Brazo's River Authority

May 2003 CHIRP Sub-bottom Profiler Survey and Sediment Core Analyses of:

Aquilla Lake
Granger Lake
Limestone Lake
Lake Proctor

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BRA-CHIRP Sub-bottom Profiler survey

Scope of work:

The goal of this project was to collect seismic data to determine the thickness of sediment within four Brazos River Authority reservoirs. To accomplish this, a CHIRP sub-bottom profiler (see description below) was used to collect high-resolution seismic profiles of the lakebeds. This equipment is designed to be used for subsurface geologic investigations of shallow (0-100 m) subsurface sediments in aquatic settings. Navigation was provided via differential GPS.

This work was carried out in conjunction with a team from Baylor University who collected core samples for calibrating and verifying a multi-frequency depth sounder. Additional core material gathered was x-rayed and profiled for ^{210}Pb and ^{137}Cs to provide an estimation of sedimentation rates and sedimentation histories in these systems.

Materials and Methods

Core Analysis:

Water Content

Samples were placed into aluminum dishes after extrusion, weighed to the ten thousandth decimal place of a gram (g) and placed into ovens for at least 24 hrs. The samples were removed and weighed again to obtain water content. The porosities were calculated to obtain corrected depths for ^{210}Pb calculations.

Grain size

Grain size distributions were determined for the cores following the Folk (1980) methodology. First, sediment samples weighing approximately 15 g were separated with Calgon (Sodium Metahexaphoshate Soap) causing deflocculation, followed with wet sieving the samples with deionized water into a 1000 ml graduated cylinder. Next the graduated cylinders were filled with deionized water and the sand content from the sieves were placed into an aluminum dish and weighed. Graduated cylinder samples were plunged for 20 seconds and left undisturbed for an additional 20 seconds, and then immediately a 20 ml pipette withdraws (4 phi) were taken at a depth of 10 cm. Approximately 2 hrs later, depending on air temperature, another 20 ml pipette withdraws (8 phi) were taken at a depth of 20 cm. All samples were dried, weighed and placed into a spreadsheet to determine fine to coarse grain distribution.

^{137}Cs and ^{210}Pb Analysis

Samples for geochemical analyses were removed from homogeneous sample bags to determine the distribution of ^{137}Cs and ^{210}Pb. Sediment samples for ^{137}Cs analysis were wet packed and sealed with electrical tape in 60X15 mm Petri dish. The samples were counted on Canberra 2000 mm^2 planar coaxial detectors for 1-2 days per sample.

Gamma energy activities were measured for ^{137}Cs at the decay energy signal of 661.7 keV.

The excess activity of ^{210}Pb was measured by alpha spectroscopy following the methodology by Santschi et al. (1980, 1999, 2001). Sediment samples weighing approximately 15 g were dried for each selected depth, then pulverized and homogenized with a mortar and pestle. Approximately 0.5 g aliquots were placed into 100 ml Teflon beakers and leached with 15 ml of HCL and HNO_3, and 10 ml of HF. The samples were spiked with 500 µl of ^{209}Po and baked to near dryness on hotplates. Then 15 ml of HCL and HNO_3 were added to the samples and taken to near dryness again. The Teflon beakers were rinsed with 10 ml of HCL and baked to complete dryness. Samples were diluted with 50 ml of 1.5 N of HCL, and ascorbic acid was stirred in with a magnetic stir bars until the samples turned to clear color appearance. A 1-cm^2 silver planchet was placed opposite of the magnetic stir bar. The beakers were covered with watch glasses and heated approximately to 80 degrees for 2.5 hrs. Silver plates were removed and counted for 1-2 days for alpha decay on Canberra Quad Alpha Spectrometer connected to S100 multi-channel analyzer to reach a counting error of ~ 2 % or less. Supported activities were estimated from total ^{210}Pb values deep in cores where excess activities have decayed to negligible values, and were subtracted from the total activity to determine excess activities (Dellapenna et al. 2003).

X-Radiography

The cores were split and half of the core was transferred to a plexiglass tray for x-raying. There was considerable effort in transferring the cores from the core barrels because the sediment tended to adhere to the core barrel and as a result, there was some disturbance to the sediment. X-radiographs were taken with a portable Medison X-radiograph Unit model PX-15HF at 72 kV and 150 mAs for each plexiglass tray. Fuji sheet negatives were developed and scanned with Microtek ScanMaker 9600XL into digital forms.

Equipment:

CHIRP Sub-bottom profiler - The CHIRP sub-bottom profiler sends out a "chirp" of energy from 2-16 kHz. The return of this signal to a receiver is used to create a linear cross section of the bay bottom along the track of the tow vessel. Return signals differ based on the bottom type encountered, some sound bouncing off the bottom itself, whereas some penetrates and reflects off interfaces within the sediment. Repeating the send/receive action, a strip chart makes a profile showing the penetration and the characteristics of the reflections. The sequence of subsurface sediments can be resolved on the decimeter scale and the sub-bottom profiler can typically penetrate between 10-100 m into the seabed.

Navigation - Position was determined using a Trimble AG132 Trimble Differential GPS with Everest, which was fed digitally into a Gateway Laptop and logged using Hypack Coastal Oceanographic software. Hypack was also used to create survey lines and was used as a chart plotter for navigation of these lines. The layback of the tow fish (fore and aft) to the DGPS antennae was estimated by measuring the distance from the antennae to

the transom and then measuring the amount and angle of the tow cable from the transom to the tow fish. The offset (a beam) was determined by measuring the offset of the DGPS antennae to the tow point of the cable on the davit. Errors for position of the fish in relation to the bottom should be limited to the error inherent in DGPS (less than 1 meter).

Results

Field work to collect the CHIRP lines were conducted off of the TAMUG Coastal Geology research boat, the R/V Cavalla (Figure 1), which is a Parker 25 using an Edgetech 272 CHIRP (Figure 2). Granger Lake was surveyed on 05/07/03, Limestone Lake was surveyed on 05/08/03, Aquilla and Proctor Lakes were surveyed on 5/09/03. Appendix A contains all of the CHIRP Lines collected for each Lake. The thickness of sediment at each point where it could be determined is shown on each line. In most lines, the pre-impoundment surface is a hard, dense surface, with reservoir sediment being soft, high watercontent material above the pre-impoundment surface. As a result, the pre-impoundment surface generally appears to be a dark reflector and the surface of the new sediment appears as a faint line which defines the sediment-water interface (mudline). The reservoir sediment is composed of mud with a high water content and appears in the CHIRP record as a faint layer. Because these reservoirs are sediment filled incised valleys, the pre-impoundment surface is often highly irregular, with reservoir sediment generally filling pre-impoundment topographic lows. In each reservoir, there is only one reflector at depth, which represents the pre-impoundment surface, with the faint layer of reservoir sediment above. For each line, the thickness of reservoir sediment is noted at key points along the line. Because of the irregular nature of the pre-impoundment surface, no attempts were made to create an isopach map of reservoir sediment.

Granger Lake - Lines G1-G5 are the survey lines for Granger Lake, it was not decided until after Granger Lake was surveyed to add additional tie lines to the surveys.

Limestone Lake - The survey in Limestone Lake was conducted between the dam and a bridge, the R/V Cavalla would not fit under the bridge at the time of the survey, and no boat ramps were found above the bridge. Limestone Lake Lines 1-6 are cross lake lines, Line 7 runs down the axis of the lake.

Aquilla Lake - Lines A1 runs across the back of the dam. Lines A2-A4 are diagonal across the main portion of the lake.

Proctor Lake - Lines P1-P5 are cross lake lines. Lines P6 and P7 were not run because there were too many trees sticking out of the water. Line P8 is a tie line, it was not run between P3 and P5 because of navigational obstructions caused by trees in the lake.

Sediment Core Data

All cores were collected by the Baylor University group and core analyses were made at the request of this group. The cores were collected in aluminum tubing, which proved to be problematic because we could not x-ray through the tubes. The high clay content of the sediment resulted in strong adhesion of the sediment to the core barrels when the cores were split.

X-radiographs - The x-radiographs from the cores for this project were of poor quality. Part of the problem is the small diameter of the core barrels used. The sediment has a high clay content, and with narrow core barrels, surface friction between the core barrel and the sediment is much more difficult to overcome, as a result, it appears that the sediment balled up in the core barrel. In addition, when the cores were split, the adhesion problem made transferring the sediment from the core barrel to the x-ray tray difficult as well. Consequently, the x-rays were not nearly as useful as originally hoped.

Water Content Data - Water content data is used in the ^{210}Pb calculations. Water content is a function of both the grain size of the sediment and is much higher in recently deposited sediments than older, more compacted sediments. As a result, it is useful as a stratigraphic indicator and often mimics the radioisotope profiles. Water content profiles are provided for each core.

Grain size Data - Sand, silt, clay distribution was determined for 1 cm thick intervals every 5 cm throughout the cores. In general, the sediment in the reservoirs were clay dominated with little sand. The sand content is equivalent to one minus the mud content.

Radioisotope Data - ^{210}Pb radioisotope profiles show that for each core, there appears to be steady-state accumulation, with little or no seabed mixing. Because these cores were of reservoir sediment and the reservoirs are less than 50 years old, the ^{210}Pb in the sediment are all at excess levels. Accumulation rates were determined by using the regression line of the excess ^{210}Pb activities of the cores. In each case the calculation was quite straight forward. ^{137}Cs was found at the base of each core, in the last sample of reservoir sediment. ^{137}Cs is a bomb produced isotope first measurable in the environment in 1954 with atmospheric testing of nuclear bombs. These reservoirs were created after the first appearance of ^{137}Cs and all of the reservoir sediment which was introduced after 1954 contains ^{137}Cs.

Aquilla Lake Core 2- (Figures 3-6) - This core generally had over 90% clay, as a result, transferring the core to the x-ray tray resulted in significant core damage resulting in an extremely poor x-radiograph. The water content profile shows little change from the top to the bottom of the core. The ^{210}Pb profile shows a nearly vertical profile as well. A best fit line for what may be a decay portion of the core was used to estimate accumulation rates, which are estimated to be 0.49 cm/yr. These rates should be used with caution, because there really is not much of a decay profile for this core. ^{137}Cs was present at the base of the core, suggesting that the sediment at the base of the core maybe

as old as 40 y. An accumulation rate of 2.5 cm/y would be consistent with this observation. The grain size profiles show two layers which are silt rich, one at 15 cm and another at 85 cm, these may represent flood layers or reservoir discharge periods. Where silt content fluctuates, interpretations of ^{210}Pb profiles becomes problematic. This core was taken in a narrow, deep channel.

Aquilla Lake Core 2B (Figures 7-10)- The x-radiograph shows the core to have a light layer at 20 cm, which correlates to the grain size profile, which shows this layer to contain a 5% increase in sand content. We had a box of x-ray film where each piece of film appears to have been exposed on the edges, which is why there are light bands on each side of the film. Unfortunately, this was not discovered until after the cores had been processed. The x-radiograph also contains a number of light spots which probably are the result of methane bubbles. These are quite common in marine sediment cores. There also appears to be a hiatal surface at 45 cm, which correlates to an increase in silt content. The ^{210}Pb profile suggests that there is a steady state decrease in isotope activity down to 30 cm, then the activity becomes linear. The water content profile shows a similar trend, with an abrupt decrease in water content at 30 cm and a large fluctuation in silt content between 30-50 cm. Because of the dramatically higher surface area to volume of clay versus silt, an increase in silt content will decrease ^{210}Pb activities. Presumably this core was taken proximal to Core 2, we have no position for Core 2B.

Aquilla Lake Core 3B (Figures 11-14)- The x-radiograph from this core is also of low quality, not sure what happened with it. There is a 10 cm thick mud layer at the surface of this core and the sand content progressively increases with depth, except for a high silt content layer at 40 cm. The ^{210}Pb activity decrease with depth may be more a function of an increase in sand content than a decay of ^{210}Pb. The rates estimated for this core should be used with caution. This core was collected near shore, where transport of sand from the shore line would be expected. Also, fluctuations in lake level would move the shore closer to the core site when lake level was lower. The periods of high sand content my represent lower lake levels. Alternatively, these sand layers may represent flood deposits.

Limestone Lake Cores

We were not provided with core locations for any of the cores we have for Limestone Lake, so interpretations were not made based on the location of the cores.

Limestone Lake LS-2B (Figures 15-18)- This core is only 20 cm long. The grain size profile shows that the sediment becomes muddier with depth. The shape of the ^{210}Pb profile probably reflects this textural change more than anything. The x-radiograph shows there to be a distinct layer at the surface and mottled mud with clay balls within the rest of the core.

Limestone Lake LS-3 (Figures 19-22)- There is a great deal of cyclicity to the silt and clay content in this core, suggesting a strong flood signal. The sand content in the lower 30 cm of this core ranges from 40% at the base to ~10% at the top of the interval. This

fining upwards sequence is probably the result of sand being transported as bedload as the reservoir is filling and once it has filled, little bedload transport is occurring. There is a degree of variability in the ^{210}Pb profiles which probably results from variations in sediment textures, however, the overall trend suggests steady-state accumulation. The position of the core location, in the middle of the reservoir suggests that the alternating clay rich and clay poor layers is probably results from high discharge/flood events, during high sediment input, first the silt will settle out then the clays will settle. This site could probably be viewed as a site where the distal signal of a flood is recorded. That is to say, it is further removed from the sources of coarse sediment so all that is seen is the settling of fines.

Limestone Lake LS-4 (Figures 23-25)- This core is only 10 cm long. It is 95% mud. There was not much reservoir fill at this site.

Lake Proctor 1B (Figures 26-29)- The high water content in the upper 5 cm, along with the uniform ^{210}Pb activity and the uniform grain size for this interval suggests this is a flood layer. The location of this core so close to shore and also proximal to the head of the lake would suggest that coarser sediment would be delivered to this site during high discharge events.

Granger Lake 1B (Figures 30-33)- The extreme range in water content as well as the fining upwards sequence shown in the grain size profiles suggest that the base of this core is in the pre-impoundment surface at about 16 cm. This core was taken directly behind the reservoir and it would appear that the changes in the sediment textures reflects the history of sediment fill and changes in the flow regime as the water depth increases. At the base of the core, the sediment is much coarser, water depths are shallower, the cross sectional area of the river would be greater, and the critical shear stress on the river bed would be high enough to allow for bedload transport of coarse material. As the water depth increases, the cross sectional area of the river increases, the flow strength decreases and the less coarse material will be transported as bedload transport becomes less. As a result, the sediment textures will become much finer.

Discussion and Conclusion

The CHIRP data shows that the each reservoir is a filled incised valley. The incised valleys were generally flat just up stream of the reservoirs, and the pre-impoundment surface is quite irregular upstream from the dam. Because the pre-impoundment surface is so irregular, no effort was made to make an isopach map of reservoir fill. Where feasible, tie lines were run down the axis of the reservoir so that correlations could be made between cross lake CHIRP lines. In each CHIRP line, there was one hard reflector, which represents the pre-impoundment surface. Above this reflector, there is a faint layer of high water-content mud which represents the reservoir sediment fill. The thickness of this fill is noted on each CHIRP line. The high clay-content of the sediment cores caused there to be a great deal of coring artifacts in the x-rays. Grain size analyses reveal clay content to generally be over 50% in most cores and some cores had intervals with clay

content approaching 100%. Radioisotope profiles reveal steady state accumulation in nearly all of the cores. However, large changes in sediment textures have limited the utility of the radioisotope interpretation in several of the cores. ^{137}Cs was present at the base of the reservoir fill in each core. Limited detector time precluded running profiles of ^{137}Cs, however, it is doubtful that profiles would have aided in interpretations, especially given the high variability of sediment textures in many of the cores. Some interesting trends in grainsize profiles were observed. For cores directly behind the dam, such as Granger Lake Core 1B, the grain size profile at the base of the core going up core shows a fining upwards sequence which reflects the early history of reservoir fill and a decrease in bedload transport as the cross sectional area of the river increases and the strength of the river decreases. Above this, the cores generally show a fluctuation between high and low clay content, reflecting either high discharge events or water release events from the dam. Because there is generally low turbulence in the deeper portions of the reservoir, fall velocity is the major control on sediment deposition. As a result, after high discharge events, such as floods, which deliver a suspended sediment load, first the silts will deposit then the clays. Alternating layers of silt and clay may reflect this trend. Cores collected in the middle of the reservoir may show a similar trend with the lower core record of transition from coarse to find grained material and then a pronounced fluctuation between silt and clay similar to the cores from the lower reservoir. Upstream cores and cores from locations near-shore, will typically have a record which shows alternating sandy and muddy layers, with sandy layers from either low water periods with shore line erosion or from flood events with a delivery of bedload material.

Appendix A

Lake	Core	Longitude	Latitude
Aquilla	1	97.11.258'	31.55.656'
Aquilla	2	97.11.289'	31.55.675'
Aquilla	3	97.12.564'	31.55.196'
Aquilla	4	97.12.968'	31.55.168'
Aquilla	5	97.11.736'	31.55.179'
Aquilla	6	97.12.379'	31.54.348'
Granger	1	97.20.178'	30.42.129'
Granger	2	97.20.312'	30.41.793'
Granger	3	97.21.279'	30.41.829'
Granger	4	97.21.212'	30.41.997'
Granger	5	97.21.484'	30.41.363'
Granger	6	97.21.362'	30.41.101'
Limestone	1	96.18.870'	31.19.718'
Limestone	2	96.21.333'	31.25.235'
Limestone	3	96.20.208'	31.23.781'
Limestone	4	96.20.003'	31.23.863'
Limestone	5	96.19.606'	31.19.746'
Proctor	1	98.30.893'	31.58.697'
Proctor	2	98.29.638'	31.58.427'
Proctor	3	98.29.649'	31.58.306'
Proctor	4	98.28.407'	31.59.216'
Proctor	5	98.28.404'	31.59.228'
Proctor	6	98.28.255'	31.59.197'

NAD83

Appendix B

Location of CHIRP Lines

Aquilla Lake

1)	Beginning:	31°55.731' N	97°11.379' W
	Ending:	31°55.683' N	97°11.219' W
2)	Beginning:	31°55.700' N	97°11.292' W
	Ending:	31°54.011' N	97°12.330' W
3)	Beginning:	31°54.421' N	97°12.737' W
	Ending:	31°54.449' N	97°11.655' W
4)	Beginning:	31°54.136' N	97°11.841' W
	Ending:	31°55.281' N	97°12.854' W

Granger Lake

1)	Beginning:	31°40.389' N	97°22.176' W
	Ending:	30°40.565' N	97°22.551' W
2)	Beginning:	30°41.119' N	97°21.330' W
	Ending:	31°41.434' N	97°21.537' W
3)	Beginning:	30°41.385' N	97°20.459' W
	Ending:	31°41.312' N	97°20.449' W
4)	Beginning:	30°42.694' N	97°20.867' W
	Ending:	30°42.861' N	97°20.766' W
5)	Beginning:	30°42.164' N	97°21.586' W
	Ending:	30°41.798' N	97°21.775' W
6)	Beginning:	30°42.350' N	97°22.883' W
	Ending:	30°41.963' N	97°22.706' W

Appendix B

CHIRP Lines from each Reservoir.

Limestone Lake

1)	Beginning:	31°19.901' N	96°18.738' W
	Ending:	31°19.653' N	97°19.724' W
2)	Beginning:	31°23.228' N	96°19.210' W
	Ending:	31°22.787' N	96°19.791' W
3)	Beginning:	31°24.339' N	96°20.482' W
	Ending:	31°24.510' N	96°20.369' W
4)	Beginning:	31°24.874' N	96°21.789' W
	Ending:	31°25.604' N	97°20.557' W
5)	Beginning:	31°26.951' N	96°21.097' W
	Ending:	31°27.000' N	96°20.983' W
6)	Beginning:	31°26.479' N	96°22.530' W
	Ending:	31°26.072' N	96°22.537' W
7)	Beginning:	31°26.401' N	96°22.736' W
	Ending:	31°19.873' N	96°18.854' W

Procter Lake

1)	Beginning:	31°58.689' N	98°30.894' W
	Ending:	31°58.438' N	98°30.883' W
2)	Beginning:	31°58.363' N	98°28.960' W
	Ending:	31°58.833' N	98°28.981' W
3)	Beginning:	31°59.114' N	98°28.778' W
	Ending:	31°59.068' N	98°28.147' W
4)	Beginning:	31°59.227' N	98°29.751' W
	Ending:	31°59.373' N	98°29.522' W
5)	Beginning:	32°01.010' N	98°30.419' W
	Ending:	32°01.061' N	98°30.356' W
6)	Beginning:		
	Ending:		
7)	Beginning:		
	Ending:		
8)	Beginning:	31°59.283' N	98°29.111' W
	Ending:	31°58.503' N	98°31.035' W

Figure 1- R/V Cavalla rigged and ready for launch in a Brazos River Reservoir

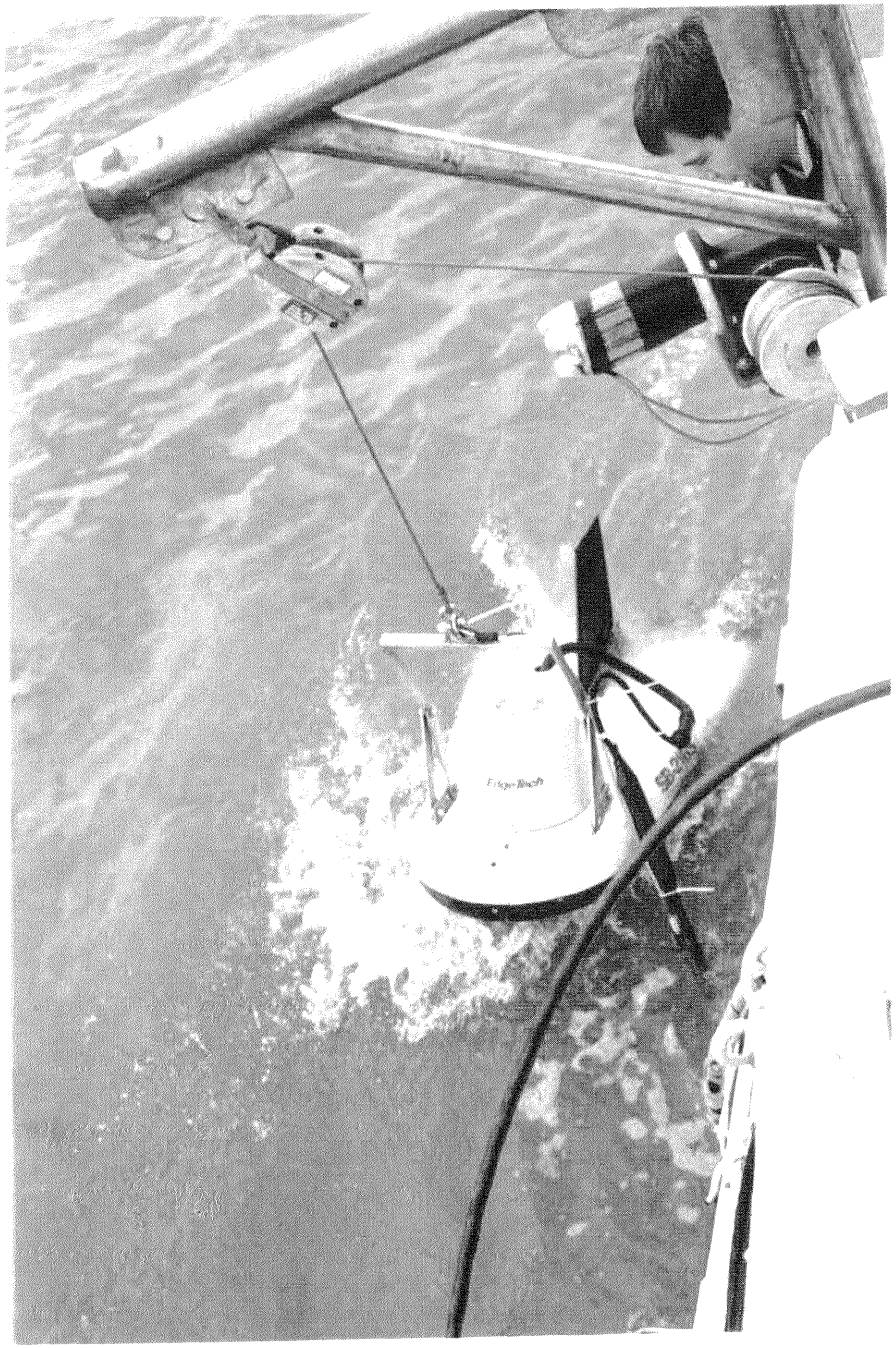


Figure 2- CHIRP being deployed

Figure 3

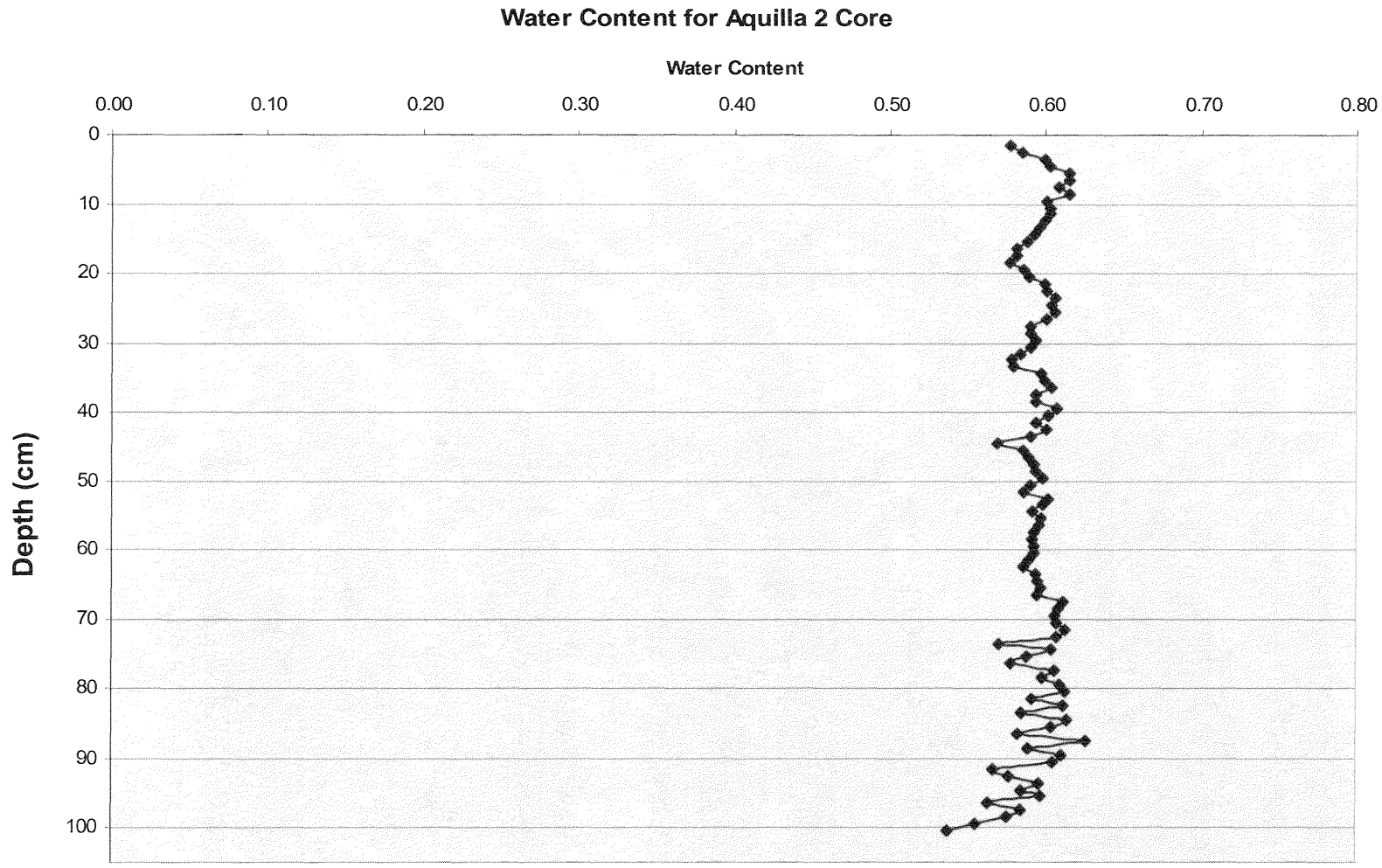

Water Content for Aquilla 2 Core
Water Content
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 4

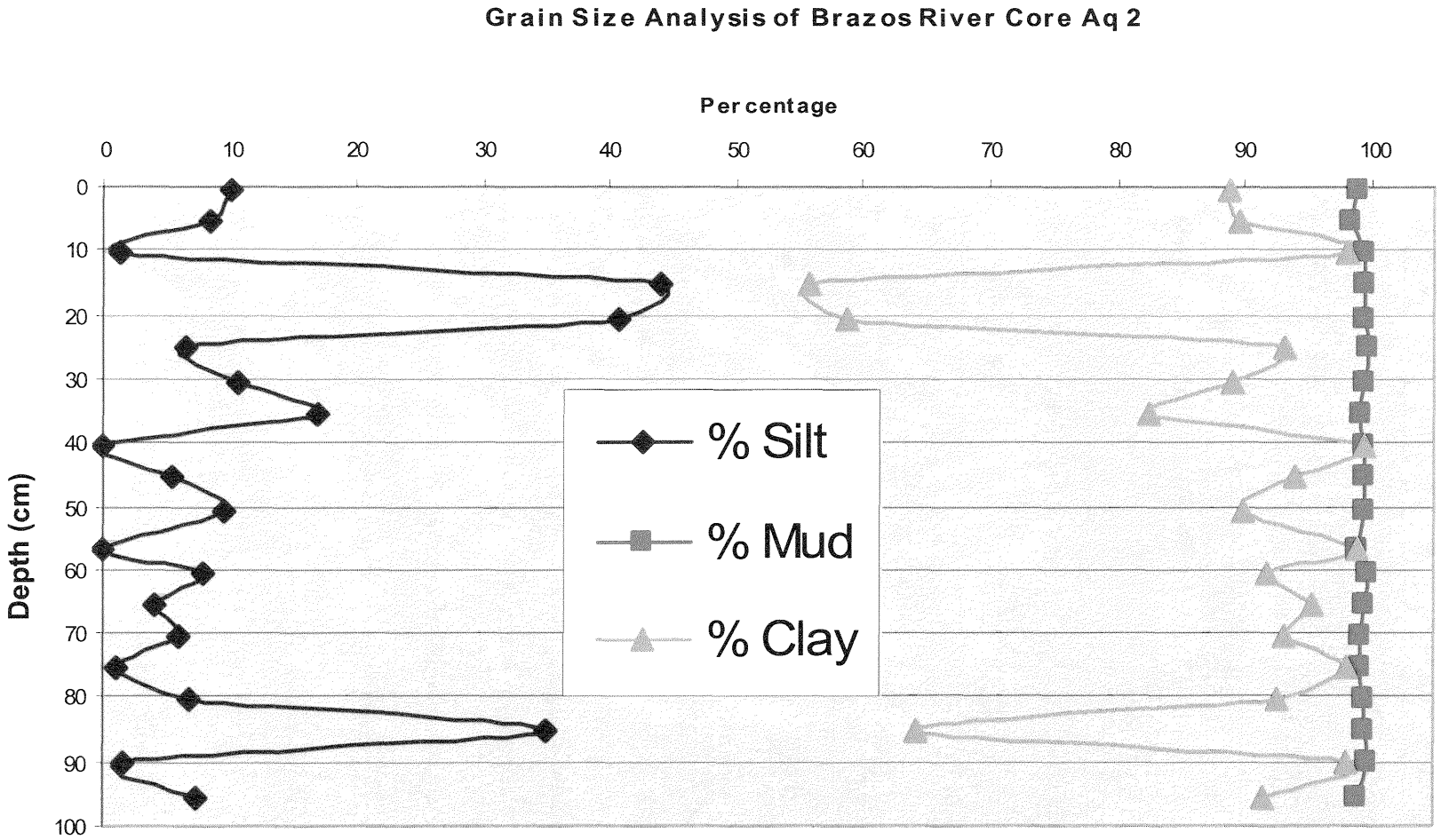

Grain Size Analysis of Brazos River Core Aq 2
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
% Silt
% Mud
% Clay

Figure 5

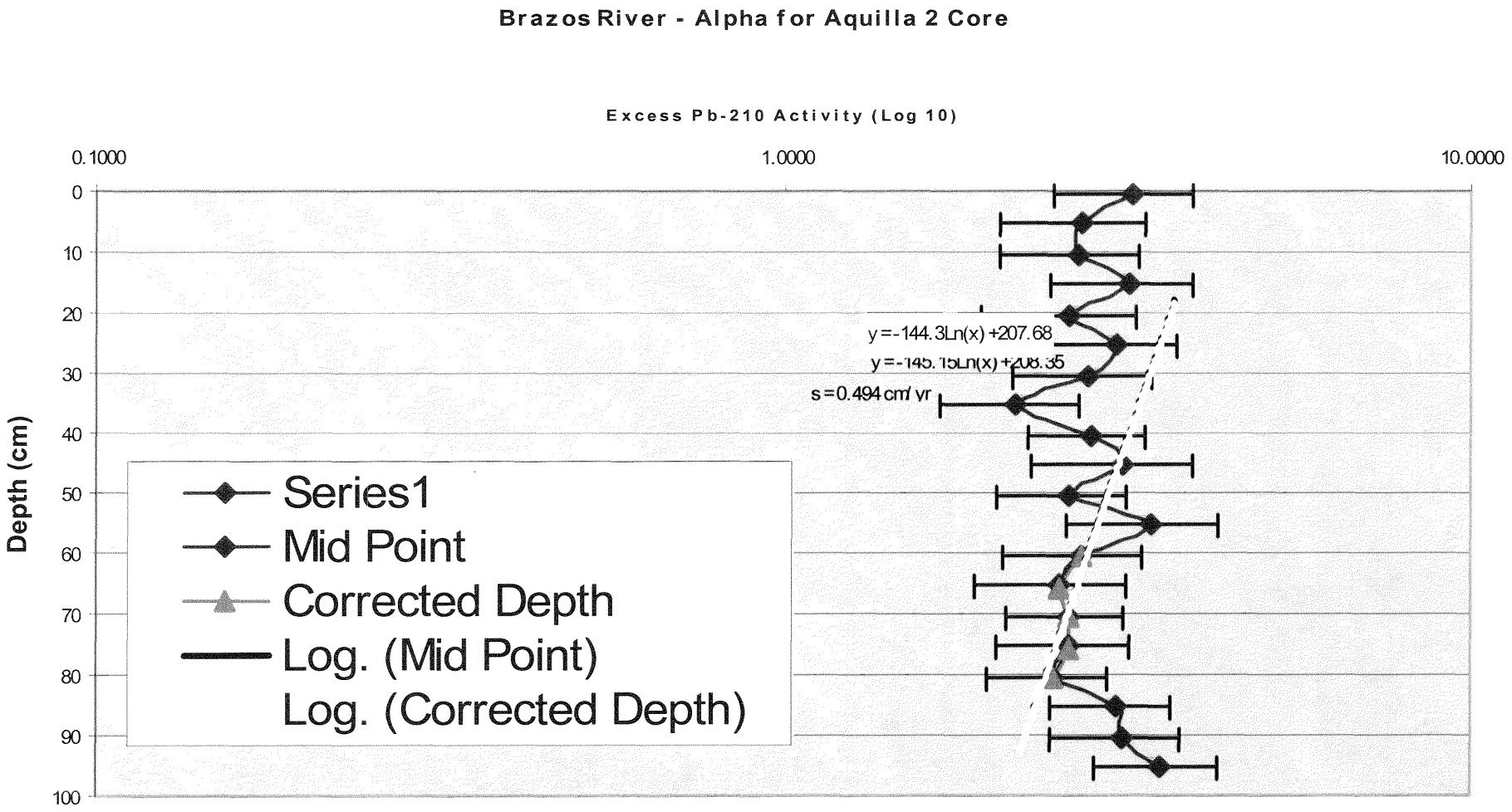

Brazos River - Alpha for Aquilla 2 Core
Excess Pb-210 Activity (Log 10)
0.1000
1.0000
10.0000
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
y = -144.3Ln(x) +207.68
y = -145.15Ln(x) +208.35
s = 0.494 cm/ yr
Series1
Mid Point
Corrected Depth
Log. (Mid Point)
Log. (Corrected Depth)

Figure 6

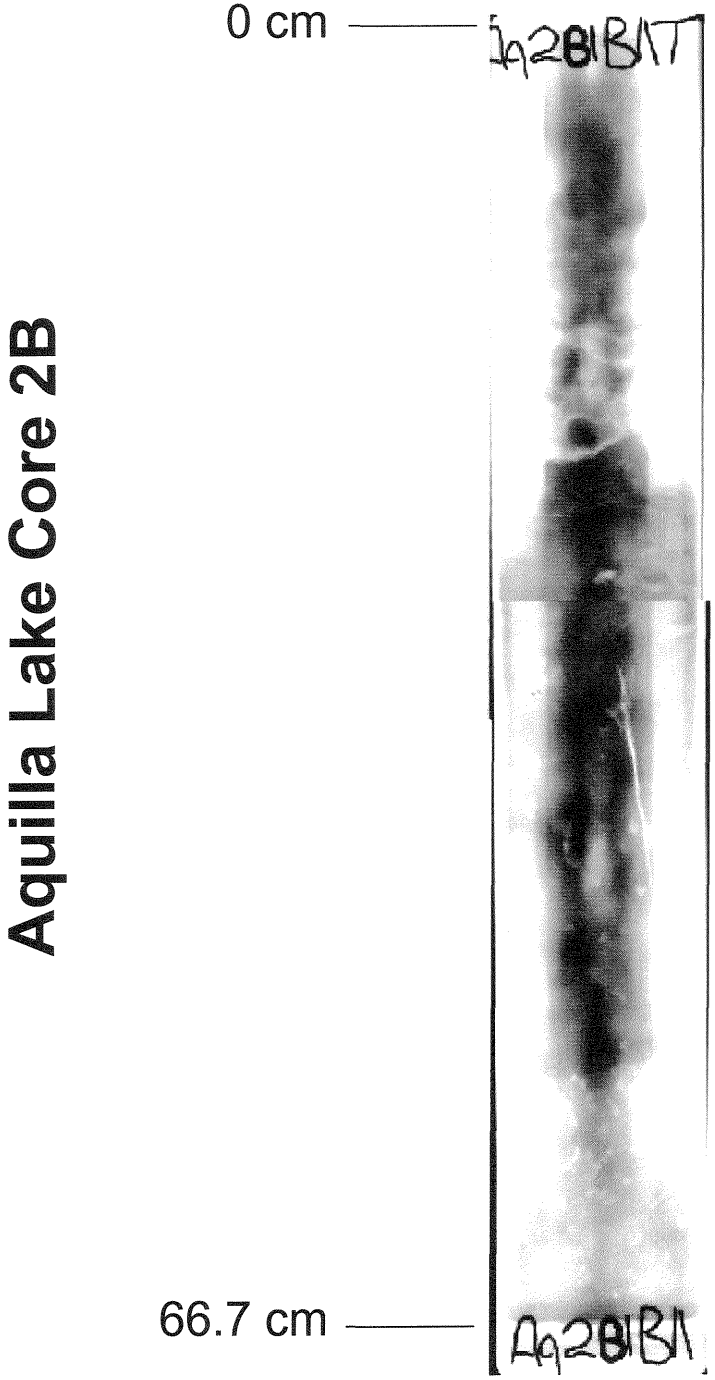


Figure 7

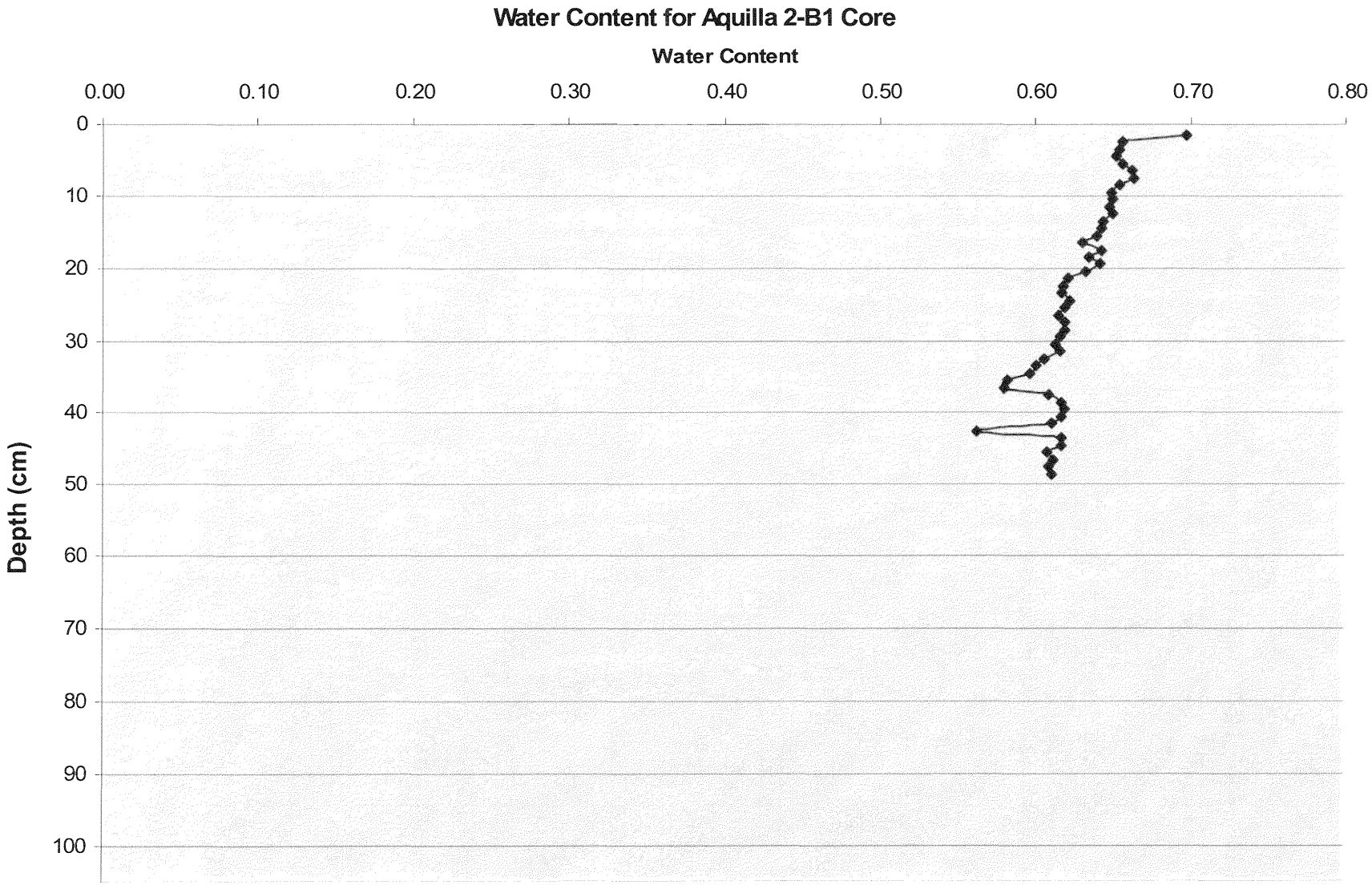

Water Content for Aquilla 2-B1 Core
Water Content
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 8

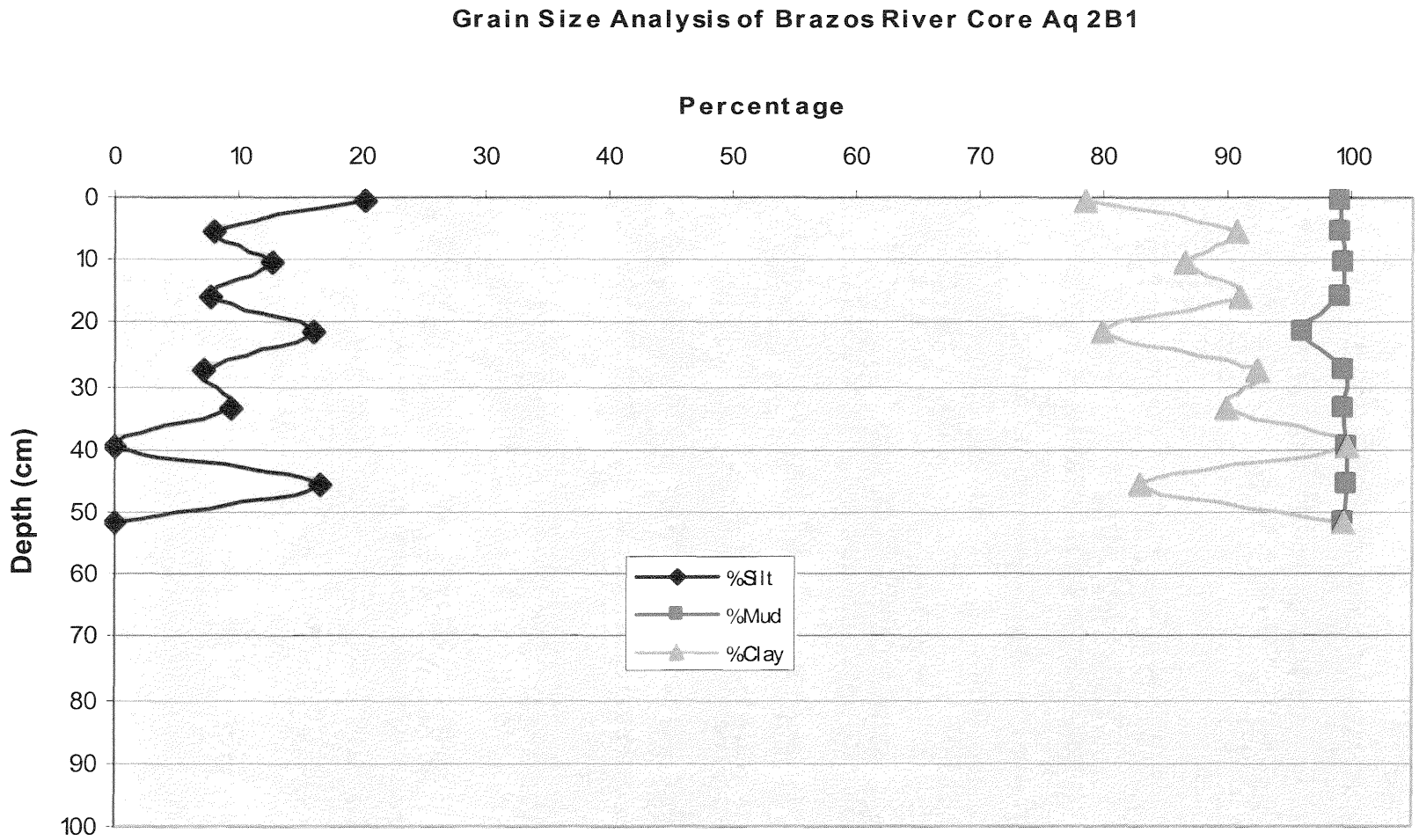

Grain Size Analysis of Brazos River Core Aq 2B1
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
%Silt
%Mud
%Clay

Figure 9

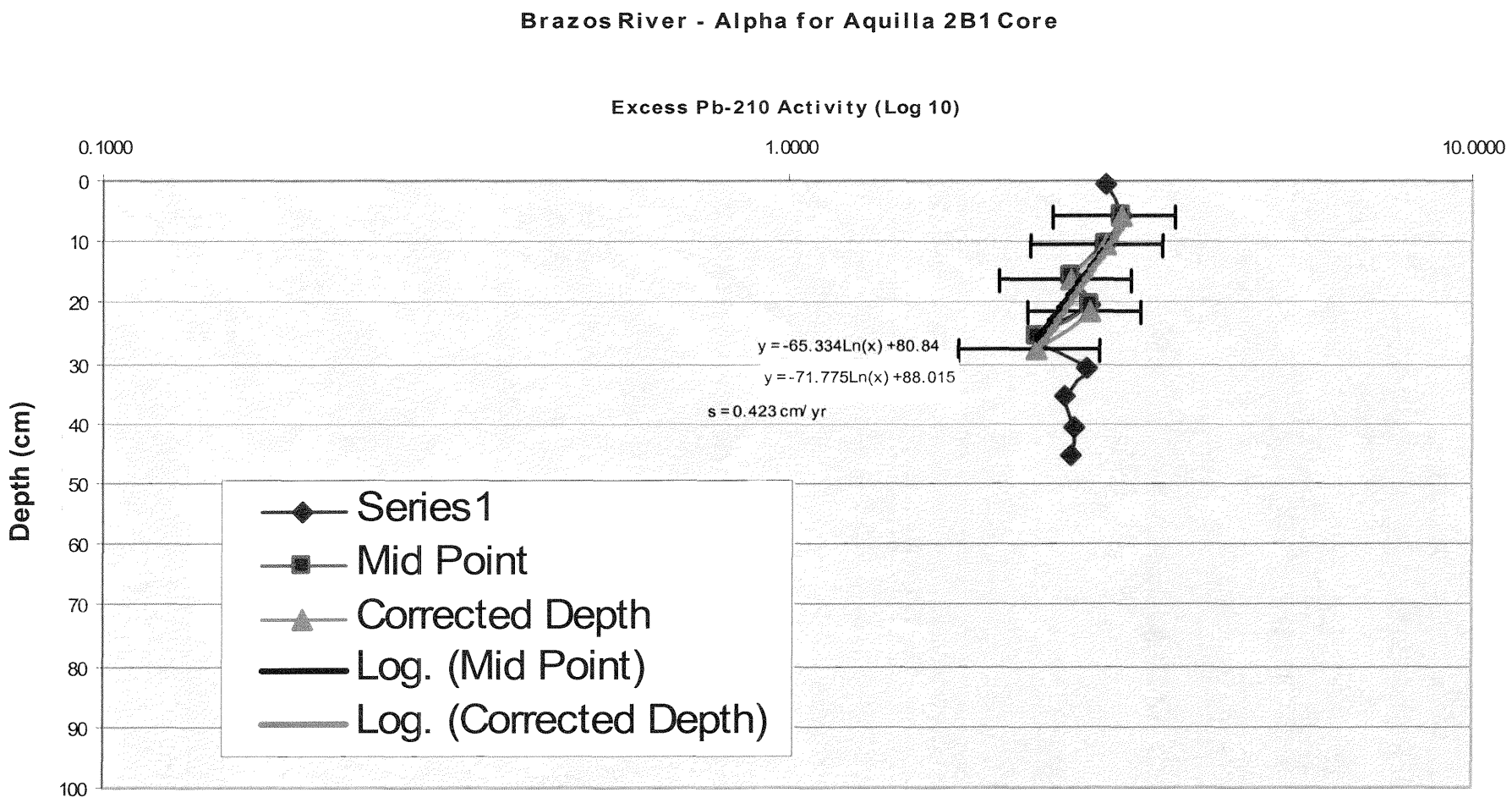

Brazos River - Alpha for Aquilla 2B1 Core
Excess Pb-210 Activity (Log 10)
0.1000
1.0000
10.0000
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
y = -65.334Ln(x) +80.84
y = -71.775Ln(x) +88.015
s = 0.423 cm/ yr
Series1
Mid Point
Corrected Depth
Log. (Mid Point)
Log. (Corrected Depth)

Figure 10

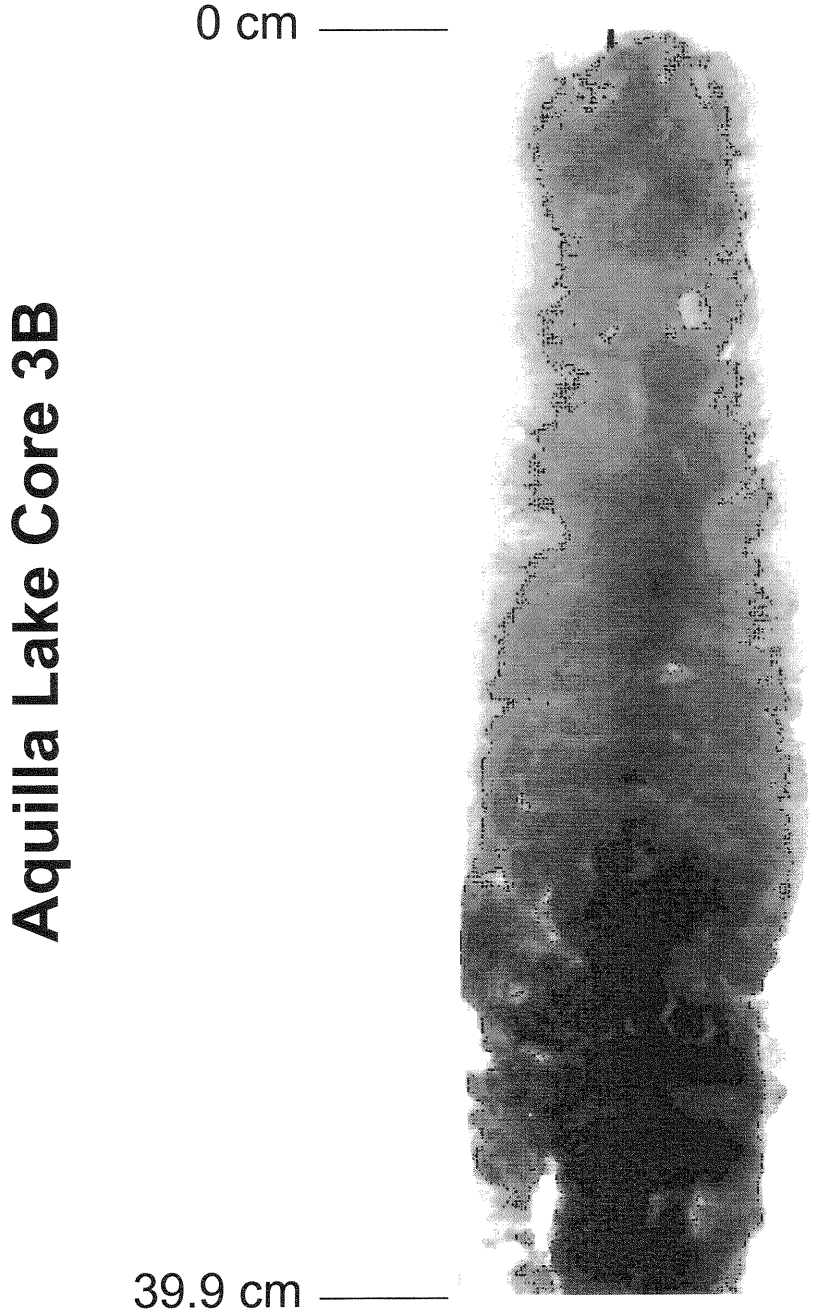


Figure 11

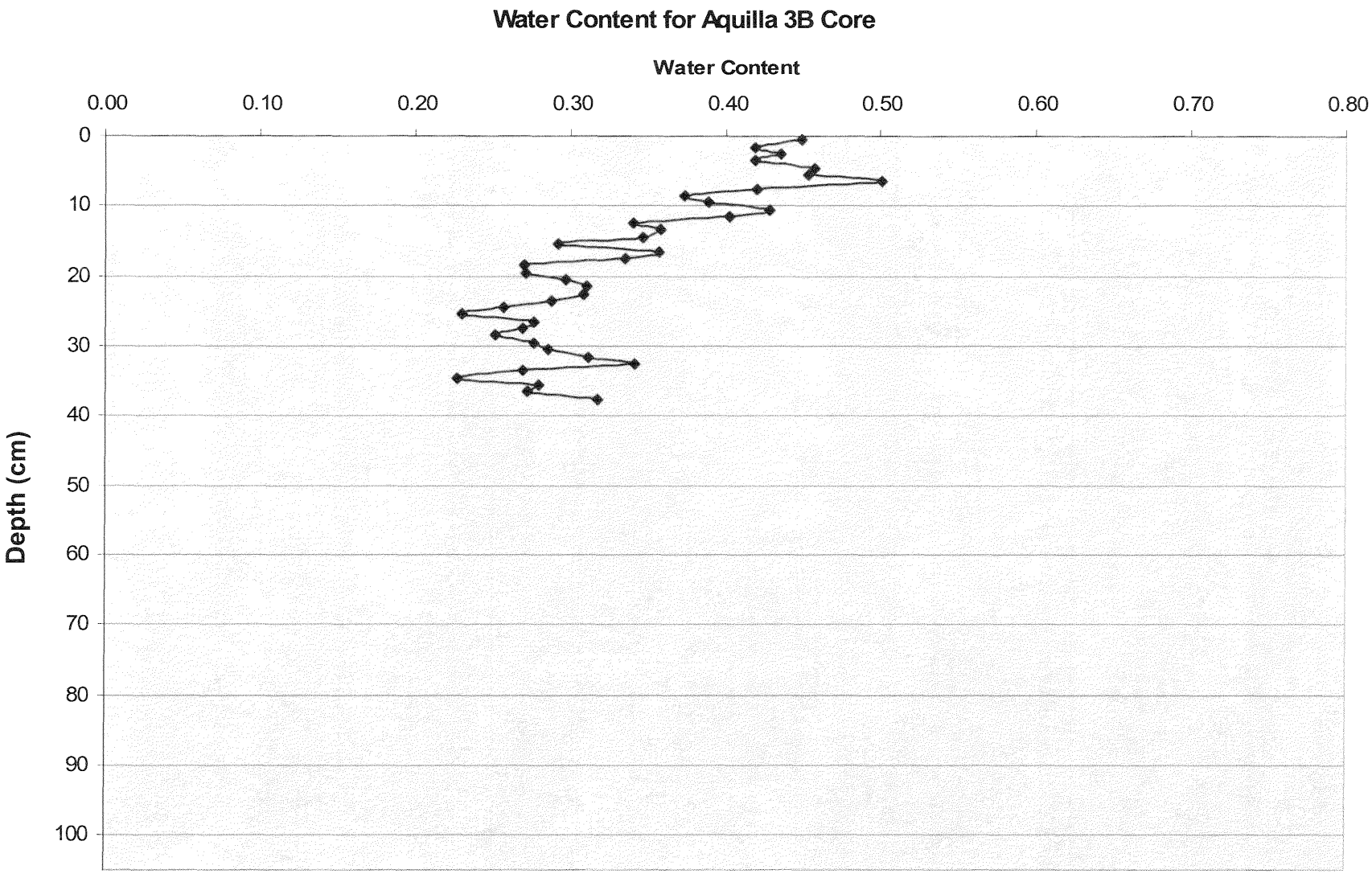

Water Content for Aquilla 3B Core
Water Content
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 12

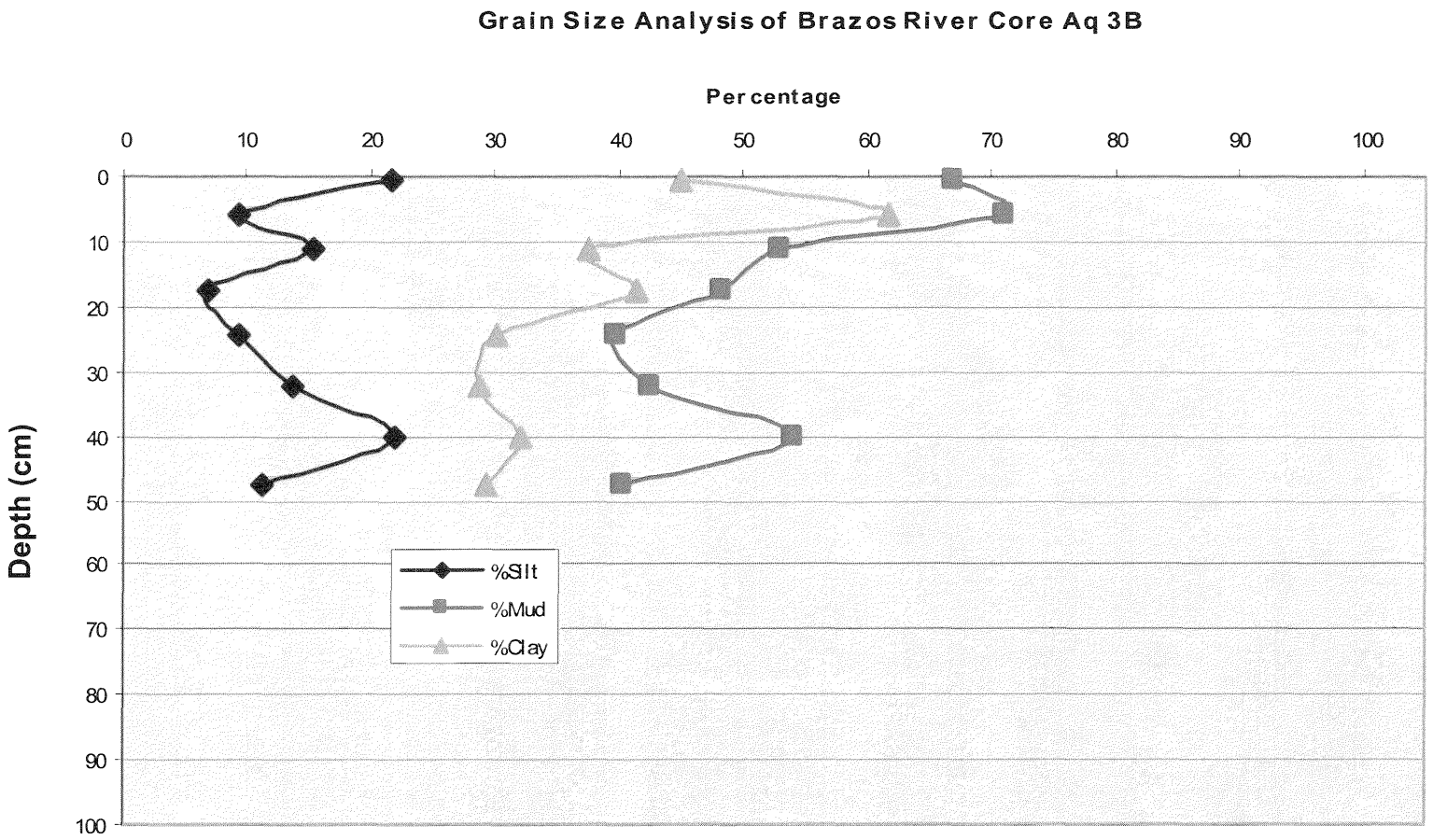

Grain Size Analysis of Brazos River Core Aq 3B
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
%Silt
%Mud
%Clay

Figure 13

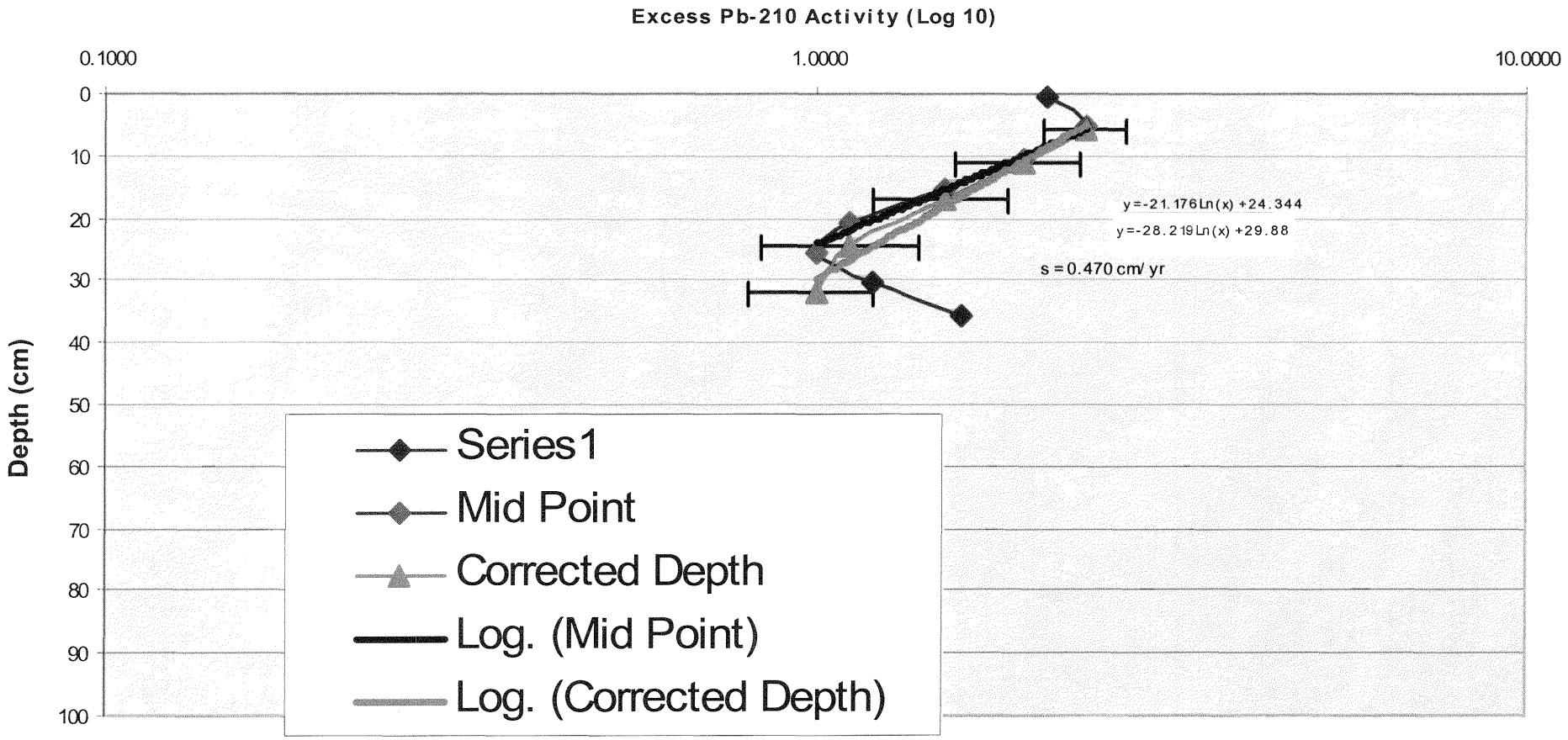

Brazos River - Alpha for Aquilla 3B Core
Excess Pb-210 Activity (Log 10)
0.1000
1.0000
10.0000
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
y=-21.176Ln(x)+24.344
y=-28.219Ln(x)+29.88
s=0.470 cm/yr
Series1
Mid Point
Corrected Depth
Log. (Mid Point)
Log. (Corrected Depth)

Figure 14

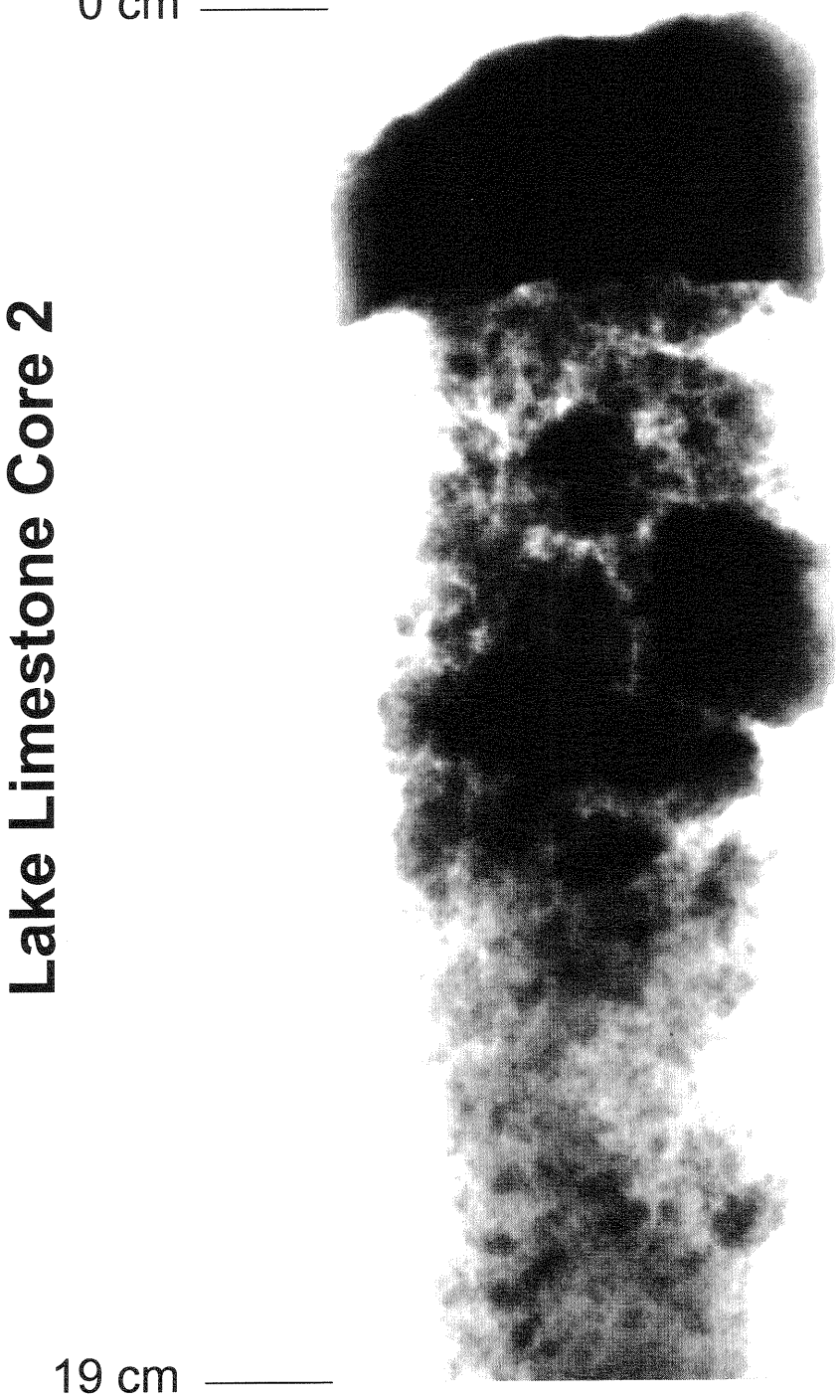


Figure 15

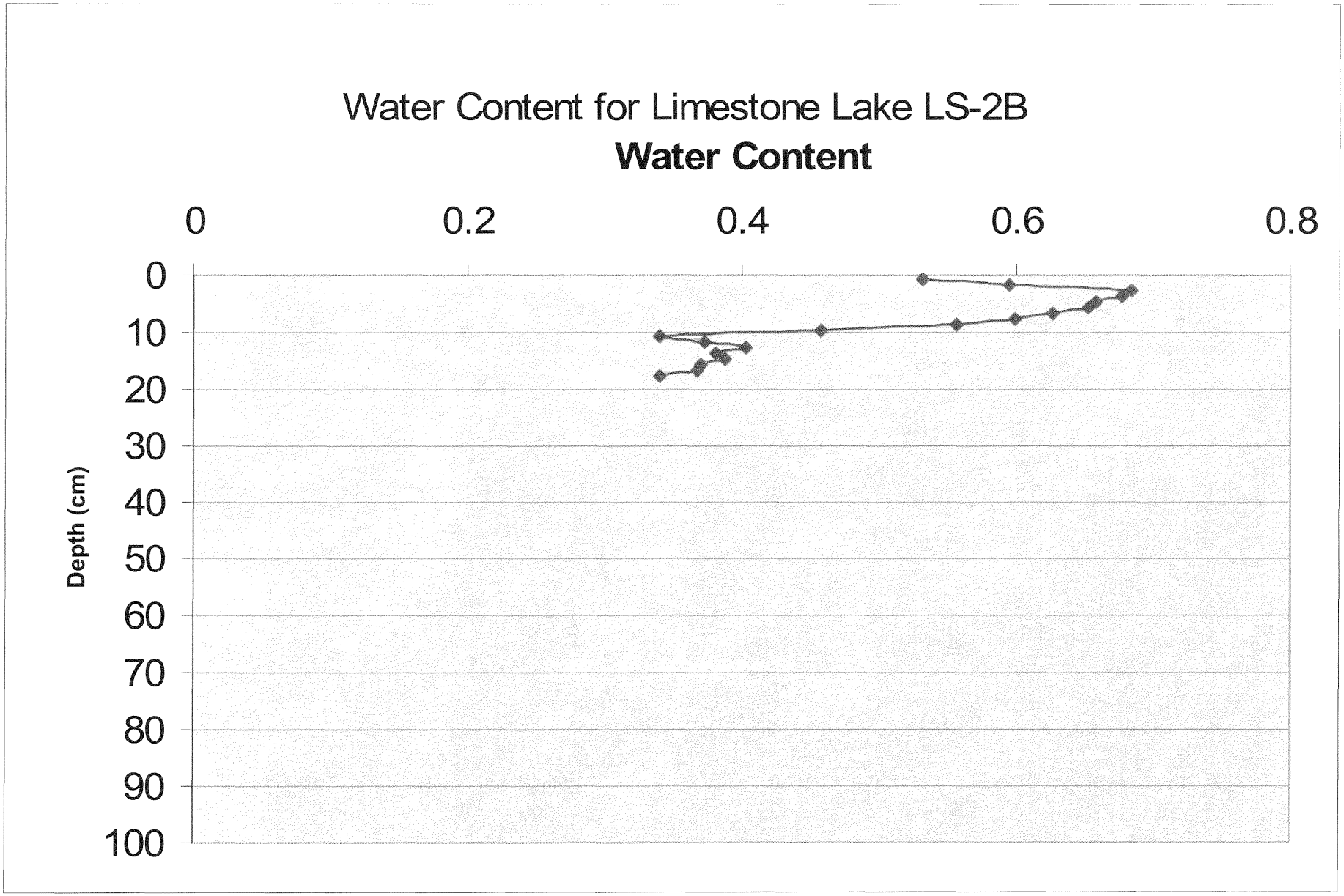

Water Content for Limestone Lake LS-2B
Water Content
0
0.2
0.4
0.6
0.8
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 16

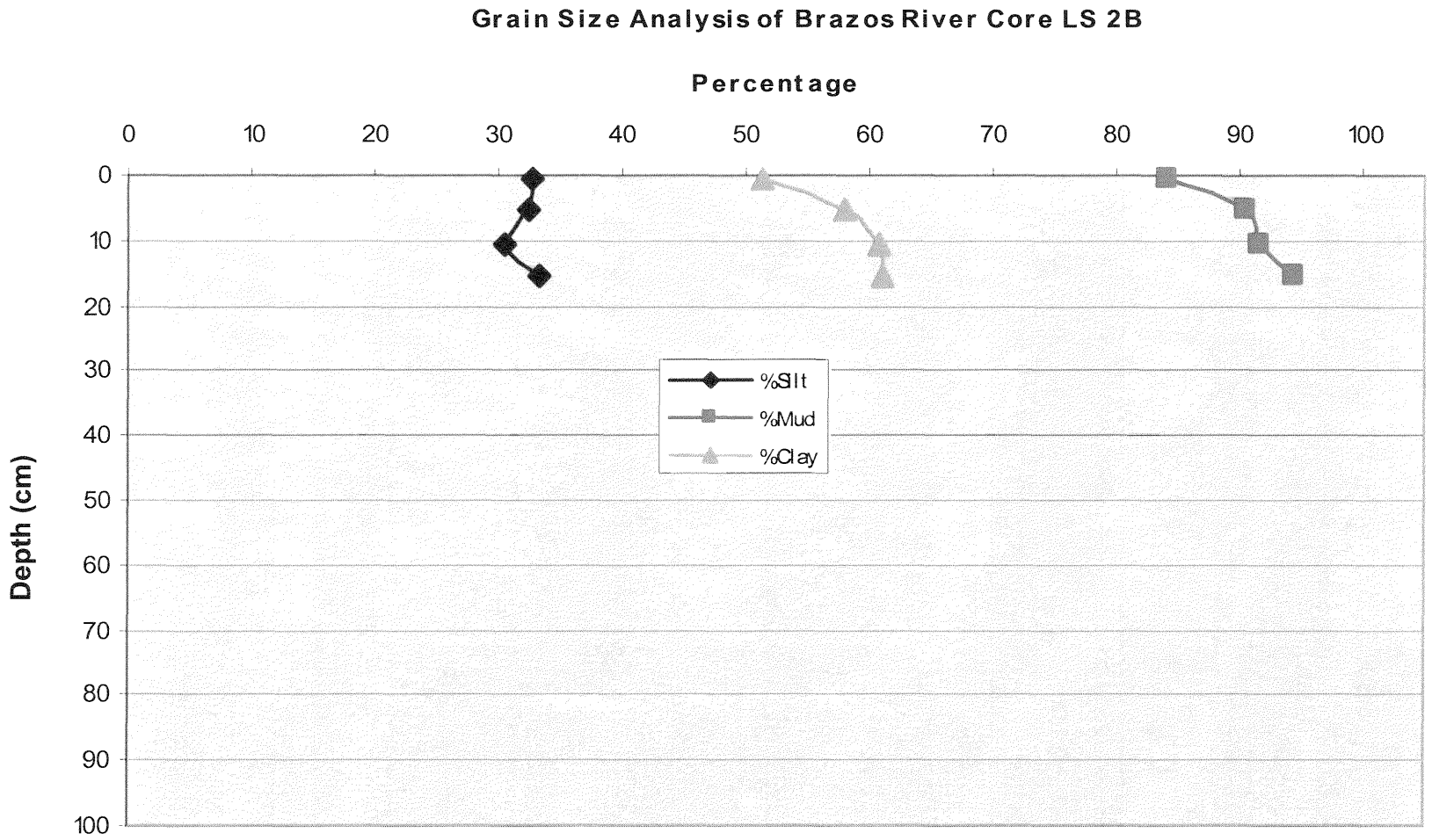

Grain Size Analysis of Brazos River Core LS 2B
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
%Silt
%Mud
%Clay

Figure 17

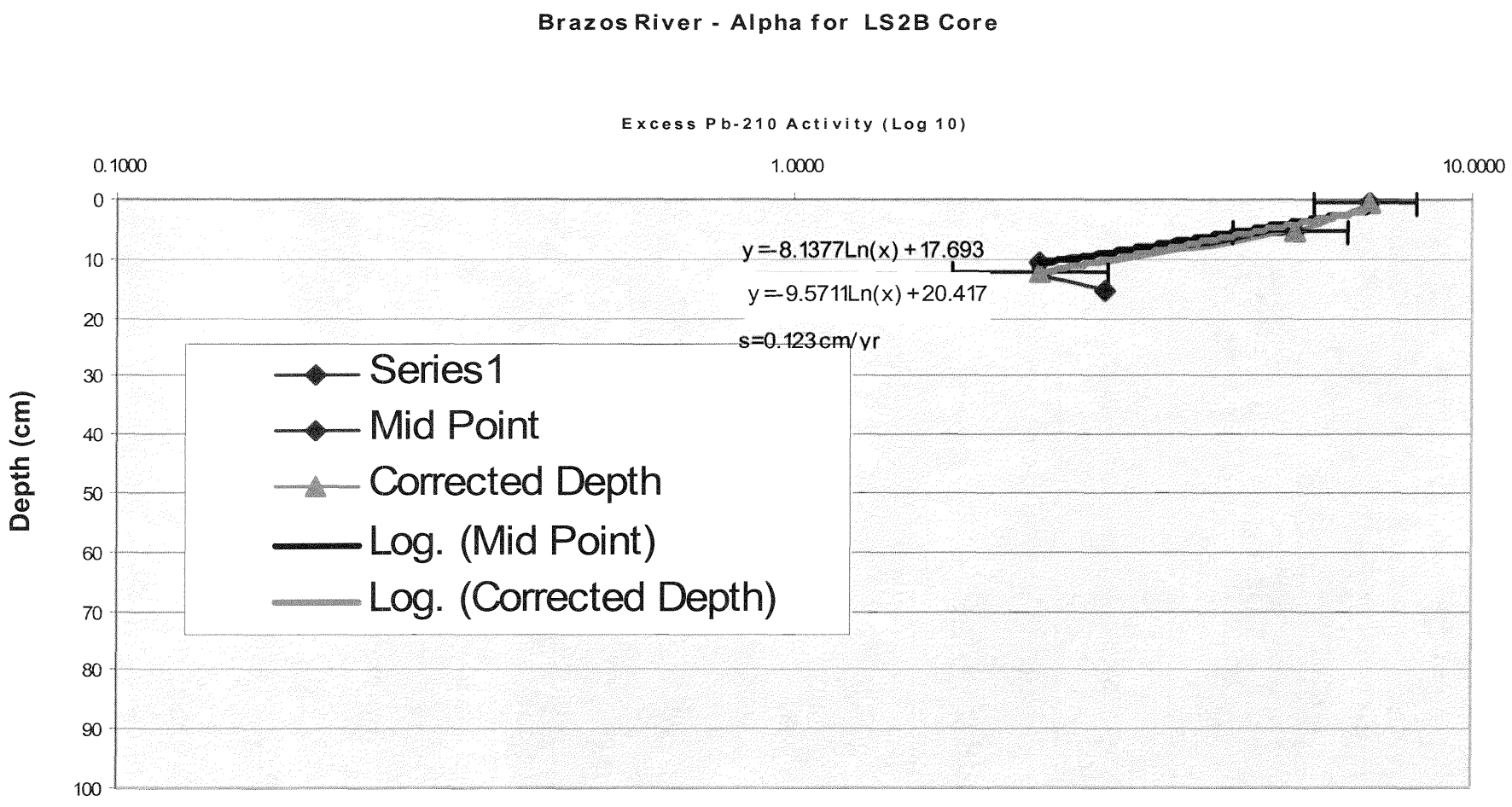

Brazos River - Alpha for LS2B Core
Excess Pb-210 Activity (Log 10)
0.1000
1.0000
10.0000
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
y = -8.1377Ln(x) + 17.693
y = -9.5711Ln(x) + 20.417
s=0.123cm/yr
Series1
Mid Point
Corrected Depth
Log. (Mid Point)
Log. (Corrected Depth)

Figure 18

Figure 19

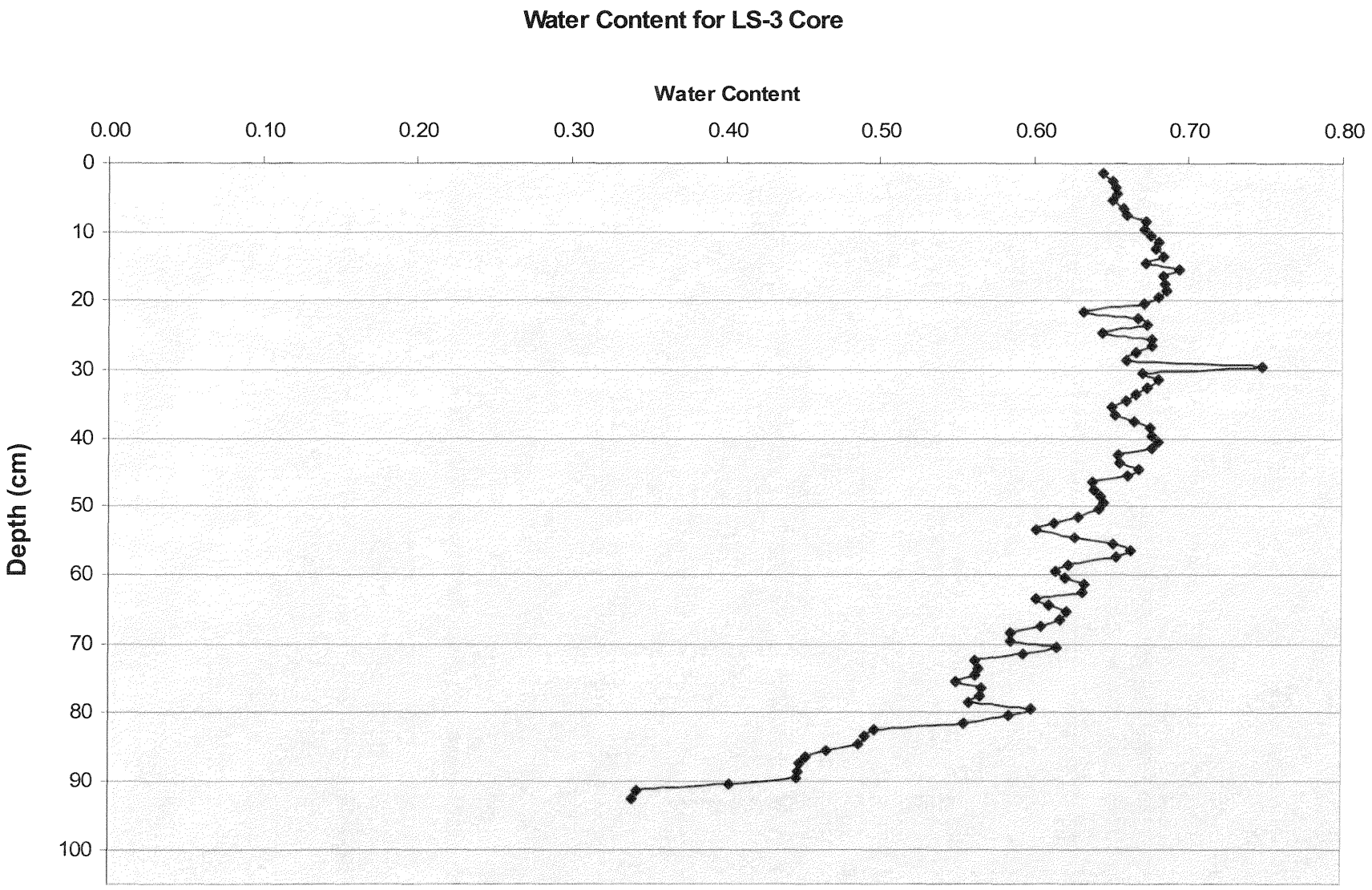

Water Content for LS-3 Core
Water Content
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 20

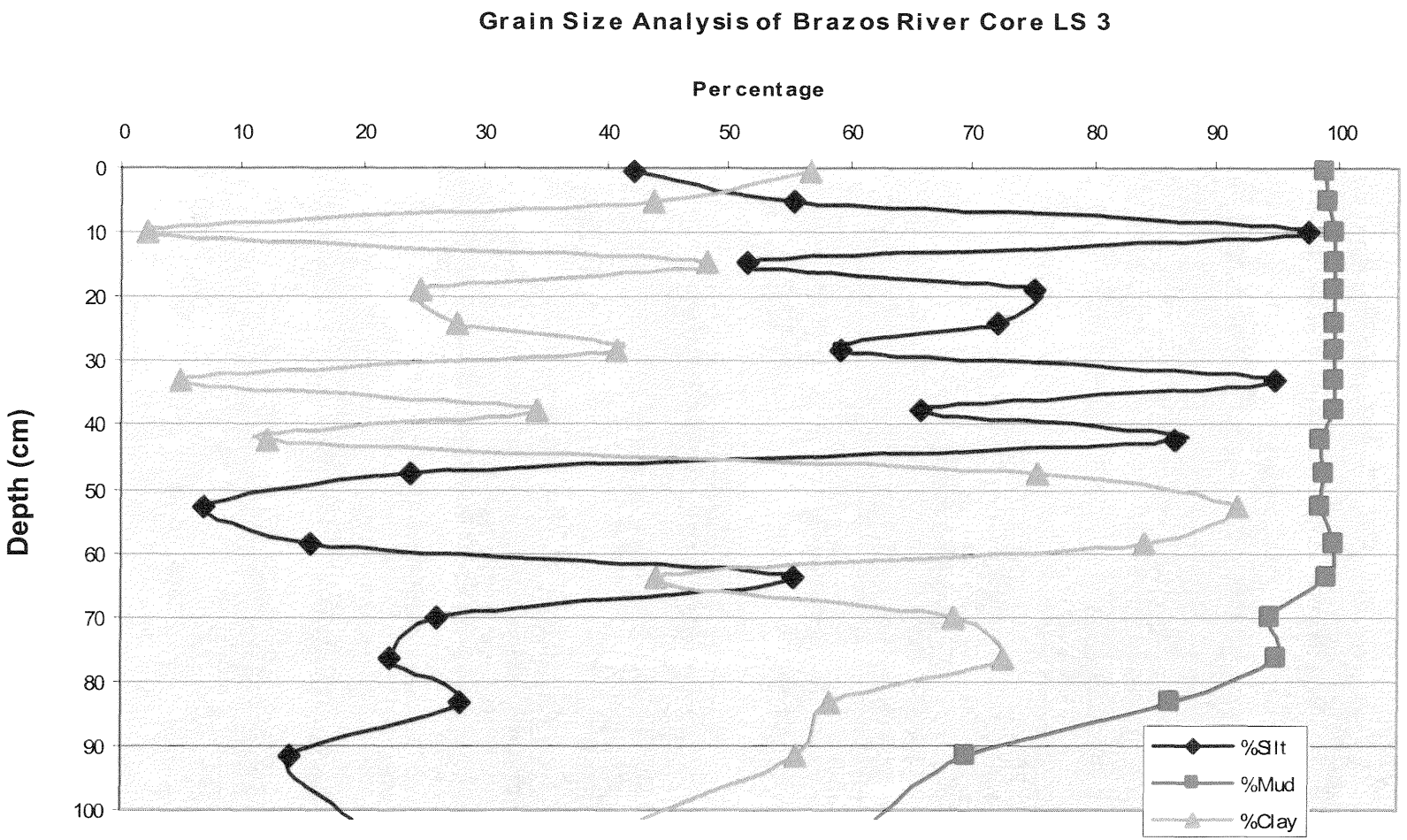

Grain Size Analysis of Brazos River Core LS 3
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
%Silt
%Mud
%Clay

Figure 21

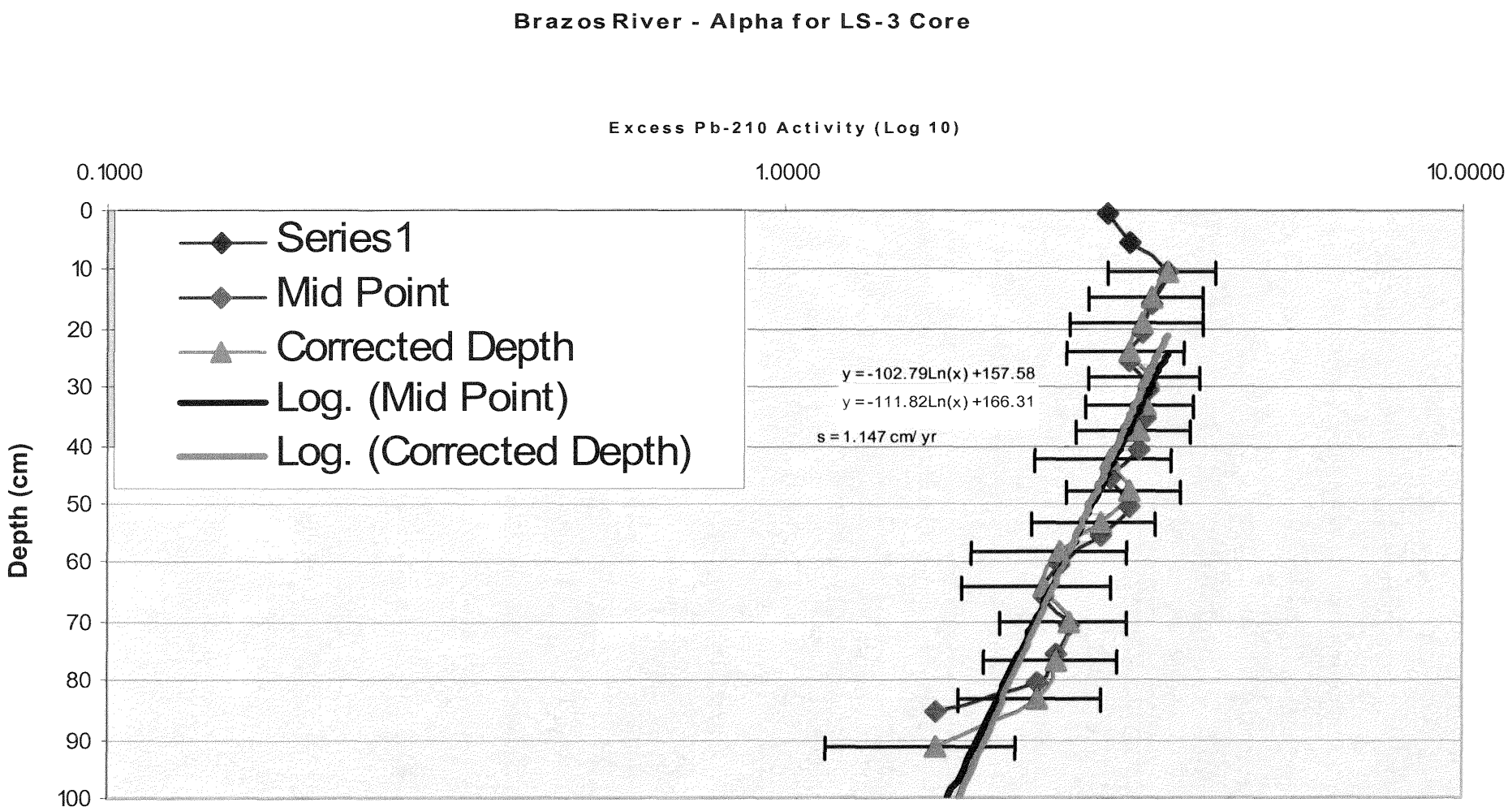

Brazos River - Alpha for LS-3 Core
Excess Pb-210 Activity (Log 10)
0.1000
1.0000
10.0000
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
Series1
Mid Point
Corrected Depth
Log. (Mid Point)
Log. (Corrected Depth)
y = -102.79Ln(x) +157.58
y = -111.82Ln(x) +166.31
s = 1.147 cm/ yr

Figure 22

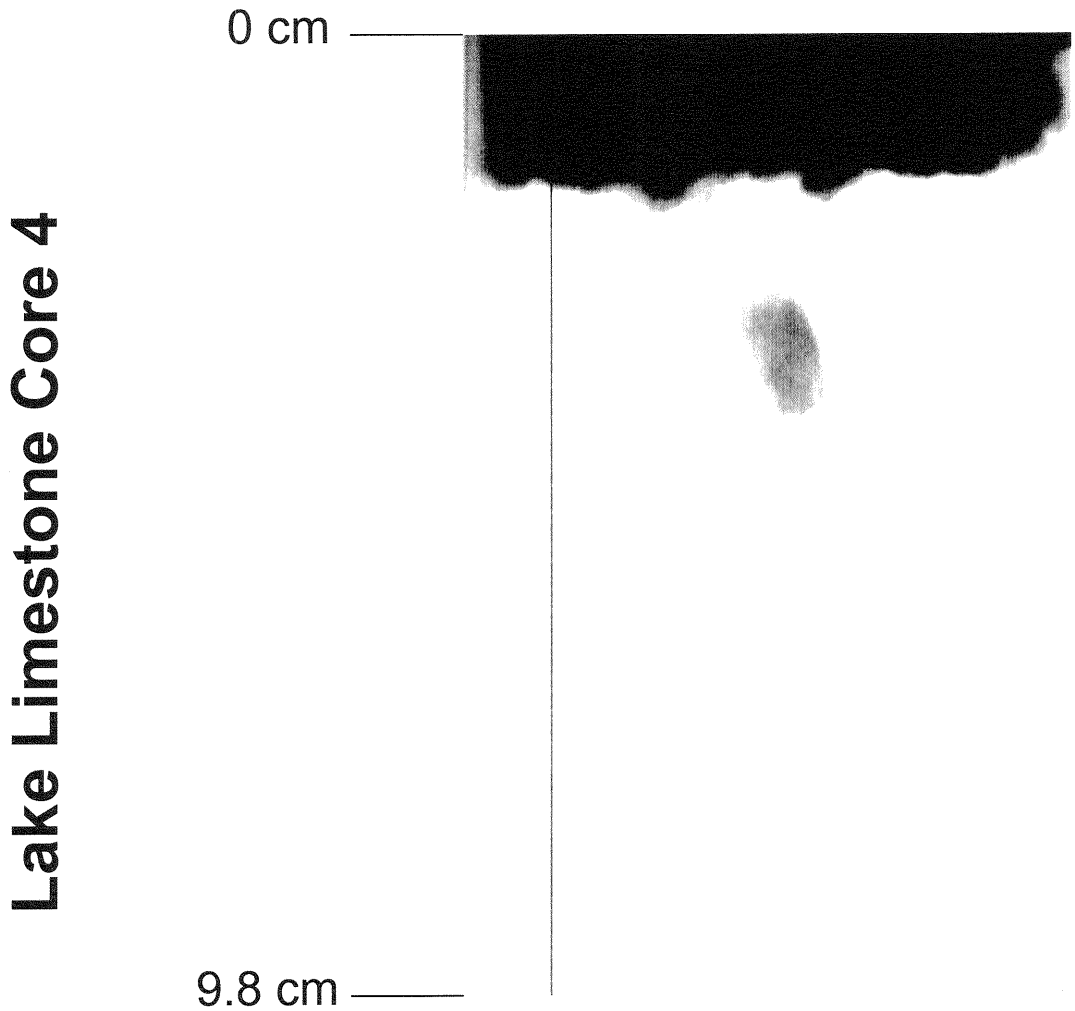


Figure 23

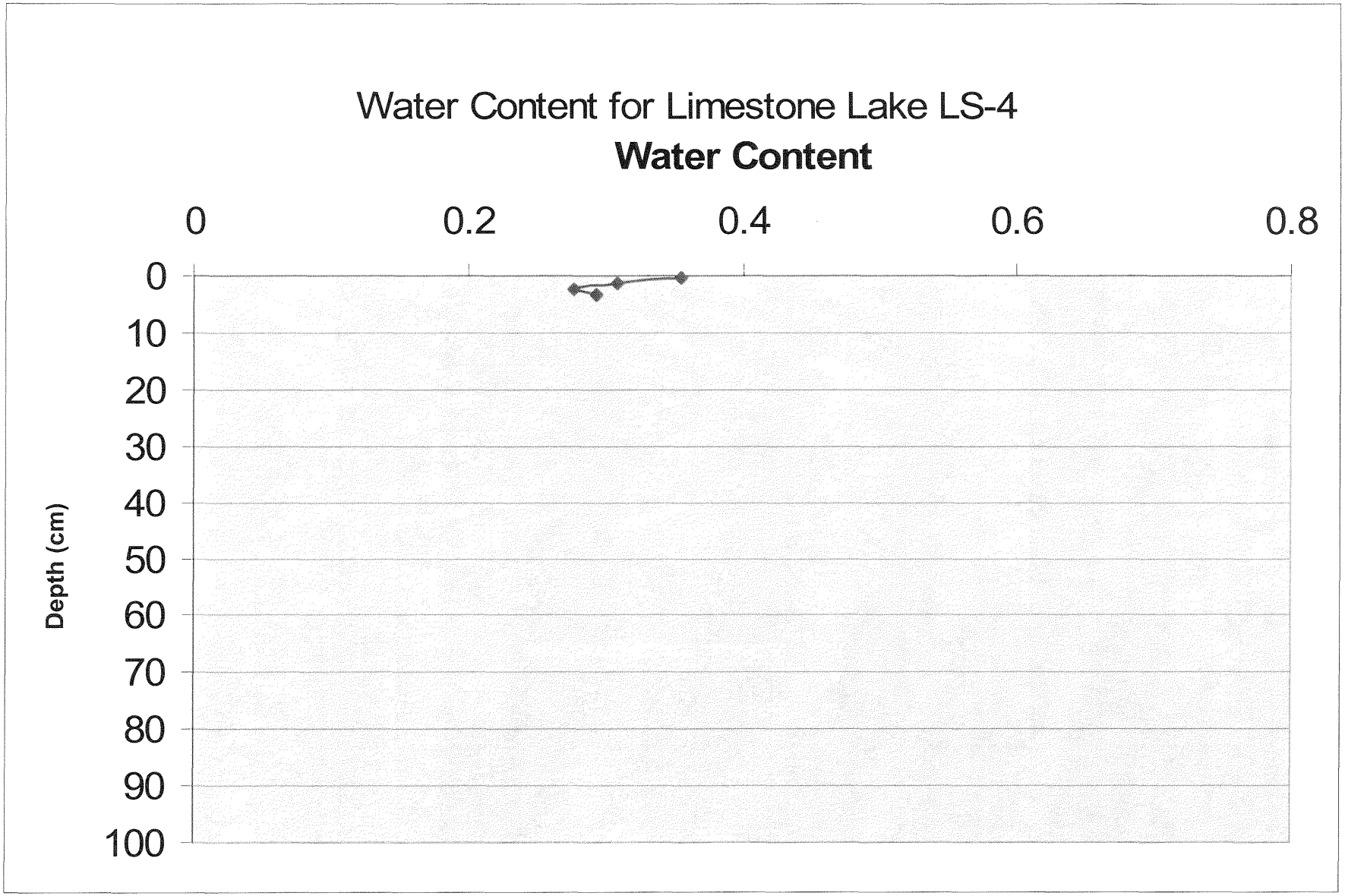

Water Content for Limestone Lake LS-4
Water Content
0
0.2
0.4
0.6
0.8
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 24

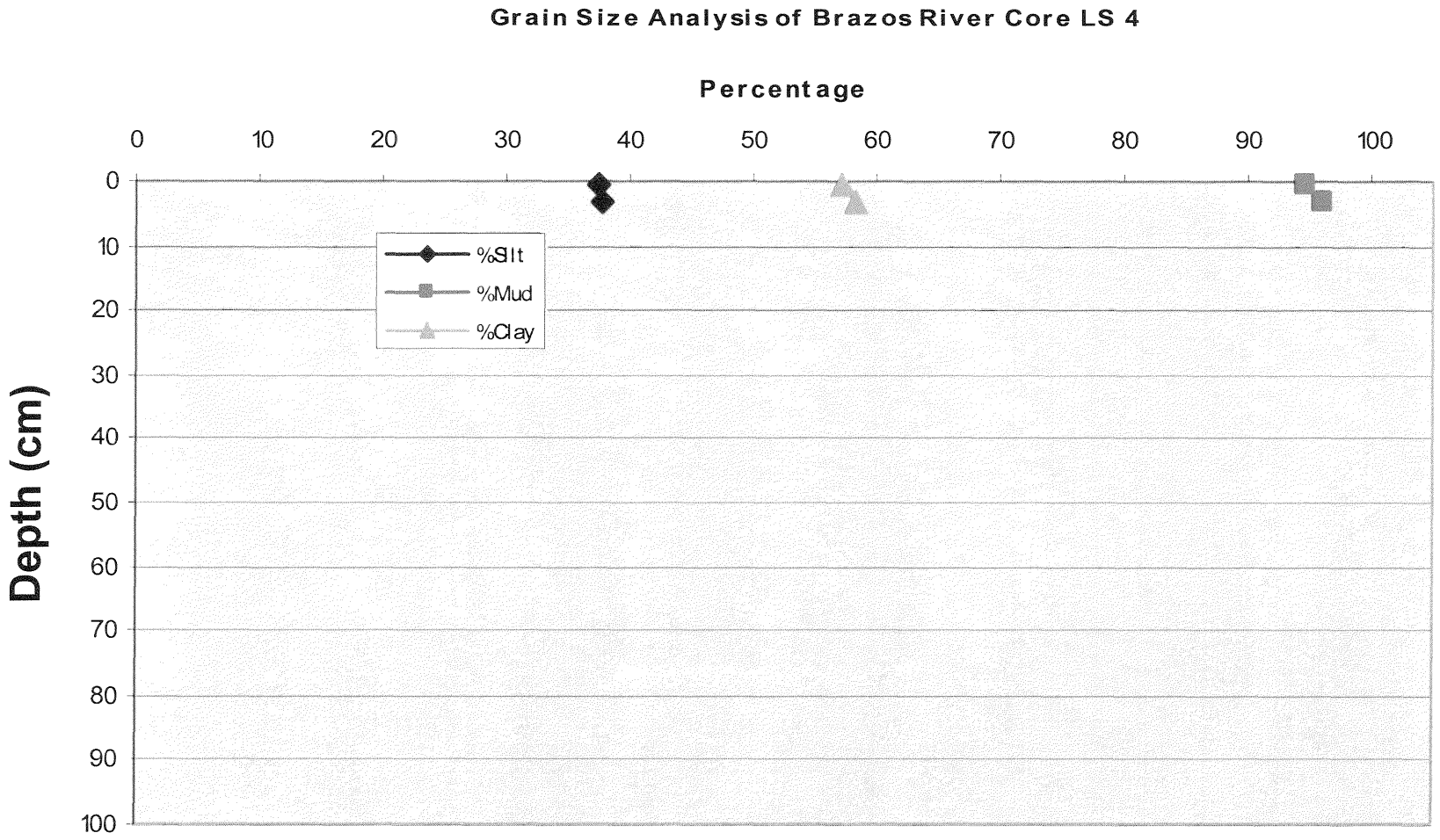

Grain Size Analysis of Brazos River Core LS 4
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
%Silt
%Mud
%Clay

Figure 25

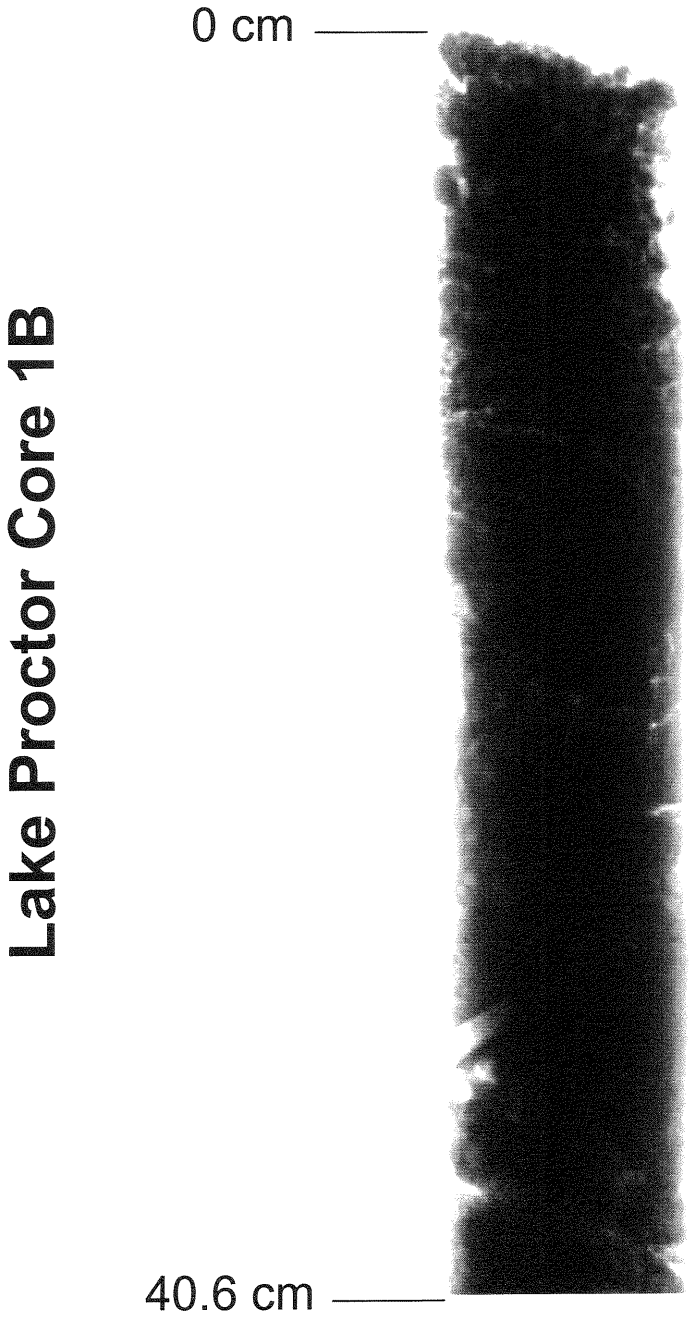


Figure 26

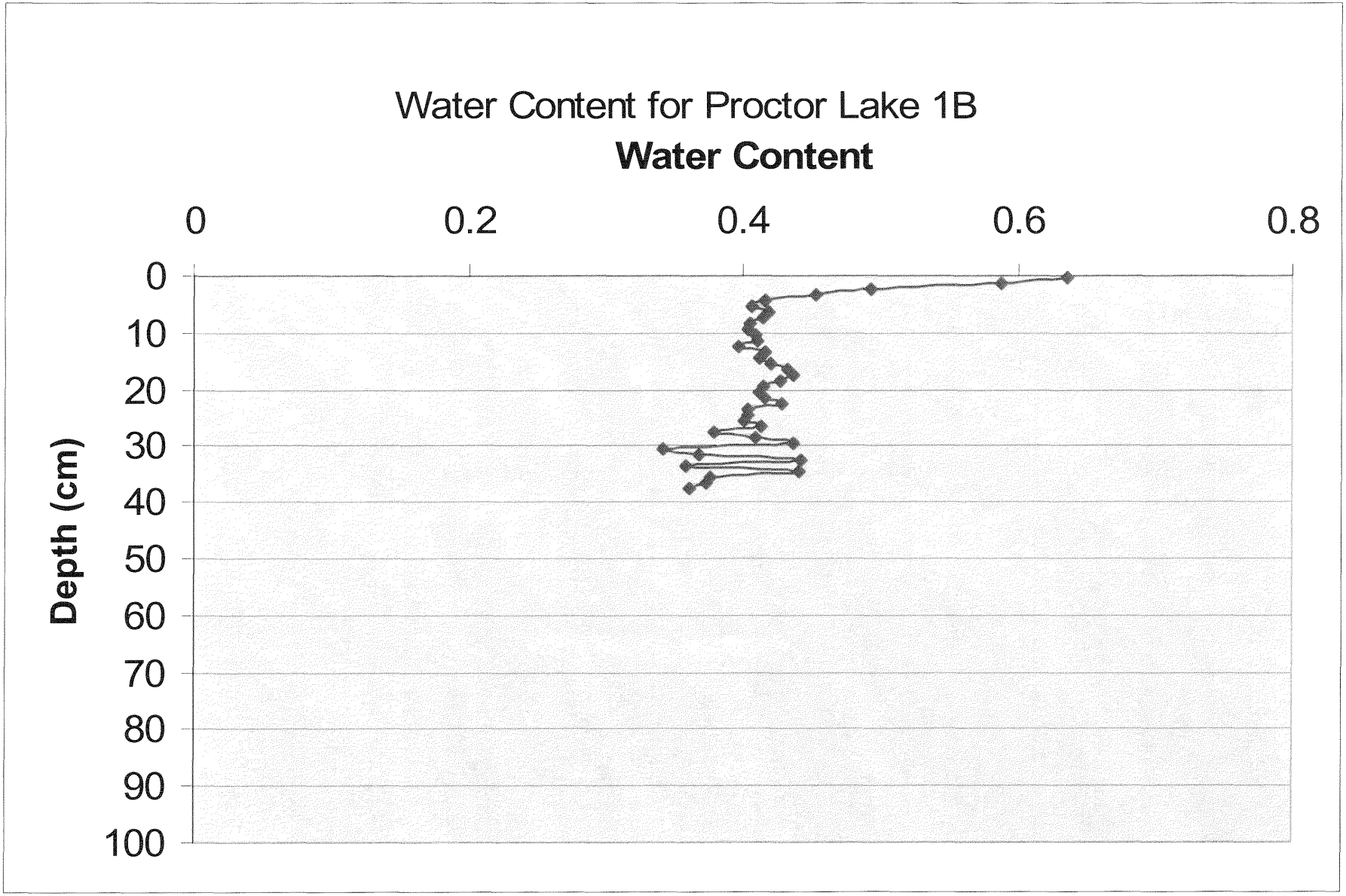

Water Content for Proctor Lake 1B
Water Content
0
0.2
0.4
0.6
0.8
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 27

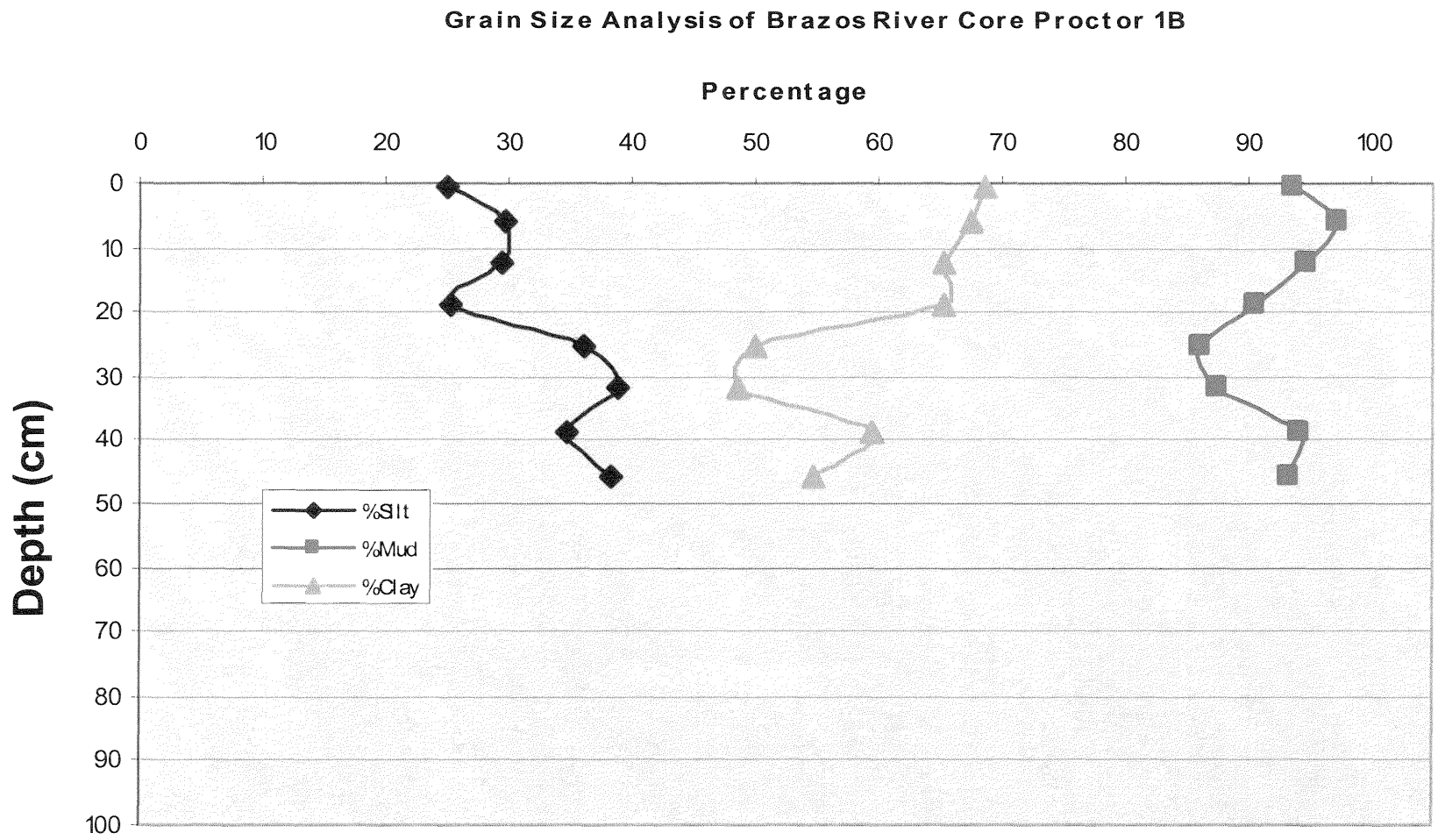

Grain Size Analysis of Brazos River Core Proctor 1B
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
%Silt
%Mud
%Clay

Figure 28

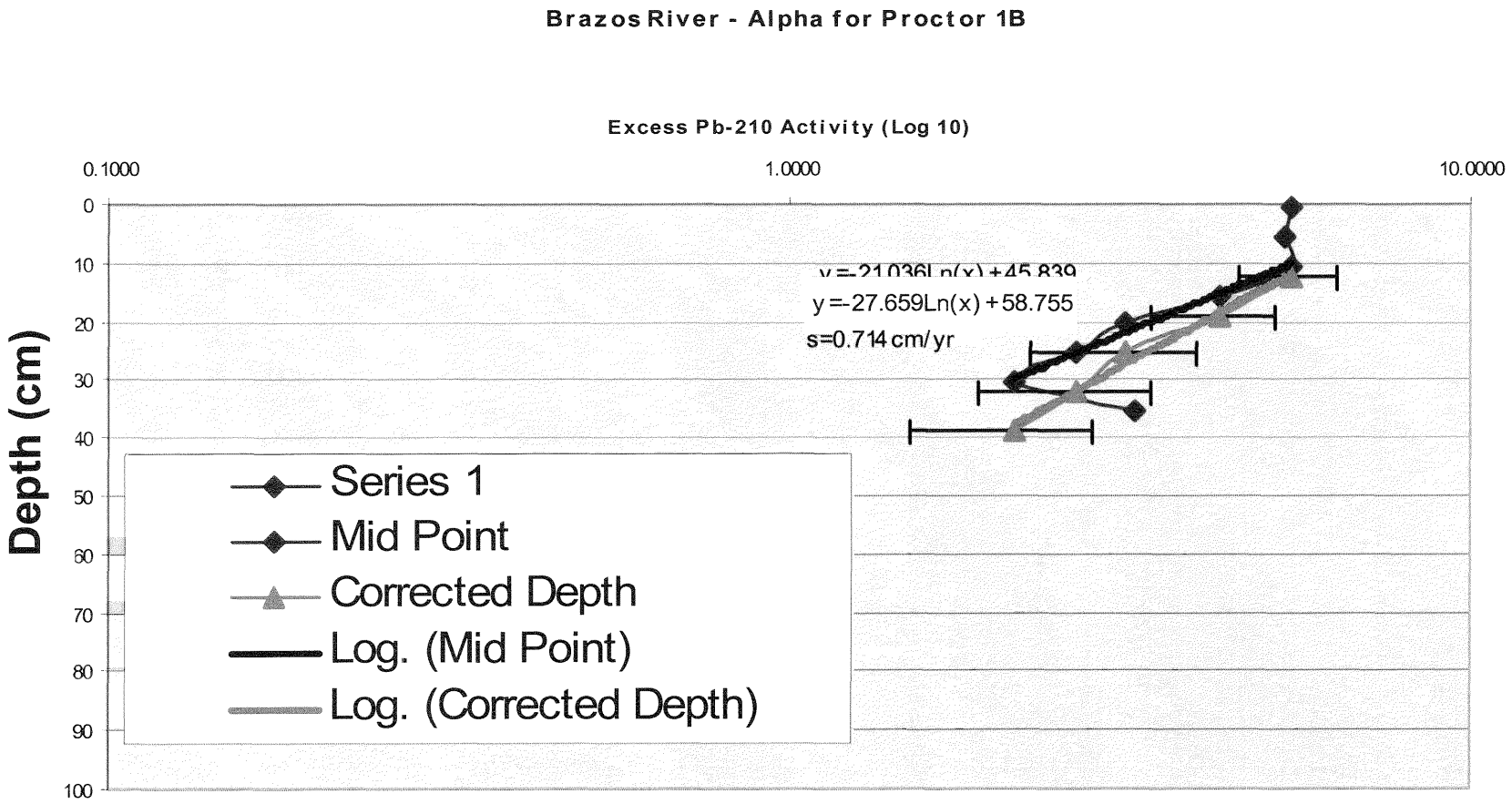

Brazos River - Alpha for Proctor 1B
Excess Pb-210 Activity (Log 10)
0.1000
1.0000
10.0000
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
y=-27.659Ln(x)+58.755
s=0.714 cm/yr
Series 1
Mid Point
Corrected Depth
Log. (Mid Point)
Log. (Corrected Depth)

Figure 29

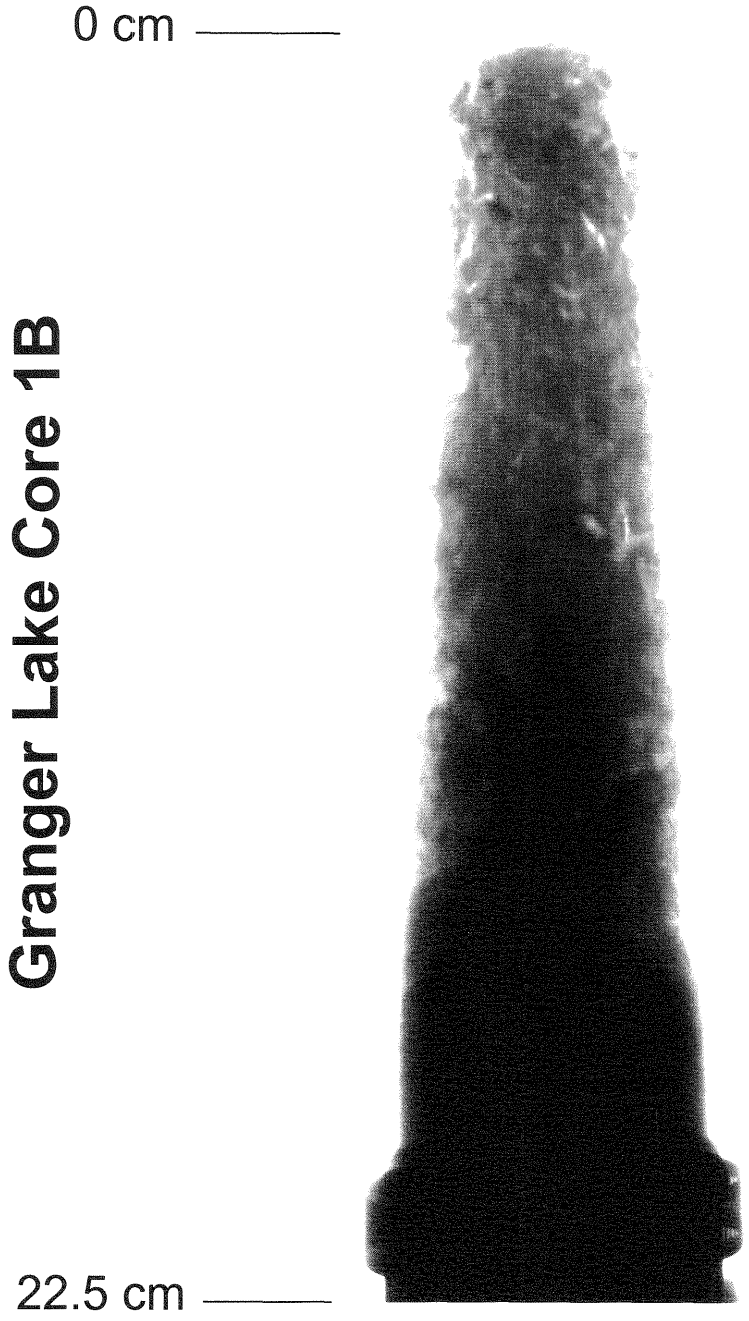


Figure 30

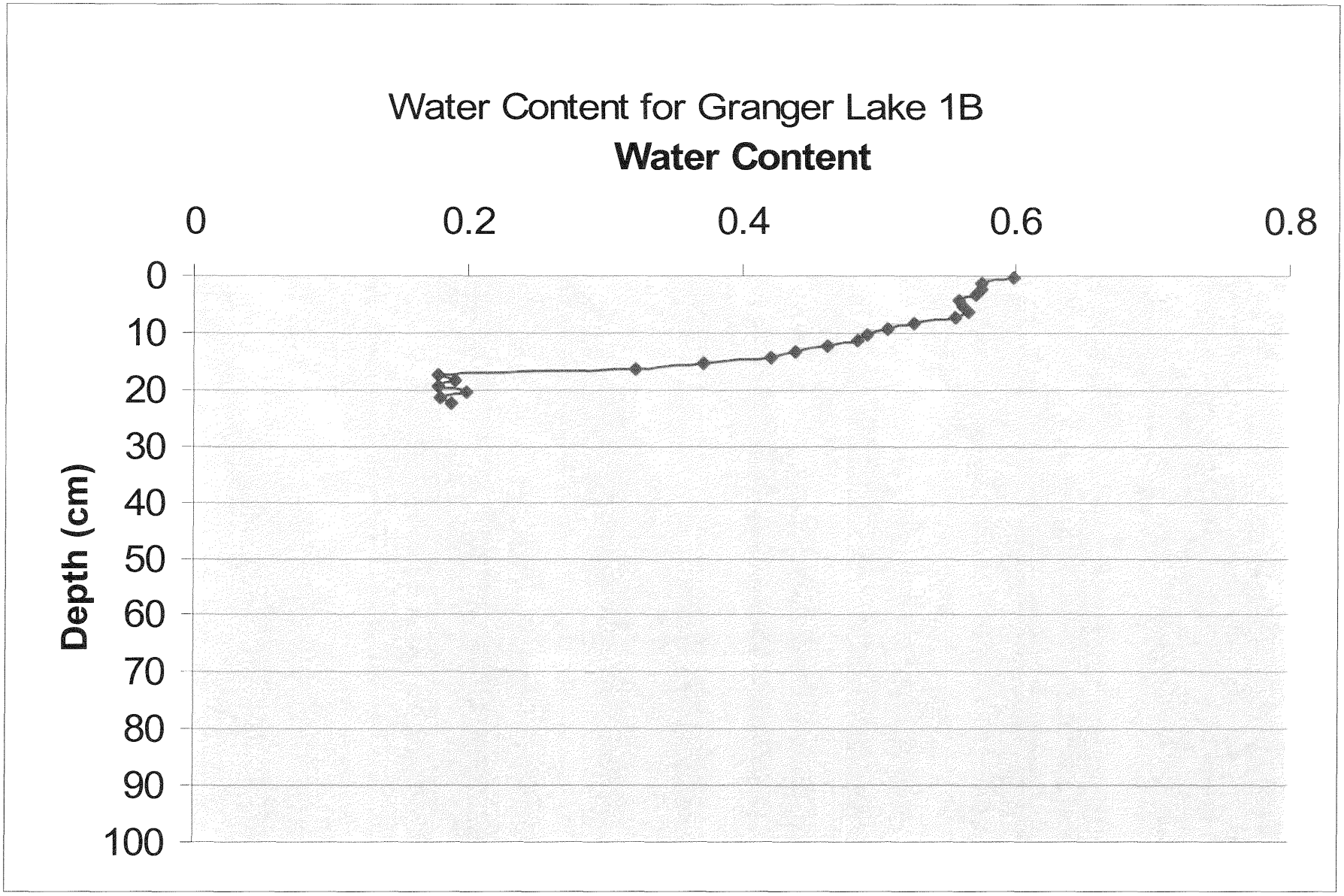

Water Content for Granger Lake 1B
Water Content
0
0.2
0.4
0.6
0.8
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Figure 31

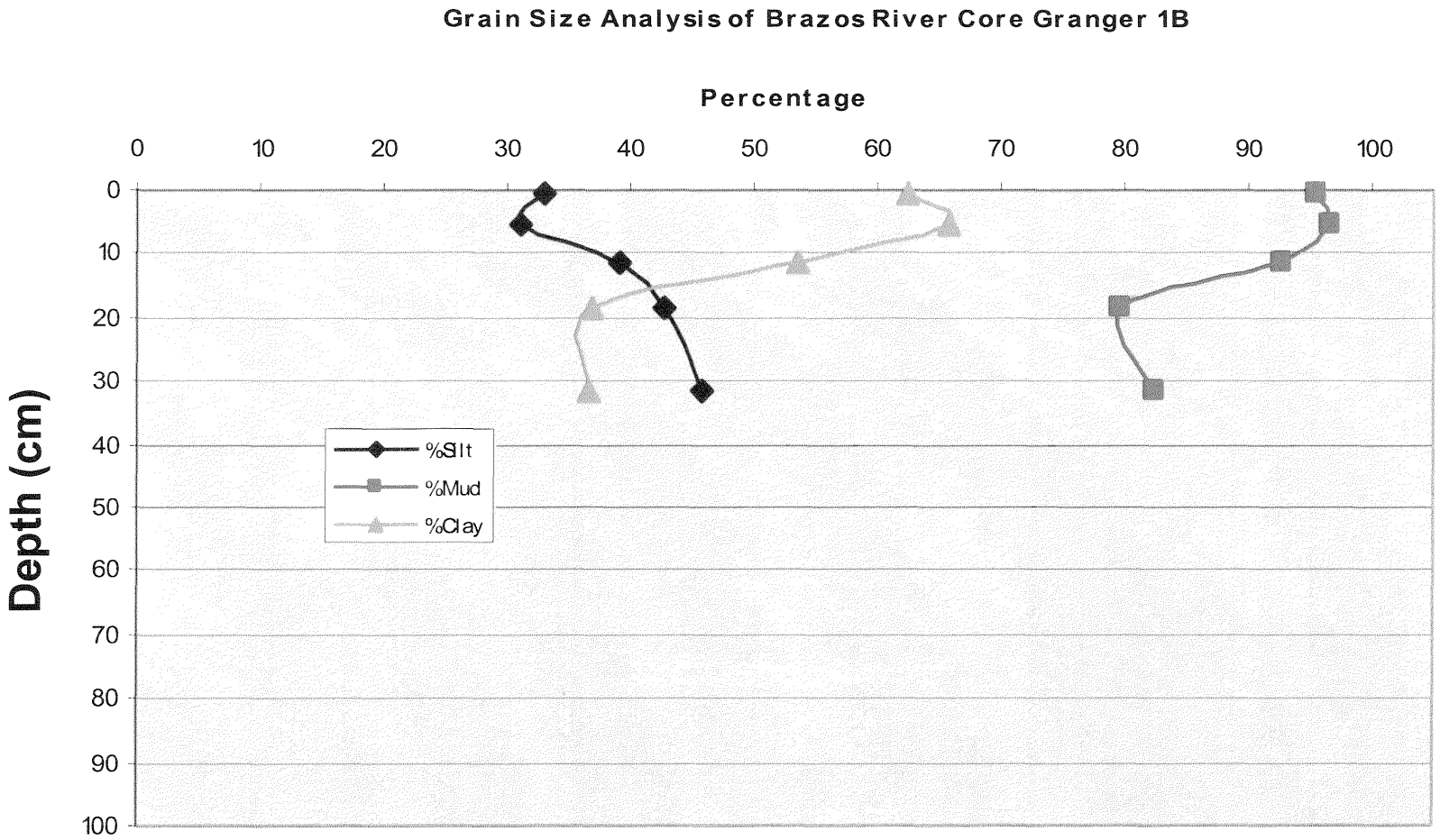

Grain Size Analysis of Brazos River Core Granger 1B
Percentage
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
%Silt
%Mud
%Clay

Figure 32

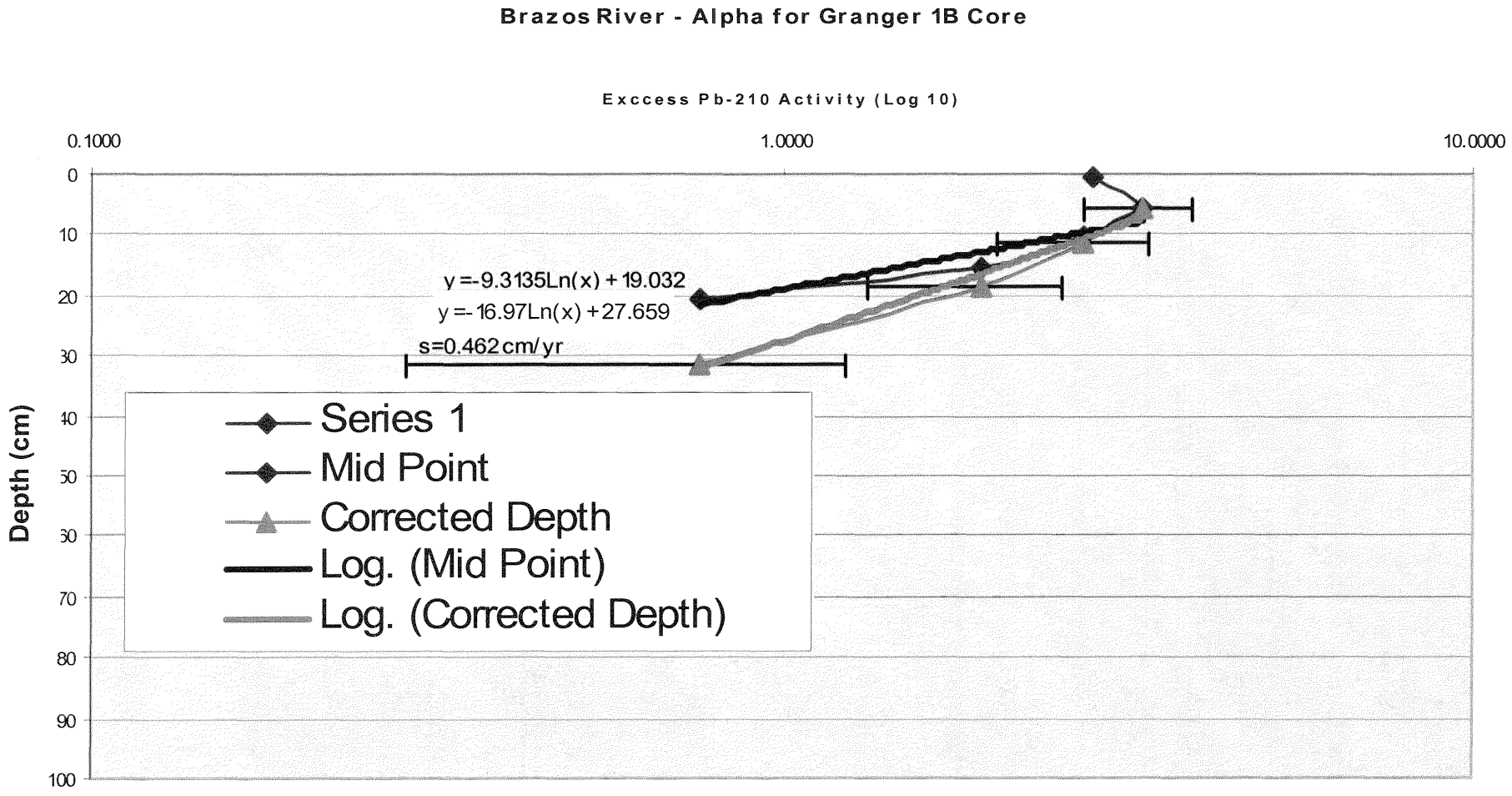
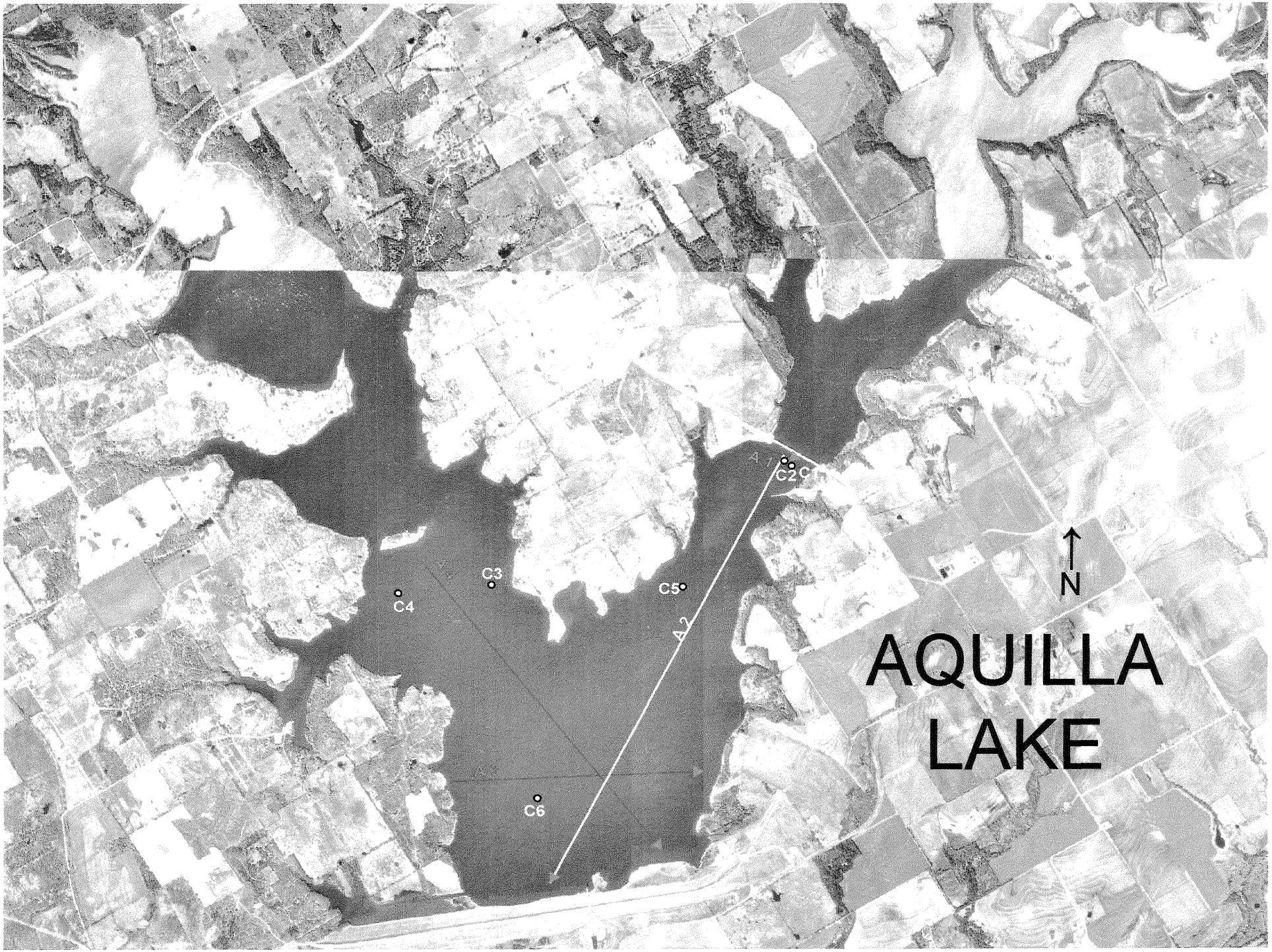
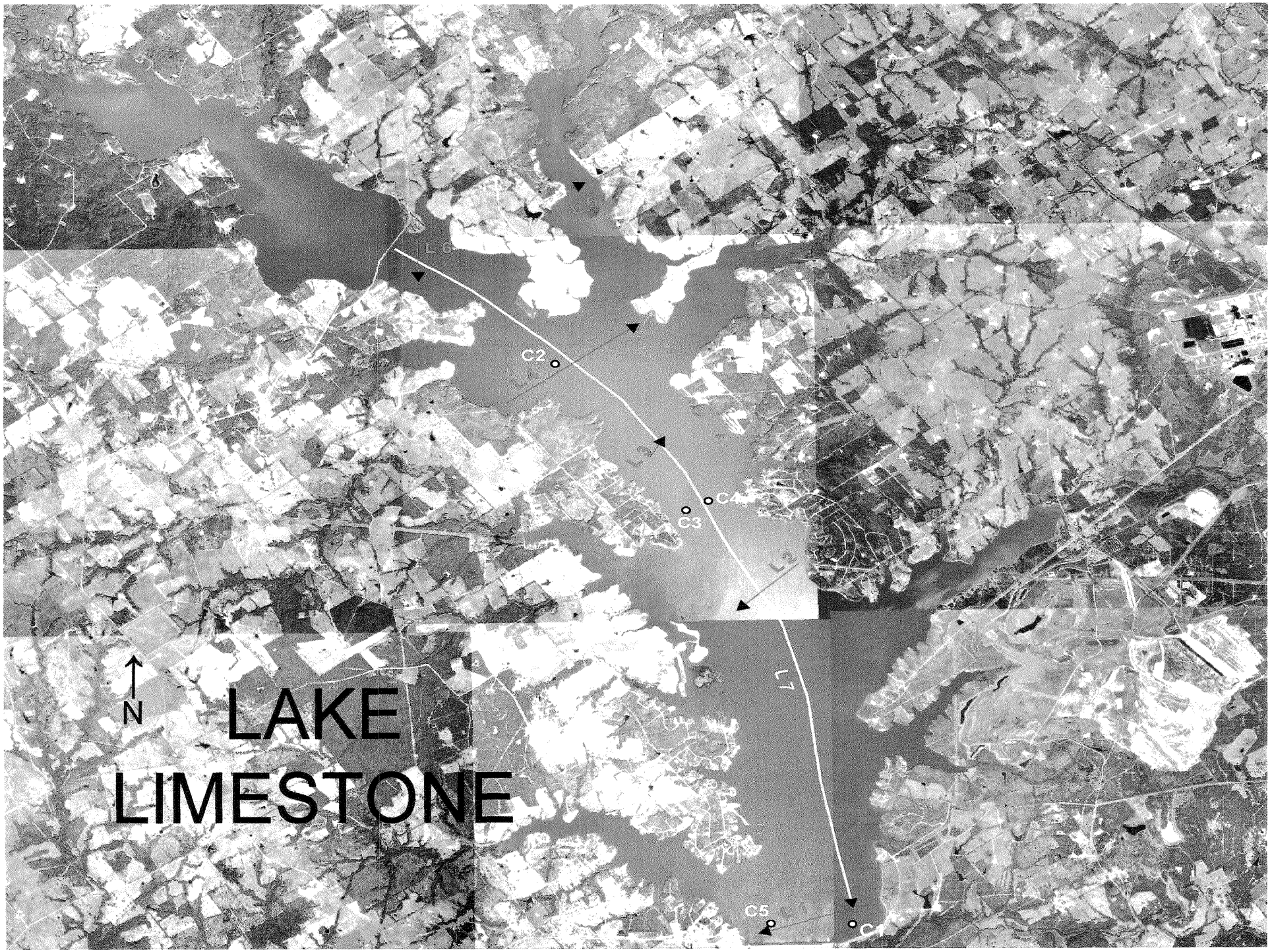
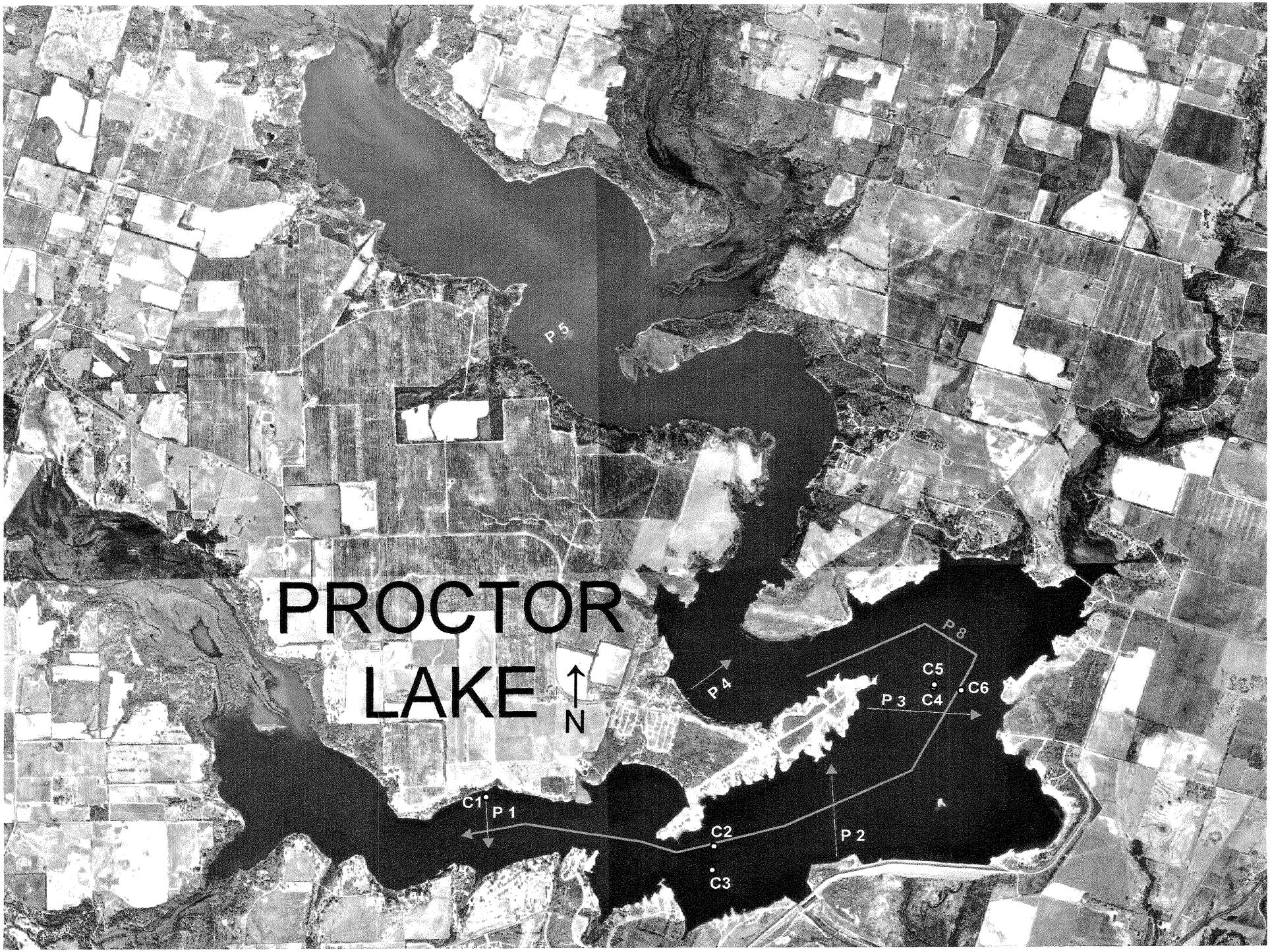

Brazos River - Alpha for Granger 1B Core
Exccess Pb-210 Activity (Log 10)
0.1000
1.0000
10.0000
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
y =-9.3135Ln(x) + 19.032
y =- 16.97Ln(x) +27.659
s=0.462 cm/yr
Series 1
Mid Point
Corrected Depth
Log. (Mid Point)
Log. (Corrected Depth)

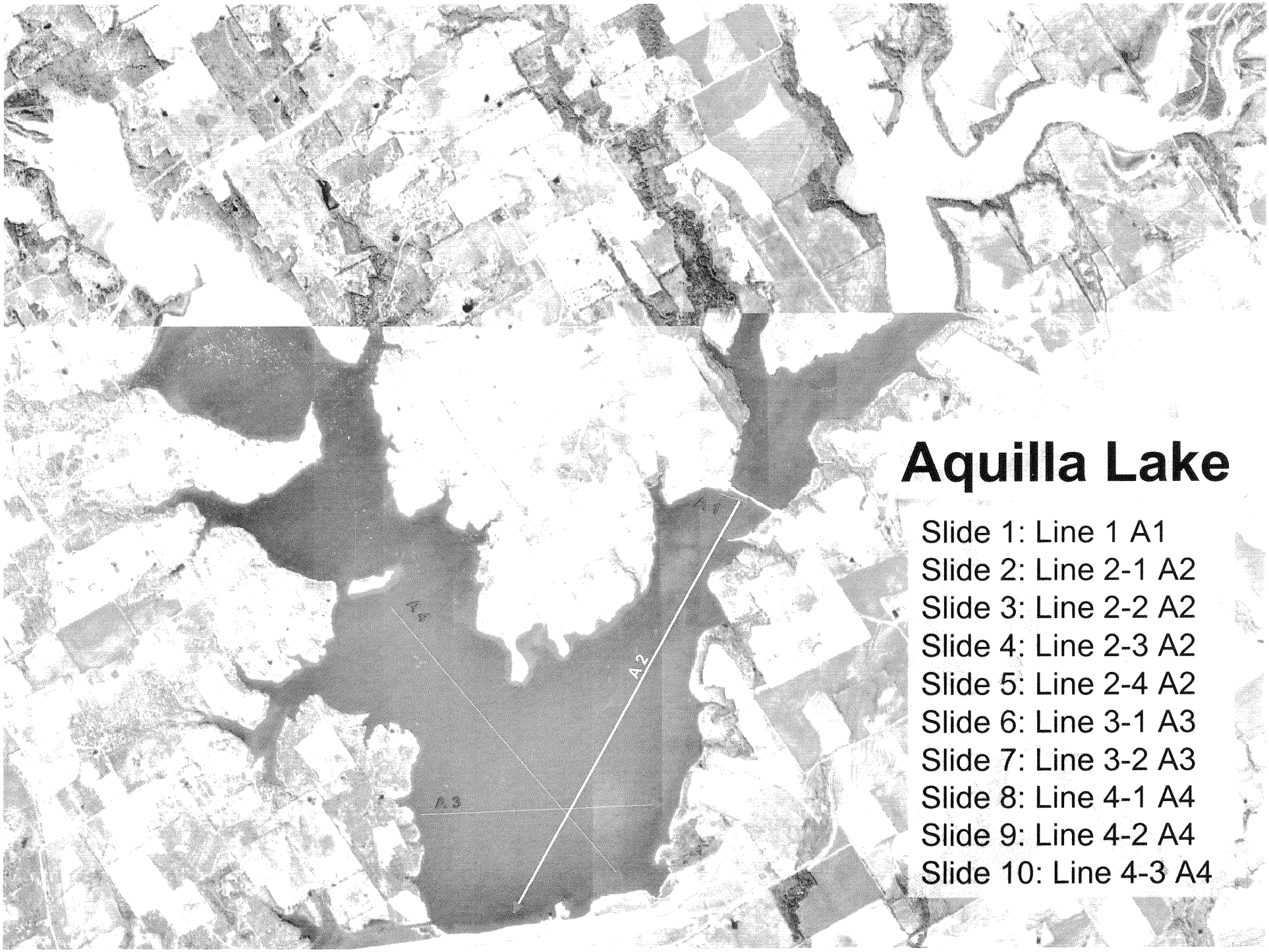
Figure 33


C1
C2
C3
C4
C5
C6
A1
A2
A3
N
AQUILLA
LAKE


GRANGER
LAKE
N
C1
C2
C3
C4
C5
C6


L 6
L 5
L 4
L 3
L 2
L 7
C2
C3
C4
C5
C1
N
LAKE
LIMESTONE

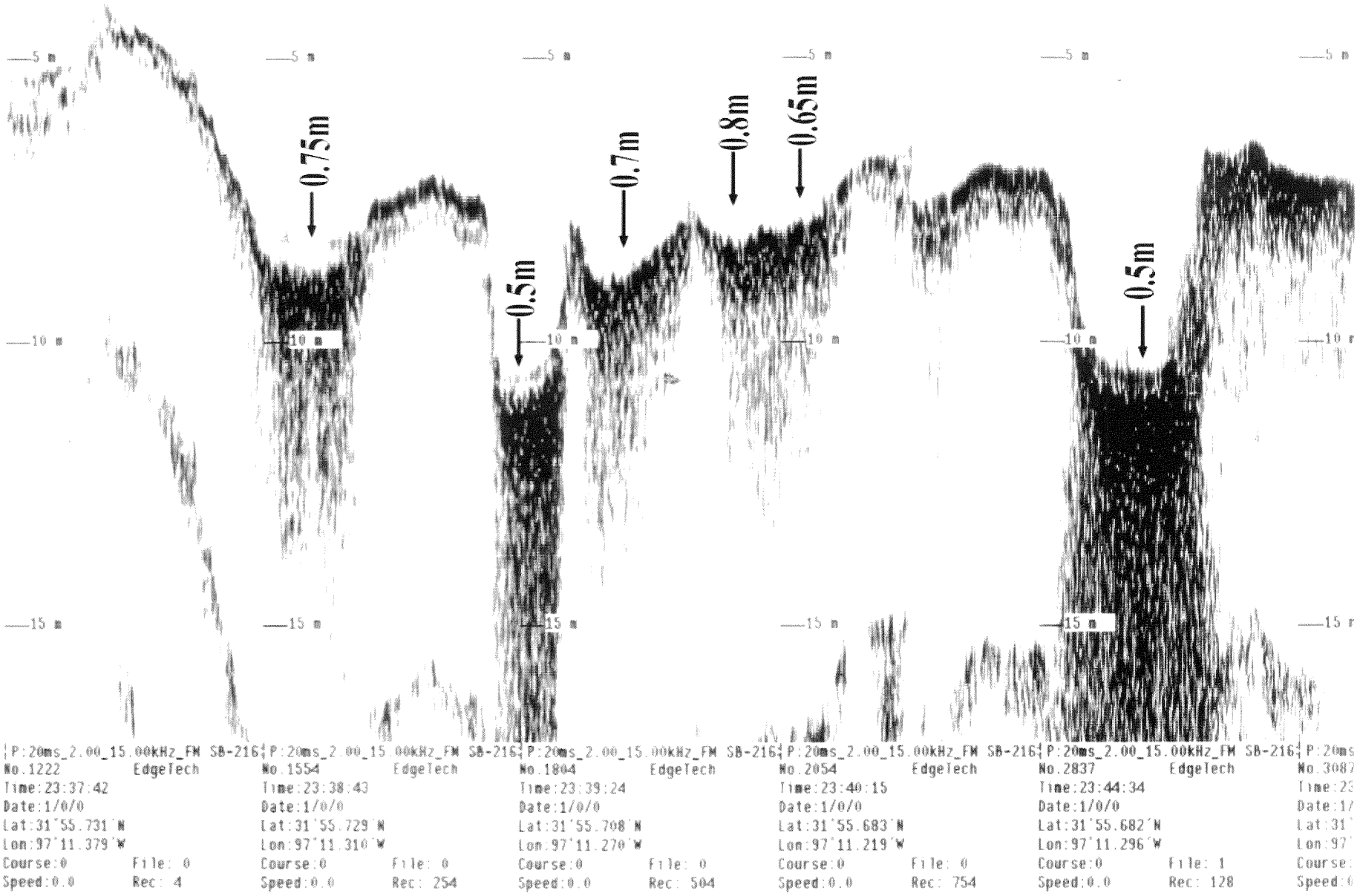

PROCTOR
LAKE
N
P 5
P 4
P 8
P 3
C4
C5
C6
C1
P 1
C2
C3
P 2



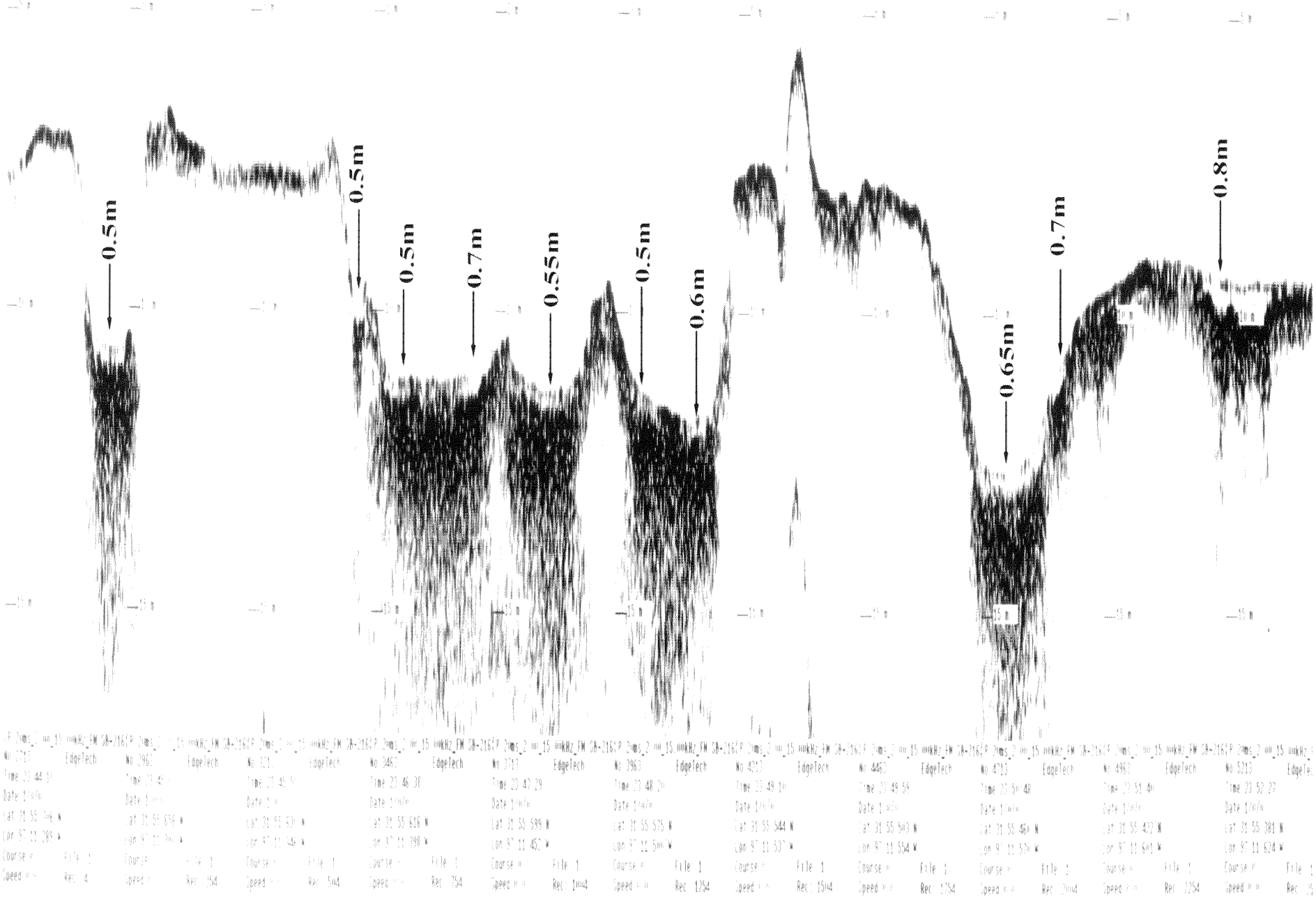
Aquilla Lake

Slide 1: Line 1 A1
Slide 2: Line 2-1 A2
Slide 3: Line 2-2 A2
Slide 4: Line 2-3 A2
Slide 5: Line 2-4 A2
Slide 6: Line 3-1 A3
Slide 7: Line 3-2 A3
Slide 8: Line 4-1 A4
Slide 9: Line 4-2 A4
Slide 10: Line 4-3 A4

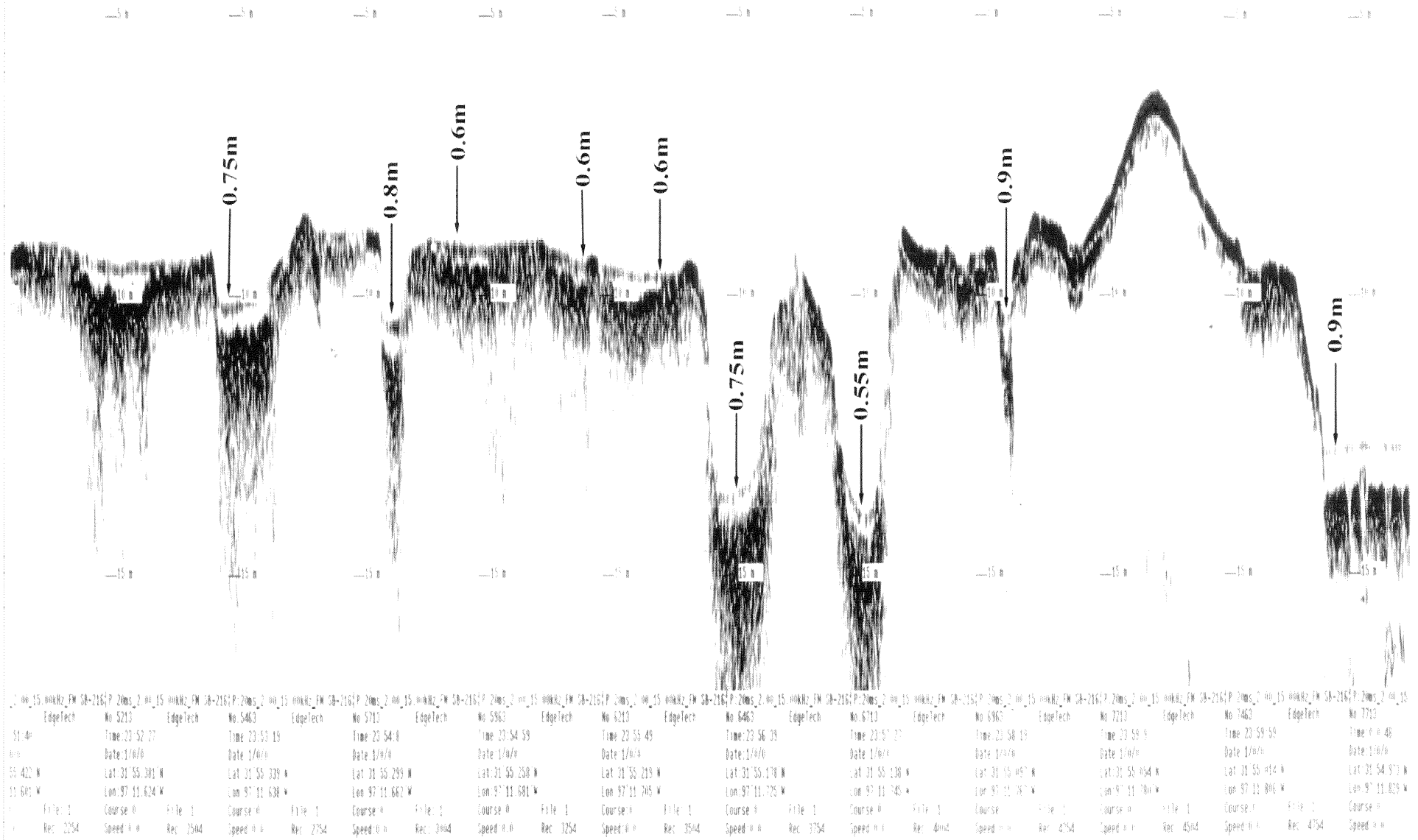
Aquilla 1 A1


0.75m
0.5m
0.7m
0.8m
0.65m
0.5m
5 m
10 m
15 m
P:20ms_2.00_15.00kHz_FM SB-216
No.1222 EdgeTech
Time:23:37:42
Date:1/0/0
Lat:31°55.731'N
Lon:97°11.379'W
Course:0 File: 0
Speed:0.0 Rec: 4
No.1554 EdgeTech
Time:23:38:43
Date:1/0/0
Lat:31°55.729'N
Lon:97°11.310'W
Course:0 File: 0
Speed:0.0 Rec: 254
No.1804 EdgeTech
Time:23:39:24
Date:1/0/0
Lat:31°55.708'N
Lon:97°11.270'W
Course:0 File: 0
Speed:0.0 Rec: 504
No.2054 EdgeTech
Time:23:40:15
Date:1/0/0
Lat:31°55.683'N
Lon:97°11.219'W
Course:0 File: 0
Speed:0.0 Rec: 754
No.2837 EdgeTech
Time:23:44:34
Date:1/0/0
Lat:31°55.682'N
Lon:97°11.296'W
Course:0 File: 1
Speed:0.0 Rec: 128

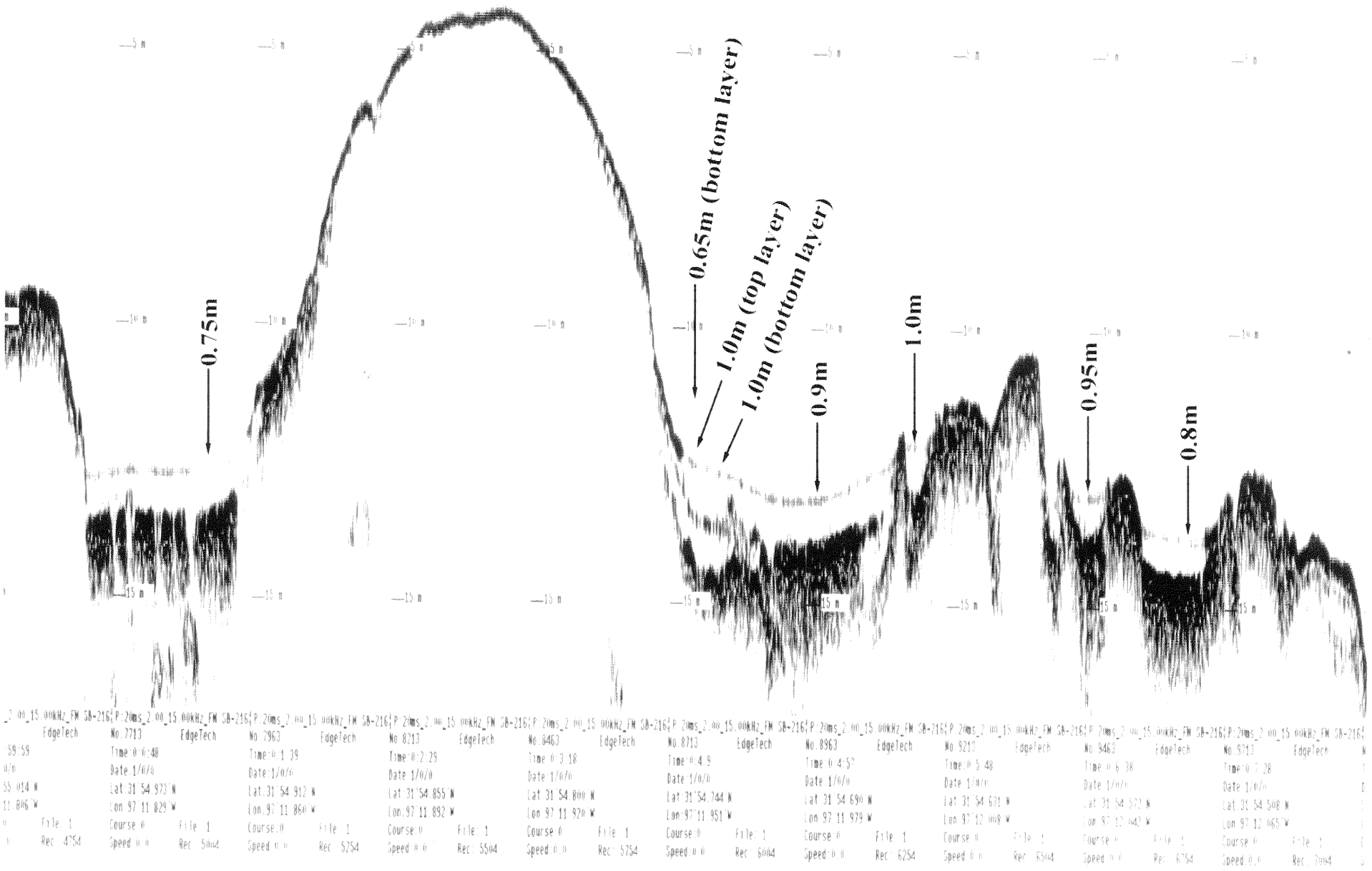
Aquilla 2-1 A2



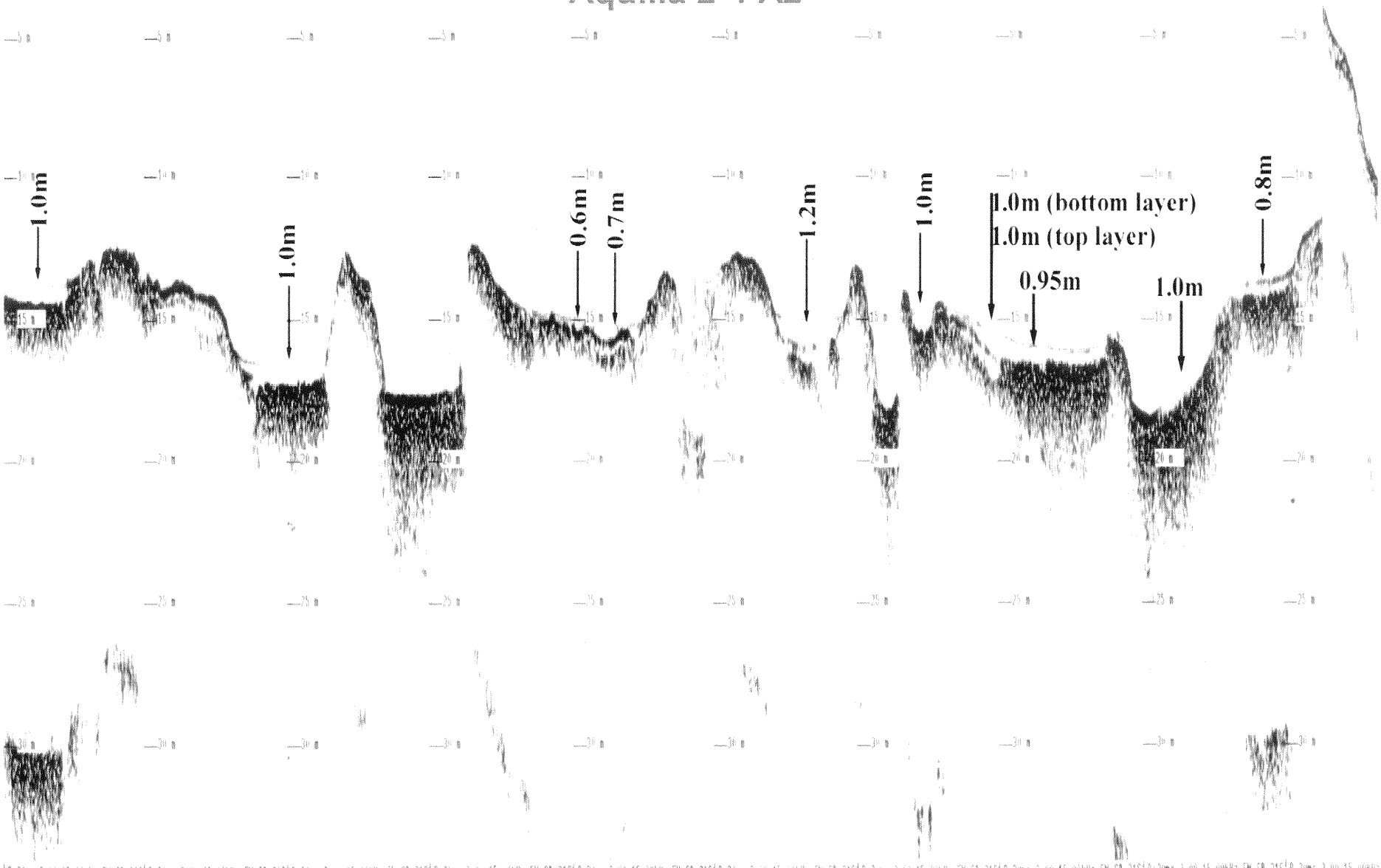
Aquilla 2-2 A2



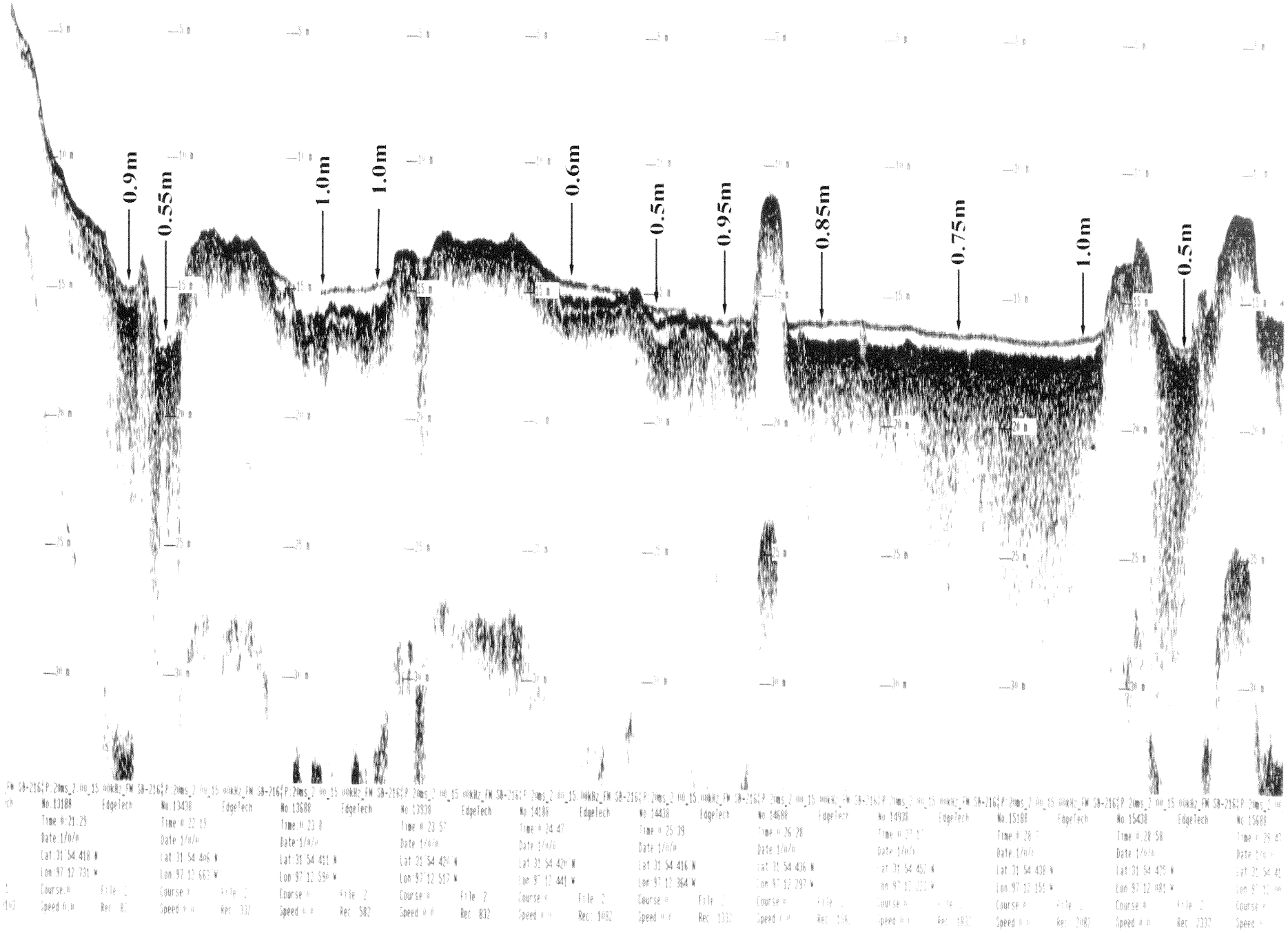
Aquilla 2-3 A2



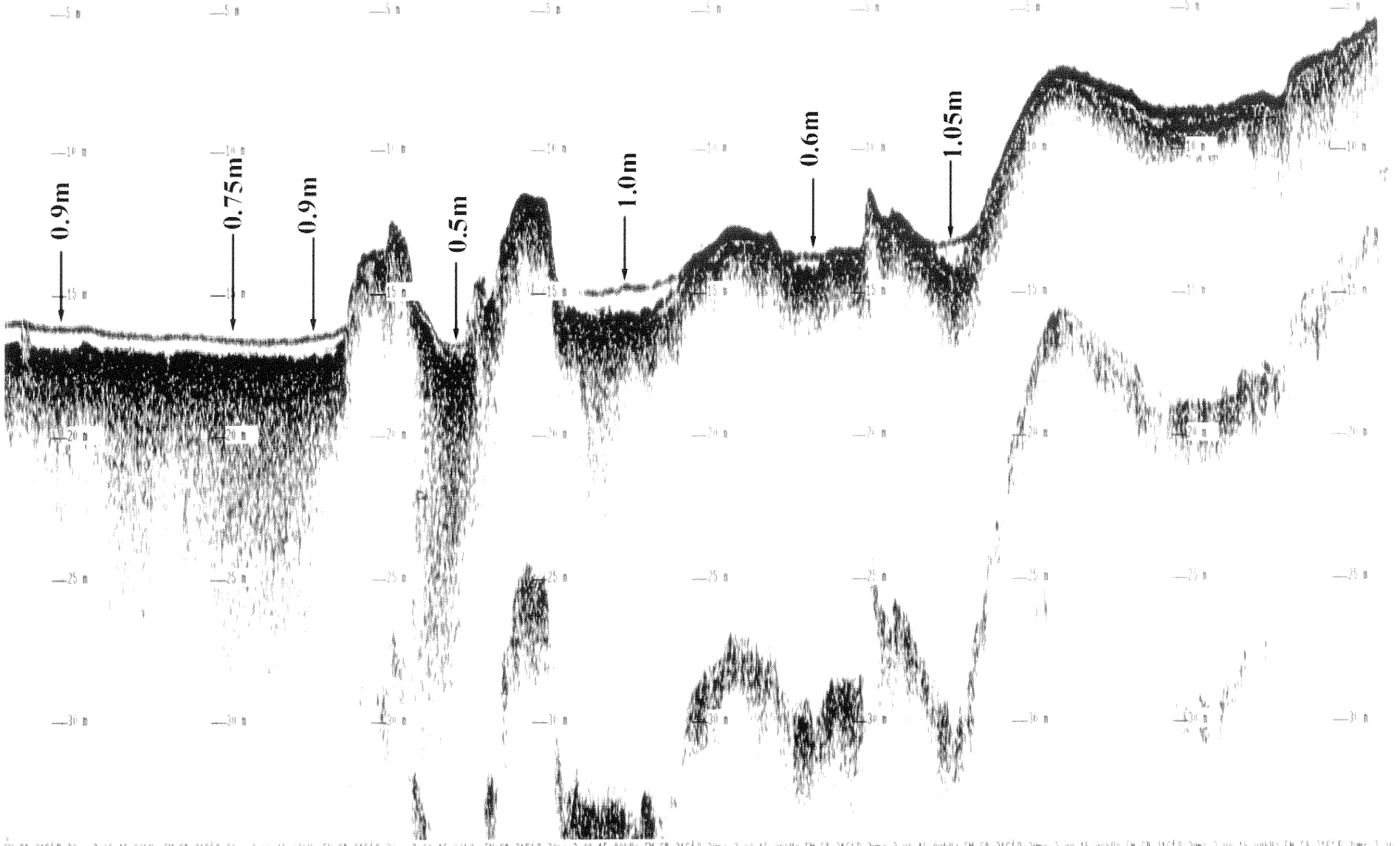
Aquilla 2-4 A2



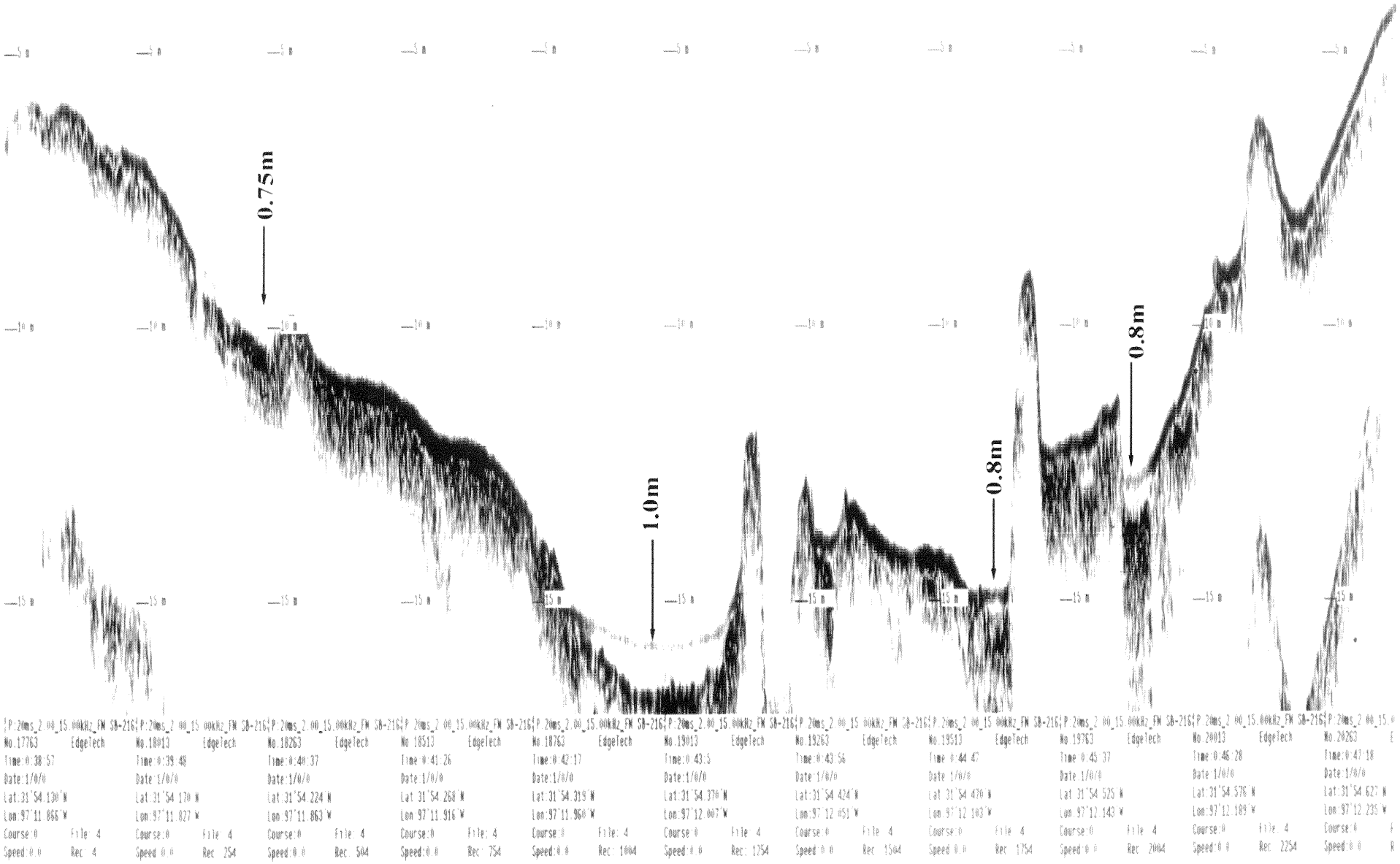
Aquilla 3-1 A3



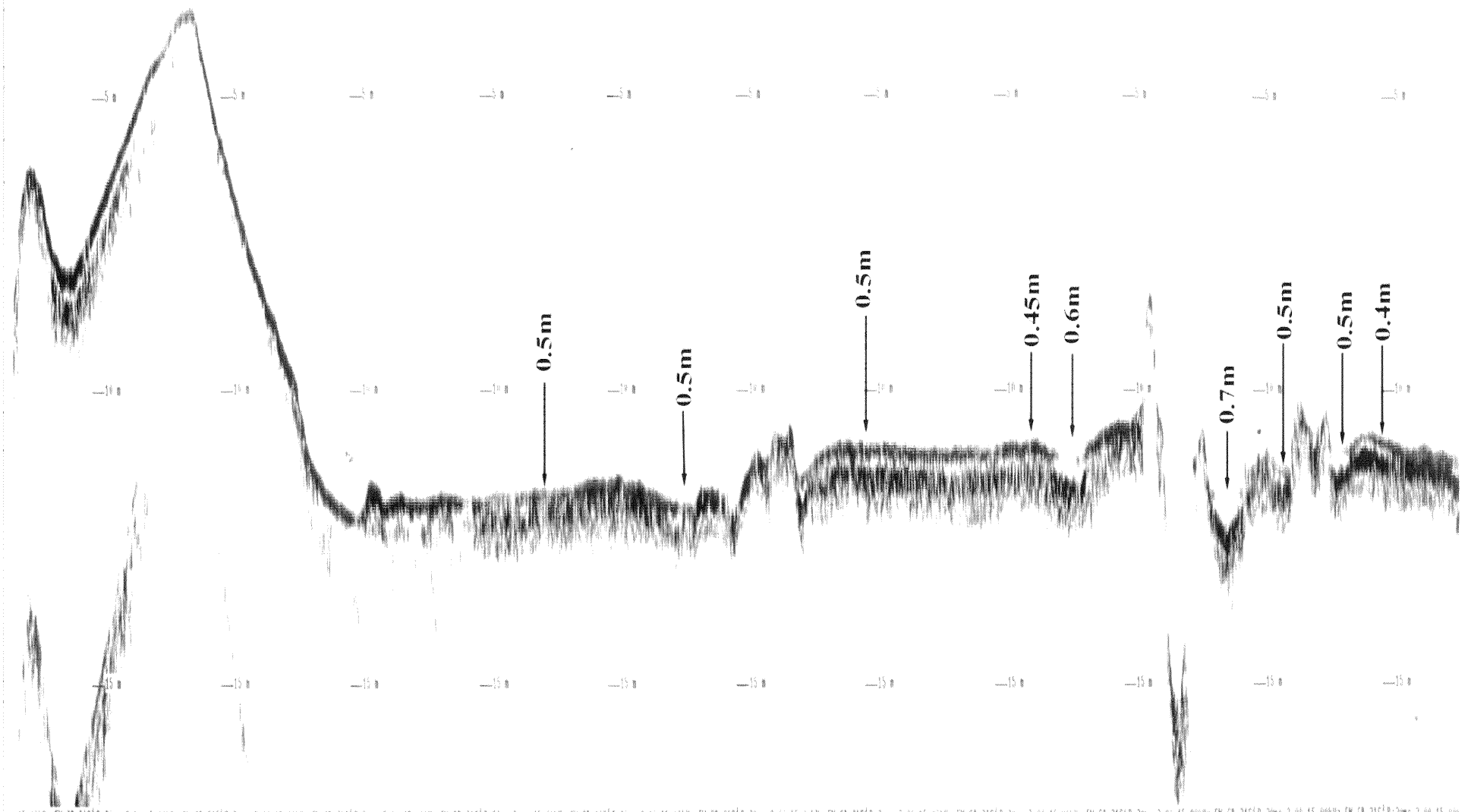
Aquilla 3-2 A3



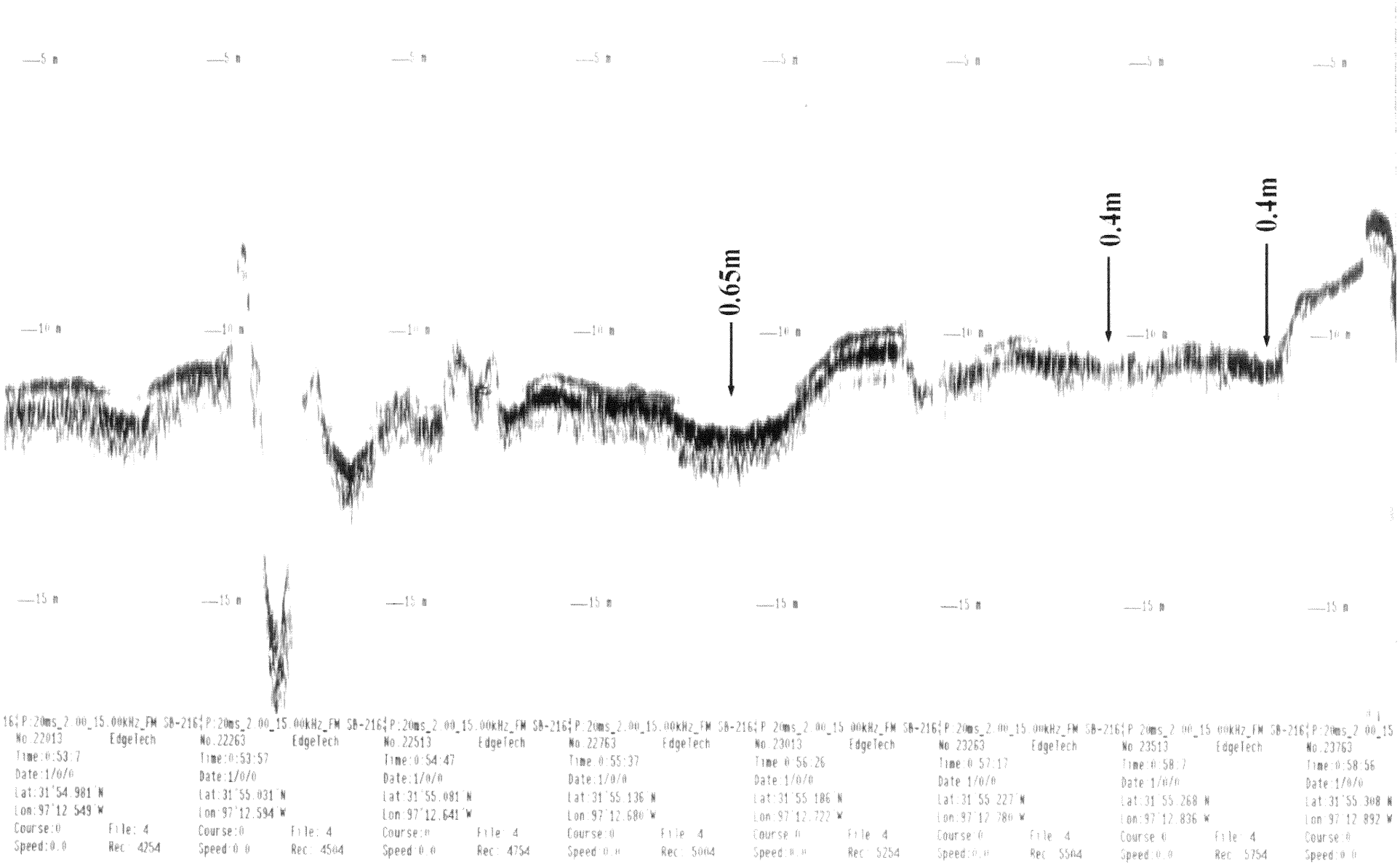
Aquilla 4-1 A4



Aquilla 4-2 A4

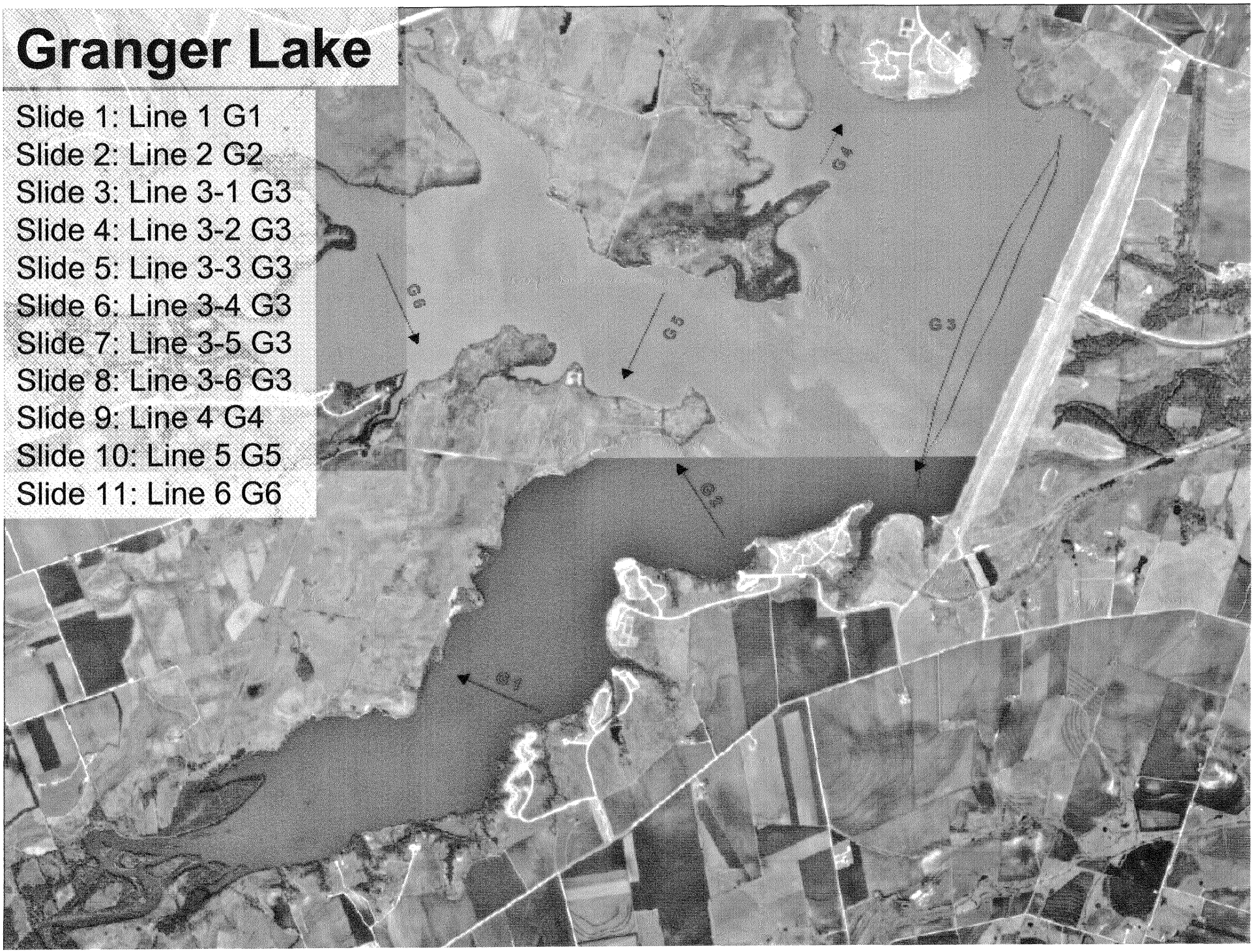


Aquilla 4-3 A4

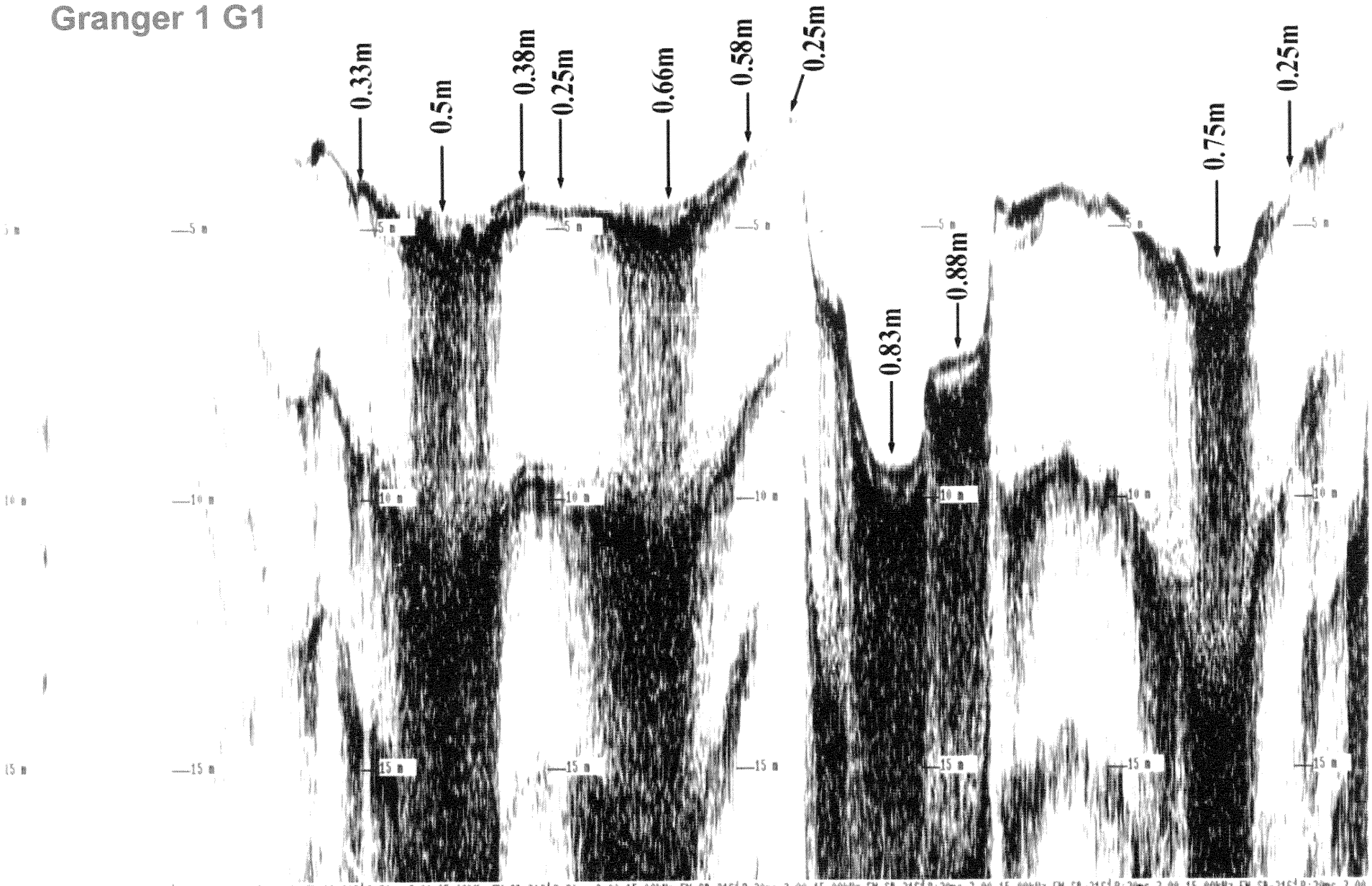


Granger Lake

Slide 1: Line 1 G1
Slide 2: Line 2 G2
Slide 3: Line 3-1 G3
Slide 4: Line 3-2 G3
Slide 5: Line 3-3 G3
Slide 6: Line 3-4 G3
Slide 7: Line 3-5 G3
Slide 8: Line 3-6 G3
Slide 9: Line 4 G4
Slide 10: Line 5 G5
Slide 11: Line 6 G6

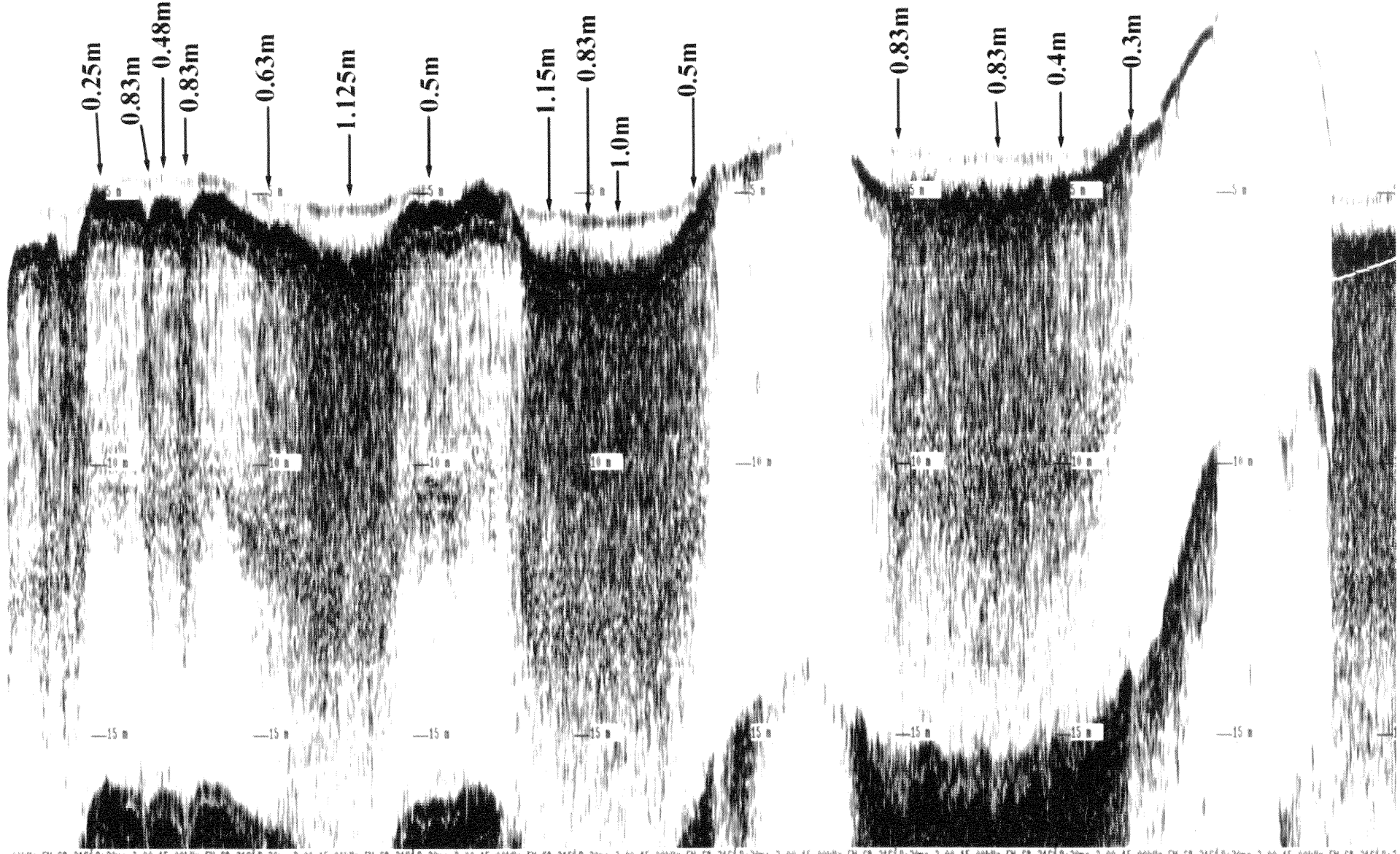


Granger 1 G1

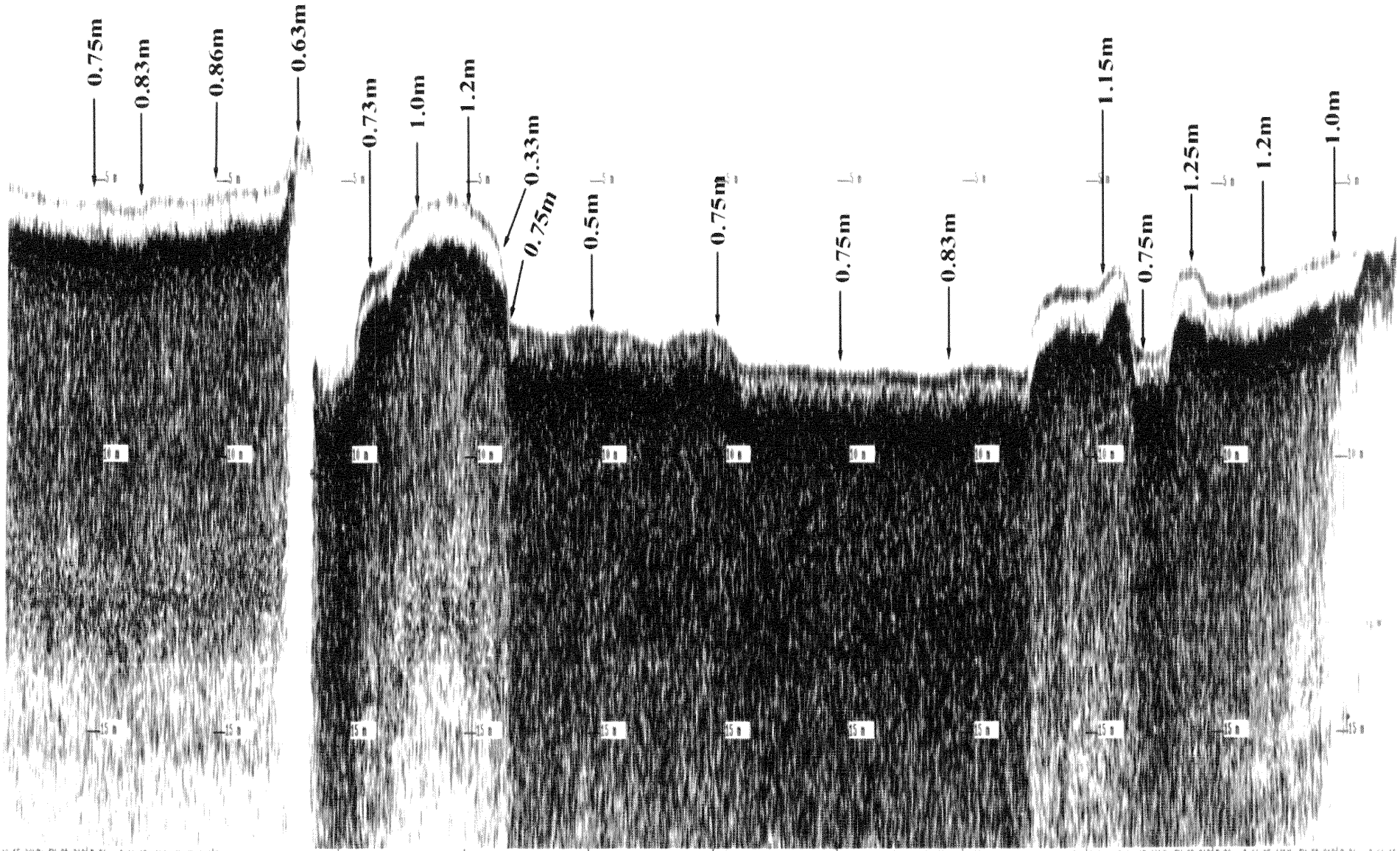


0ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00	
205	EdgeTech	No.2455	EdgeTech	No.2706	EdgeTech	No.2956	EdgeTech	No.3206	EdgeTech	No.3456	EdgeTech	No.3706	EdgeTech	No.3956	
23:56:45		Time:23:57:35		Time:23:58:24		Time:23:59:15		Time:0:0:4		Time:0:0:55		Time:0:1:43		Time:0:2:35	
1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0	
30'40.397"N		Lat:30'40.393"N		Lat:30'40.417"N		Lat:30'40.446"N		Lat:30'40.483"N		Lat:30'40.517"N		Lat:30'40.551"N		Lat:30'40.58	
97'22.206"W		Lon:97'22.191"W		Lon:97'22.252"W		Lon:97'22.328"W		Lon:97'22.390"W		Lon:97'22.458"W		Lon:97'22.521"W		Lon:97'22.59	
se:0	File: 0	Course:0	File: 0	Course:0	File: 0	Course:0	File: 0	Course:0	File: 0	Course:0	File: 0	Course:0	File: 0	Course:0	
d:0.0	Rec: 4	Speed:0.0	Rec: 254	Speed:0.0	Rec: 504	Speed:0.0	Rec: 754	Speed:0.0	Rec: 1004	Speed:0.0	Rec: 1254	Speed:0.0	Rec: 1504	Speed:0.0	

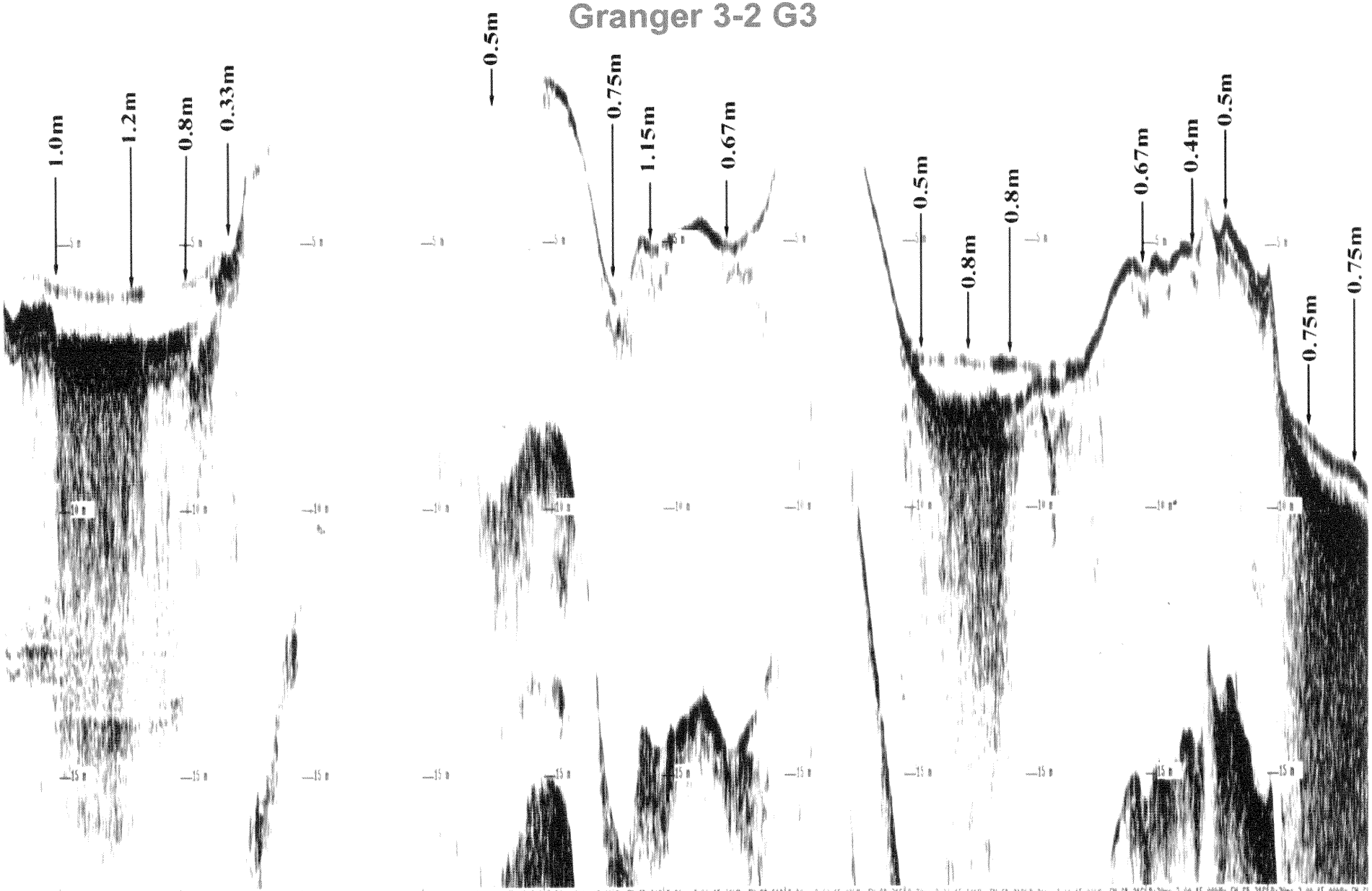
Granger 2 G2


0.25m
0.83m
0.48m
0.83m
0.63m
1.125m
0.5m
1.15m
0.83m
1.0m
0.5m
0.83m
0.83m
0.4m
0.3m
5 m
10 m
15 m
EdgeTech No.5415 Time:0:15:33 Date:1/0/0 Lat:30°41.136'N Lon:97°21.335'W File: 0 Rec: 1754 Course:0 Speed:0.0 File: 1 Rec: 185
EdgeTech No.5665 Time:0:16:23 Date:1/0/0 Lat:30°41.182'N Lon:97°21.366'W File: 1 Rec: 435 Course:0 Speed:0.0
EdgeTech No.5915 Time:0:17:12 Date:1/0/0 Lat:30°41.223'N Lon:97°21.399'W File: 1 Rec: 685 Course:0 Speed:0.0
EdgeTech No.6165 Time:0:18:3 Date:1/0/0 Lat:30°41.265'N Lon:97°21.438'W File: 1 Rec: 935 Course:0 Speed:0.0
EdgeTech No.6415 Time:0:18:53 Date:1/0/0 Lat:30°41.310'N Lon:97°21.469'W File: 1 Rec: 1185 Course:0 Speed:0.0
EdgeTech No.6665 Time:0:19:43 Date:1/0/0 Lat:30°41.359'N Lon:97°21.492'W File: 1 Rec: 1435 Course:0 Speed:0.0
EdgeTech No.6915 Time:0:20:33 Date:1/0/0 Lat:30°41.403'N Lon:97°21.515'W File: 1 Rec: 1685 Course:0 Speed:0.0
EdgeTech No.7165 Time:0:21:23 Date:1/0/0 Lat:30°41.448'N Lon:97°21.549'W File: 1 Rec: 1935 Course:0 Speed:0.0

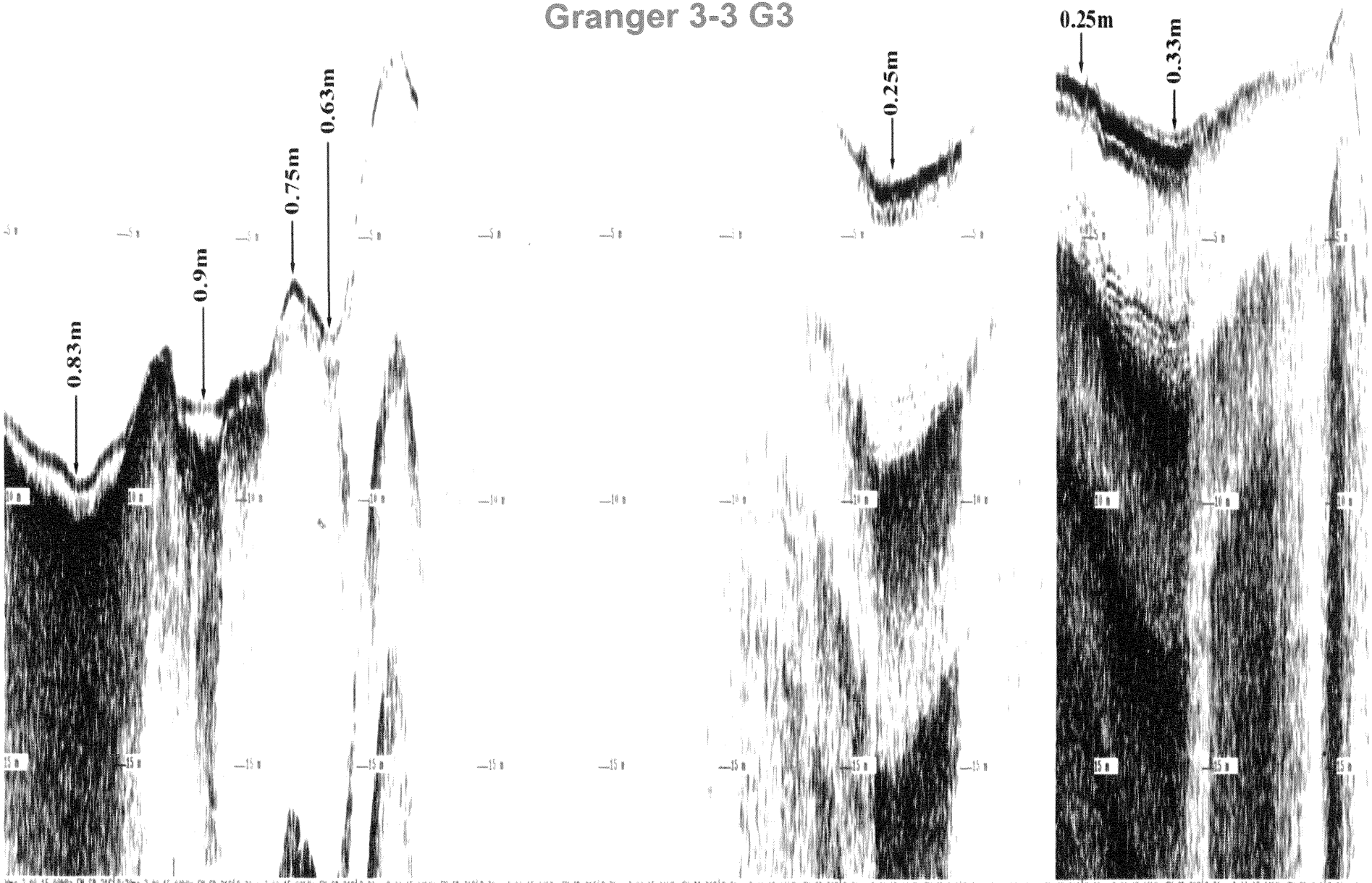
Granger 3-1 G3



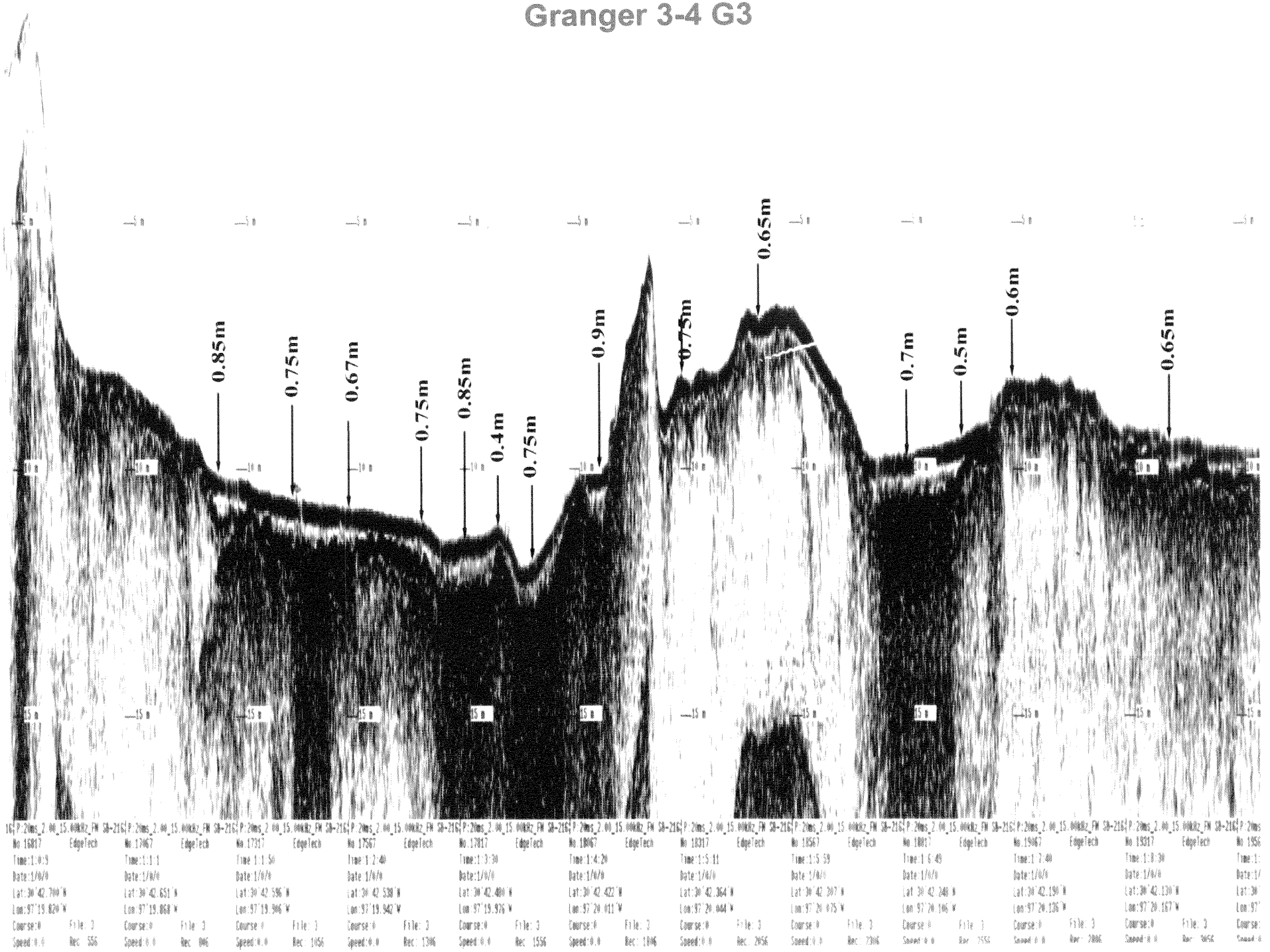
Granger 3-2 G3



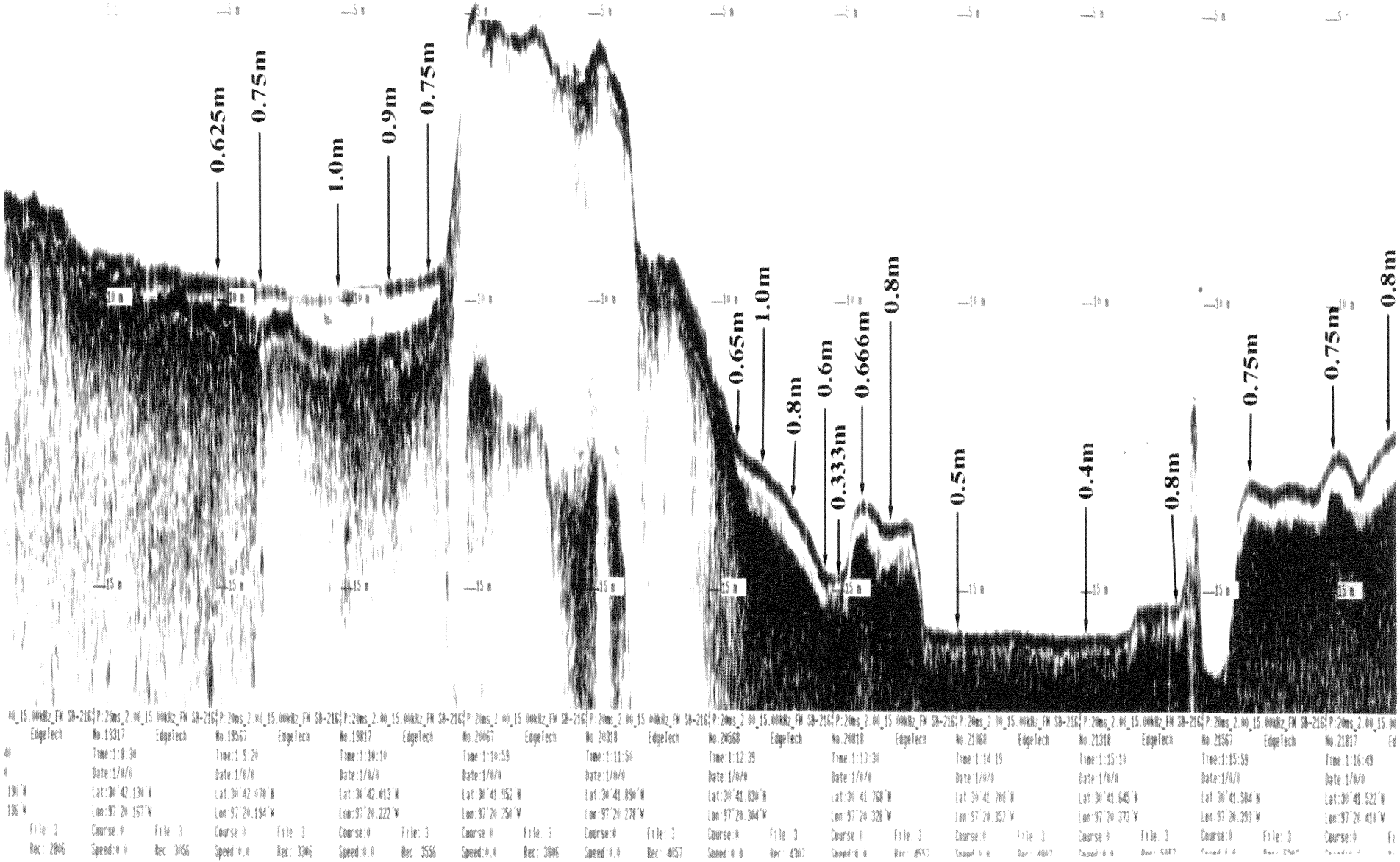
Granger 3-3 G3



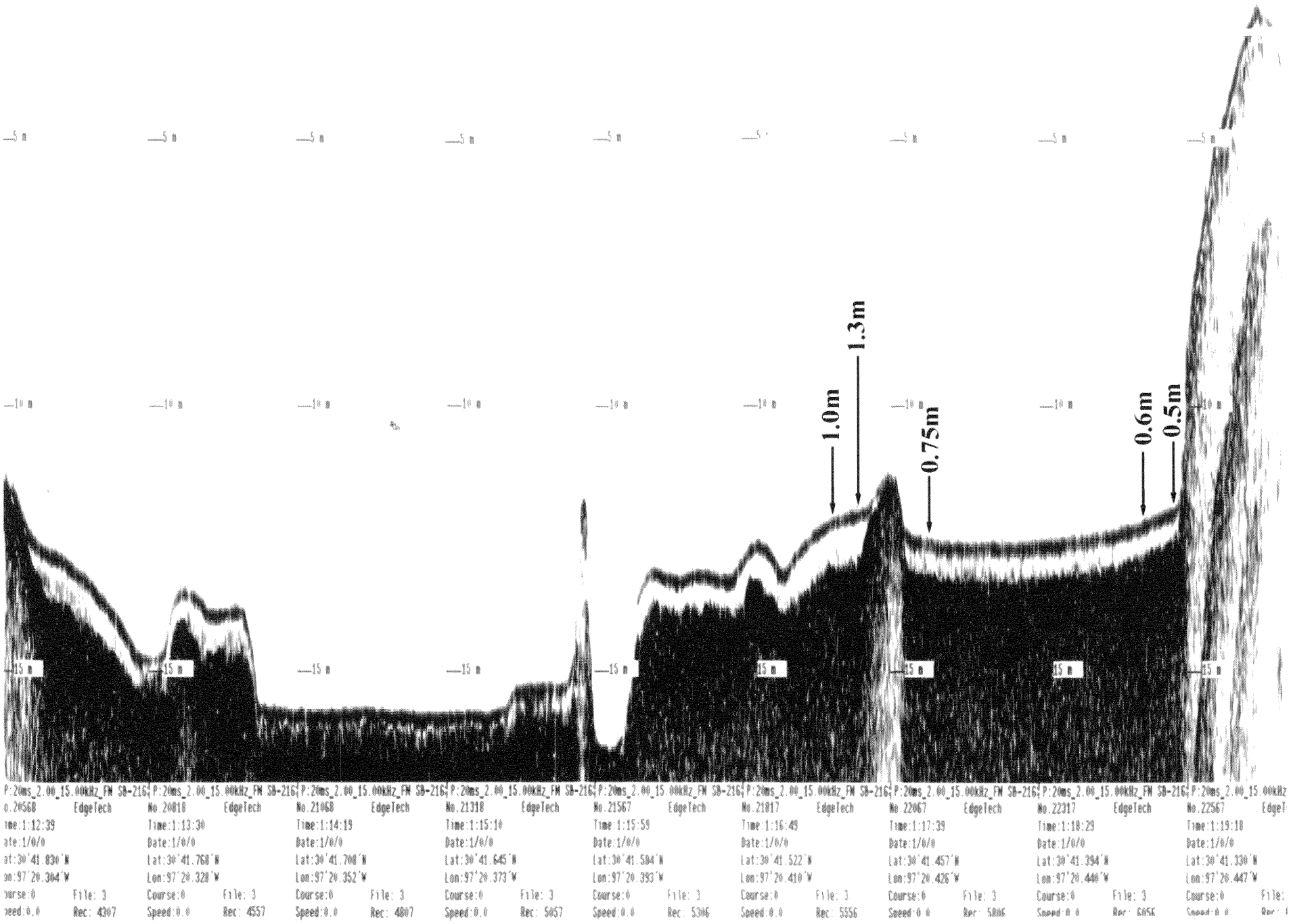
Granger 3-4 G3



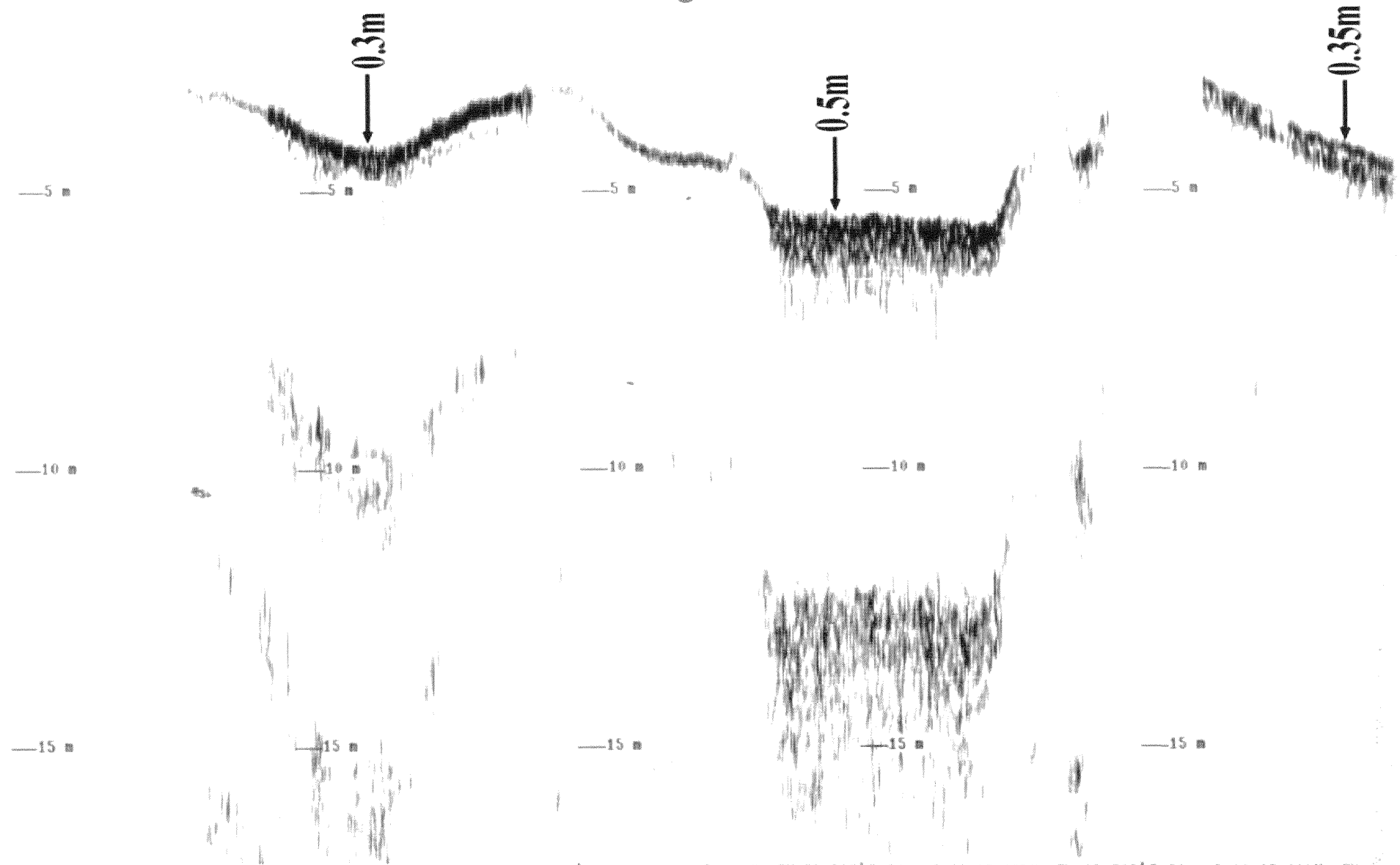
Granger 3-5 G3



Granger 3-6 G3

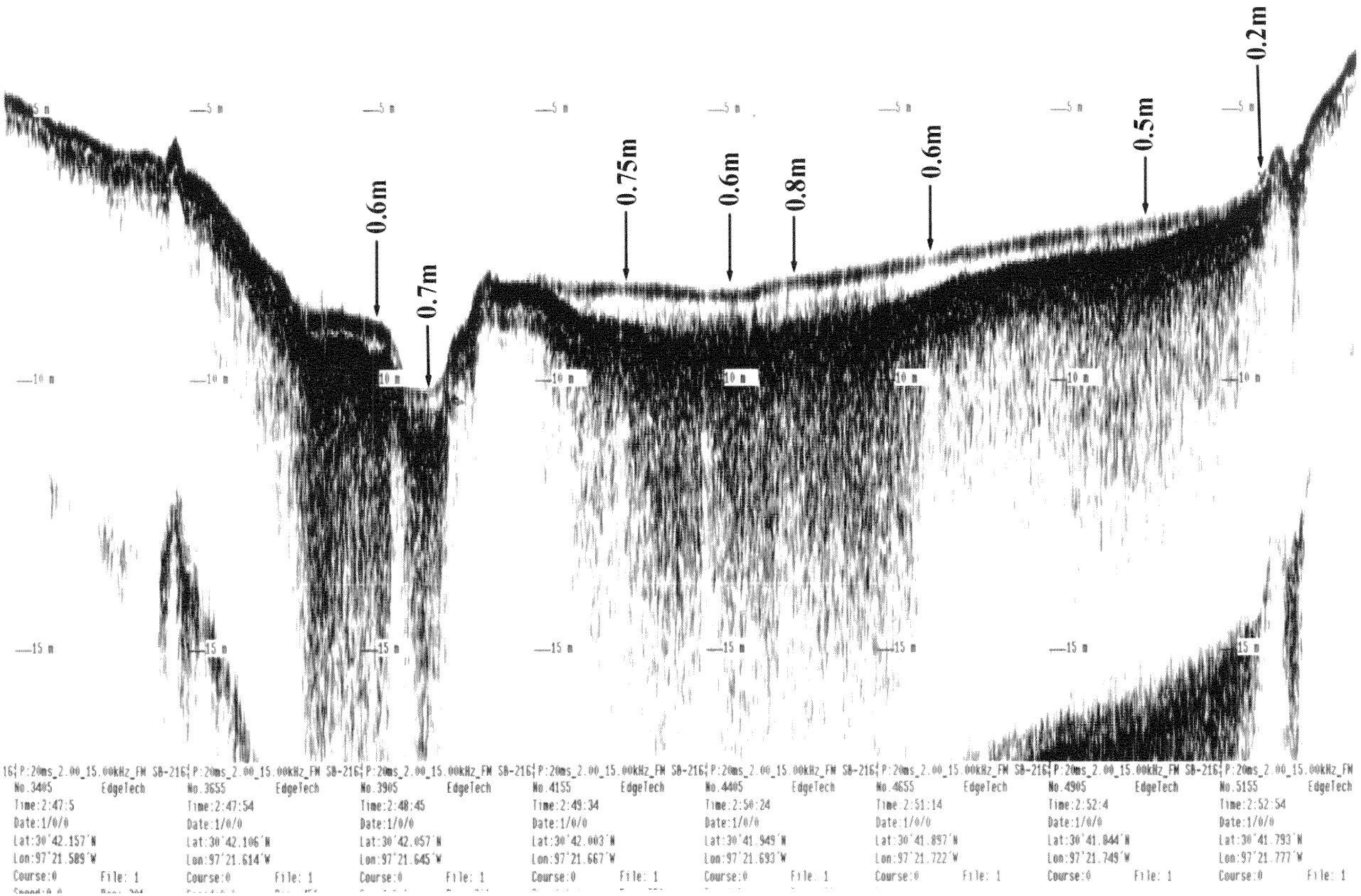


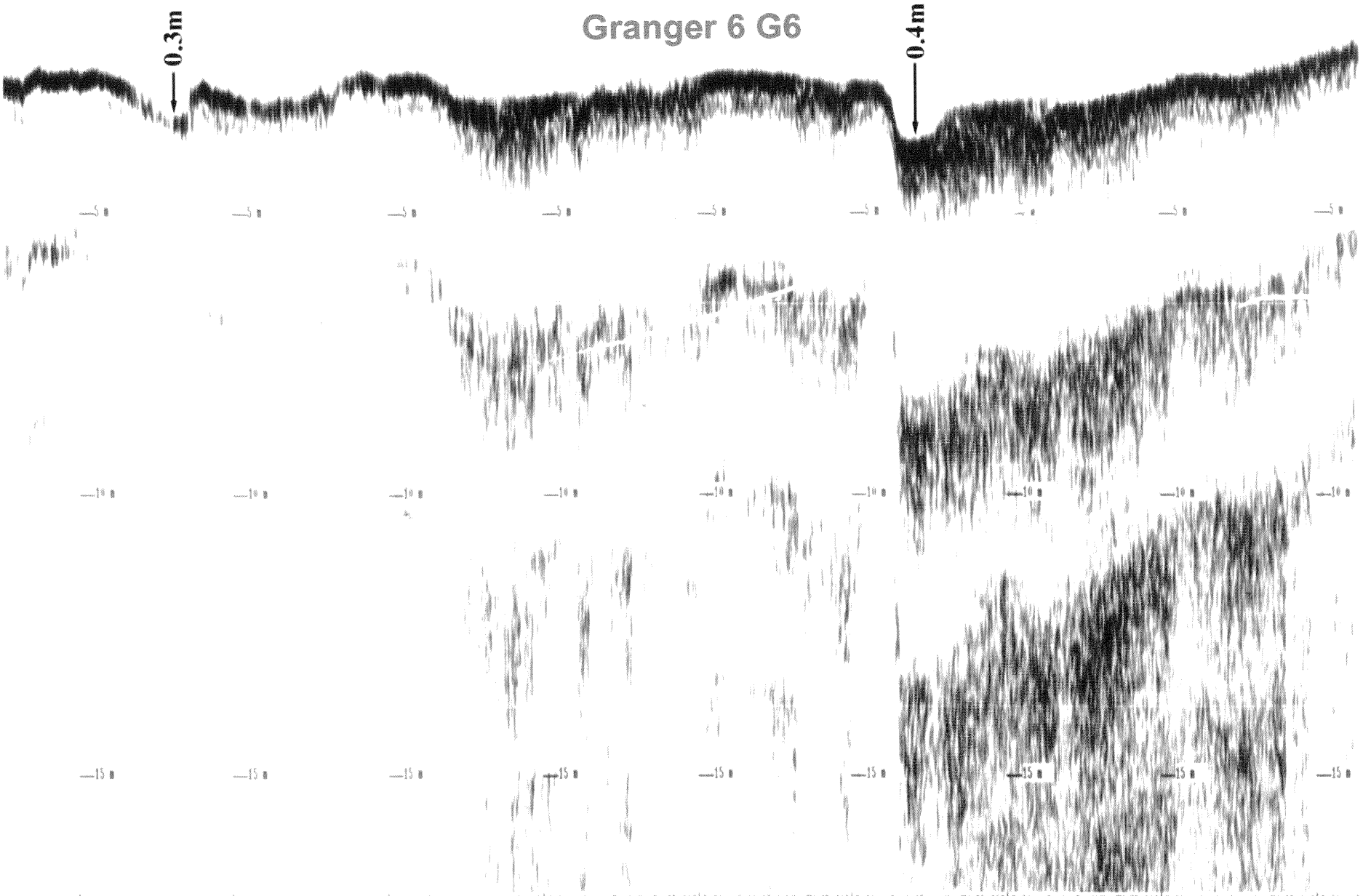
Granger 4 G4



P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM SB-216		P:20ms_2.00_15.00kHz_FM	
No.1323	EdgeTech	No.1573	EdgeTech	No.1823	EdgeTech	No.2073	EdgeTech	No.2323	EdgeTech
Time:2:31:17		Time:2:32:11		Time:2:32:55		Time:2:33:45		Time:2:34:36	
Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0	
Lat:30°42.694'N		Lat:30°42.743'N		Lat:30°42.800'N		Lat:30°42.861'N		Lat:30°42.925'N	
Lon:97°20.867'W		Lon:97°20.813'W		Lon:97°20.794'W		Lon:97°20.766'W		Lon:97°20.737'W	
Course:0	File: 0	Course:0	File: 0	Course:0	File: 0	Course:0	File: 0	Course:0	File: 0
Speed:0.0	Rec: 4	Speed:0.0	Rec: 254	Speed:0.0	Rec: 504	Speed:0.0	Rec: 754	Speed:0.0	Rec: 1004

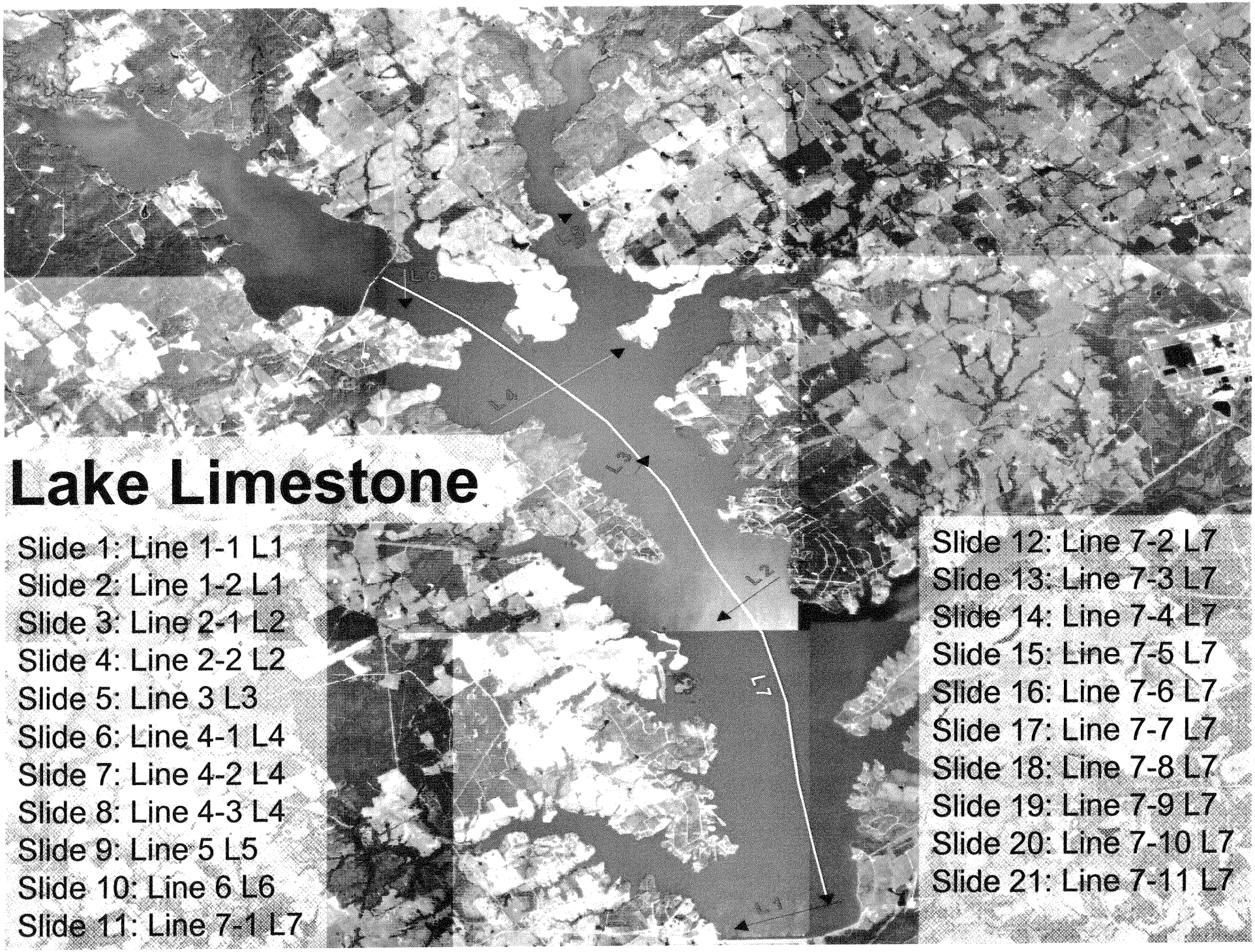
Granger 5 G5


0.6m
0.7m
0.75m
0.6m
0.8m
0.6m
0.5m
0.2m
5 m
10 m
15 m
16¦P:20ms_2.00_15.00kHz_FM SB-216¦P:20ms_2.00_15.00kHz_FM SB-216¦P:20ms_2.00_15.00kHz_FM SB-216¦P:20ms_2.00_15.00kHz_FM SB-216¦P:20ms_2.00_15.00kHz_FM SB-216¦P:20ms_2.00_15.00kHz_FM SB-216¦P:20ms_2.00_15.00kHz_FM SB-216¦P:20ms_2.00_15.00kHz_FM
No.3405 EdgeTech
Time:2:47:5
Date:1/0/0
Lat:30°42.157'N
Lon:97°21.589'W
Course:0 File: 1
No.3655 EdgeTech
Time:2:47:54
Date:1/0/0
Lat:30°42.106'N
Lon:97°21.614'W
Course:0 File: 1
No.3905 EdgeTech
Time:2:48:45
Date:1/0/0
Lat:30°42.057'N
Lon:97°21.645'W
Course:0 File: 1
No.4155 EdgeTech
Time:2:49:34
Date:1/0/0
Lat:30°42.003'N
Lon:97°21.667'W
Course:0 File: 1
No.4405 EdgeTech
Time:2:50:24
Date:1/0/0
Lat:30°41.949'N
Lon:97°21.693'W
Course:0 File: 1
No.4655 EdgeTech
Time:2:51:14
Date:1/0/0
Lat:30°41.897'N
Lon:97°21.722'W
Course:0 File: 1
No.4905 EdgeTech
Time:2:52:4
Date:1/0/0
Lat:30°41.844'N
Lon:97°21.749'W
Course:0 File: 1
No.5155 EdgeTech
Time:2:52:54
Date:1/0/0
Lat:30°41.793'N
Lon:97°21.777'W
Course:0 File: 1



00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2.00_15.00kHz_FW SB-216 P:20ms_2

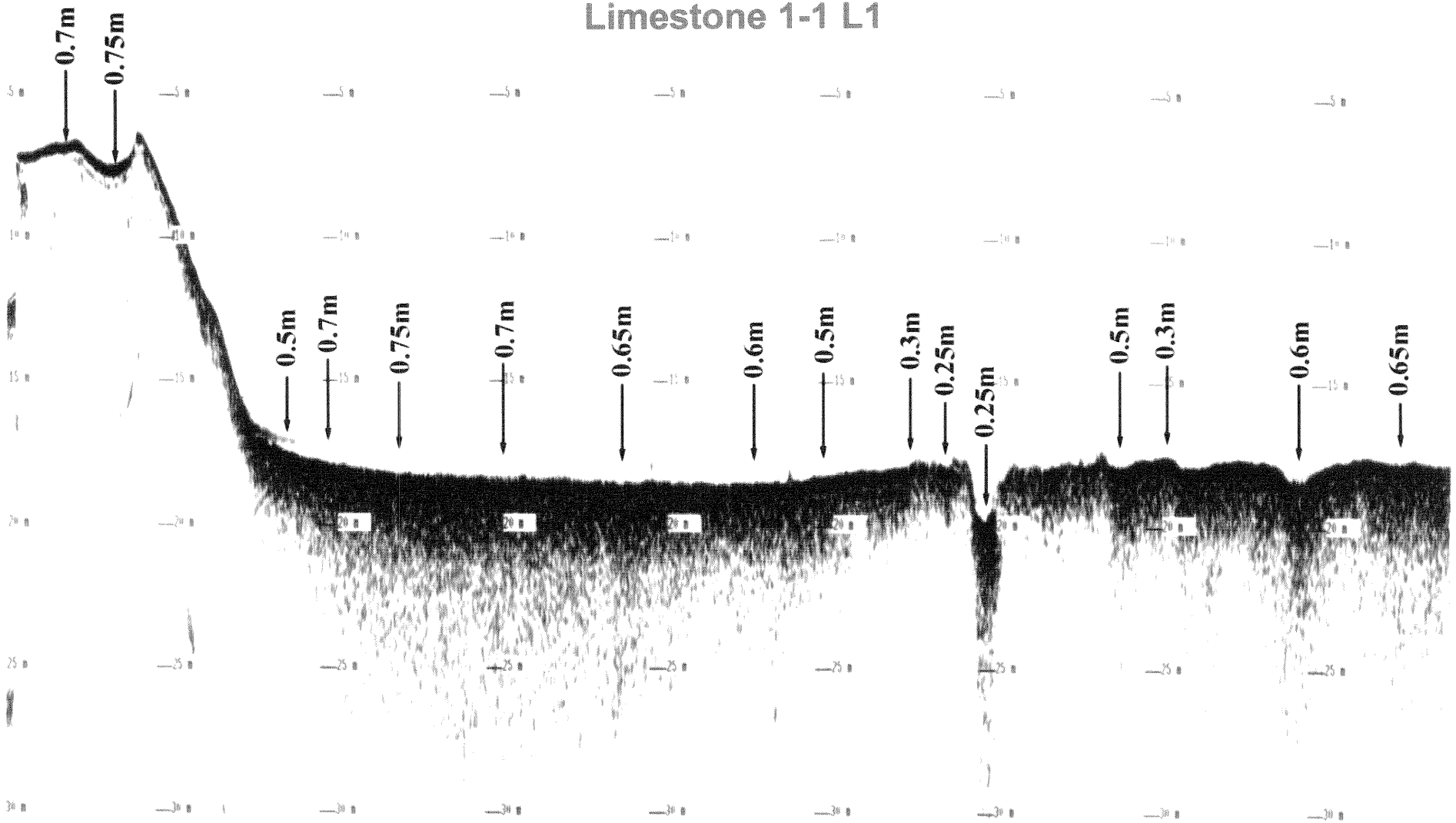
dgeTech	No.7104	EdgeTech	No.7354	EdgeTech	No.7604	EdgeTech	No.7854	EdgeTech	No.8104	EdgeTech	No.8354	EdgeTech	No.8604	EdgeTech	No.8854	EdgeTech	No.9104
	Time:3:9:3		Time:3:9:52		Time:3:10:43		Time:3:11:32		Time:3:12:23		Time:3:13:13		Time:3:14:2		Time:3:14:52		Time:3:15
	Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/0		Date:1/0/
	Lat:30°42.297'N		Lat:30°42.257'N		Lat:30°42.209'N		Lat:30°42.167'N		Lat:30°42.121'N		Lat:30°42.071'N		Lat:30°42.025'N		Lat:30°41.981'N		Lat:30°41
	Lon:97°22.876'W		Lon:97°22.856'W		Lon:97°22.842'W		Lon:97°22.816'W		Lon:97°22.787'W		Lon:97°22.768'W		Lon:97°22.745'W		Lon:97°22.714'W		Lon:97°22
ile: 2	Course:0	File: 2	Course:0	File: 2	Course:0	File: 2	Course:0	File: 2	Course:0	File: 2	Course:0	File: 2	Course:0	File: 2	Course:0	File: 2	Course:0
ec: 127	Speed:0.0	Rec: 377	Speed:0.0	Rec: 627	Speed:0.0	Rec: 877	Speed:0.0	Rec: 1127	Speed:0.0	Rec: 1377	Speed:0.0	Rec: 1627	Speed:0.0	Rec: 1877	Speed:0.0	Rec: 2127	Speed:0.0



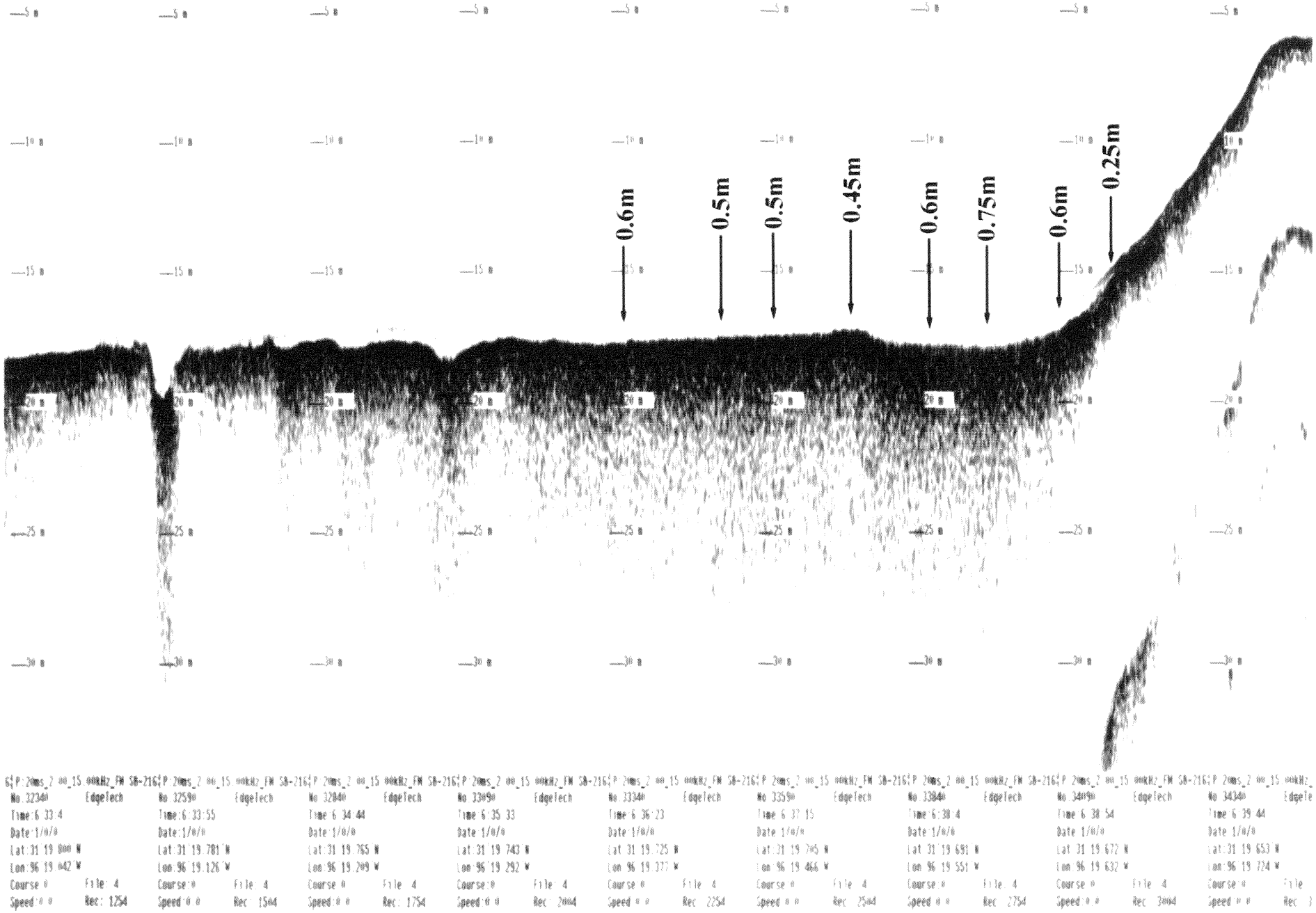
Lake Limestone

Slide 1: Line 1-1 L1
Slide 2: Line 1-2 L1
Slide 3: Line 2-1 L2
Slide 4: Line 2-2 L2
Slide 5: Line 3 L3
Slide 6: Line 4-1 L4
Slide 7: Line 4-2 L4
Slide 8: Line 4-3 L4
Slide 9: Line 5 L5
Slide 10: Line 6 L6
Slide 11: Line 7-1 L7
Slide 12: Line 7-2 L7
Slide 13: Line 7-3 L7
Slide 14: Line 7-4 L7
Slide 15: Line 7-5 L7
Slide 16: Line 7-6 L7
Slide 17: Line 7-7 L7
Slide 18: Line 7-8 L7
Slide 19: Line 7-9 L7
Slide 20: Line 7-10 L7
Slide 21: Line 7-11 L7

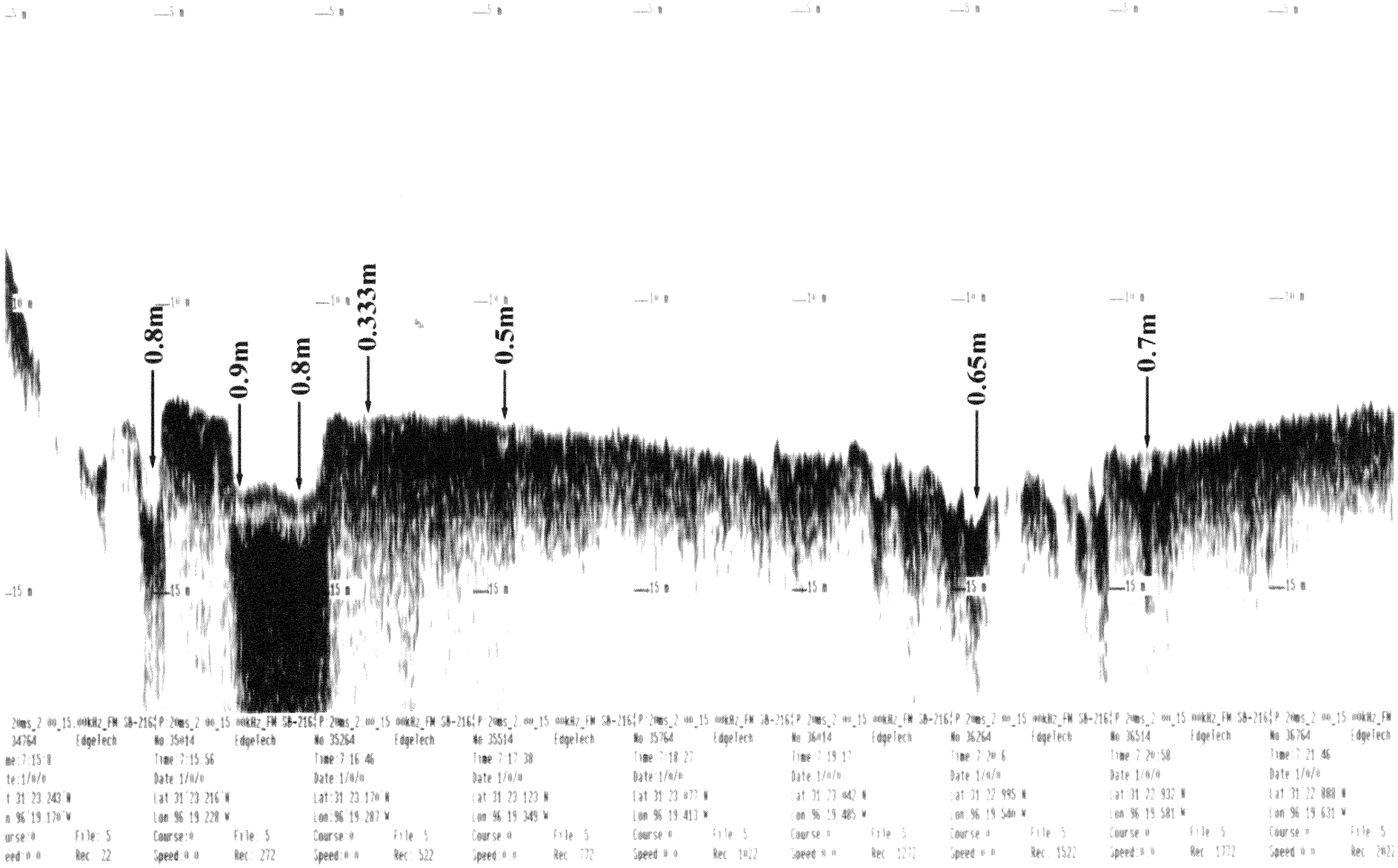
Limestone 1-1 L1



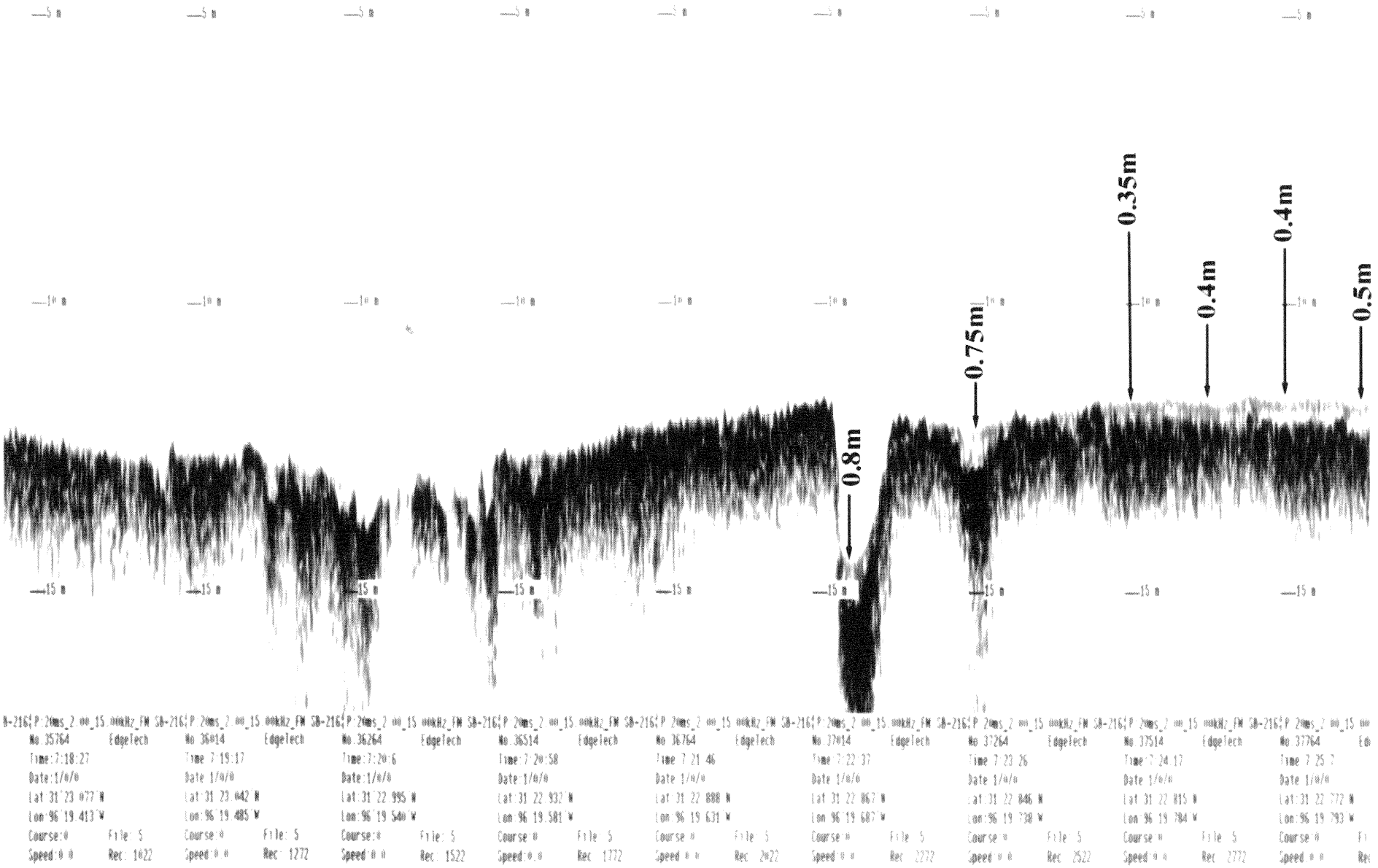
Limestone 1-2 L1



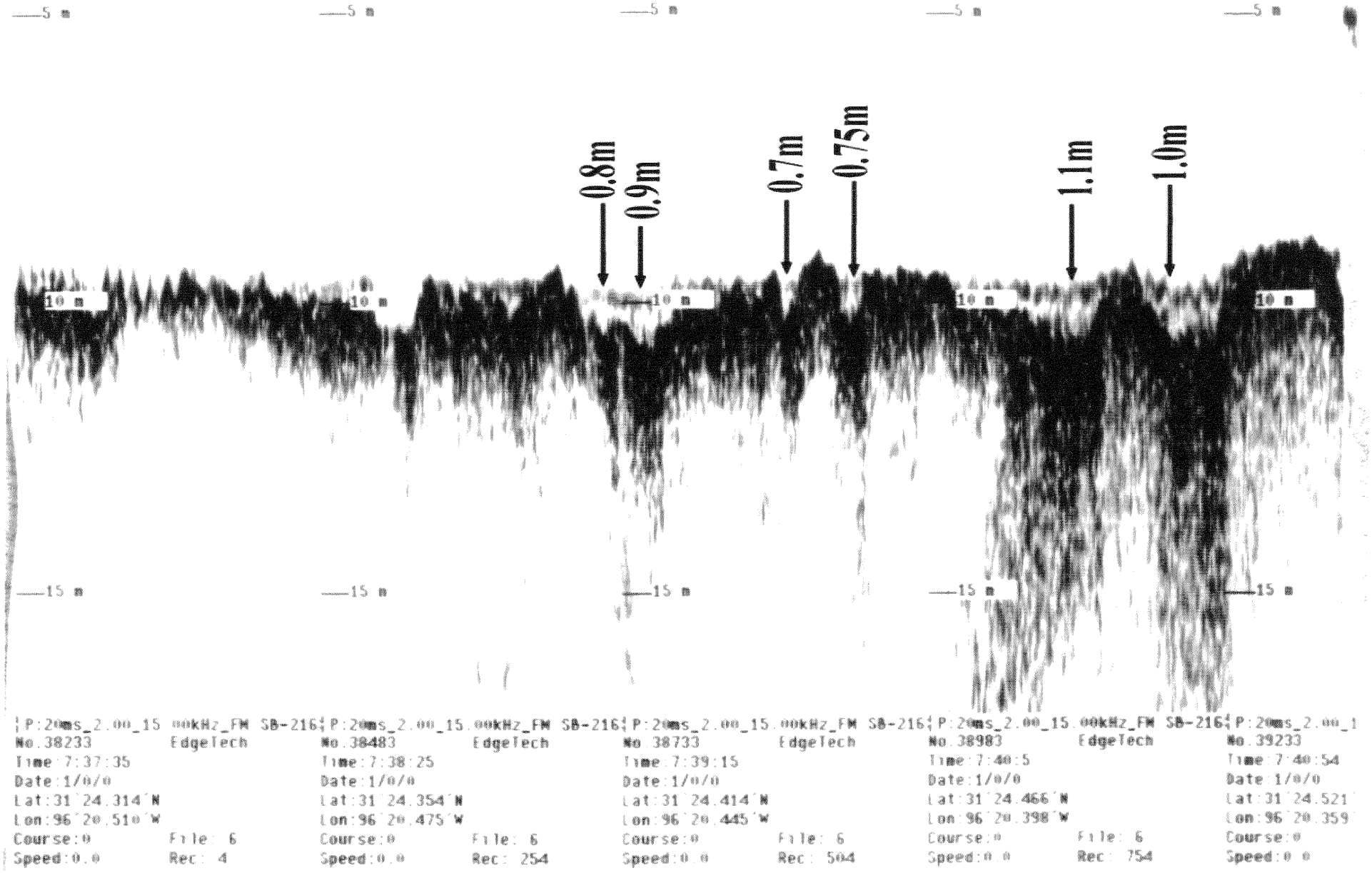
Limestone 2-1 L2



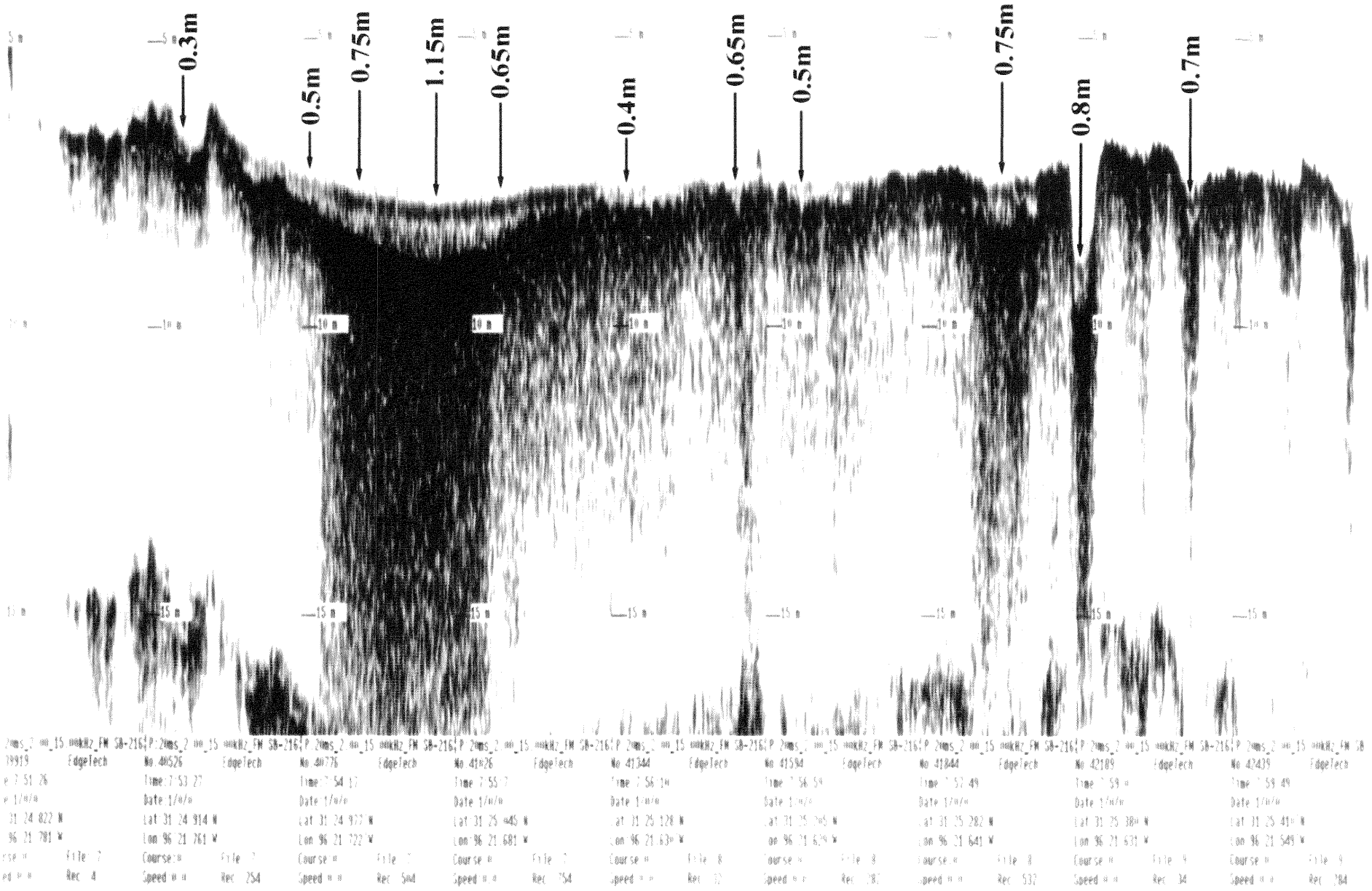
Limestone 2-2 L2



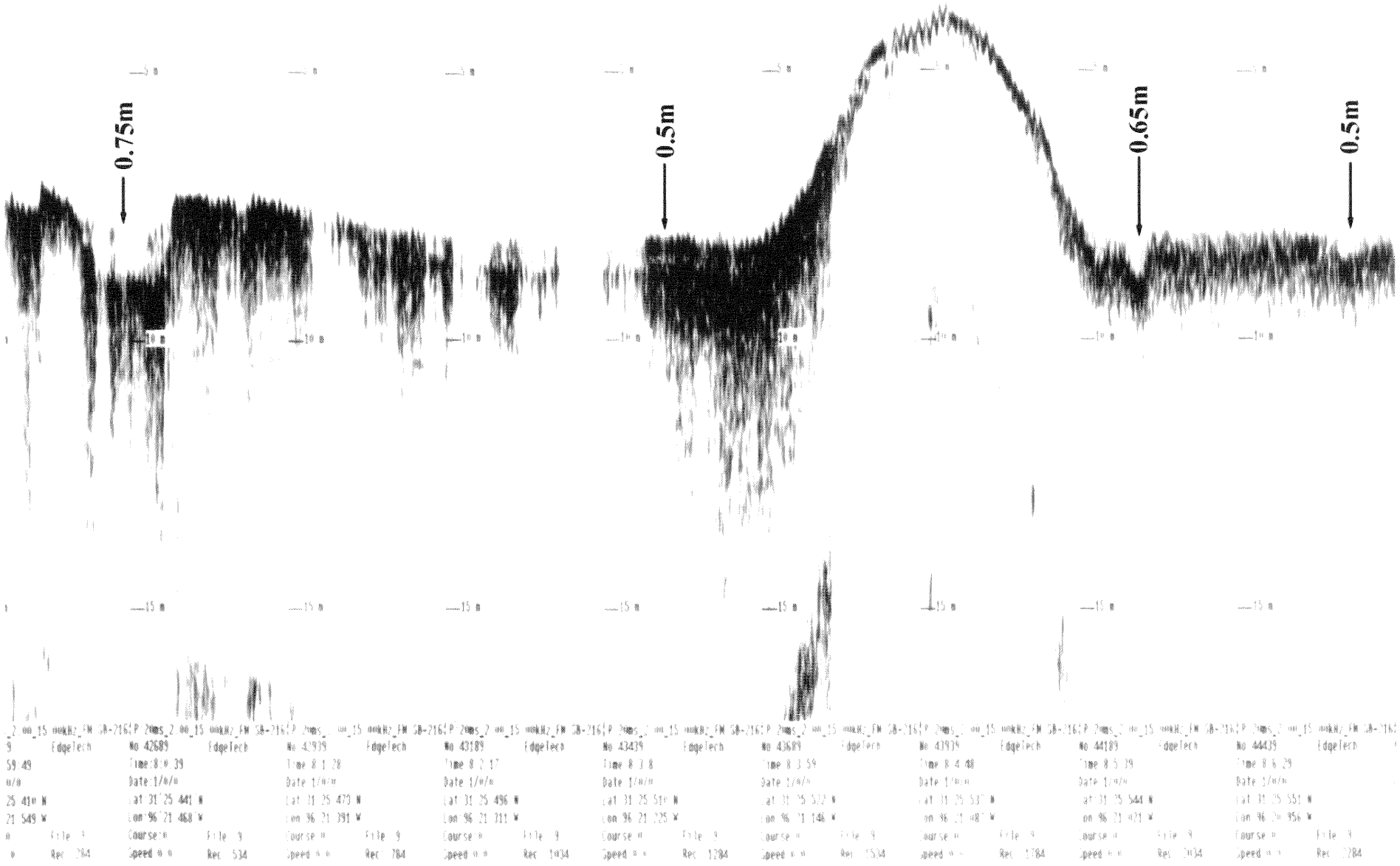
Limestone 3 L3



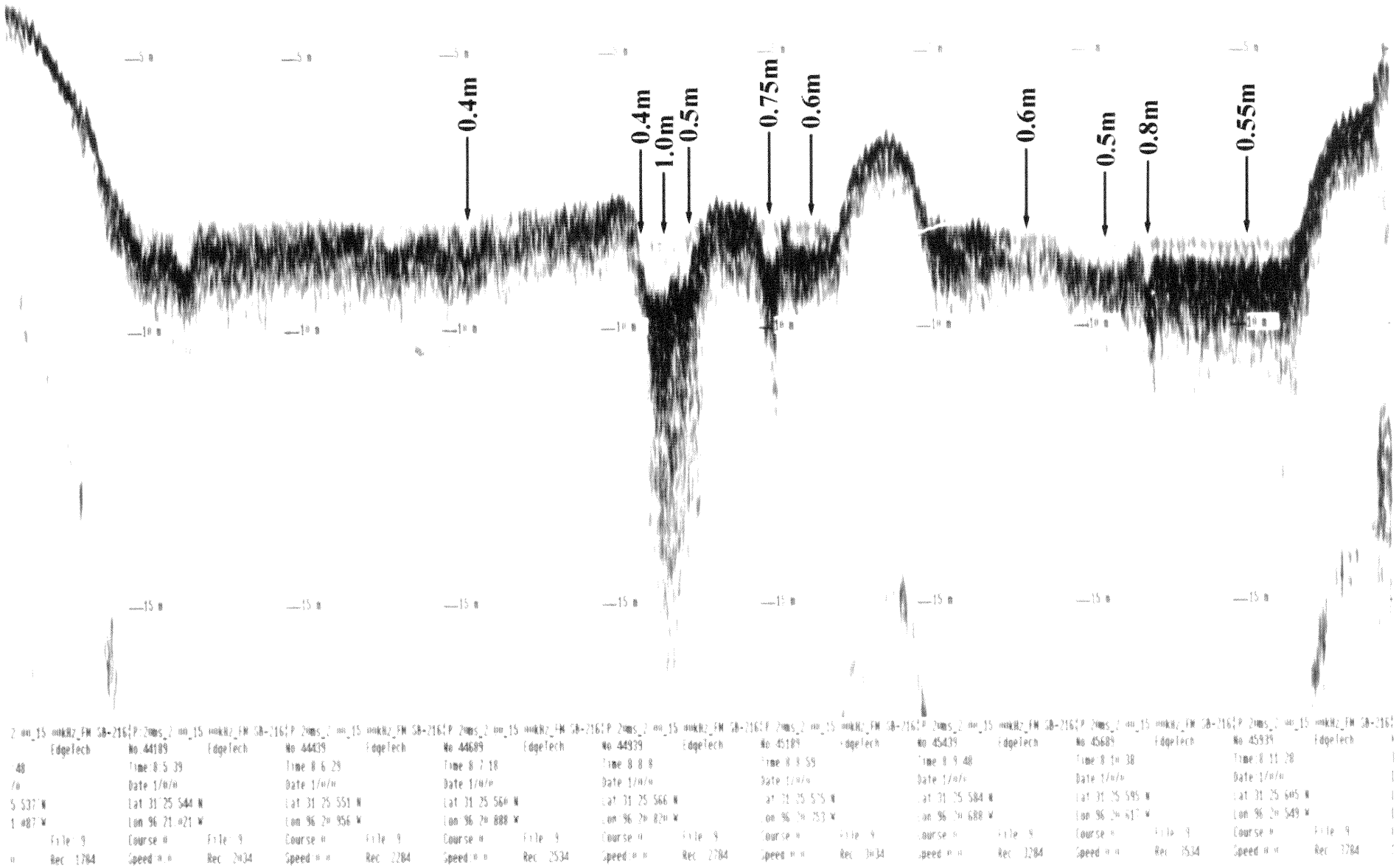
Limestone 4-1 L4

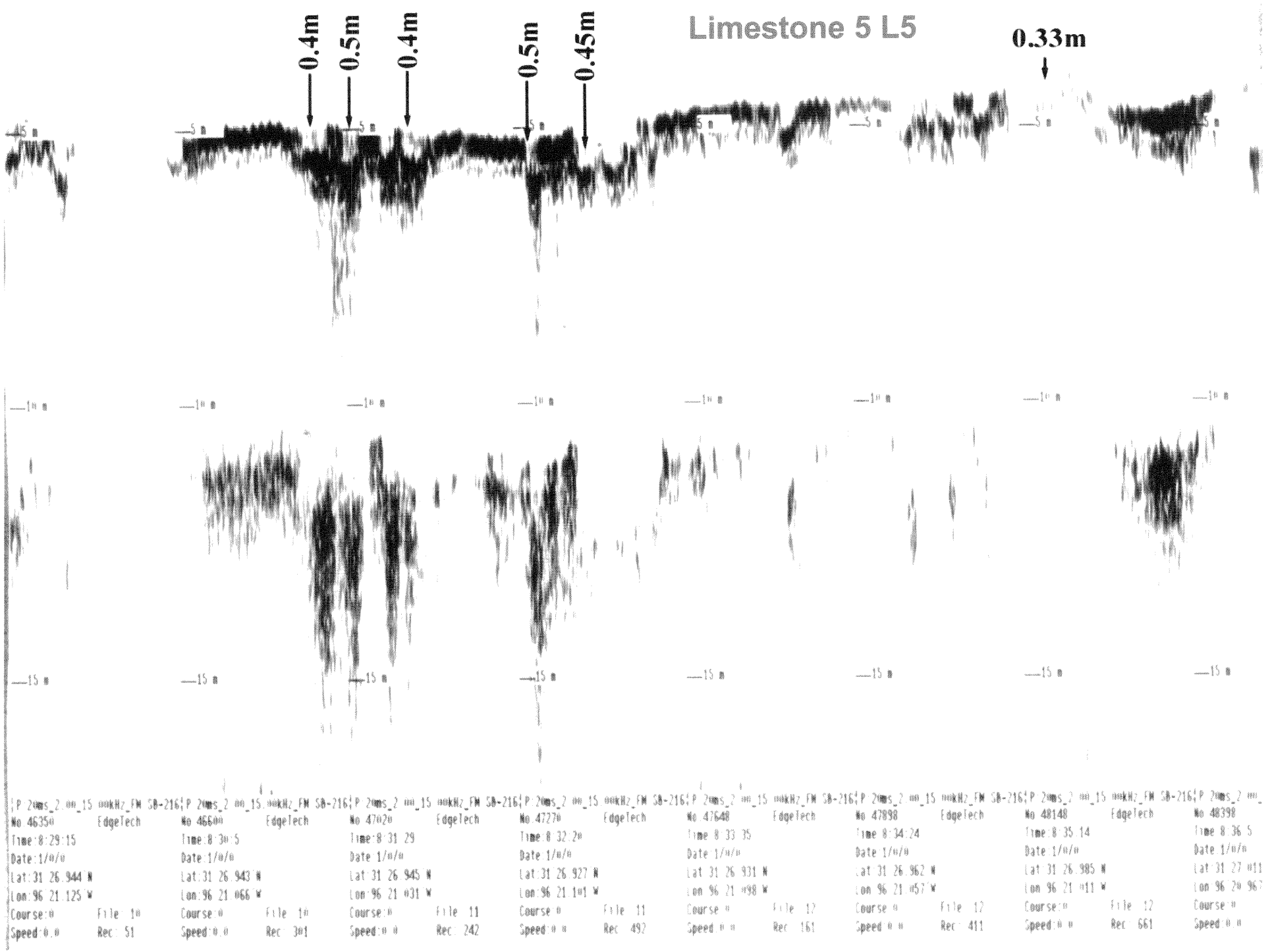


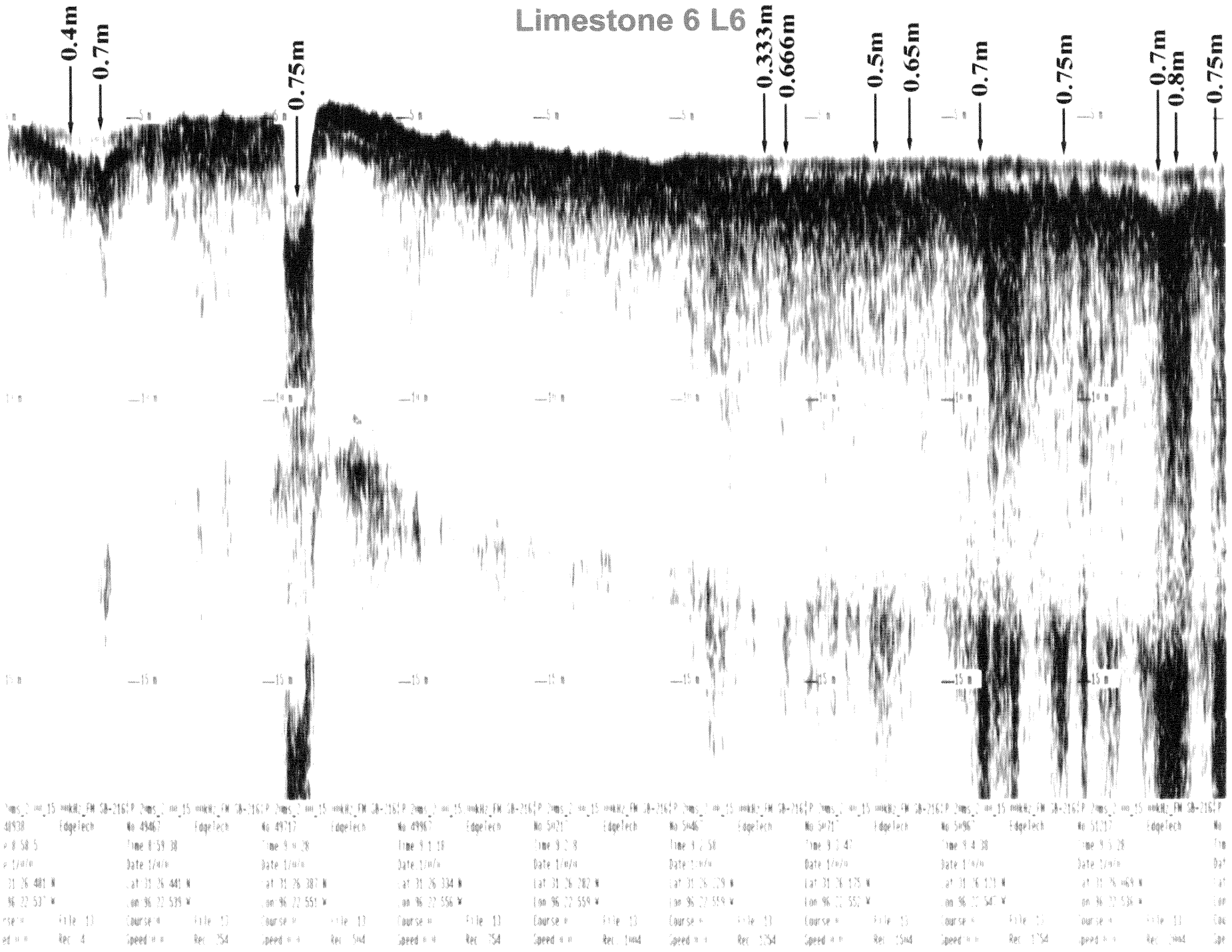
Limestone 4-2 L4

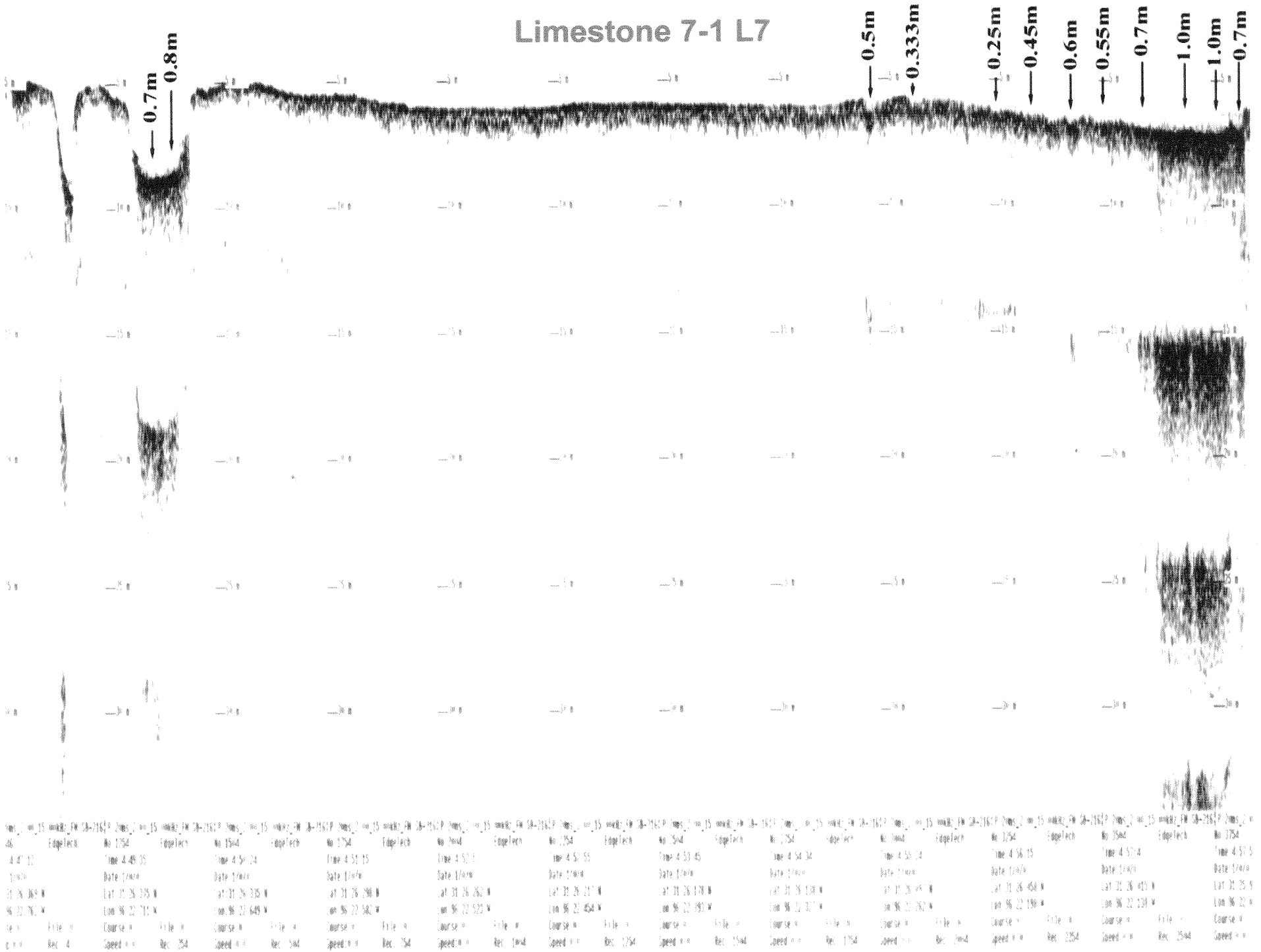


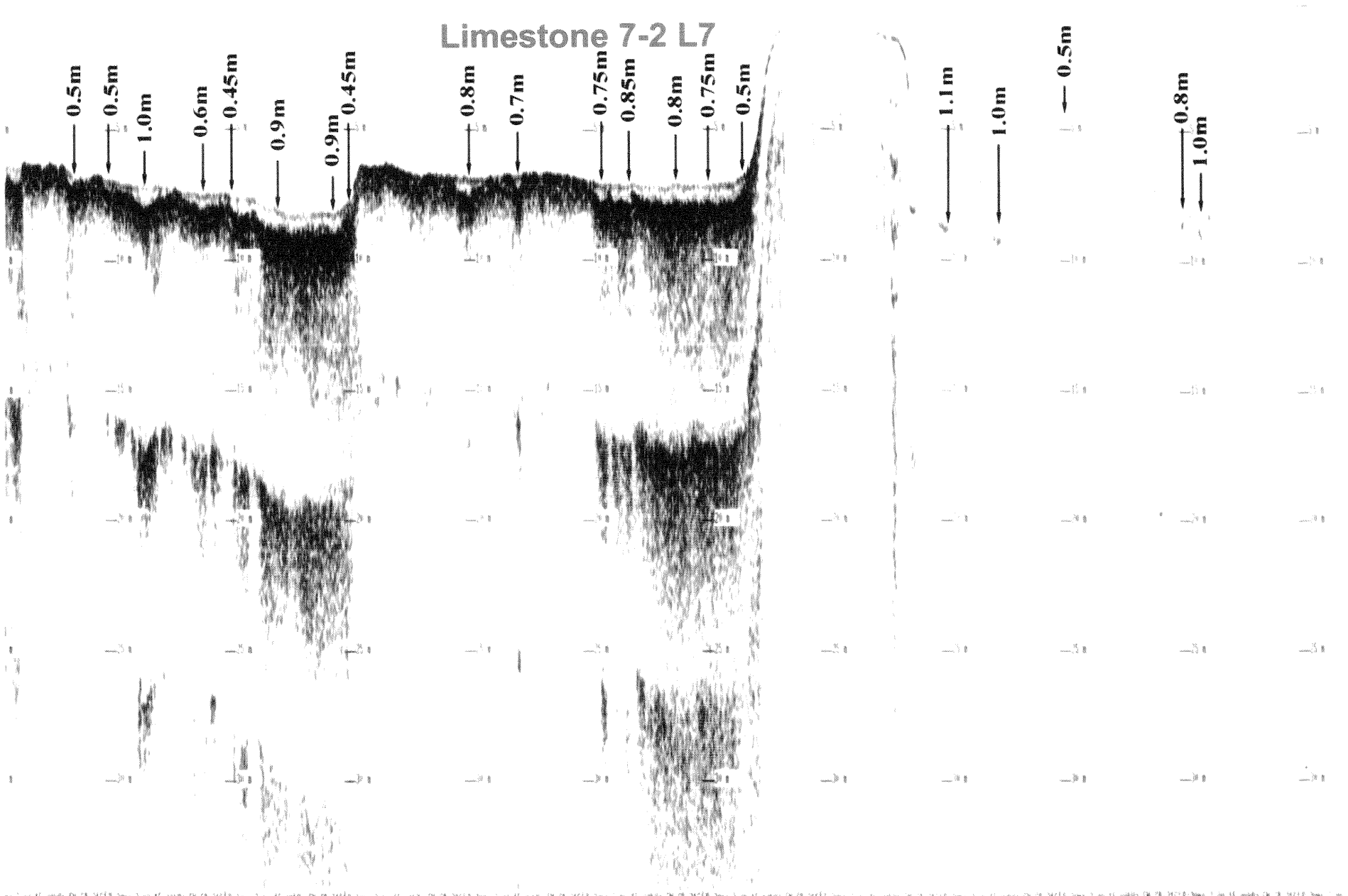
Limestone 4-3 L4

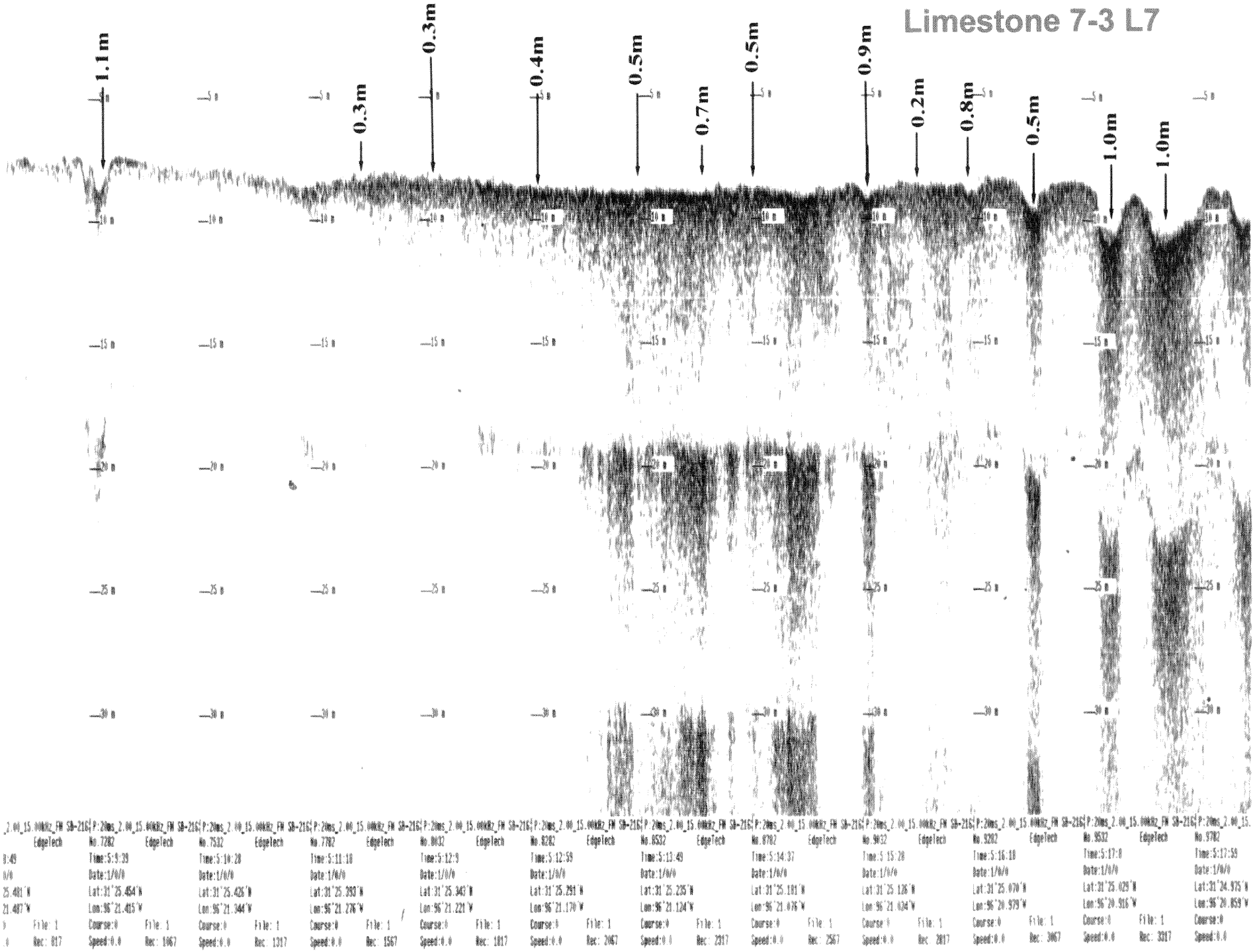



Limestone 5 L5
0.4m
0.5m
0.4m
0.5m
0.45m
0.33m
5 m
10 m
15 m
P 2ms_2 mm_15 mkHz_FM SB-216
No 46350 EdgeTech
Time:8:29:15
Date:1/0/0
Lat:31 26.944 N
Lon:96 21.125 W
Course:0 File 10
Speed:0.0 Rec 51
No 46600 EdgeTech
Time:8:30:5
Date:1/0/0
Lat:31 26.943 N
Lon:96 21 066 W
Course:0 File 10
Speed:0.0 Rec 301
No 47020 EdgeTech
Time:8:31 29
Date 1/0/0
Lat:31 26.945 N
Lon:96 21 031 W
Course:0 File 11
Speed:0 0 Rec 242
No 47270 EdgeTech
Time:8:32:20
Date 1/0/0
Lat:31 26.927 N
Lon:96 21.101 W
Course:0 File 11
Speed:0 0 Rec 492
No 47648 EdgeTech
Time 8:33 35
Date 1/0/0
Lat 31 26 931 N
Lon 96 21 098 W
Course 0 File 12
Speed 0 0 Rec 161
No 47898 EdgeTech
Time 8:34:24
Date 1/0/0
Lat 31 26.962 N
Lon 96 21.057 W
Course 0 File 12
Speed 0 0 Rec 411
No 48148 EdgeTech
Time:8:35.14
Date:1/0/0
Lat 31 26.985 N
Lon 96 21 011 W
Course:0 File 12
Speed:0 0 Rec 661
No 48398
Time 8:36 5
Date 1/0/0
Lat 31 27 011
Lon 96 20 967
Course:0
Speed:0 0

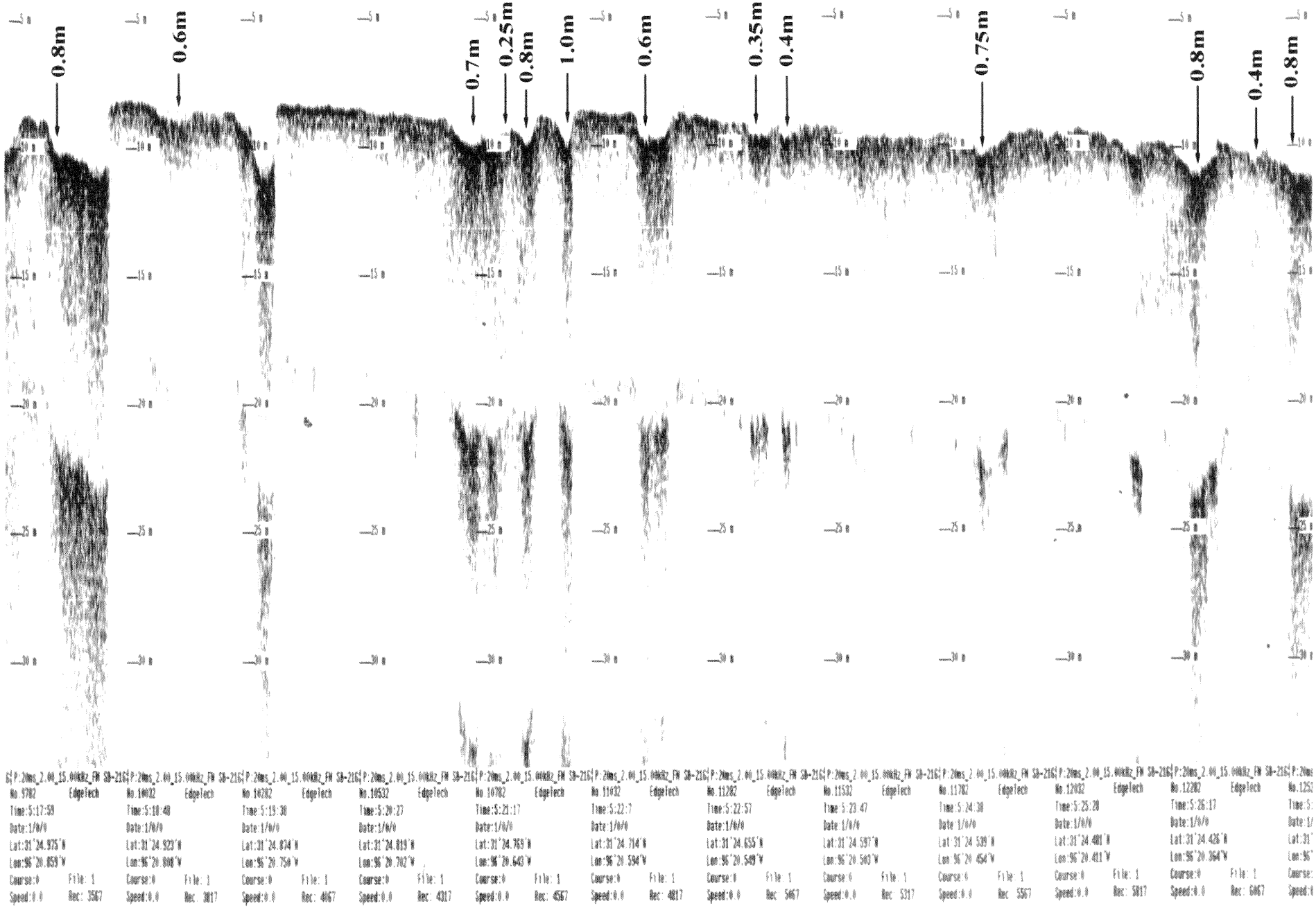

Limestone 6 L6
0.4m
0.7m
0.75m
0.333m
0.666m
0.5m
0.65m
0.7m
0.75m
0.7m
0.8m
0.75m


Limestone 7-1 L7
0.7m
0.8m
0.5m
0.333m
0.25m
0.45m
0.6m
0.55m
0.7m
1.0m
1.0m
0.7m

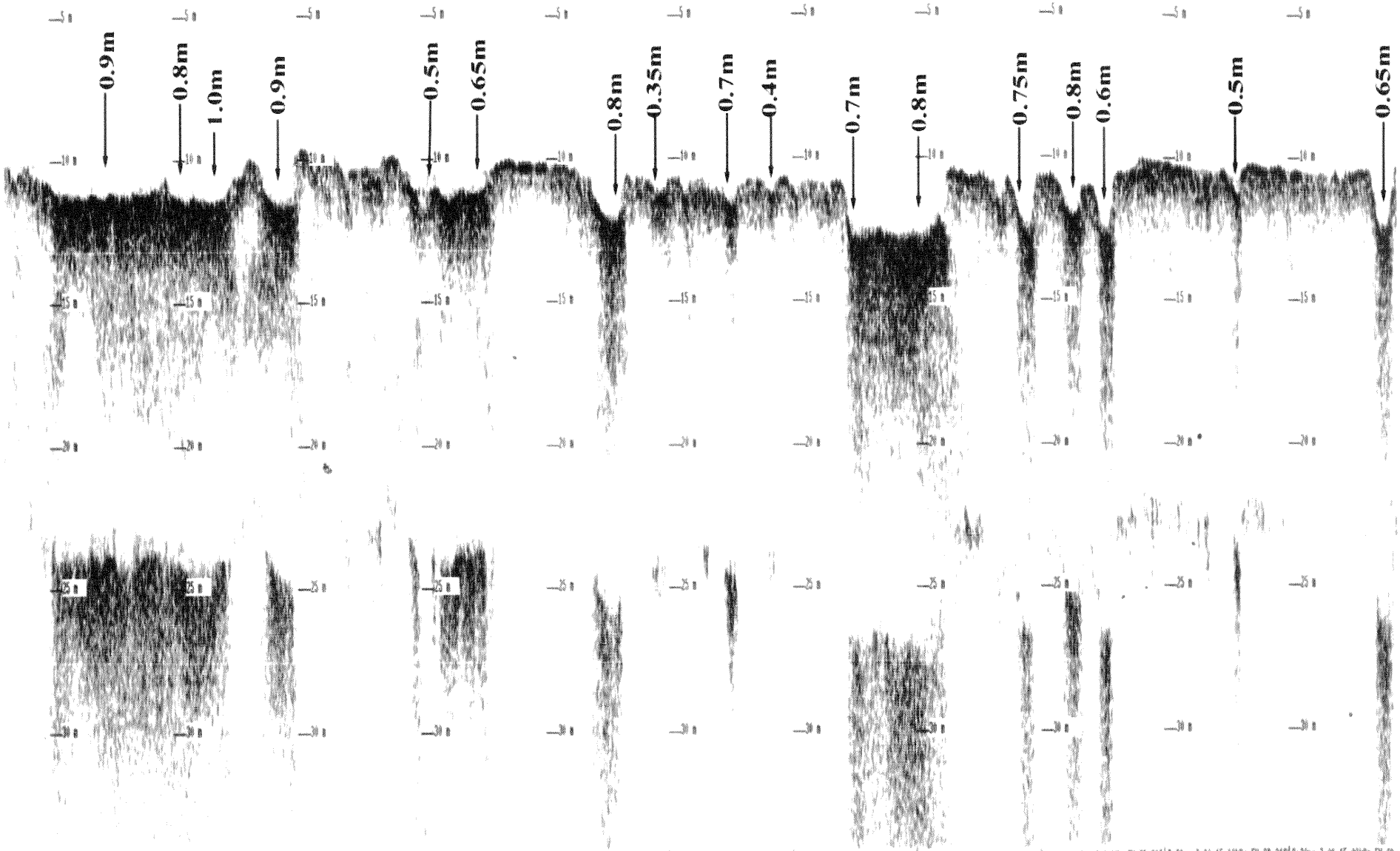

Limestone 7-2 L7
0.5m
0.5m
1.0m
0.6m
0.45m
0.9m
0.9m
0.45m
0.8m
0.7m
0.75m
0.85m
0.8m
0.75m
0.5m
1.1m
1.0m
0.5m
0.8m
1.0m

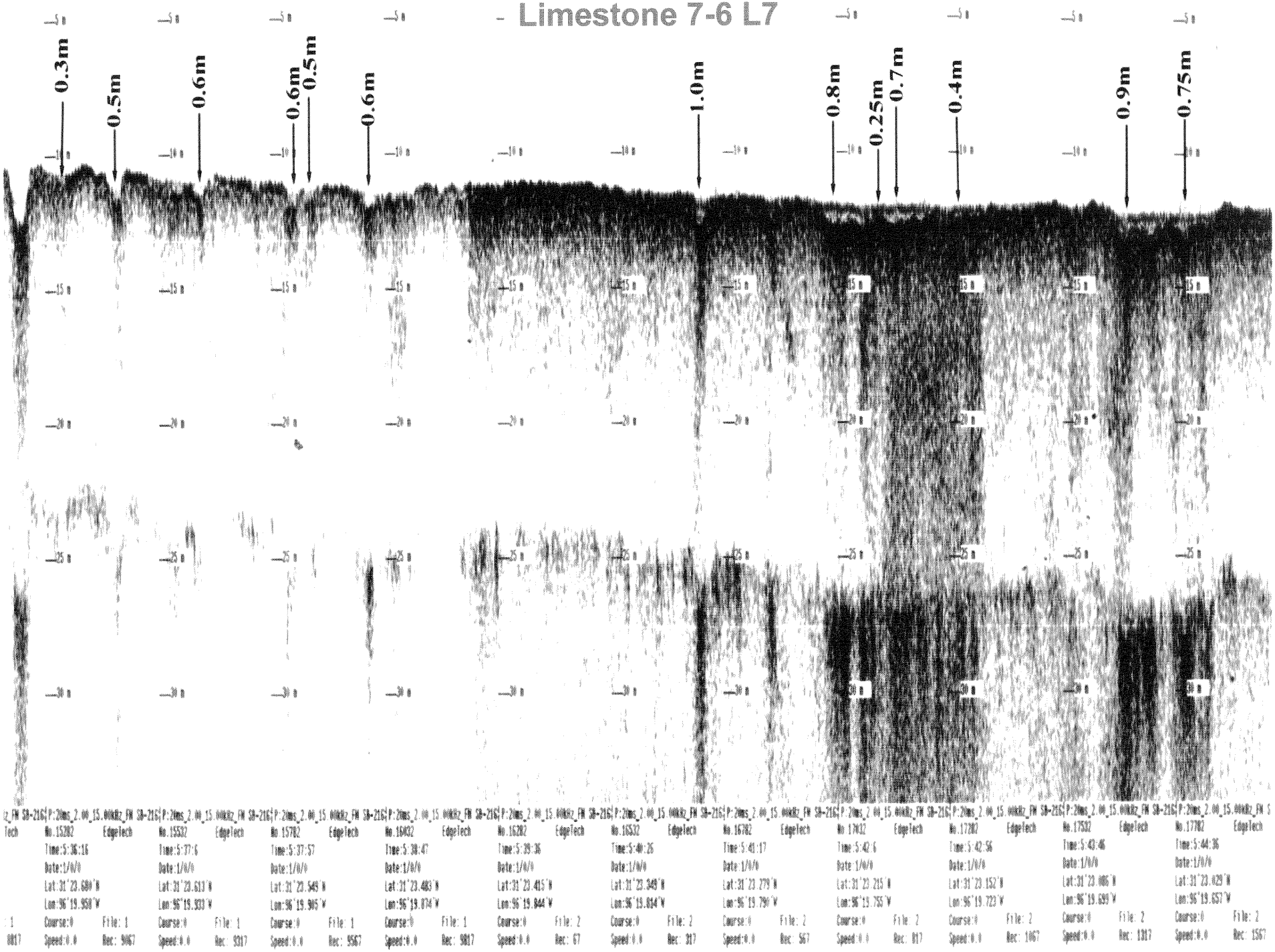

Limestone 7-3 L7
1.1m
0.3m
0.3m
0.4m
0.5m
0.7m
0.5m
0.9m
0.2m
0.8m
0.5m
1.0m
1.0m

Limestone 7-4 L7

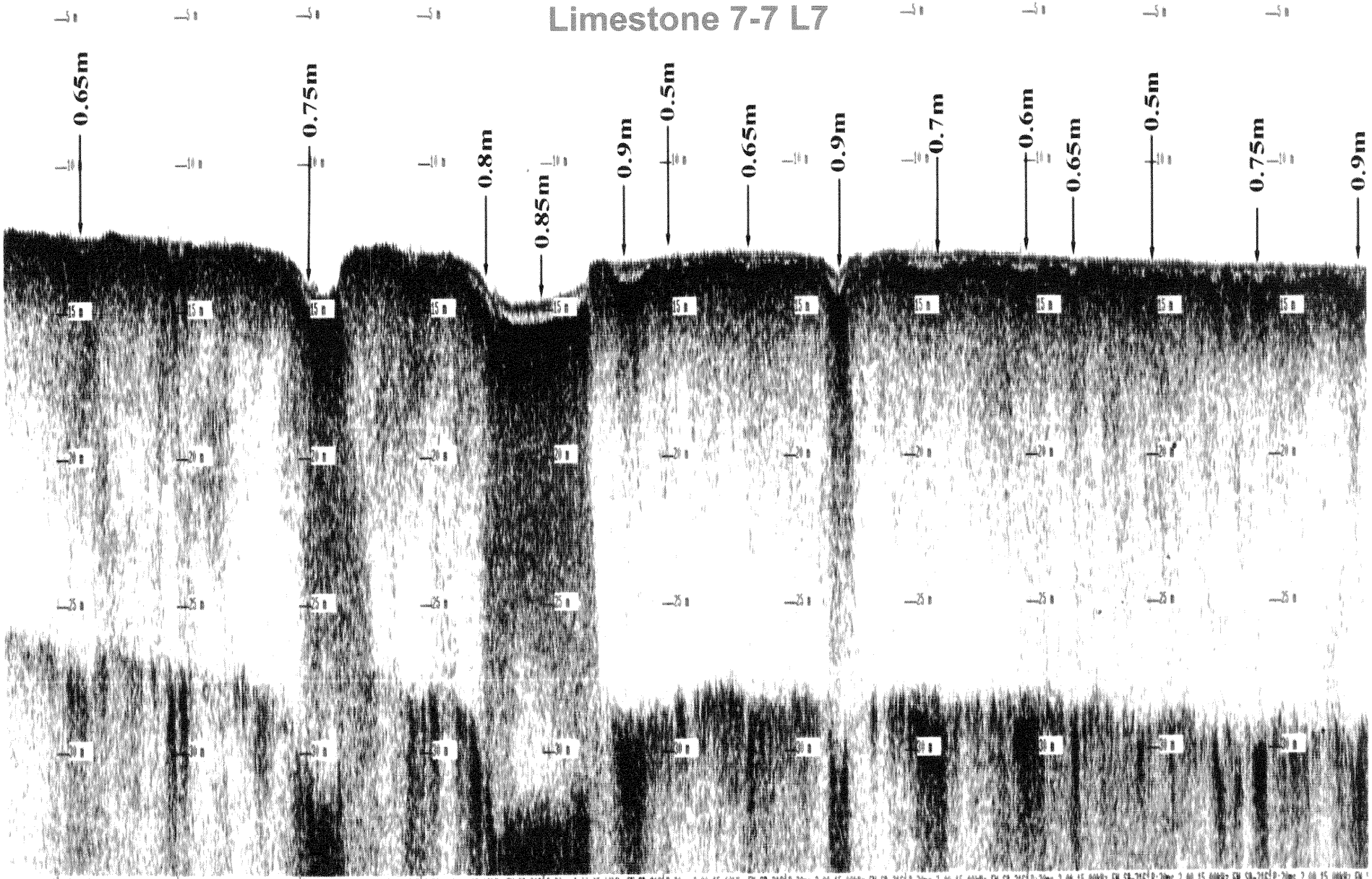


Limestone 7-5 L7

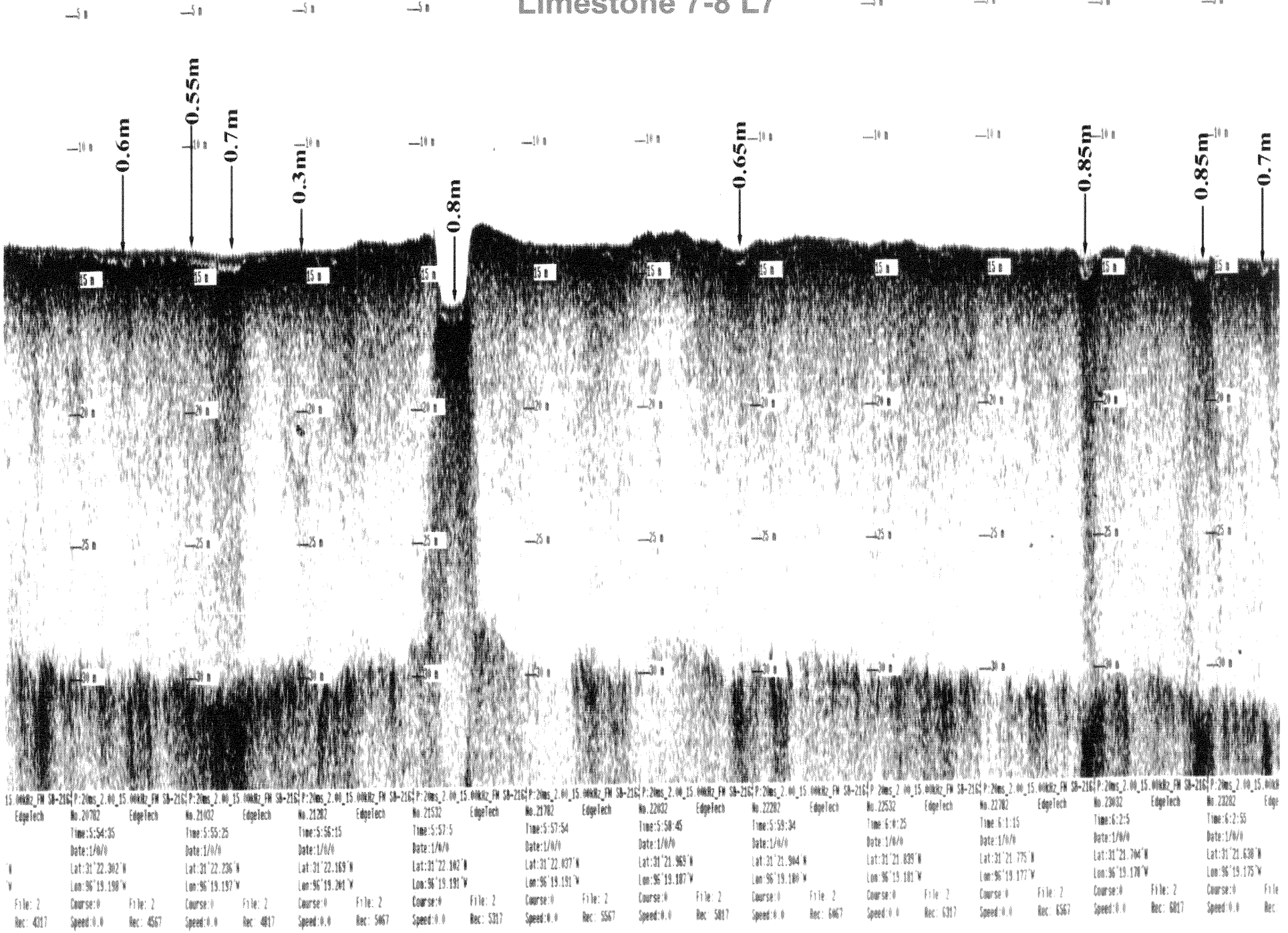



- Limestone 7-6 L7
0.3m
0.5m
0.6m
0.6m
0.5m
0.6m
1.0m
0.8m
0.25m
0.7m
0.4m
0.9m
0.75m
5 m
10 m
15 m
20 m
25 m
30 m
Tech
No.15282
Time:5:36:16
Date:1/0/0
Lat:31°23.689'N
Lon:96°19.958'W
Course:0
Speed:0.0
File: 1
Rec: 9967
No.15532
Time:5:37:6
Date:1/0/0
Lat:31°23.613'N
Lon:96°19.933'W
Course:0
Speed:0.0
File: 1
Rec: 9317
No.15782
Time:5:37:57
Date:1/0/0
Lat:31°23.545'N
Lon:96°19.905'W
Course:0
Speed:0.0
File: 1
Rec: 9567
No.16402
Time:5:38:47
Date:1/0/0
Lat:31°23.485'N
Lon:96°19.874'W
Course:0
Speed:0.0
File: 1
Rec: 9817
No.16282
Time:5:39:36
Date:1/0/0
Lat:31°23.415'N
Lon:96°19.844'W
Course:0
Speed:0.0
File: 2
Rec: 67
No.16532
Time:5:40:26
Date:1/0/0
Lat:31°23.349'N
Lon:96°19.814'W
Course:0
Speed:0.0
File: 2
Rec: 317
No.16782
Time:5:41:17
Date:1/0/0
Lat:31°23.279'N
Lon:96°19.799'W
Course:0
Speed:0.0
File: 2
Rec: 567
No.17032
Time:5:42:6
Date:1/0/0
Lat:31°23.215'N
Lon:96°19.755'W
Course:0
Speed:0.0
File: 2
Rec: 817
No.17282
Time:5:42:56
Date:1/0/0
Lat:31°23.152'N
Lon:96°19.723'W
Course:0
Speed:0.0
File: 2
Rec: 1067
No.17532
Time:5:43:46
Date:1/0/0
Lat:31°23.086'N
Lon:96°19.699'W
Course:0
Speed:0.0
File: 2
Rec: 1317
No.17782
Time:5:44:36
Date:1/0/0
Lat:31°23.029'N
Lon:96°19.657'W
Course:0
Speed:0.0
File: 2
Rec: 1567

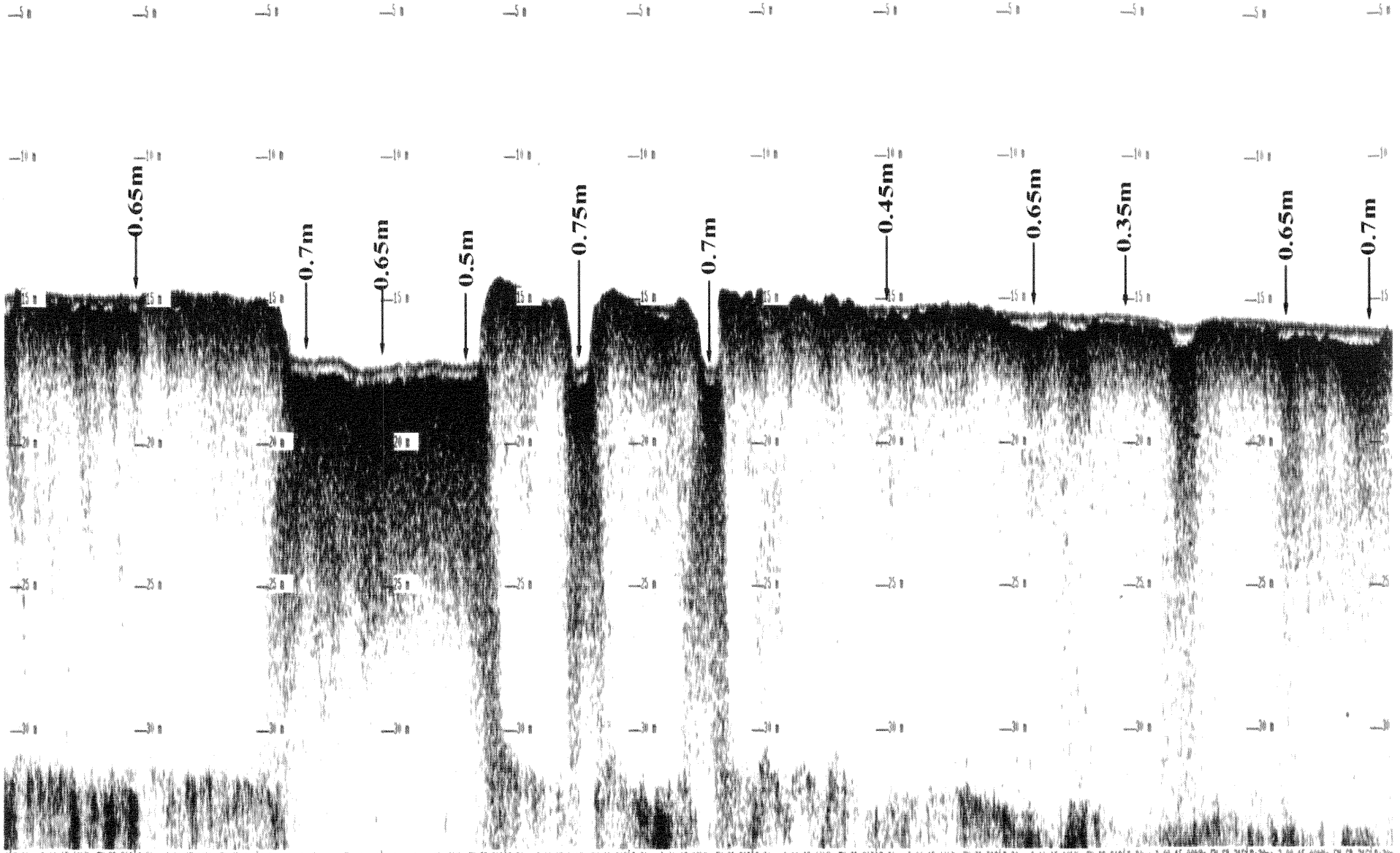
Limestone 7-7 L7



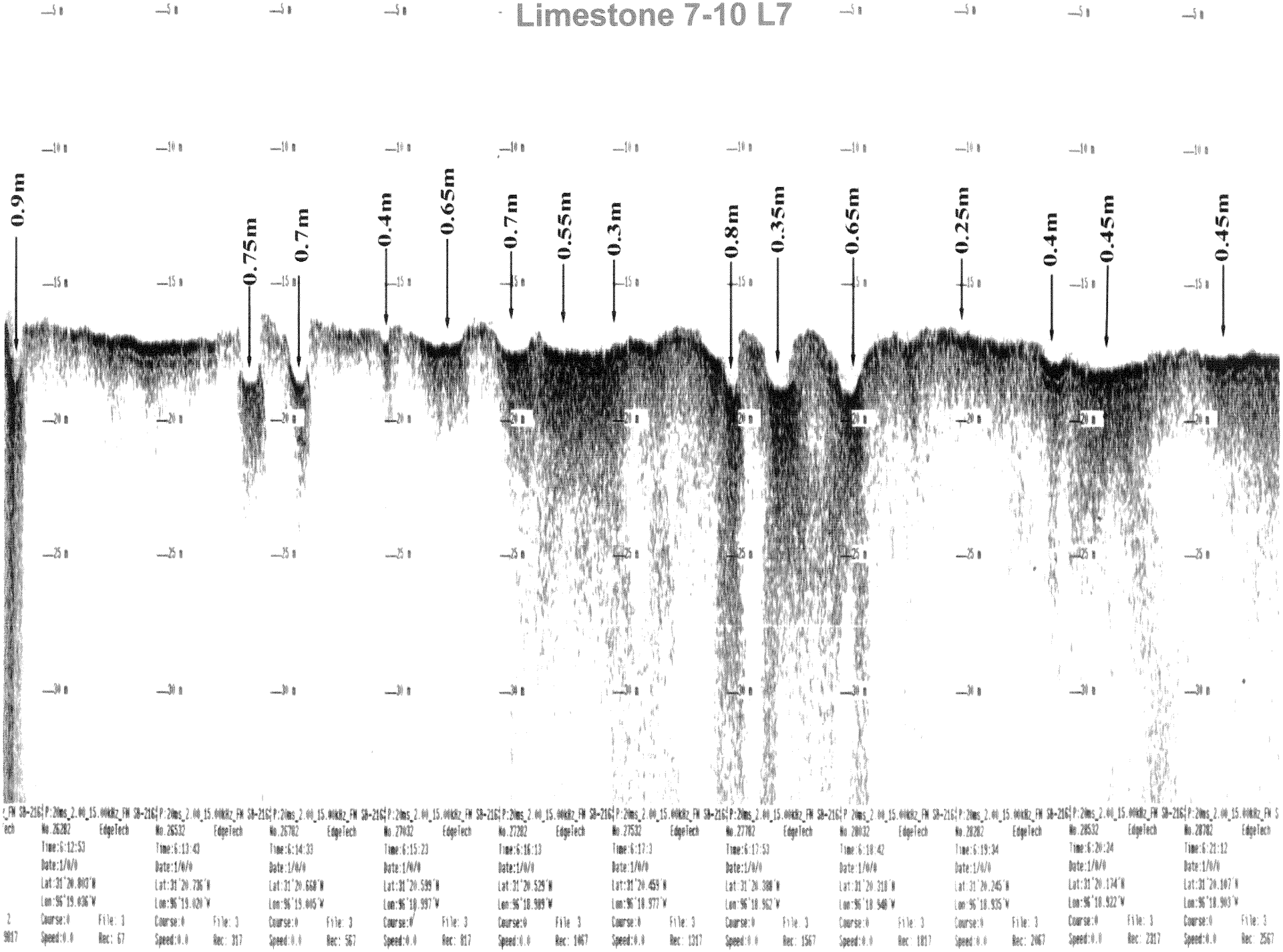
Limestone 7-8 L7



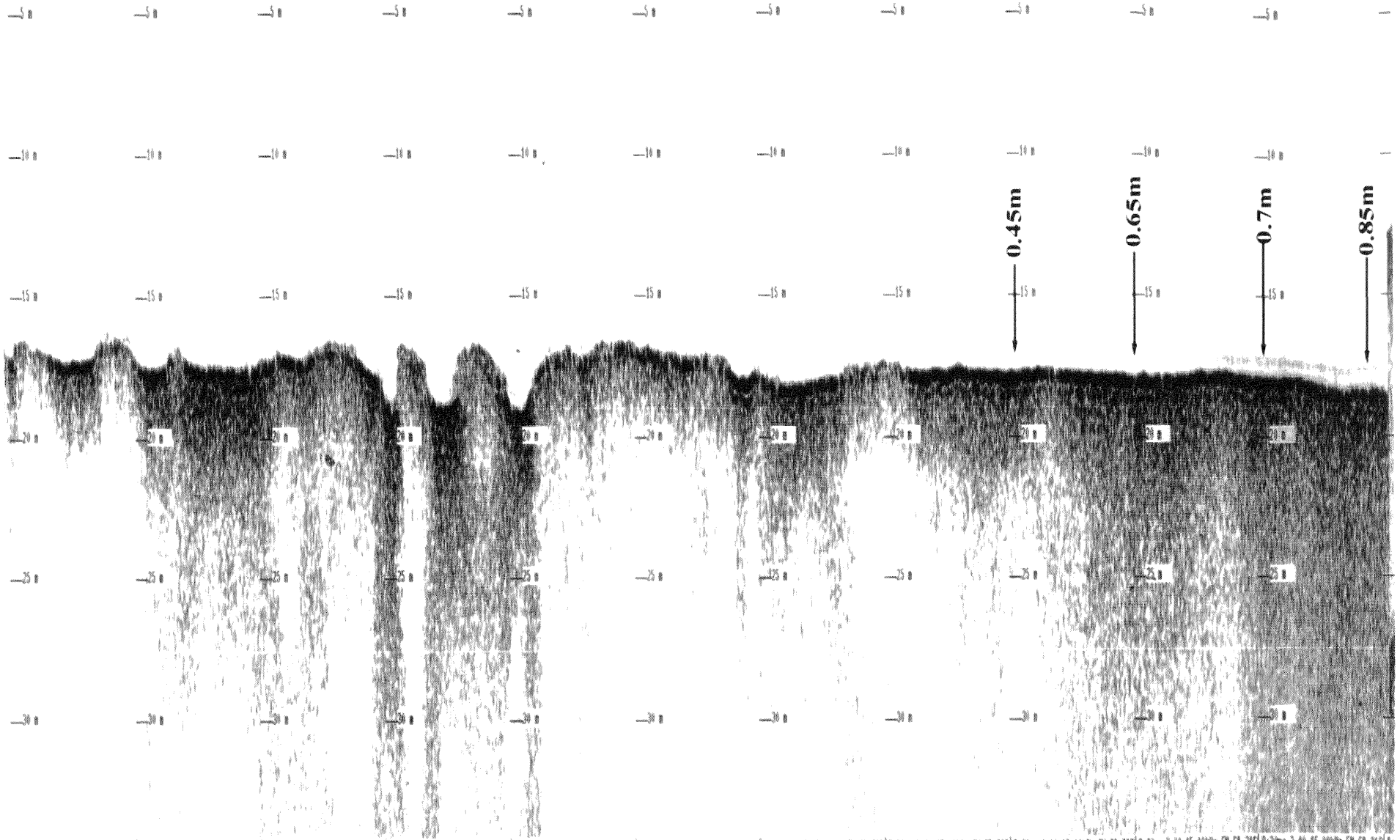
Limestone 7-9 L7

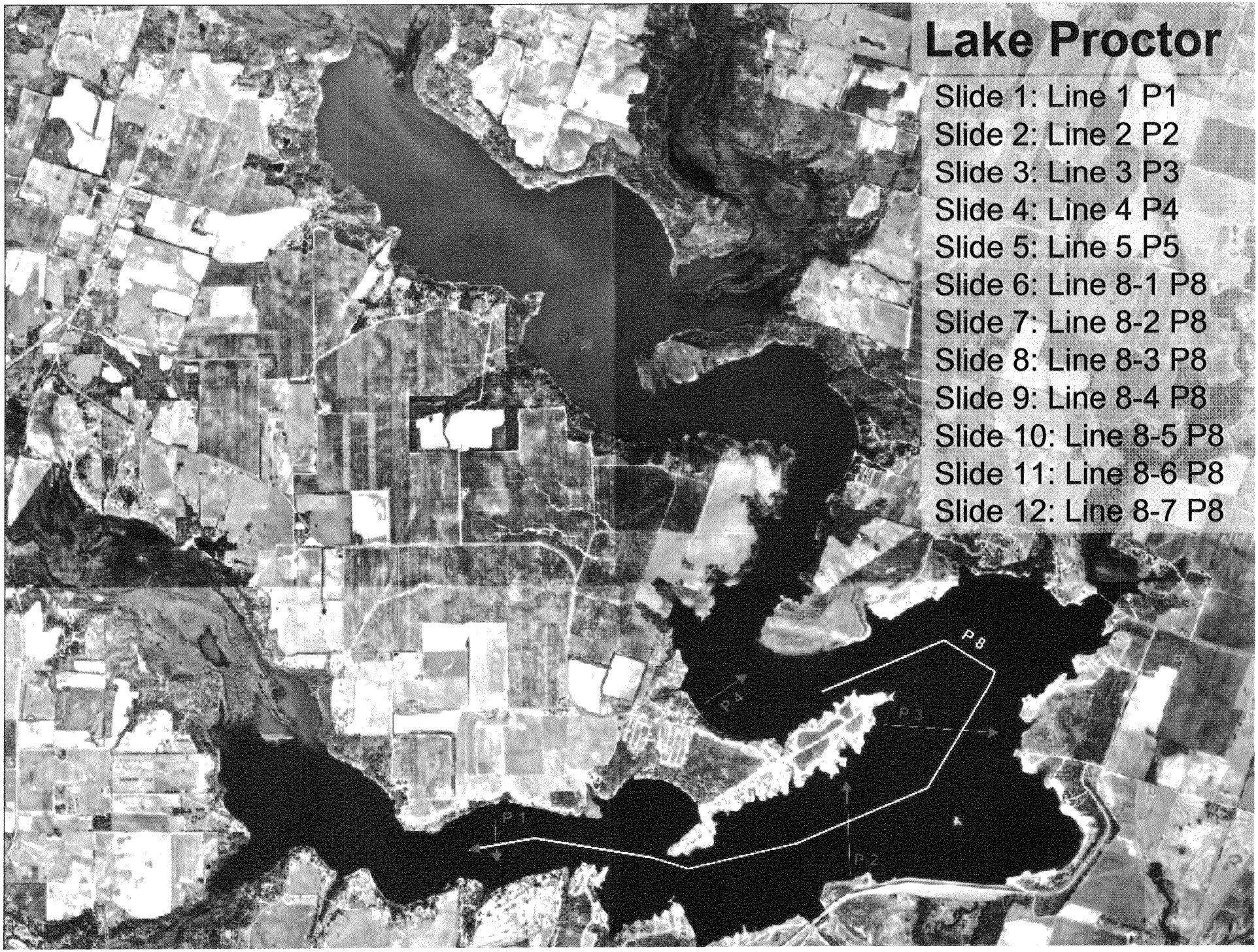


Limestone 7-10 L7

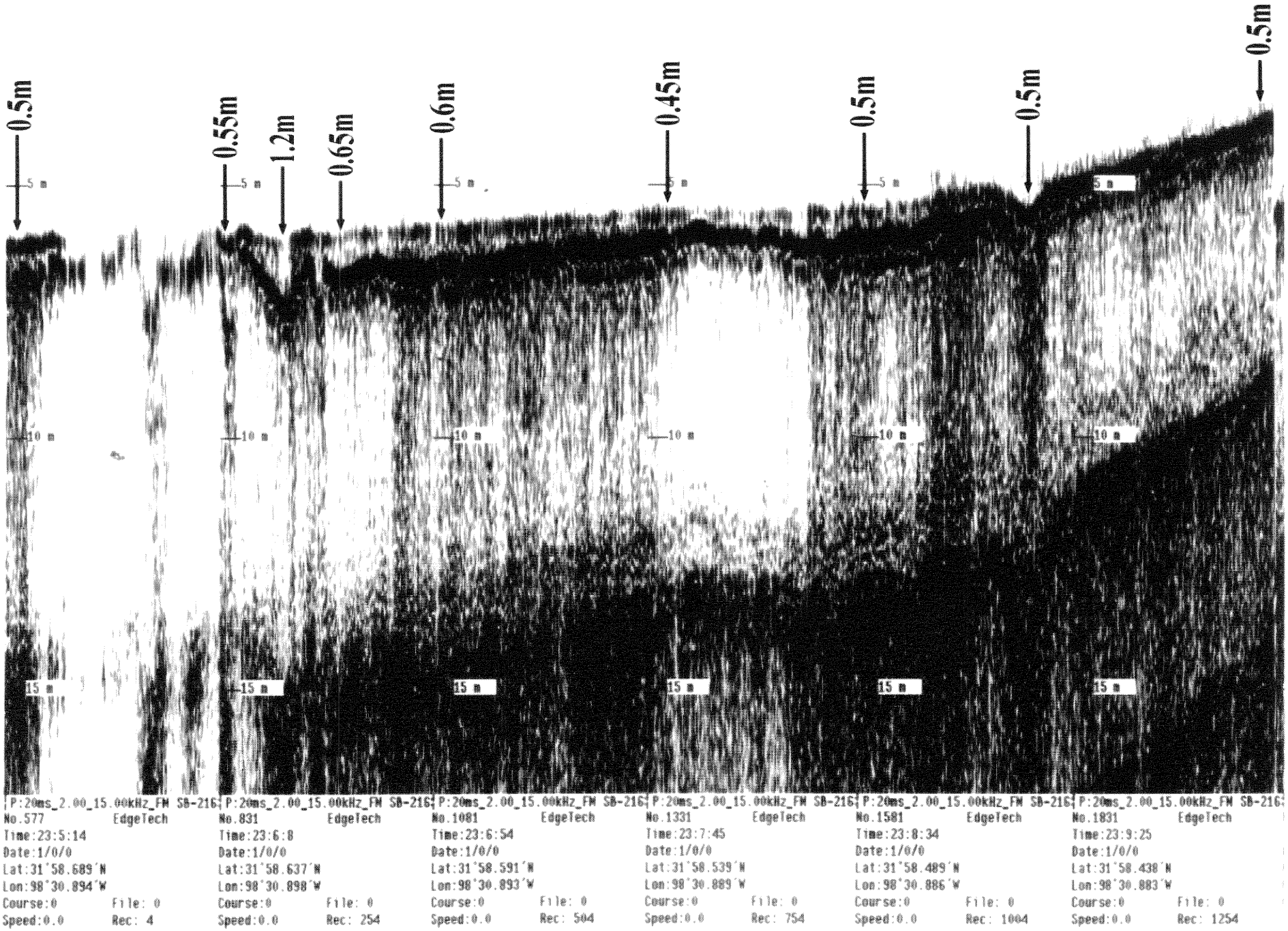


Limestone 7-11 L7

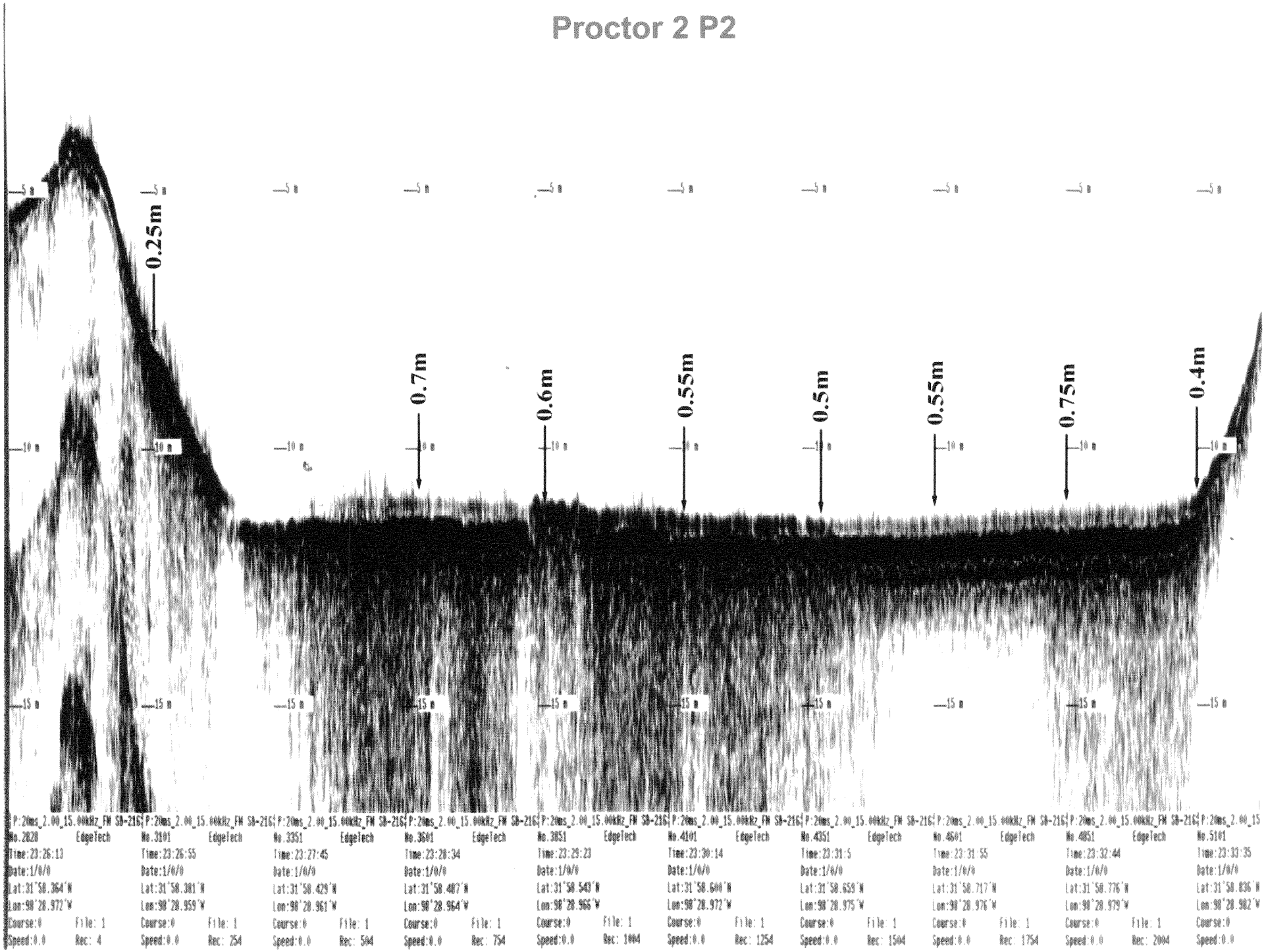



Lake Proctor
Slide 1: Line 1 P1
Slide 2: Line 2 P2
Slide 3: Line 3 P3
Slide 4: Line 4 P4
Slide 5: Line 5 P5
Slide 6: Line 8-1 P8
Slide 7: Line 8-2 P8
Slide 8: Line 8-3 P8
Slide 9: Line 8-4 P8
Slide 10: Line 8-5 P8
Slide 11: Line 8-6 P8
Slide 12: Line 8-7 P8
P 8
P 4
P 3
P 1
P 2

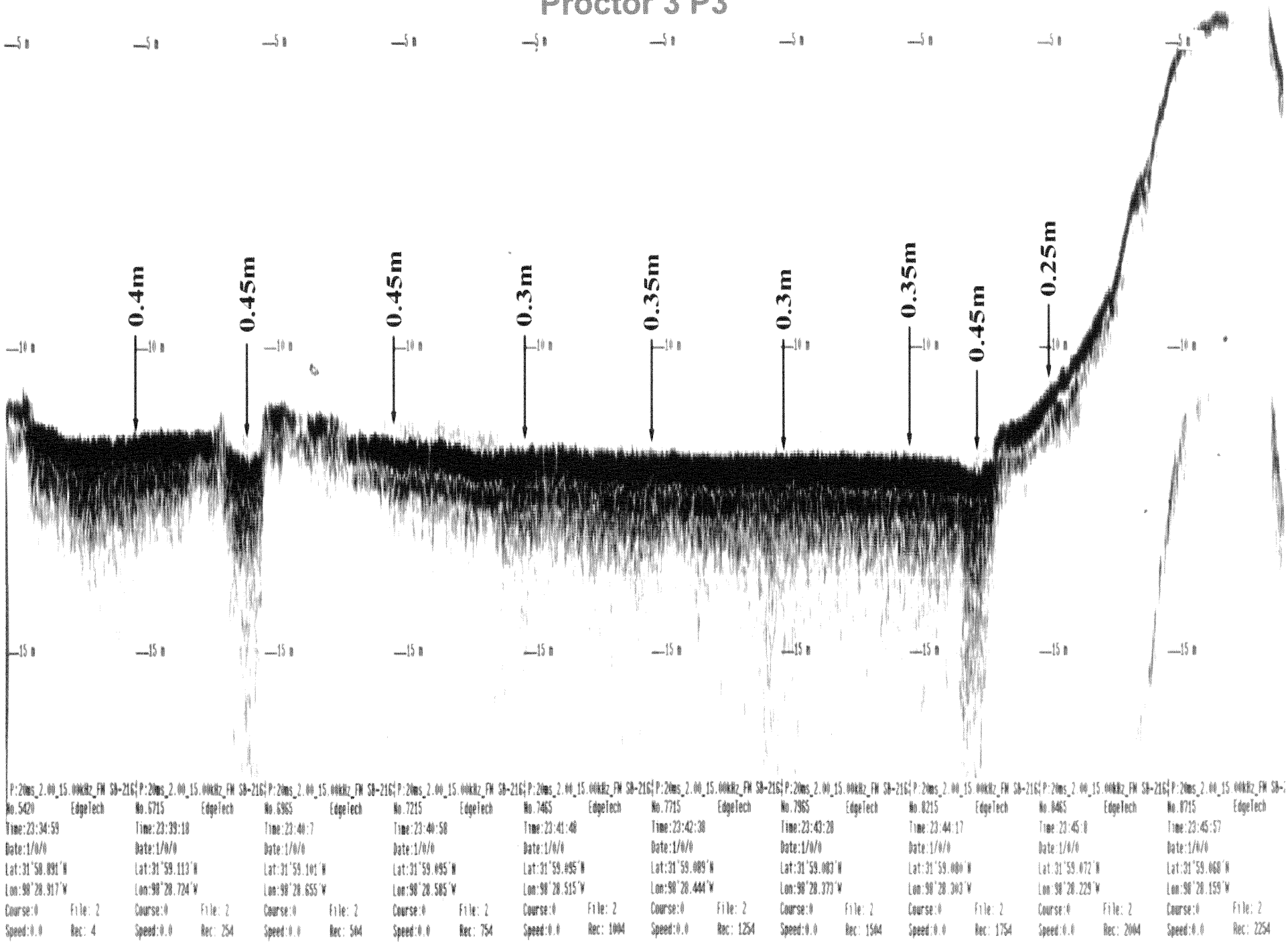
Proctor 1 P1


0.5m
0.55m
1.2m
0.65m
0.6m
0.45m
0.5m
0.5m
0.5m
5 m
10 m
15 m
P:20ms_2.00_15.00kHz_FM SB-216
No.577 EdgeTech
Time:23:5:14
Date:1/0/0
Lat:31°58.689′N
Lon:98°30.894′W
Course:0 File: 0
Speed:0.0 Rec: 4
No.831 EdgeTech
Time:23:6:8
Date:1/0/0
Lat:31°58.637′N
Lon:98°30.898′W
Course:0 File: 0
Speed:0.0 Rec: 254
No.1081 EdgeTech
Time:23:6:54
Date:1/0/0
Lat:31°58.591′N
Lon:98°30.893′W
Course:0 File: 0
Speed:0.0 Rec: 504
No.1331 EdgeTech
Time:23:7:45
Date:1/0/0
Lat:31°58.539′N
Lon:98°30.889′W
Course:0 File: 0
Speed:0.0 Rec: 754
No.1581 EdgeTech
Time:23:8:34
Date:1/0/0
Lat:31°58.489′N
Lon:98°30.886′W
Course:0 File: 0
Speed:0.0 Rec: 1004
No.1831 EdgeTech
Time:23:9:25
Date:1/0/0
Lat:31°58.438′N
Lon:98°30.883′W
Course:0 File: 0
Speed:0.0 Rec: 1254

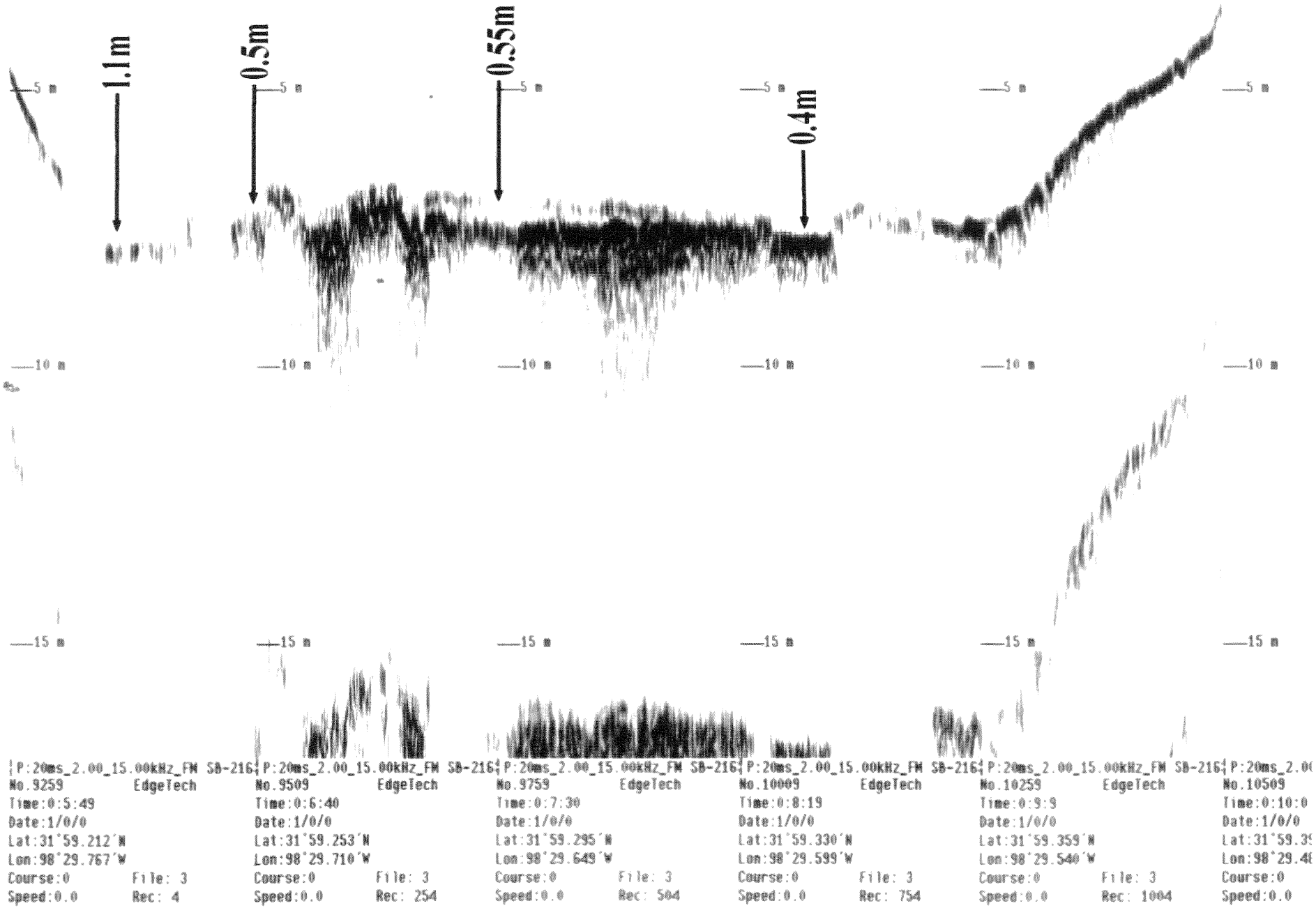
Proctor 2 P2

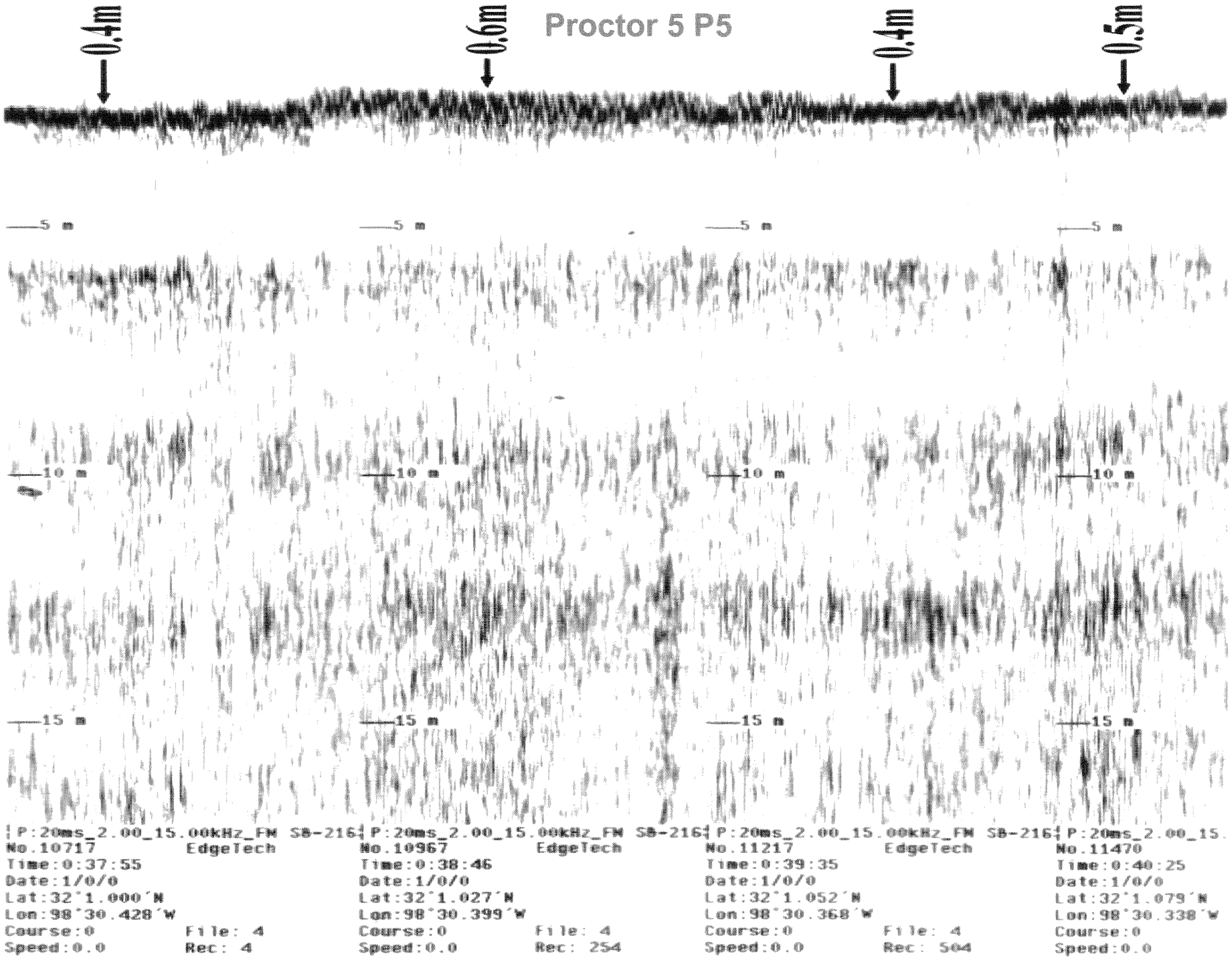

0.25m
0.7m
0.6m
0.55m
0.5m
0.55m
0.75m
0.4m
5 m
10 m
15 m
P:20ms_2.00_15.00kHz_FM SB-216
No.2828 Edgetech
Time:23:26:13
Date:1/0/0
Lat:31°58.364'N
Lon:98°28.972'W
Course:0 File: 1
Speed:0.0 Rec: 4
No.3101 Edgetech
Time:23:26:55
Date:1/0/0
Lat:31°58.381'N
Lon:98°28.959'W
Course:0 File: 1
Speed:0.0 Rec: 254
No.3351 Edgetech
Time:23:27:45
Date:1/0/0
Lat:31°58.429'N
Lon:98°28.961'W
Course:0 File: 1
Speed:0.0 Rec: 504
No.3601 Edgetech
Time:23:28:34
Date:1/0/0
Lat:31°58.487'N
Lon:98°28.964'W
Course:0 File: 1
Speed:0.0 Rec: 754
No.3851 Edgetech
Time:23:29:23
Date:1/0/0
Lat:31°58.543'N
Lon:98°28.966'W
Course:0 File: 1
Speed:0.0 Rec: 1004
No.4101 Edgetech
Time:23:30:14
Date:1/0/0
Lat:31°58.600'N
Lon:98°28.972'W
Course:0 File: 1
Speed:0.0 Rec: 1254
No.4351 Edgetech
Time:23:31:5
Date:1/0/0
Lat:31°58.659'N
Lon:98°28.975'W
Course:0 File: 1
Speed:0.0 Rec: 1504
No.4601 Edgetech
Time:23:31:55
Date:1/0/0
Lat:31°58.717'N
Lon:98°28.976'W
Course:0 File: 1
Speed:0.0 Rec: 1754
No.4851 Edgetech
Time:23:32:44
Date:1/0/0
Lat:31°58.776'N
Lon:98°28.979'W
Course:0 File: 1
Speed:0.0 Rec: 2004
No.5101
Time:23:33:35
Date:1/0/0
Lat:31°58.836'N
Lon:98°28.982'W
Course:0
Speed:0.0

Proctor 3 P3

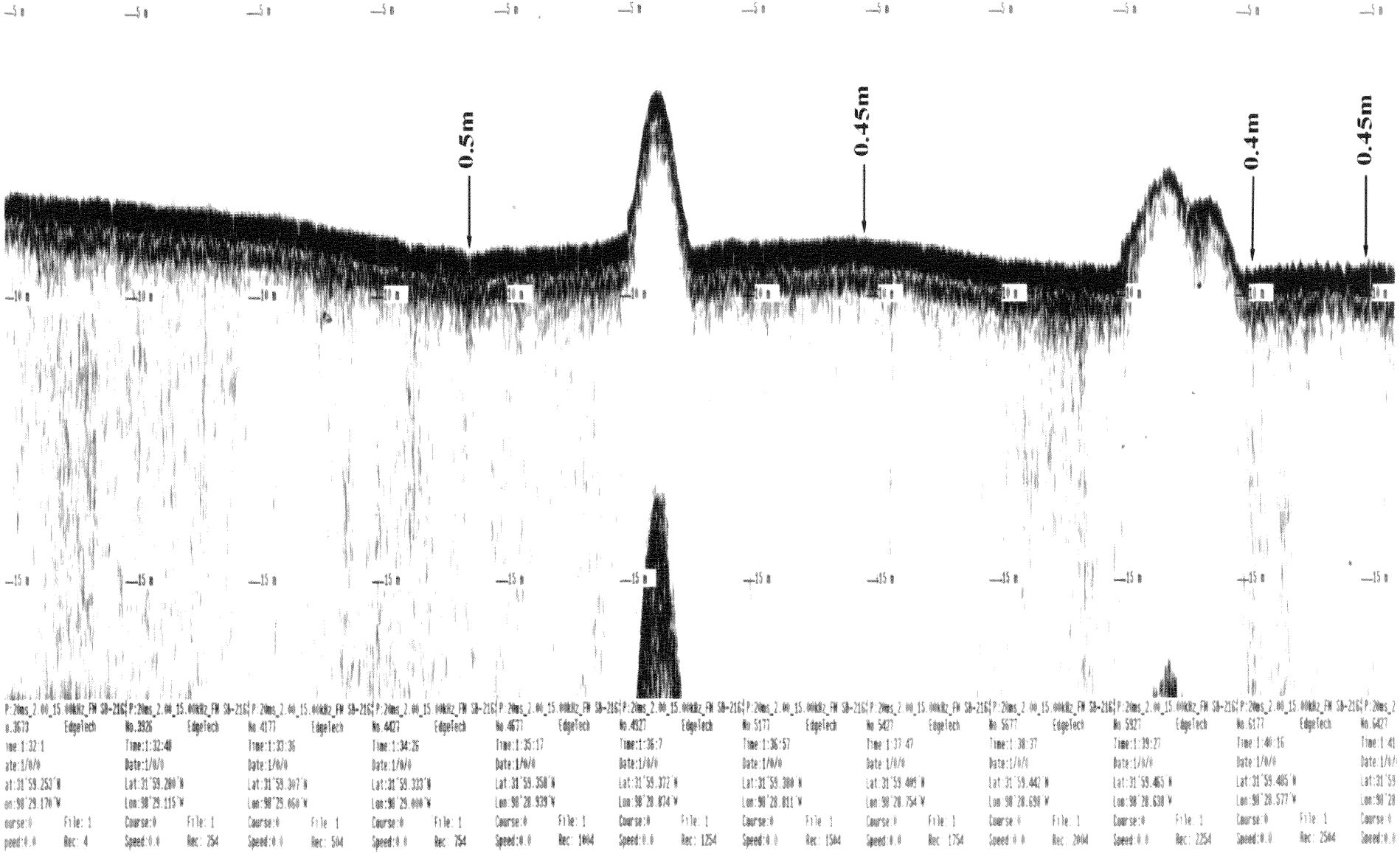

5 m
10 m
15 m
0.4m
0.45m
0.45m
0.3m
0.35m
0.3m
0.35m
0.45m
0.25m
P:2ms_2.00_15.00kHz_FW SB-216 No.5420 EdgeTech Time:23:34:59 Date:1/0/0 Lat:31°58.891'N Lon:98°28.917'W Course:0 File: 2 Speed:0.0 Rec: 4
P:2ms_2.00_15.00kHz_FW SB-216 No.6715 EdgeTech Time:23:39:18 Date:1/0/0 Lat:31°59.113'N Lon:98°28.724'W Course:0 File: 2 Speed:0.0 Rec: 254
P:2ms_2.00_15.00kHz_FW SB-216 No.6965 EdgeTech Time:23:40:7 Date:1/0/0 Lat:31°59.101'N Lon:98°28.655'W Course:0 File: 2 Speed:0.0 Rec: 504
P:2ms_2.00_15.00kHz_FW SB-216 No.7215 EdgeTech Time:23:40:58 Date:1/0/0 Lat:31°59.095'N Lon:98°28.585'W Course:0 File: 2 Speed:0.0 Rec: 754
P:2ms_2.00_15.00kHz_FW SB-216 No.7465 EdgeTech Time:23:41:48 Date:1/0/0 Lat:31°59.095'N Lon:98°28.515'W Course:0 File: 2 Speed:0.0 Rec: 1004
P:2ms_2.00_15.00kHz_FW SB-216 No.7715 EdgeTech Time:23:42:38 Date:1/0/0 Lat:31°59.089'N Lon:98°28.444'W Course:0 File: 2 Speed:0.0 Rec: 1254
P:2ms_2.00_15.00kHz_FW SB-216 No.7965 EdgeTech Time:23:43:28 Date:1/0/0 Lat:31°59.083'N Lon:98°28.373'W Course:0 File: 2 Speed:0.0 Rec: 1504
P:2ms_2.00_15.00kHz_FW SB-216 No.8215 EdgeTech Time:23:44:17 Date:1/0/0 Lat:31°59.080'N Lon:98°28.303'W Course:0 File: 2 Speed:0.0 Rec: 1754
P:2ms_2.00_15.00kHz_FW SB-216 No.8465 EdgeTech Time:23:45:8 Date:1/0/0 Lat:31°59.072'N Lon:98°28.229'W Course:0 File: 2 Speed:0.0 Rec: 2004
P:2ms_2.00_15.00kHz_FW SB-216 No.8715 EdgeTech Time:23:45:57 Date:1/0/0 Lat:31°59.068'N Lon:98°28.159'W Course:0 File: 2 Speed:0.0 Rec: 2254

Proctor 4 P4

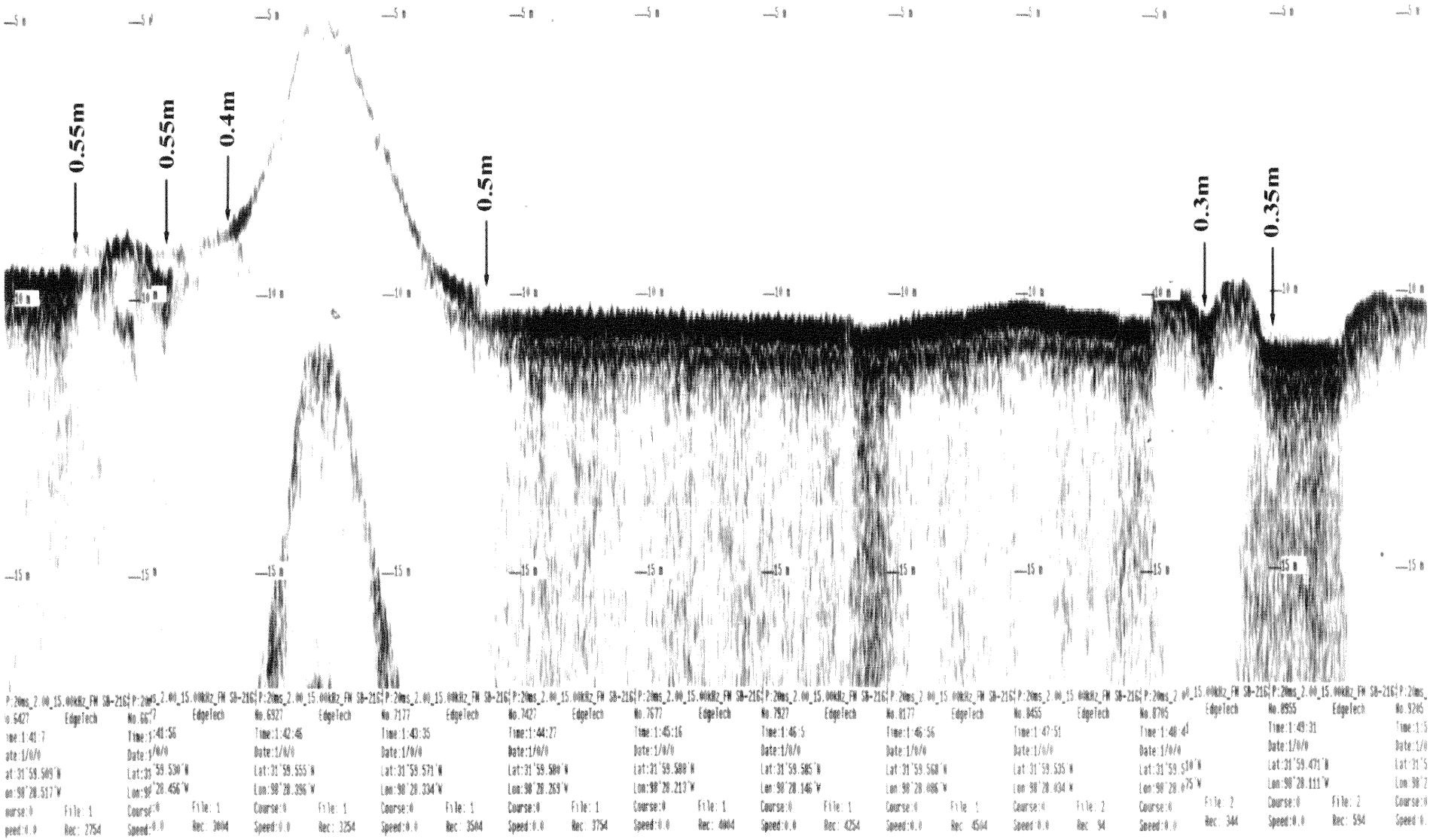

1.1m
0.5m
0.55m
0.4m
5 m
10 m
15 m
P:20ms_2.00_15.00kHz_FM SB-216
No.9259 EdgeTech
Time:0:5:49
Date:1/0/0
Lat:31°59.212'N
Lon:98°29.767'W
Course:0 File: 3
Speed:0.0 Rec: 4
No.9509 EdgeTech
Time:0:6:40
Lat:31°59.253'N
Lon:98°29.710'W
Rec: 254
No.9759 EdgeTech
Time:0:7:30
Lat:31°59.295'N
Lon:98°29.649'W
Rec: 504
No.10009 EdgeTech
Time:0:8:19
Lat:31°59.330'N
Lon:98°29.599'W
Rec: 754
No.10259 EdgeTech
Time:0:9:9
Lat:31°59.359'N
Lon:98°29.540'W
Rec: 1004
No.10509
Time:0:10:0
Date:1/0/0
Course:0
Speed:0.0


0.4m
0.6m
Proctor 5 P5
0.4m
0.5m
5 m
10 m
15 m
P:20ms_2.00_15.00kHz_FM SB-216
No.10717
Time:0:37:55
Date:1/0/0
Lat:32°1.000'N
Lon:98°30.428'W
Course:0
Speed:0.0
EdgeTech
File: 4
Rec: 4
P:20ms_2.00_15.00kHz_FM SB-216
No.10967
Time:0:38:46
Date:1/0/0
Lat:32°1.027'N
Lon:98°30.399'W
Course:0
Speed:0.0
EdgeTech
File: 4
Rec: 254
P:20ms_2.00_15.00kHz_FM SB-216
No.11217
Time:0:39:35
Date:1/0/0
Lat:32°1.052'N
Lon:98°30.368'W
Course:0
Speed:0.0
EdgeTech
File: 4
Rec: 504
P:20ms_2.00_15.
No.11470
Time:0:40:25
Date:1/0/0
Lat:32°1.079'N
Lon:98°30.338'W
Course:0
Speed:0.0

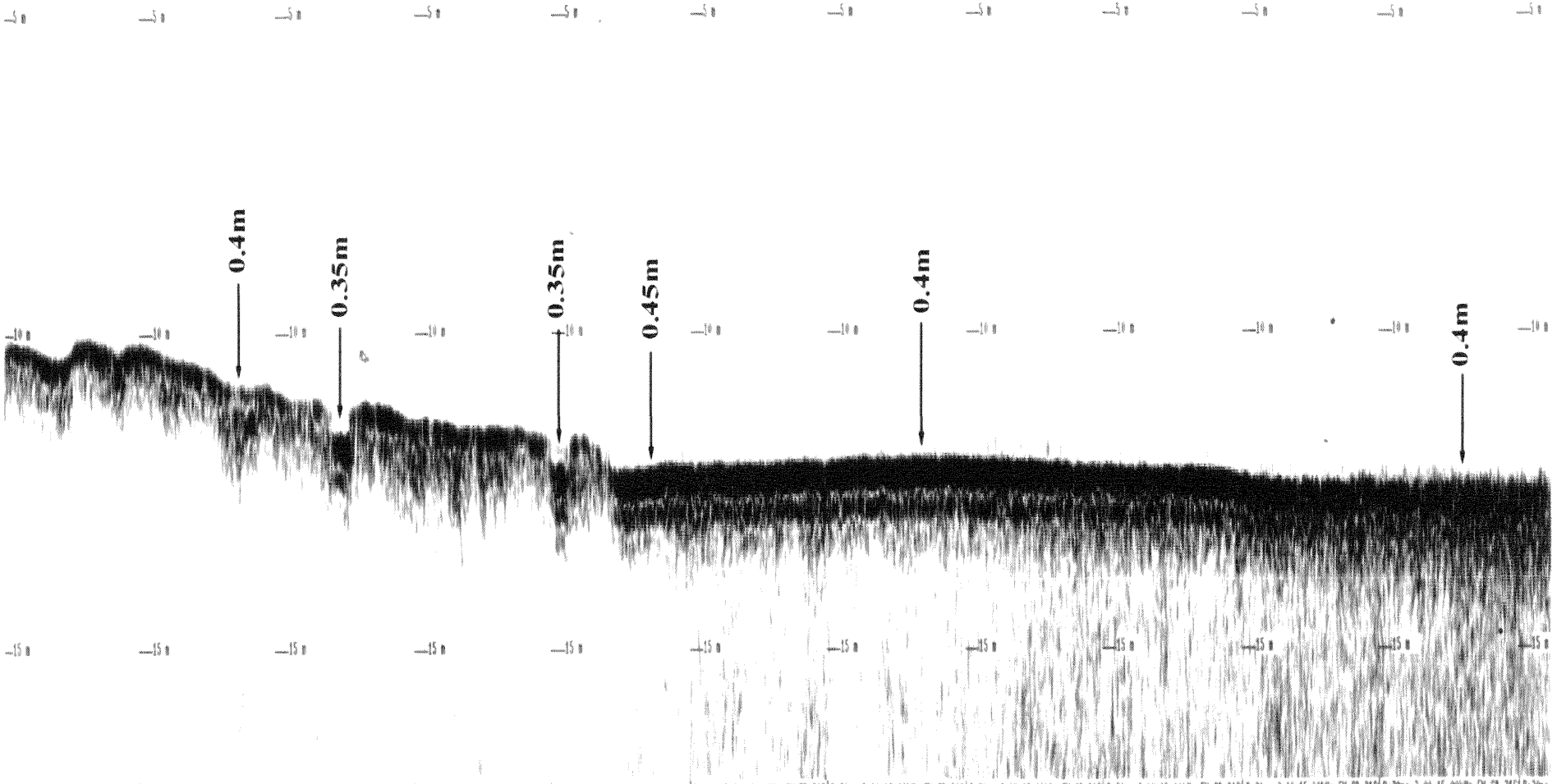
Proctor 8-1 P8



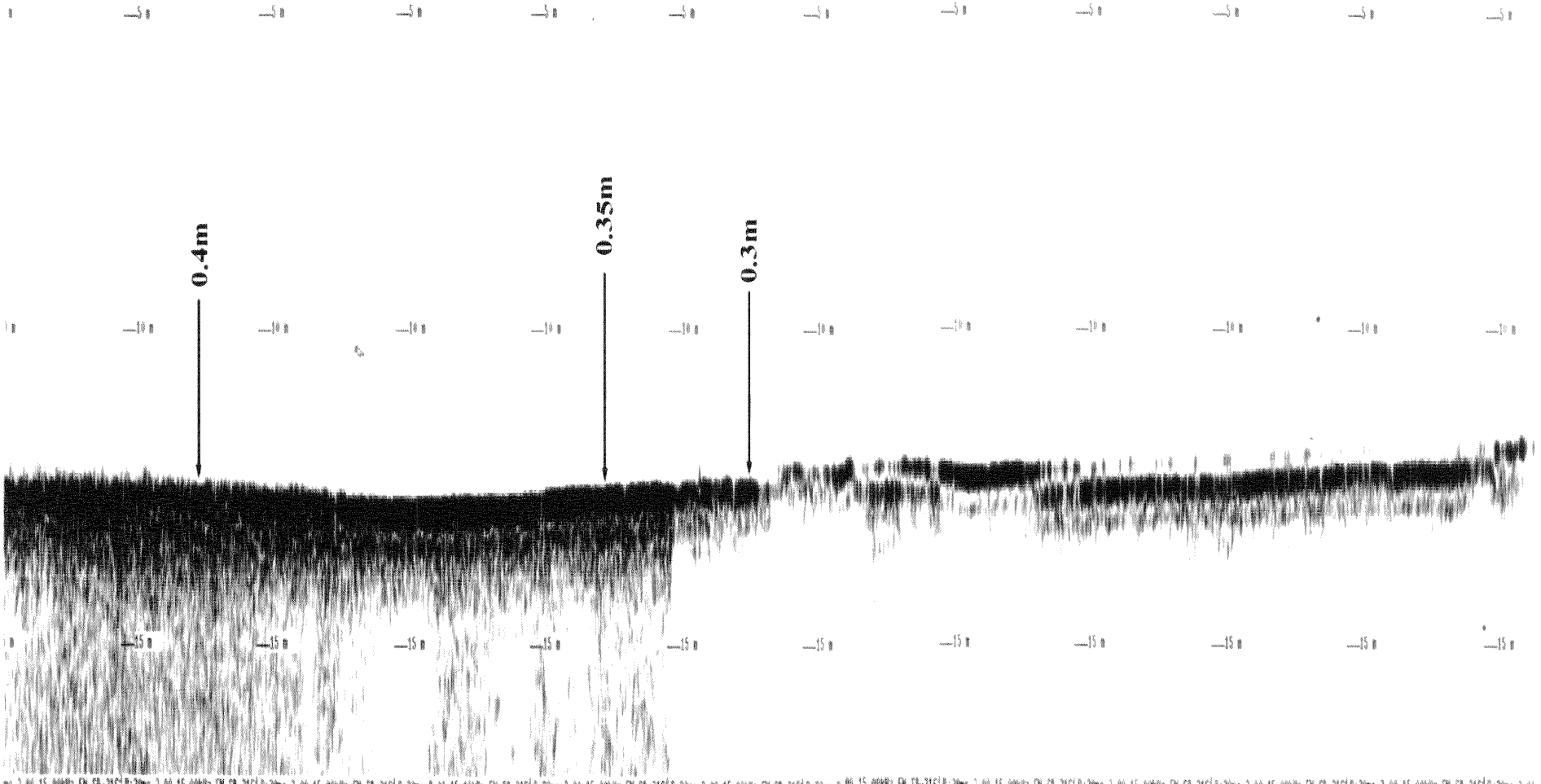
Proctor 8-1 P8



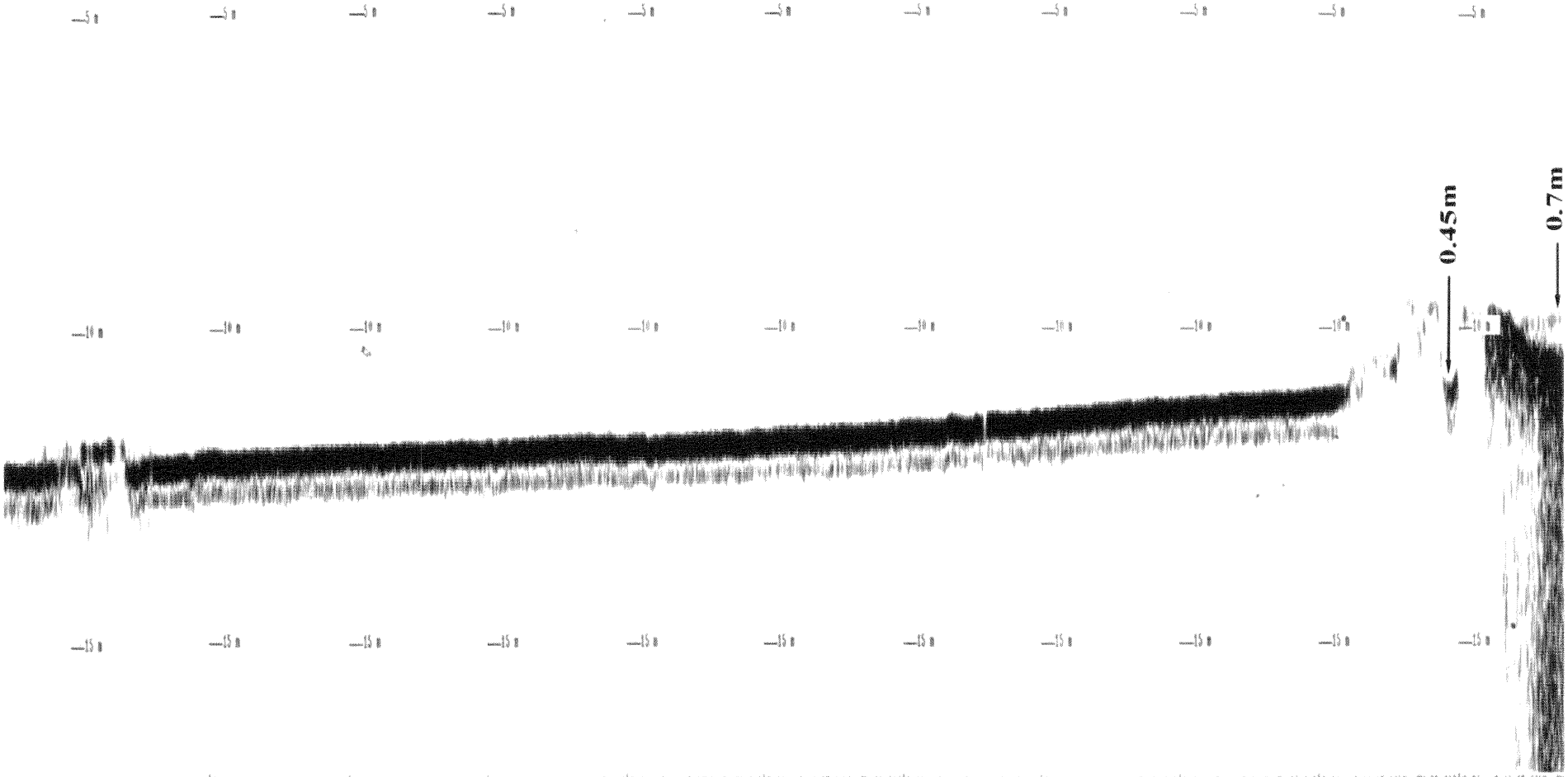
Proctor 8-3 P8



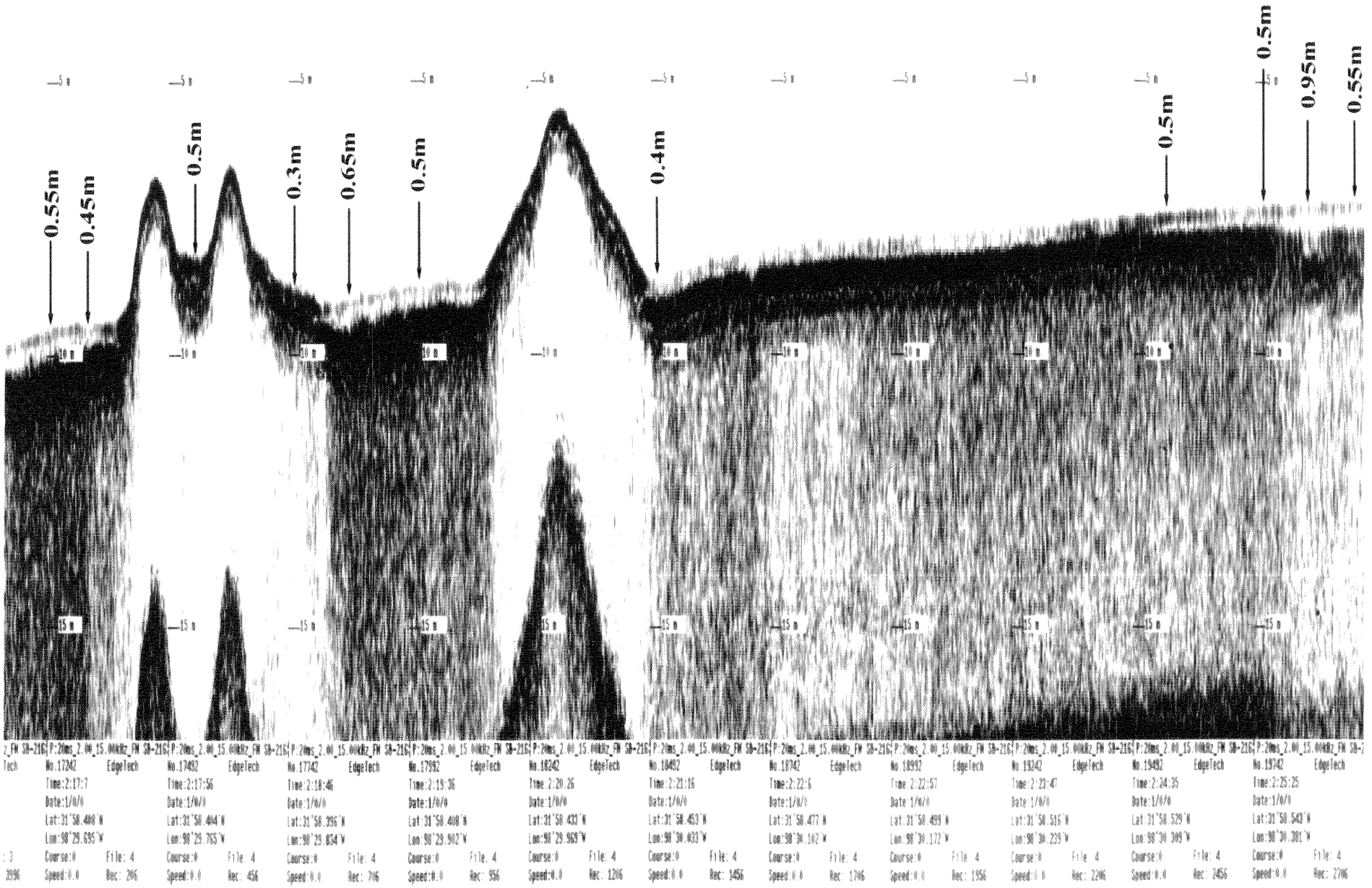
Proctor 8-4 P8



Proctor 8-5 P8



Proctor 8-6 P8



Proctor 8-7 P8