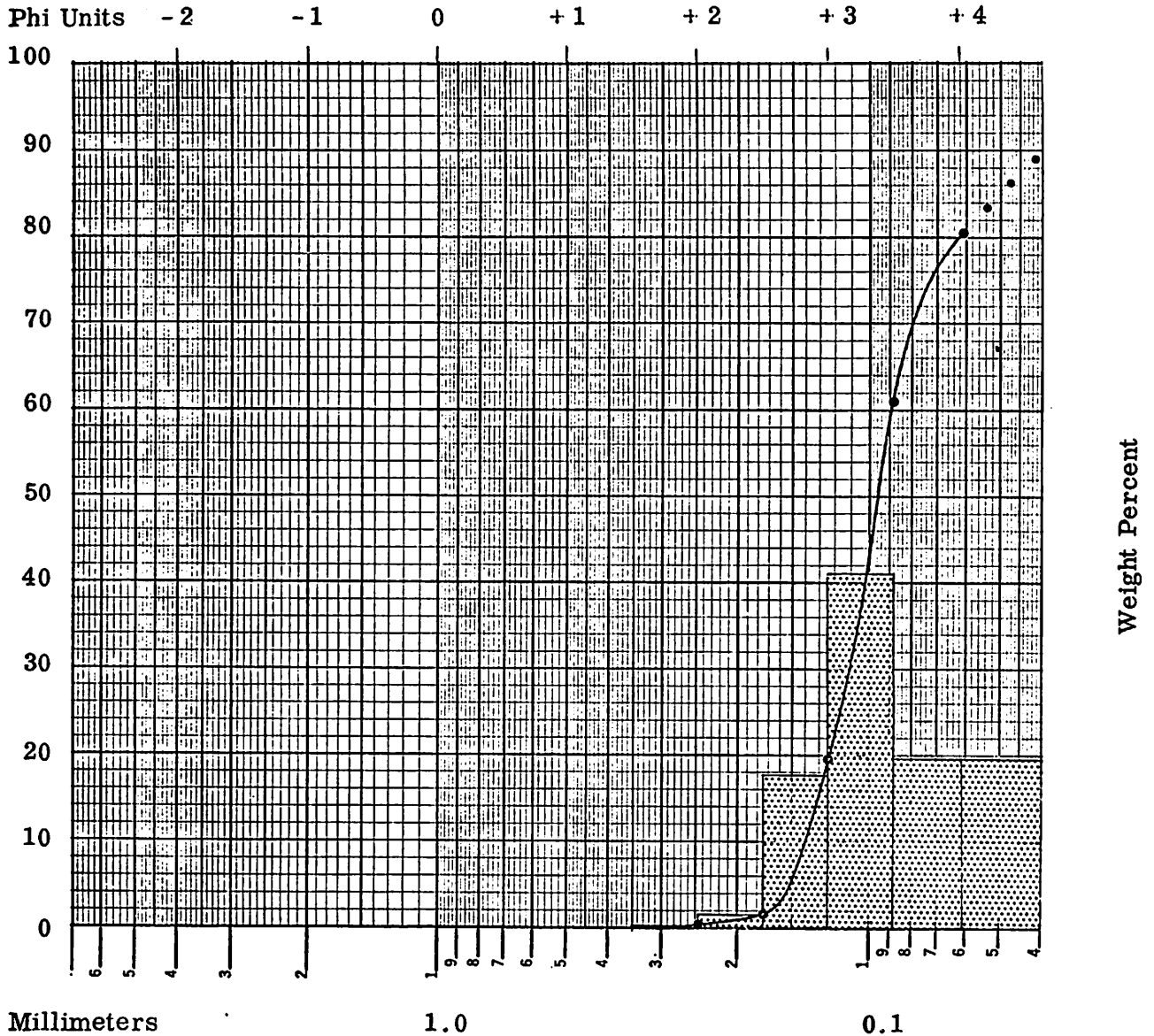
SIZE PARAMETERS

1st Mode <u>0.124 - 0.088 mm</u>	Q ₂₅ <u>0.12 mm</u>	Sorting Coef. <u>1.28</u>
2nd Mode _____	Median: Q ₅₀ <u>0.10 mm</u>	Skewness <u>0.94</u>
3rd Mode _____	Q ₇₅ <u>0.07 mm</u>	Kurtosis <u>0.23</u>

SIZE ANALYSIS

Sample 2006
 Lat. 37°52'48" Long. 122°38'13"
 Depth 9.00 Fathoms
16.48 Meters
54.00 Feet

Sample description Very fine, gray silty sand
 Sample Weight 77.73 gms



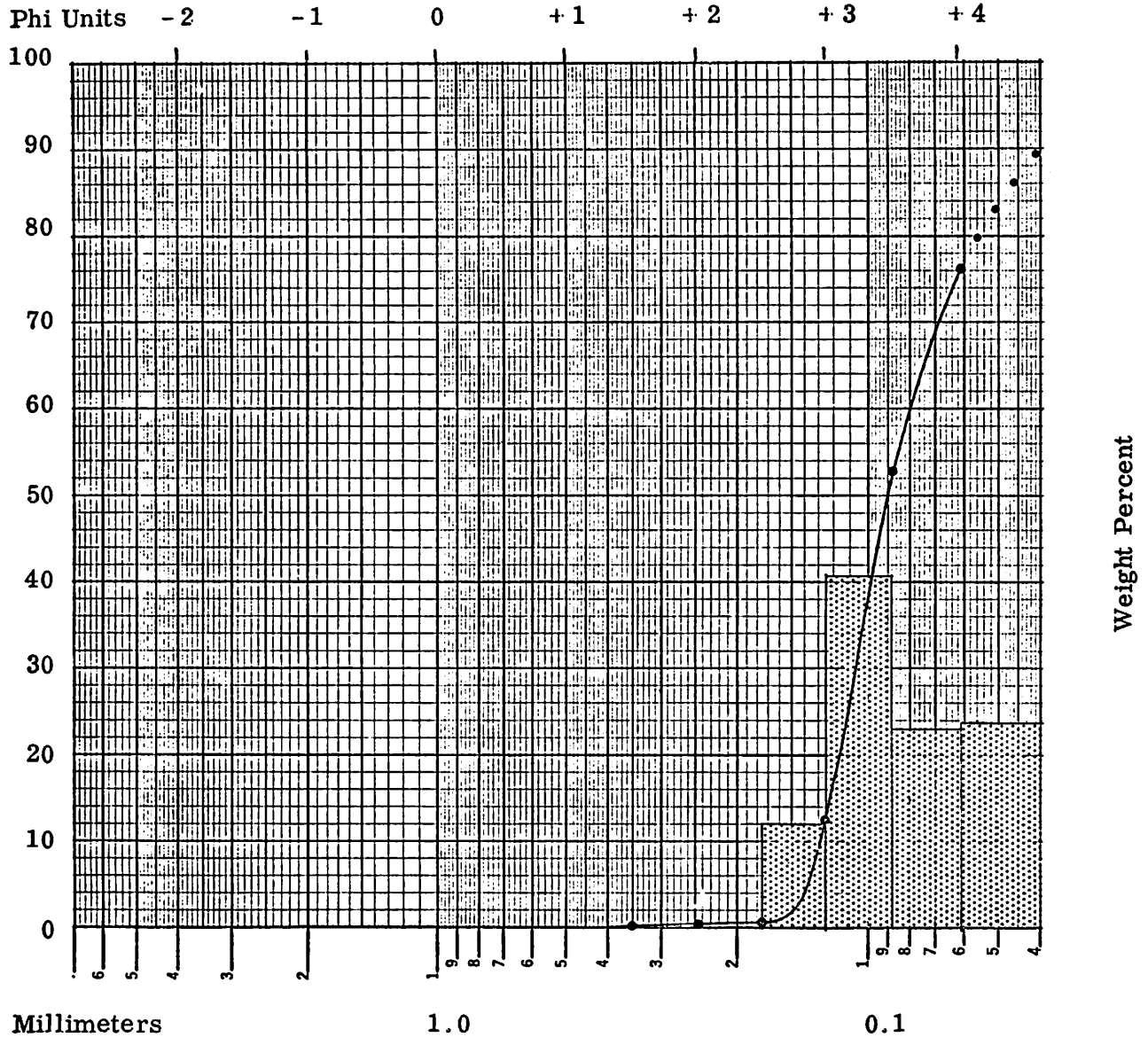
SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.29
 2nd Mode _____ Median: Q_{50} 0.10 mm Skewness 0.91
 3rd Mode _____ Q_{75} 0.07 mm Kurtosis 0.24

SIZE ANALYSIS

Sample 2008
 Lat. 37°52'33" Long. 122°38'24"
 Depth 9.50 Fathoms
17.38 Meters
57.00 Feet

Sample description Very fine, silty
gray sand
 Sample Weight 197.55 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.11 mm Sorting Coef. 1.34
 2nd Mode _____ Median: Q_{50} 0.09 mm Skewness 0.83
 3rd Mode _____ Q_{75} 0.06 mm Kurtosis 0.28

Sample 2009

Sample description Very fine, silty

Lat. 37°52'53" Long. 122°38'59"

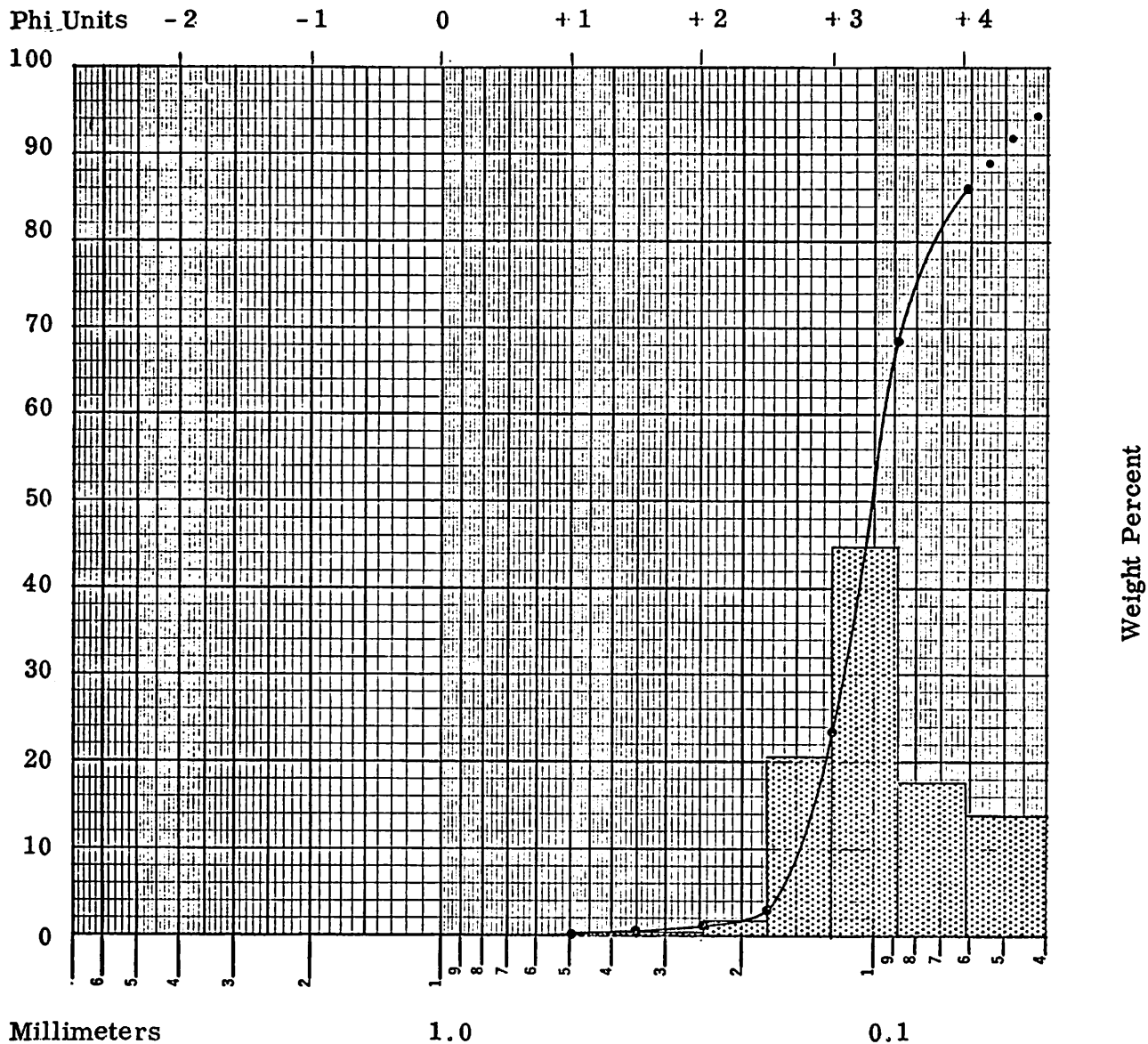
gray sand

Depth 9.17 Fathoms

16.77 Meters

55.00 Feet

Sample Weight 232.54 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.24
 2nd Mode _____ Median: Q_{50} 0.10 mm Skewness 0.89
 3rd Mode _____ Q_{75} 0.08 mm Kurtosis 0.23

SIZE ANALYSIS

Sample 2010

Sample description Very fine, gray

Lat. 37°53'8" Long. 122°39'29"

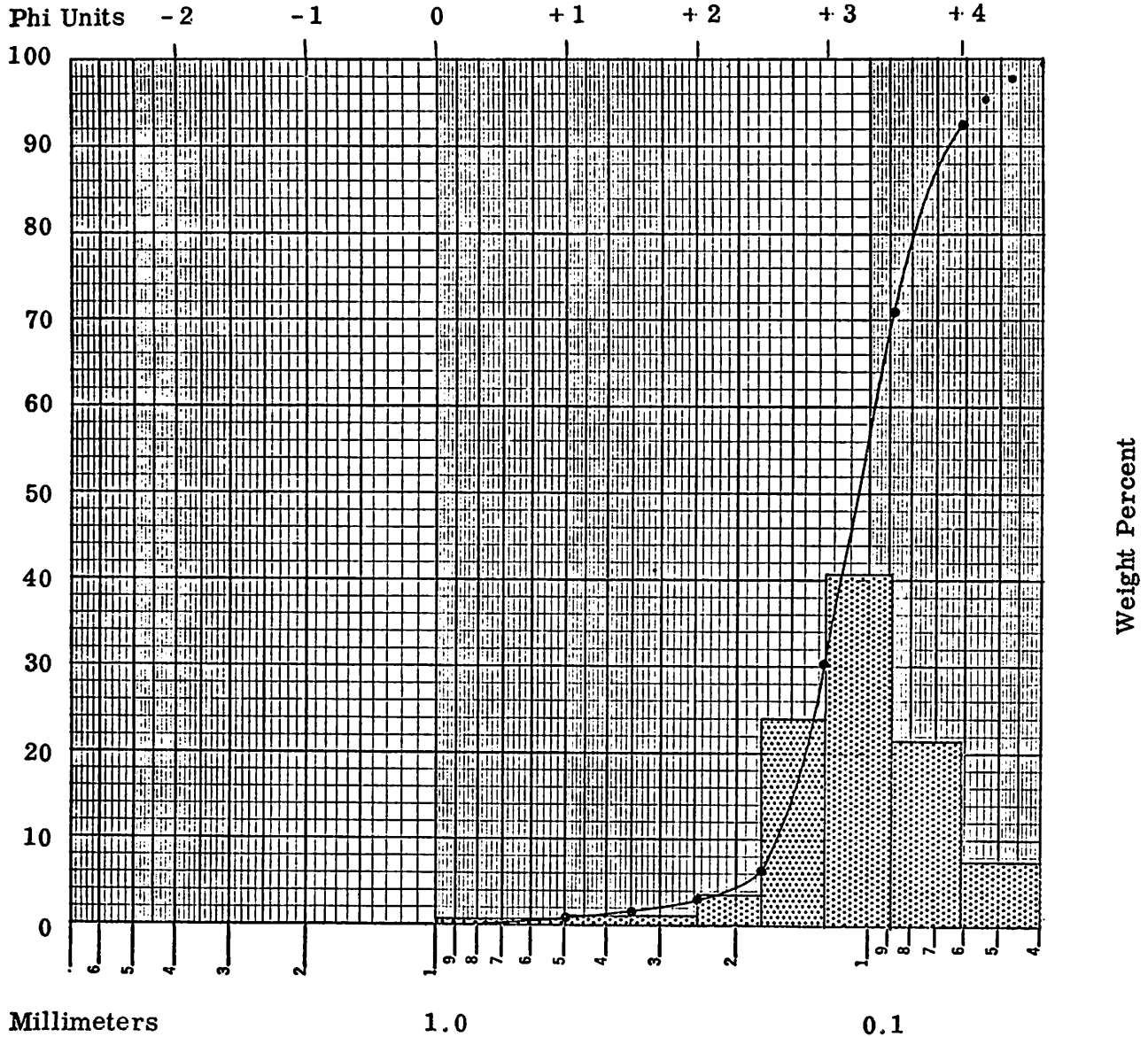
sand

Depth 8.00 Fathoms

14.63 Meters

48.00 Feet

Sample Weight 123.14 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.13 mm Sorting Coef. 1.25
 2nd Mode _____ Median: Q_{50} 0.11 mm Skewness 1.00
 3rd Mode _____ Q_{75} 0.09 mm Kurtosis 0.24

SIZE ANALYSIS

Sample 2011

Sample description Very fine, silty

Lat. 37°52'56" Long. 122°39'52"

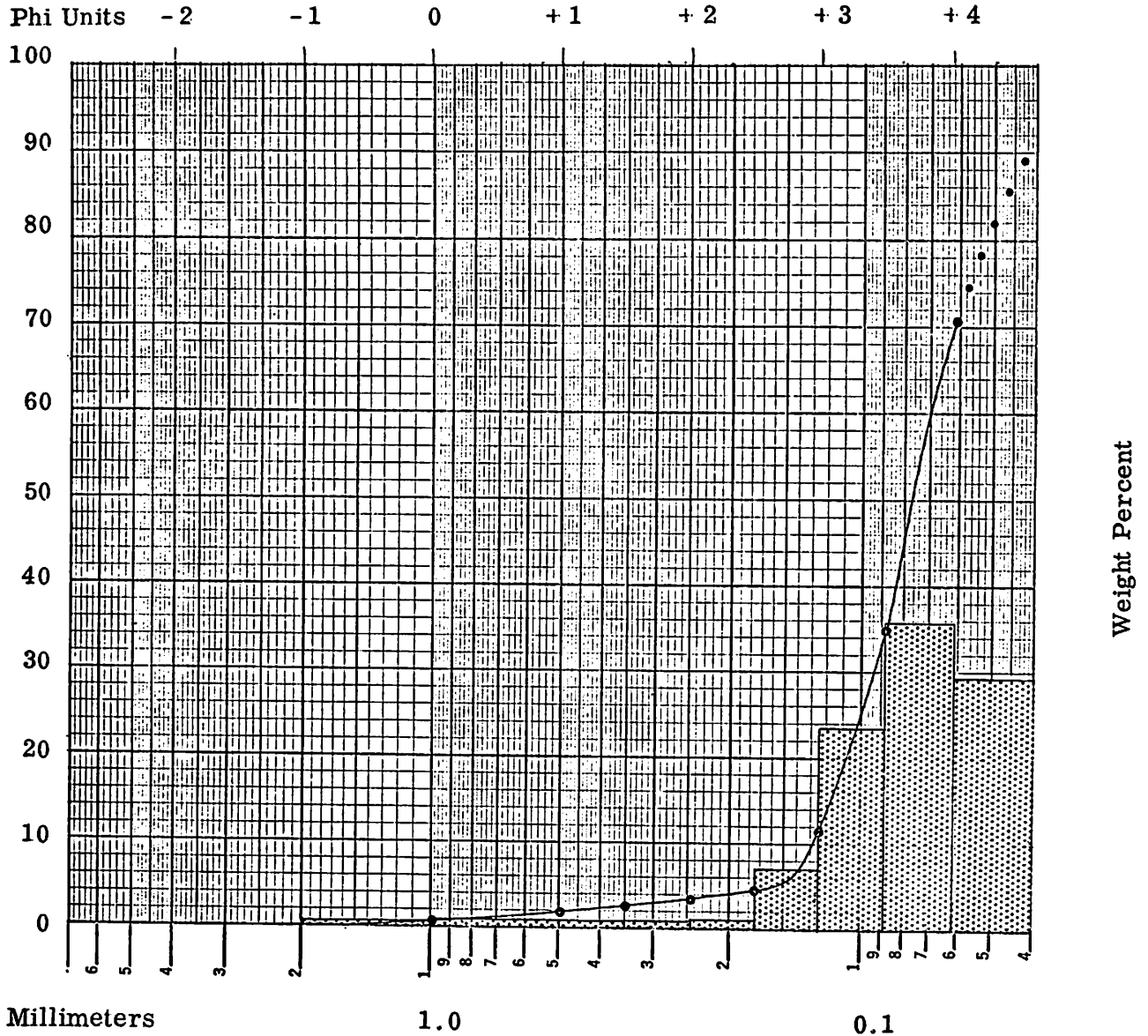
gray sand

Depth 7.50 Fathoms

13.72 Meters

45.00 Feet

Sample Weight 121.21 gms



SIZE PARAMETERS

1st Mode <u>0.088 - 0.061</u>	Q ₂₅ <u>0.10 mm</u>	Sorting Coef. <u>1.34</u>
2nd Mode _____	Median: Q ₅₀ <u>0.07 mm</u>	Skewness <u>1.02</u>
3rd Mode _____	Q ₇₅ <u>0.06 mm</u>	Kurtosis <u>0.26</u>

Sample 2012

Sample description Very fine, silty

Lat. 37°52'39" Long. 122°39'20"

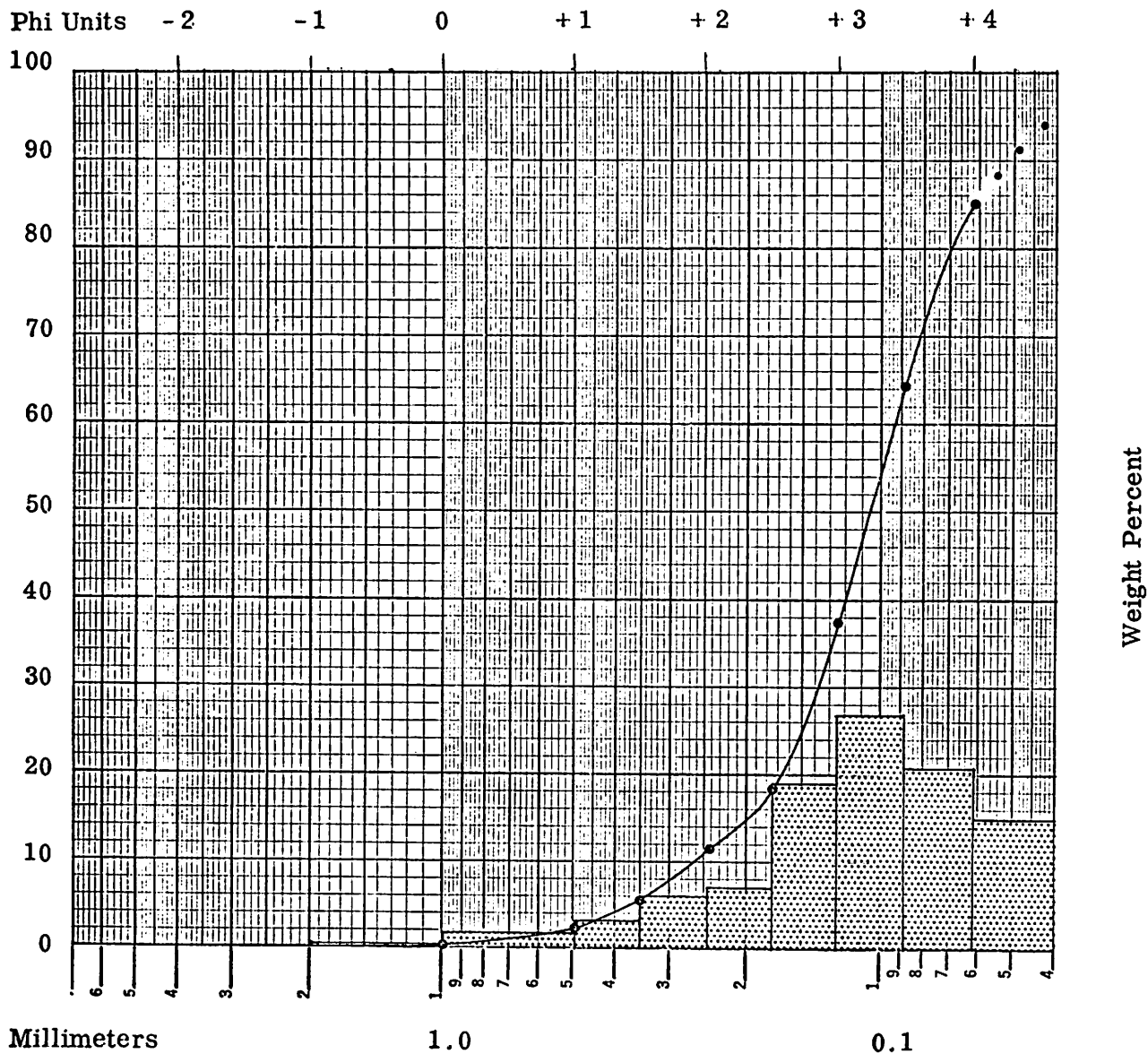
gray sand

Depth 9.00 Fathoms

16.47 Meters

54.00 Feet

Sample Weight 124.20 gms



SIZE PARAMETERS

1st Mode <u>0.124 - 0.088</u> mm	Q ₂₅ <u>0.15</u> mm	Sorting Coef. <u>1.41</u>
2nd Mode _____	Median: Q ₅₀ <u>0.10</u> mm	Skewness <u>1.10</u>
3rd Mode _____	Q ₇₅ <u>0.08</u> mm	Kurtosis <u>0.18</u>

SIZE ANALYSIS

Sample 2013

Sample description Very fine, silty

Lat. 37°52'28" Long. 122°38'42"

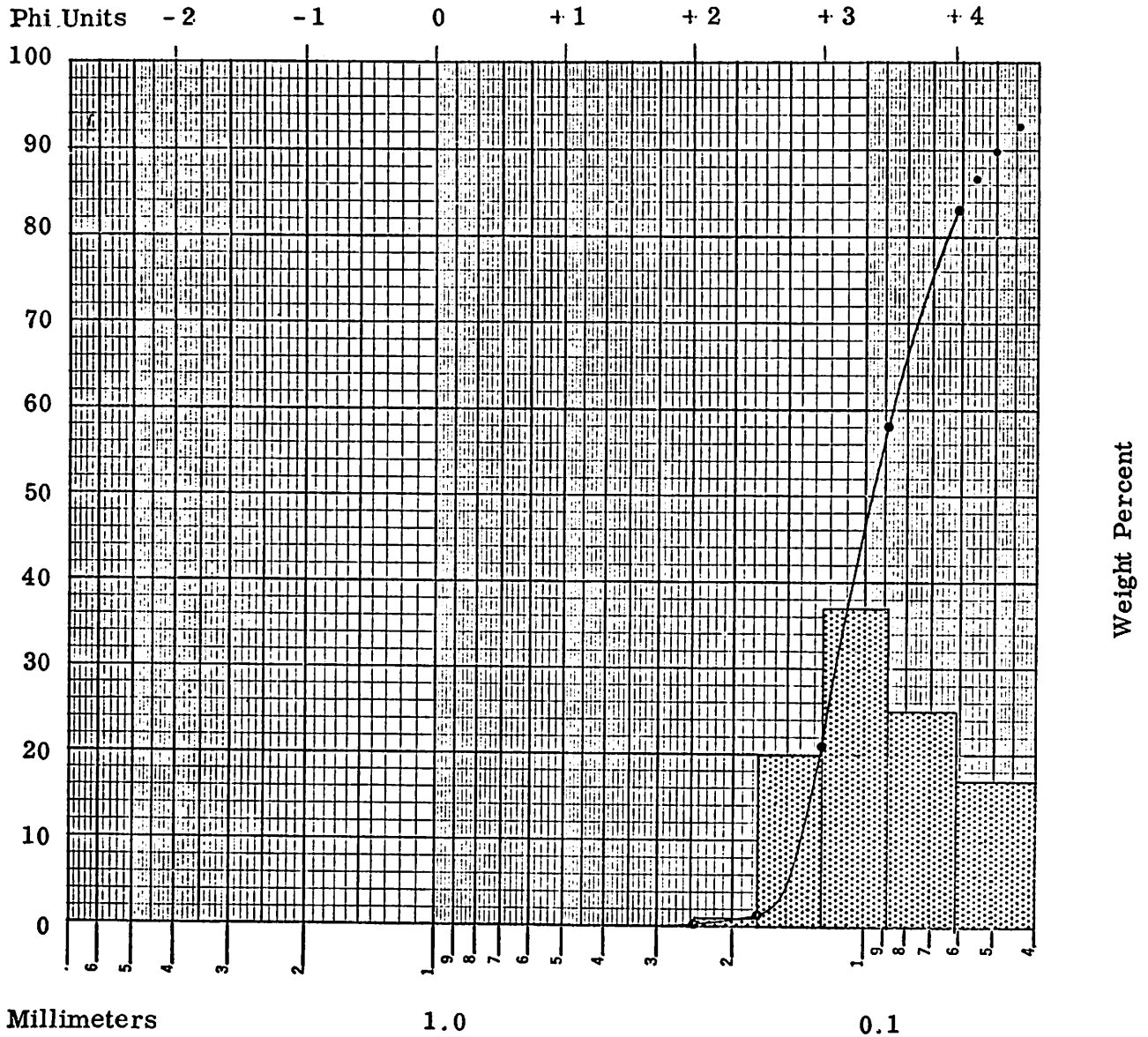
gray sand

Depth 9.67 Fathoms

17.69 Meters

58.00 Feet

Sample Weight 104.54 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.31
 2nd Mode _____ Median: Q_{50} 0.10 mm Skewness 0.89
 3rd Mode _____ Q_{75} 0.07 mm Kurtosis 0.28

SIZE ANALYSIS

Sample 2014

Sample description Very fine, silty

Lat. 37°52'4" Long. 122°37'40"

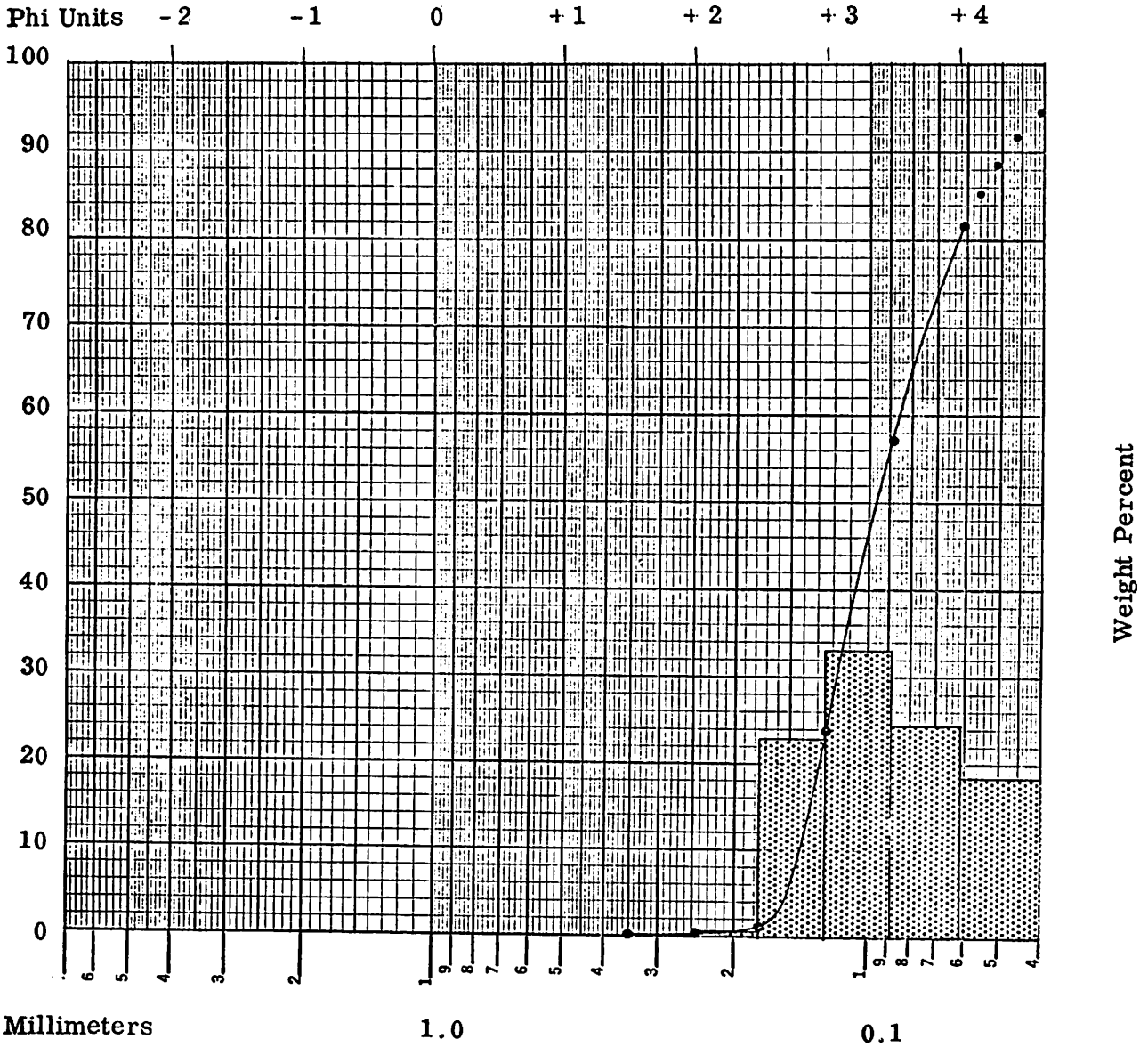
gray sand

Depth 9.83 Fathoms

18.00 Meters

59.00 Feet

Sample Weight 119.95 gms



SIZE PARAMETERS

1st Mode 0.124 - 0.088 mm Q_{25} 0.12 mm Sorting Coef. 1.35
 2nd Mode _____ Median: Q_{50} 0.10 mm Skewness 0.92
 3rd Mode _____ Q_{75} 0.07 mm Kurtosis 0.32

Sample 2015

Sample description Coarse, brown,

Lat. 37° 53' 40" Long. 122° 41' 58"

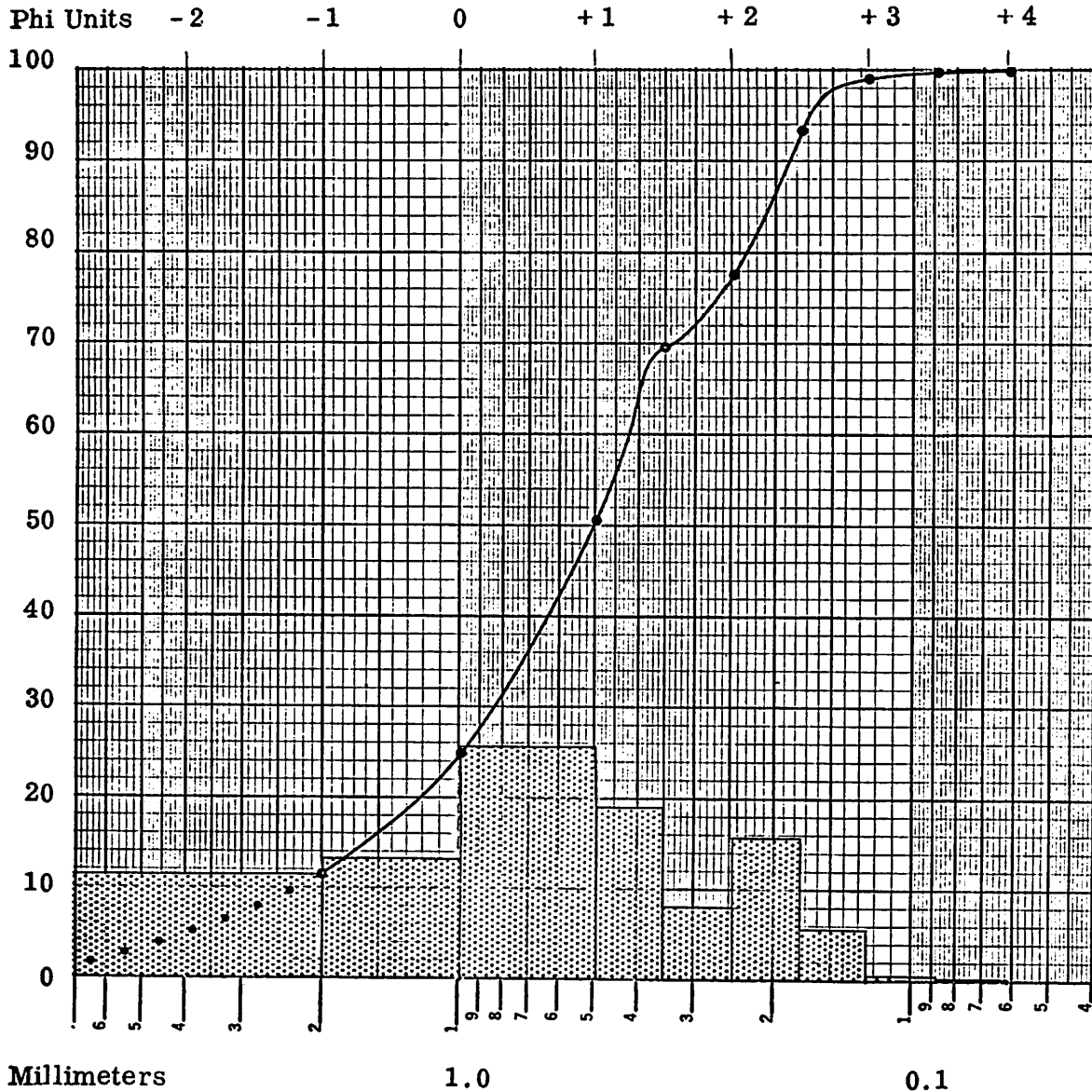
pebbly sand with 20% shell fragments

Depth Mean high tide Fathoms
level

Meters

Feet

Sample Weight 199.42 gms.



SIZE PARAMETERS

1st Mode 0.991 - 0.495 mm Q_{25} 0.99 mm Sorting Coef. 1.94
 2nd Mode 0.246 - 0.175 mm Median: Q_{50} 0.5 mm Skewness 1.59
 3rd Mode _____ Q_{75} 0.27 mm Kurtosis 0.18

Sample 2016

Sample description Medium brown sand with 25% shell fragments. Also a few small pebbles.

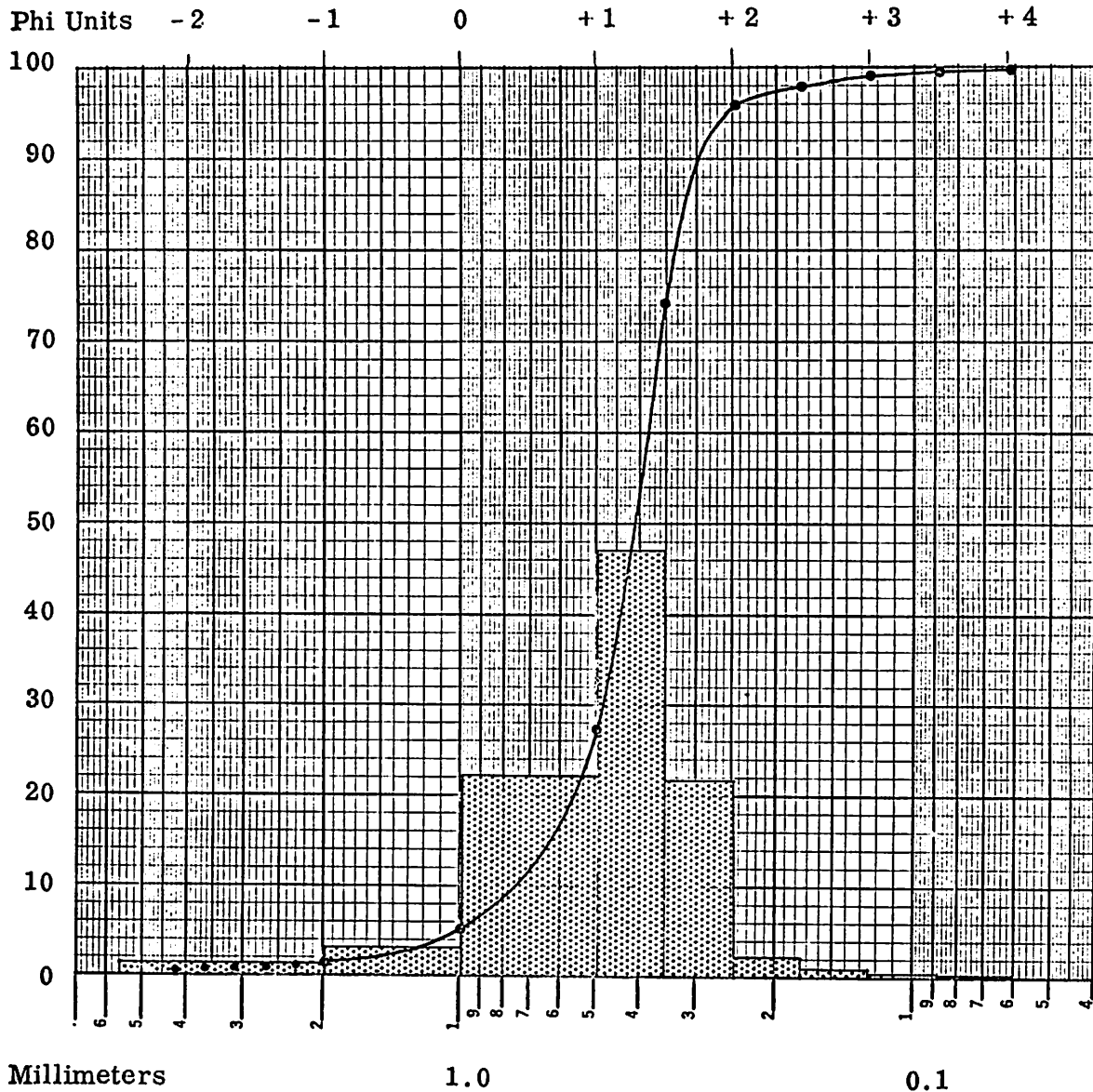
Lat. 37° 53' 39" Long. 122° 41' 58"

Depth Mean low tide level Fathoms

Meters

Feet

Sample Weight 172.47 gms.



SIZE PARAMETERS

1st Mode 0.495 - 0.351 mm Q_{25} 0.52 mm Sorting Coef. 1.22
 2nd Mode _____ Median: Q_{50} 0.41 mm Skewness 1.11
 3rd Mode _____ Q_{75} 0.35 mm Kurtosis 0.17

Sample 2017

Sample description Medium-fine, tan

Lat. 37° 53' 47" Long. 122° 41' 54"

pebbly sand with 10% coarse shell

Depth High tide level Fathoms

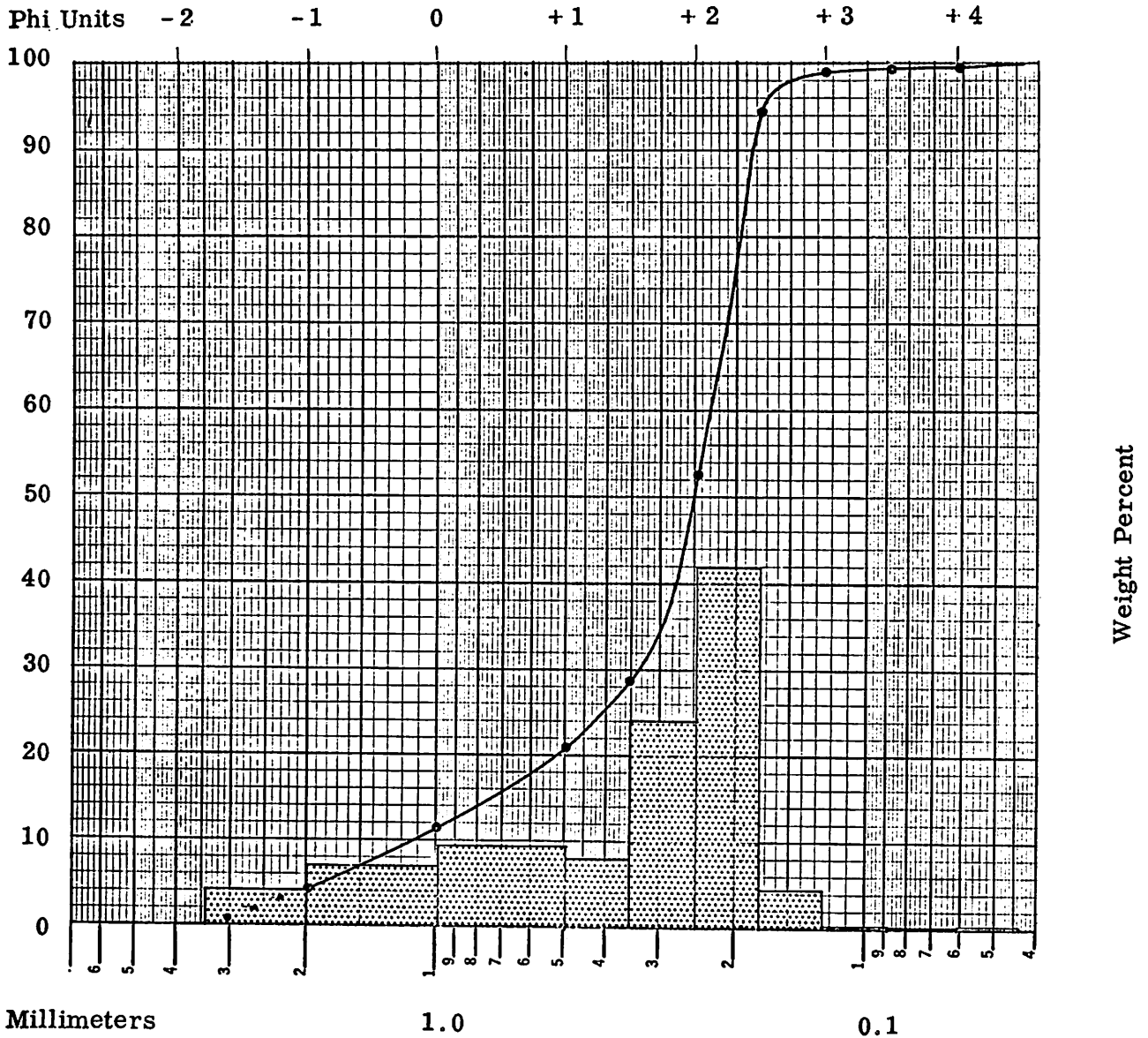
fragments and some coarse rock

_____ Meters

fragments.

_____ Feet

Sample Weight 222.74 gms.



SIZE PARAMETERS

1st Mode 0.246 - 0.175 mm Q_{25} 0.40 mm Sorting Coef. 1.36
 2nd Mode _____ Median: Q_{50} 0.26 mm Skewness 1.32
 3rd Mode _____ Q_{75} 0.22 mm Kurtosis 0.10

SIZE ANALYSIS

Sample 2018

Sample description Fine brown sand

Lat. 37° 53' 45" Long. 122° 41' 46"

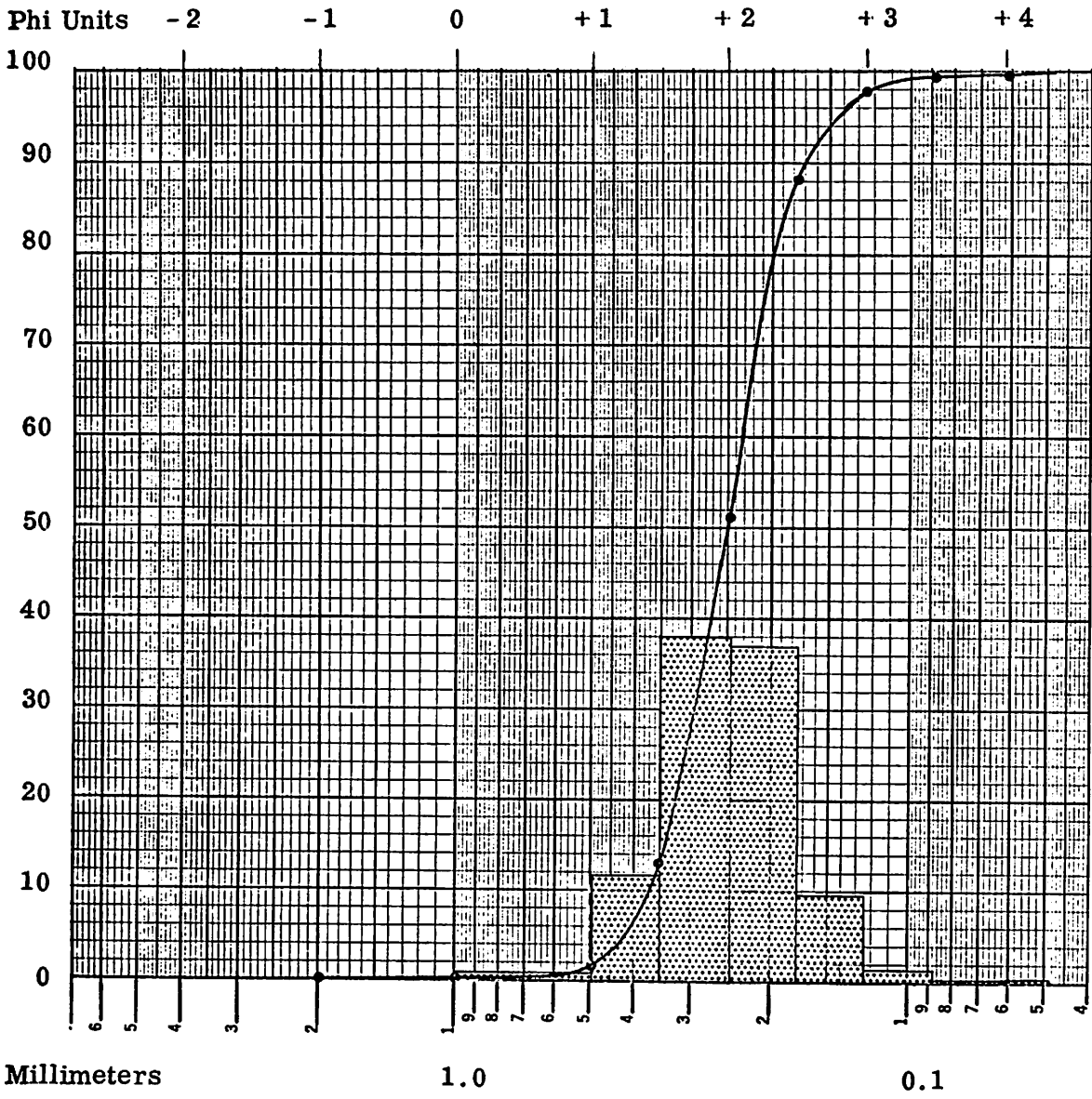
with 10 - 15% shell fragments.

Depth Low tide level Fathoms _____

_____ Meters _____

_____ Feet _____

Sample Weight 176.06 gms.



SIZE PARAMETERS

1st Mode 0.351 - 0.175 mm Q_{25} 0.31 mm Sorting Coef. 1.23
 2nd Mode _____ Median: Q_{50} 0.25 mm Skewness 1.02
 3rd Mode _____ Q_{75} 0.21 mm Kurtosis 0.26

SIZE ANALYSIS

Sample 2019

Sample description Fine brown sand

Lat. 37° 54' 7" Long. 122° 41' 28"

with some small pebbles and 10 - 15%

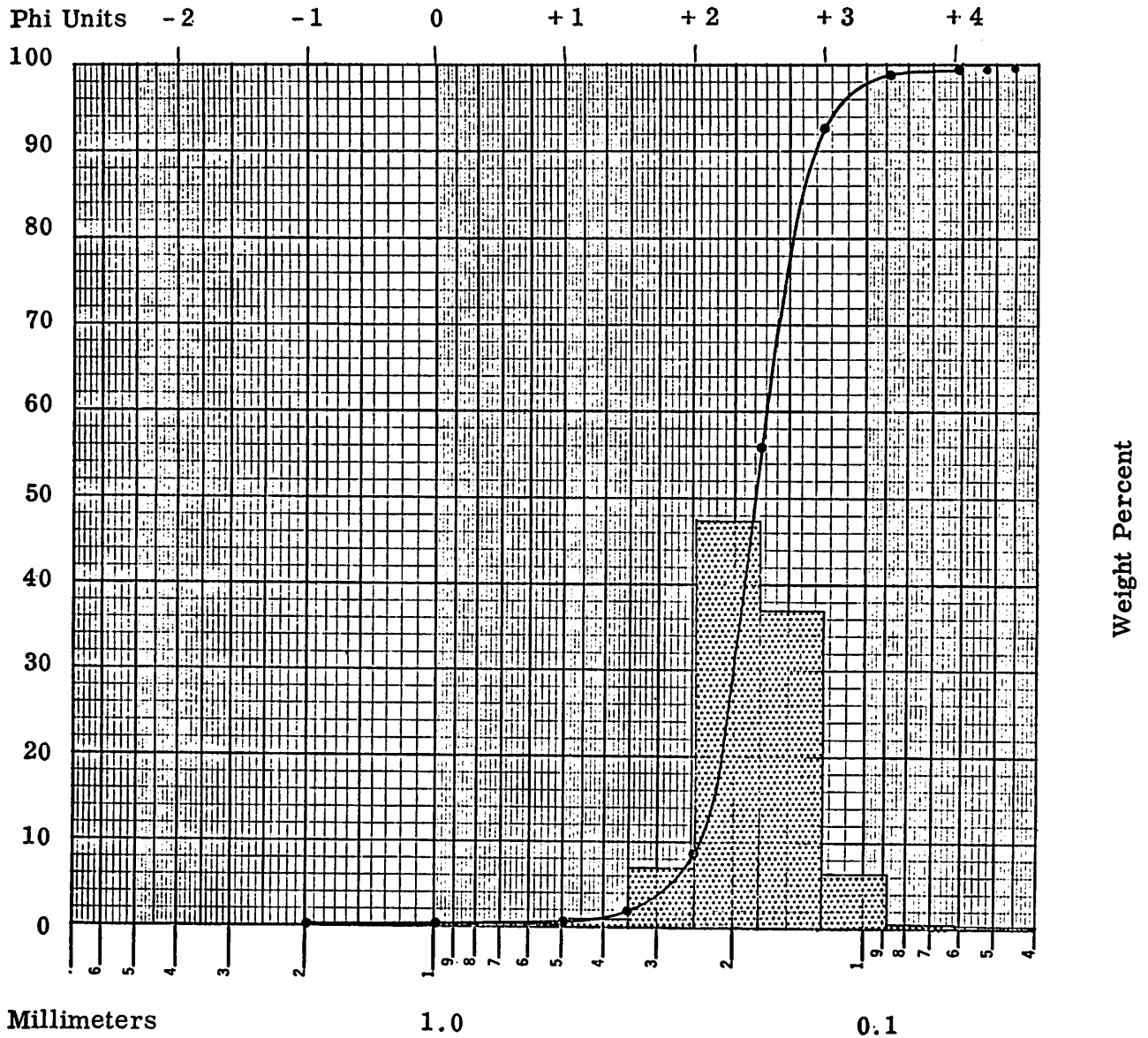
Depth High tide level Fathoms

shell fragments.

_____ Meters

_____ Feet

Sample Weight 242.09 gms.



SIZE PARAMETERS

1st Mode 0.246 - 0.175 mm Q_{25} 0.22 mm Sorting Coef. 1.21
 2nd Mode _____ Median: Q_{50} 0.18 mm Skewness 0.97
 3rd Mode _____ Q_{75} 0.15mm Kurtosis 0.57

Sample 2020

Sample description Fine tan sand with
10 - 15% shell fragments.

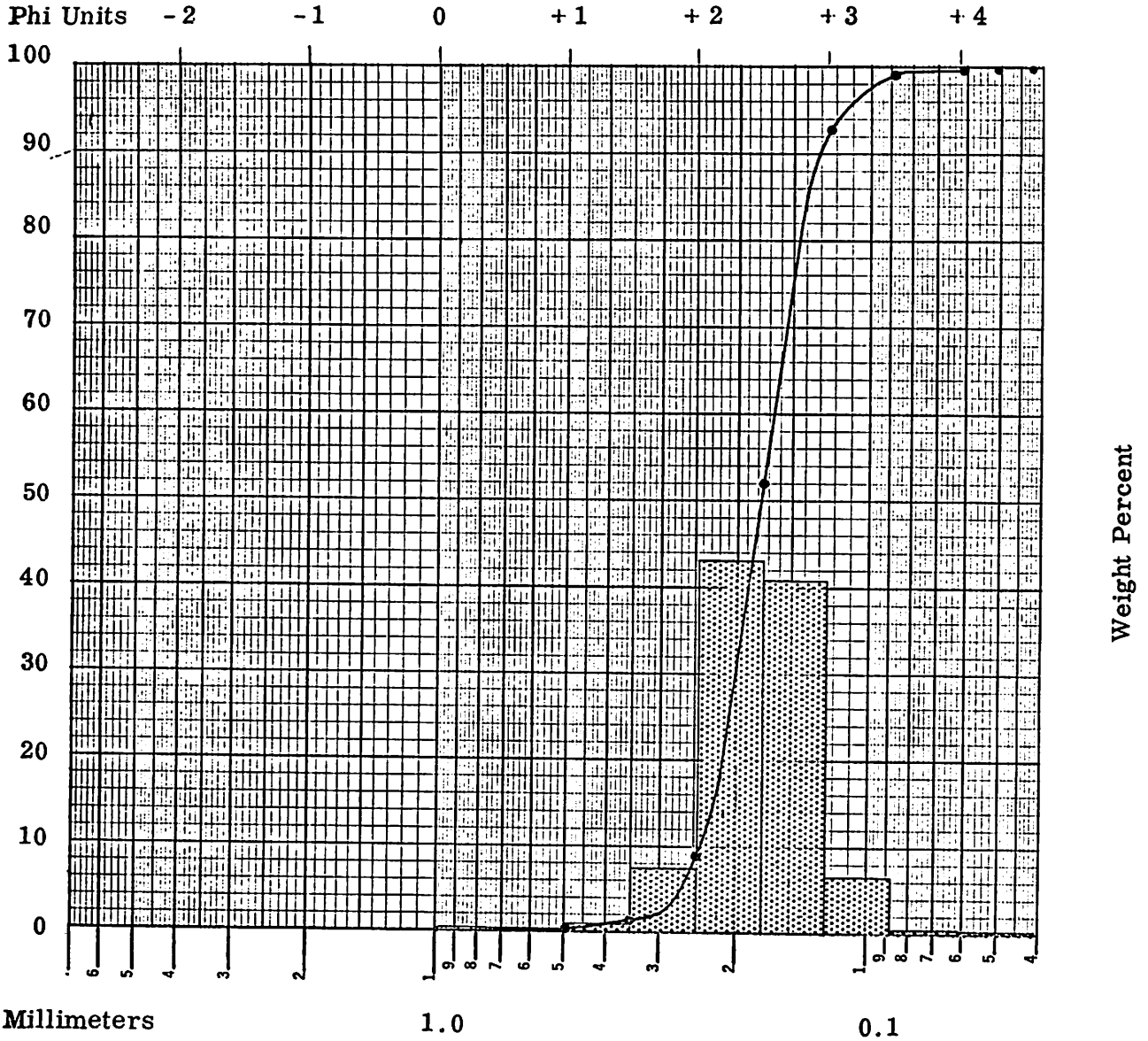
Lat. 37° 54' 4" Long. 122° 41' 27"

Depth Low tide level Fathoms _____

Meters _____

Feet _____

Sample Weight 259.54 gms



SIZE PARAMETERS

1st Mode 0.246 - 0.124 mm Q_{25} 0.22 mm Sorting Coef. 1.21
 2nd Mode _____ Median: Q_{50} 0.18 mm Skewness 1.03
 3rd Mode _____ Q_{75} 0.15 mm Kurtosis 0.31

SIZE ANALYSIS

Sample 2021

Sample description Fine dark gray to tan sand with 10 - 15% shell fragments.

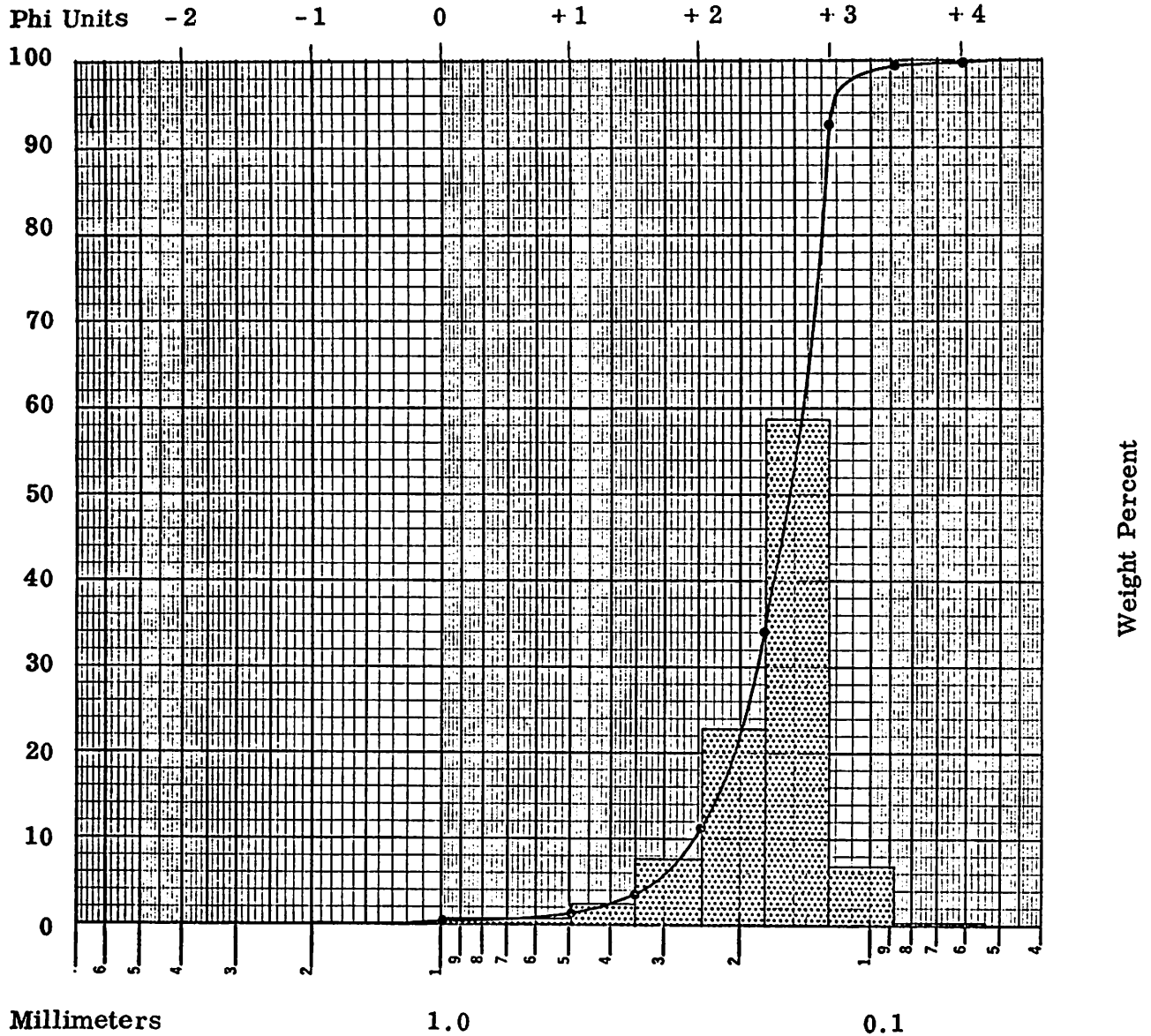
Lat. 37° 54' 8" Long. 122° 41' 15"

Depth Mean tide level Fathoms

_____ Meters

_____ Feet

Sample Weight 225.80 gms



SIZE PARAMETERS

1st Mode 0.175 - 0.124 mm Q_{25} 0.20 mm Sorting Coef. 1.20
 2nd Mode _____ Median: Q_{50} 0.15 mm Skewness 1.13
 3rd Mode _____ Q_{75} 0.14 mm Kurtosis 0.23

Sample 2022

Sample description Fine light gray to

Lat. 37° 54' 20" Long. 122° 40' 47"

tan sand with small dark pebbles and

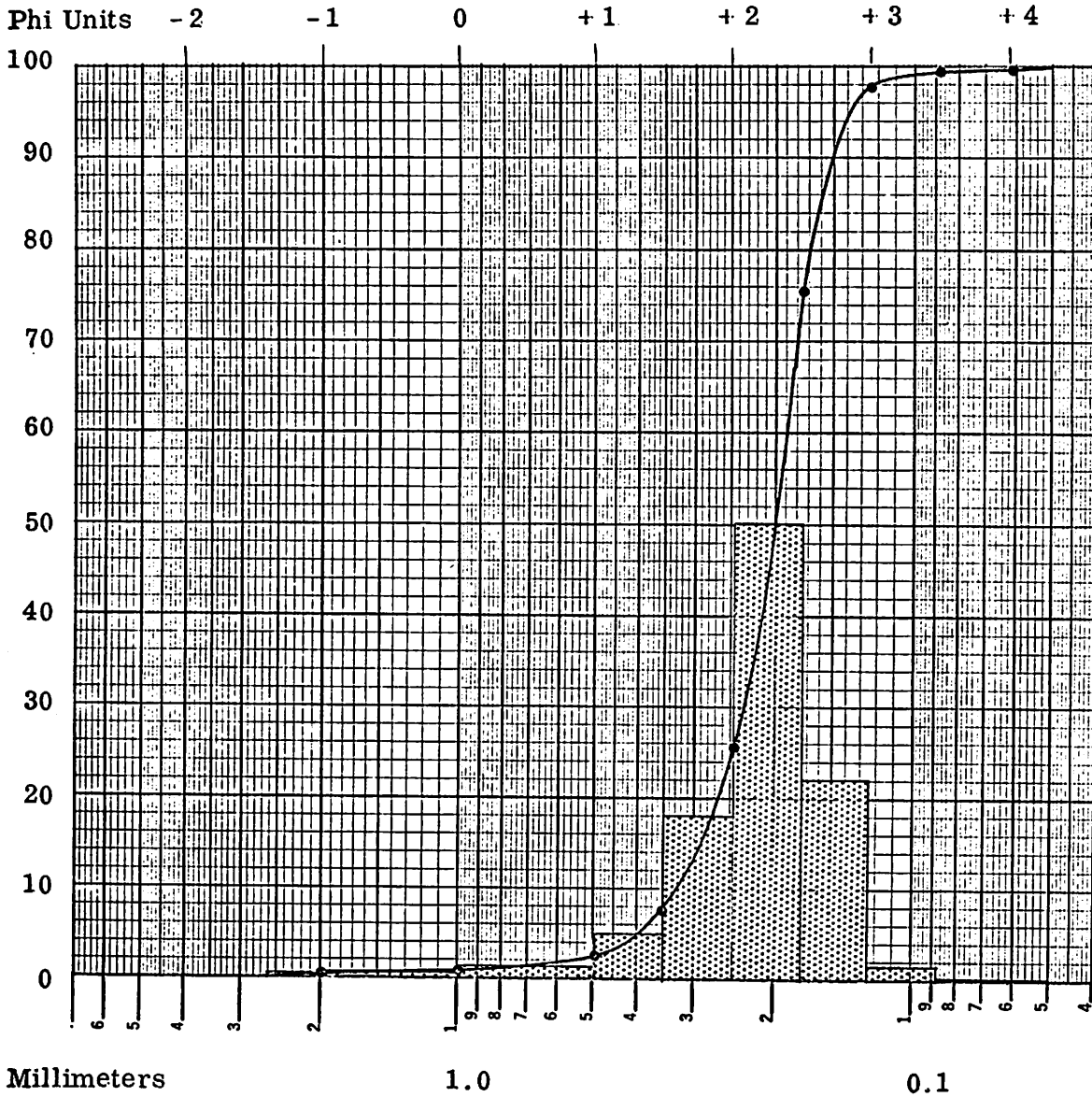
Depth Low tide level Fathoms

5% shell fragments.

_____ Meters

_____ Feet

Sample Weight 293.67 gms



SIZE PARAMETERS

1st Mode <u>0.246 - 0.175 mm</u>	Q ₂₅ <u>0.25 mm</u>	Sorting Coef. <u>1.18</u>
2nd Mode _____	Median: Q ₅₀ <u>0.20 mm</u>	Skewness <u>1.07</u>
3rd Mode _____	Q ₇₅ <u>0.18 mm</u>	Kurtosis <u>0.21</u>

Sample 2023

Sample description Medium gray pebbly

Lat. 37° 54' 28" Long. 122° 40' 52"

sand with some large pebbles and

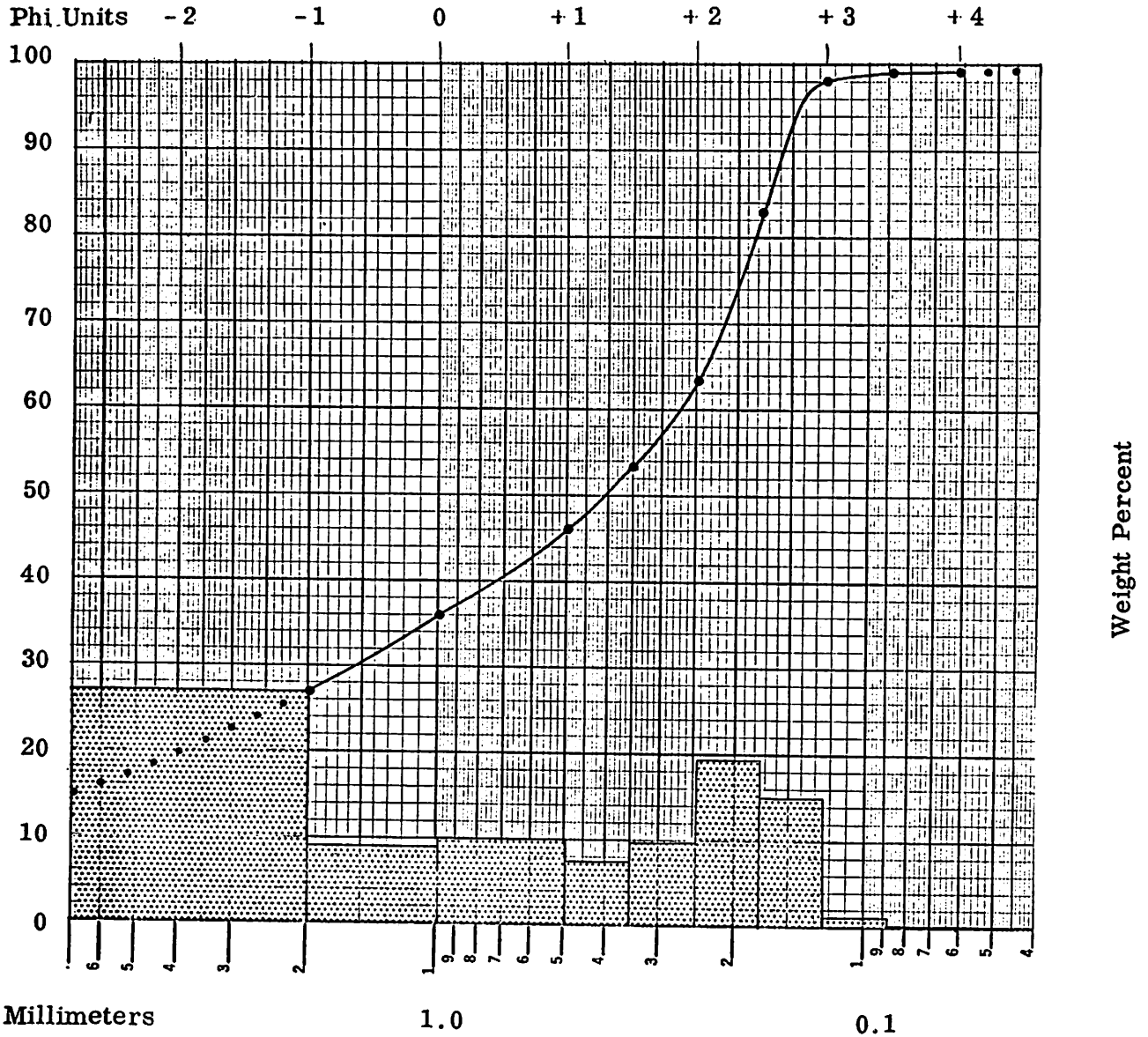
Depth Mean tide level Fathoms

5 - 10% shell fragments.

Meters

Feet

Sample Weight 180.24 grams



SIZE PARAMETERS

1st Mode > 1.981 - 1.981 mm Q_{25} 2.50 mm Sorting Coef. 3.35
 2nd Mode 0.246 - 0.175 mm Median: Q_{50} 0.40 mm Skewness 3.12
 3rd Mode _____ Q_{75} 0.20 mm Kurtosis 0.09

Sample 2024

Sample description Fine gray sand

Lat. 37° 54' 27" Long. 122° 40' 49"

with 5% shell fragments and a few

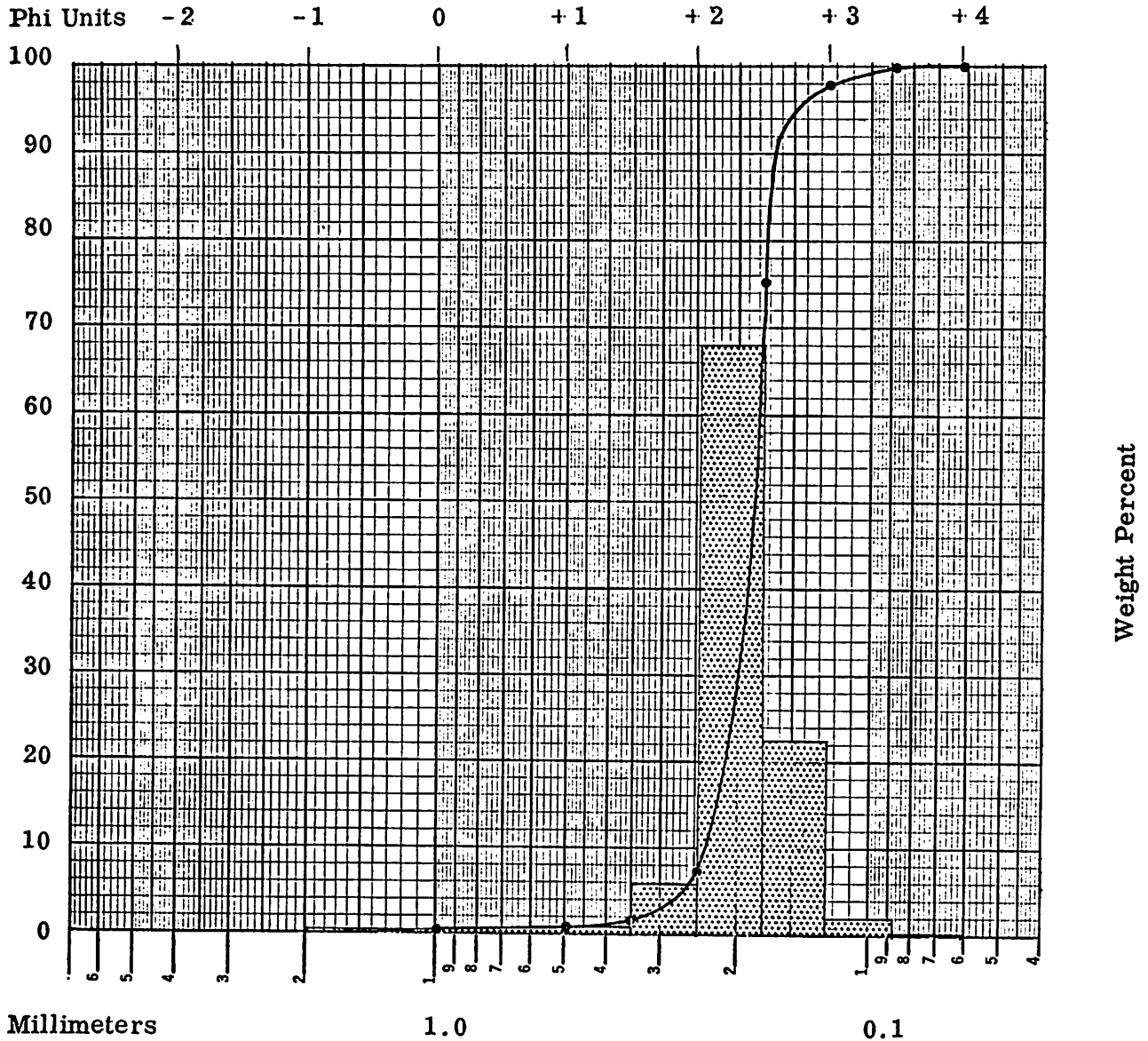
Depth Low tide level Fathoms

small dark pebbles

_____ Meters

_____ Feet

Sample Weight 282.75 gms.



SIZE PARAMETERS

1st Mode	<u>0.246 - 0.175 mm</u>	Q ₂₅	<u>0.19 mm</u>	Sorting Coef.	<u>1.03</u>
2nd Mode	_____	Median: Q ₅₀	<u>0.18 mm</u>	Skewness	<u>1.01</u>
3rd Mode	_____	Q ₇₅	<u>0.17 mm</u>	Kurtosis	<u>0.09</u>

Sample 2025

Sample description Fine gray sand

Lat. 37° 54' 23" Long. 122° 40' 55"

with dark gray pebbles and 10 - 15%

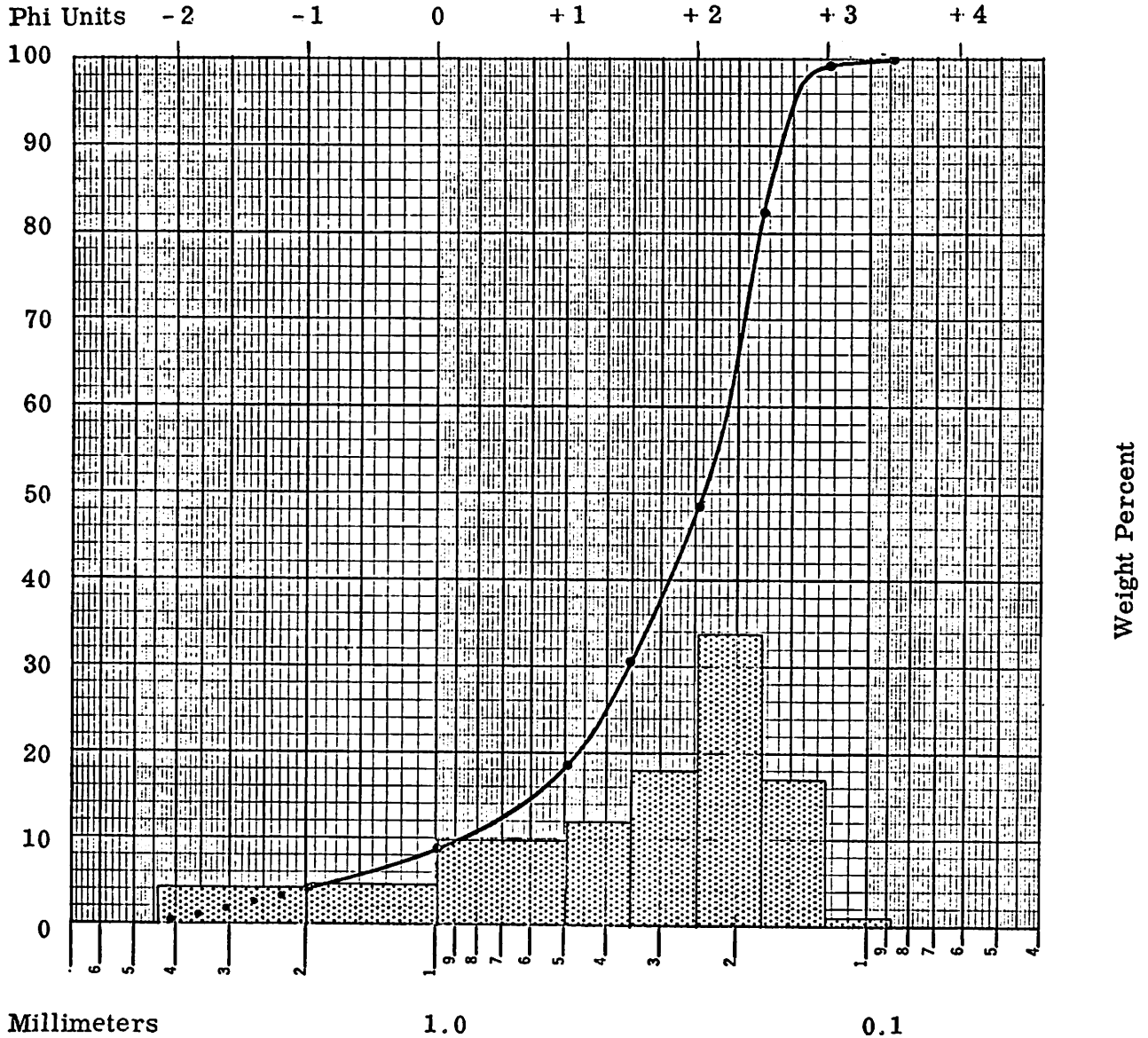
Depth High tide level Fathoms

shell fragments.

Meters

Feet

Sample Weight 235.79 gms



SIZE PARAMETERS

1st Mode 0.246 - 0.175 mm Q₂₅ 0.40 mm Sorting Coef. 1.47
 2nd Mode _____ Median: Q₅₀ 0.24 mm Skewness 1.29
 3rd Mode _____ Q₇₅ 0.19 mm Kurtosis 0.15

Sample 2026

Sample description Fine gray sand

Lat. 37° 54' 17" Long. 122° 41' 3"

with some pebbles and 5 - 10% shell

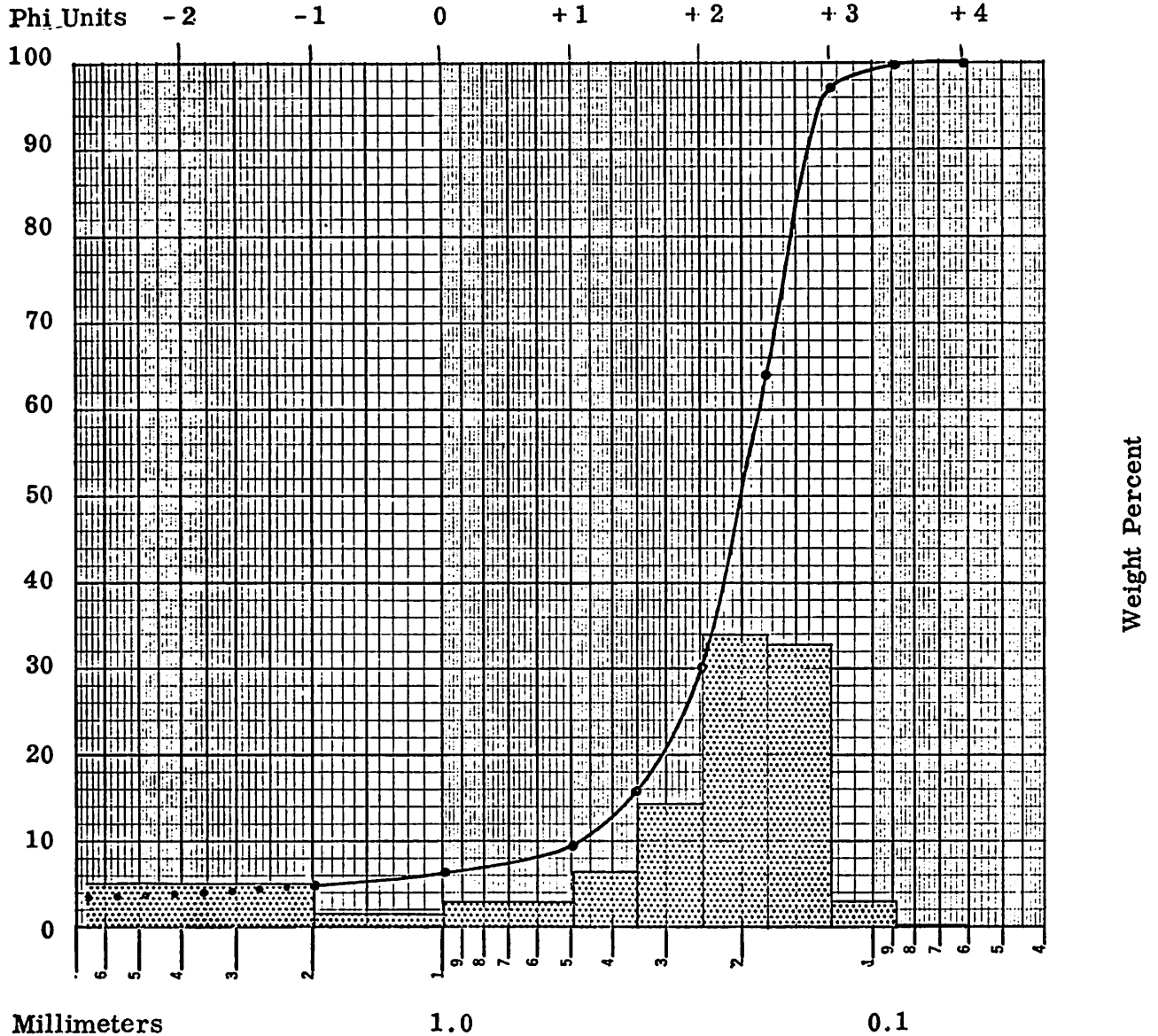
Depth Mean tide level Fathoms

fragments.

Meters

Feet

Sample Weight 219.79 gms



SIZE PARAMETERS

1st Mode > 1.981 - 1.981 mm Q_{25} 0.27 mm Sorting Coef. 1.28
 2nd Mode 0.246 - 0.124 mm Median: Q_{50} 0.20 mm Skewness 1.17
 3rd Mode _____ Q_{75} 0.17 mm Kurtosis 0.14