

Preliminary Design Survey Report

Geophysical Survey MR-B-09 and MR-E-09 Riverine Sand Mining Areas

Prepared for:



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1.0 EXECUTIVE SUMMARY

Alpine Ocean Seismic Survey, Inc. (Alpine) under contract to SJB Group, LLC. has conducted a geophysical survey of the Mississippi River Borrow Areas MR-B-09 and MR-E-09. Borrow Area MR-B-09 is located on the east side of the Mississippi River near Empire, Louisiana. Borrow Area MR-E-09 is located on the west side of the river south of Buras, Louisiana (Figure 1). The surveys consisted of bathymetric, side scan sonar, magnetometer, and subbottom profile data acquisition within Borrow Areas MR-B-09 and MR-E-09. Approximately 11 line miles of survey data were collected in the MR-E-09 area and approximately 12 line miles of data were collected in the MR-B-09 area. Line spacing on the primary survey lines was 200 to 400 feet in MR-E-09 and variable from 50-200 in MR-E-09. Several cross lines were run in each block at line spacing of 1500-2000 feet.

The purpose of the magnetometer survey was to identify potential hazards to sand mining operations within Borrow Areas MR-B-09 and MR-E-09. Only one of the metallic objects, namely a linear target found in MR-E-09, correlated with anything on the side scan sonar data, indicating that most objects were smaller in size and likely buried below river bottom.

Although no pipelines or cables were detected crossing within either borrow area, abundant scattered debris was found throughout both borrow areas. Most of this debris was at or just below the riverbed. Some of the debris may be large enough to pose a risk to sand mining operations, but the majority of the targets detected with the magnetometer appear to represent small to medium sized metallic objects, up to about the size of a 55 gallon drum. The few larger targets noted on the side scan data appeared to be relatively straight, and were interpreted as likely being wood timbers carried downstream at time of high current flow in the river. Such pieces are likely to move again at times of higher current, and are therefore ephemeral to the site conditions.

The subbottom profile data and side scan sonar data were collected to attempt to determine what portions of the sites would contain sandy sediments. The geophysical data were used to determine locations for Vibracore samples collected on a separate cruise as part of the overall project.

Distinct seismic reflectors were found near the riverbank of each borrow site and these corresponded to peat layers in some cases and to the top of a yellow silt in other cases. The yellow silt may be indicative of the top of an older sediment unit once exposed above water surface.

The subbottom seismic reflectors on the seismic lines collected toward the middle of the river in both borrow areas were more indicative of cross bedded sandy sediments, which corresponds well to the strong sandwaves detected on the river bottom in the side scan sonar data.

Vibracore samples collected during this project and during previous work by others in these areas contained sediments which correspond well with the types and depths of the significant subbottom reflectors present on the data.

The southern portion of Borrow Area MR-B-09, and the majority of Borrow Area MR-E-09, especially starting about 500 feet east of the western boundary of MR-E-09, appear to contain significant quantities of sandy sediments usable as beach restoration material on Scofield Island.

2.0 INTRODUCTION

The following report presents Alpine Ocean Seismic Survey, Inc.'s (Alpine) the field methods and findings with regards to the geophysical survey of Borrow Areas MR-B-09 and MR-E-09. The cores taken in the geotechnical portion of the project have been correlated with the geophysical data in this report.

3.0 GEOPHYSICAL SURVEY METHODOLOGY

3.1 Survey Layout

The survey consisted of two areas. Borrow Area MR-B-09 is an approximately 600 ft x 11,800 ft sand borrow area located on the east side of the Mississippi River near Empire, Louisiana. Borrow Area MR-E-09 is an approximately 900 ft x 6,700 ft sand borrow area located on the west side of the river south of Buras, Louisiana (Figure 1). Line spacing and length varied and was adjusted in the field to maximize coverage throughout both survey areas. Chirp subbottom data was collected in several long lines and many cross lines to provide cross-sectional coverage with maximized subbottom structure of the borrow areas.

3.2 Survey Vessel

The vessel utilized for the survey was the M/V Laney, a 35-foot crew boat (Figure 2). The vessel provided adequate deck and lab space to accommodate the survey equipment and personnel. The M/V Laney was well suited for this type of survey work because of its excellent maneuverability and agility. Stability due to its size was not a problem because of the calm water conditions typical of the survey area.

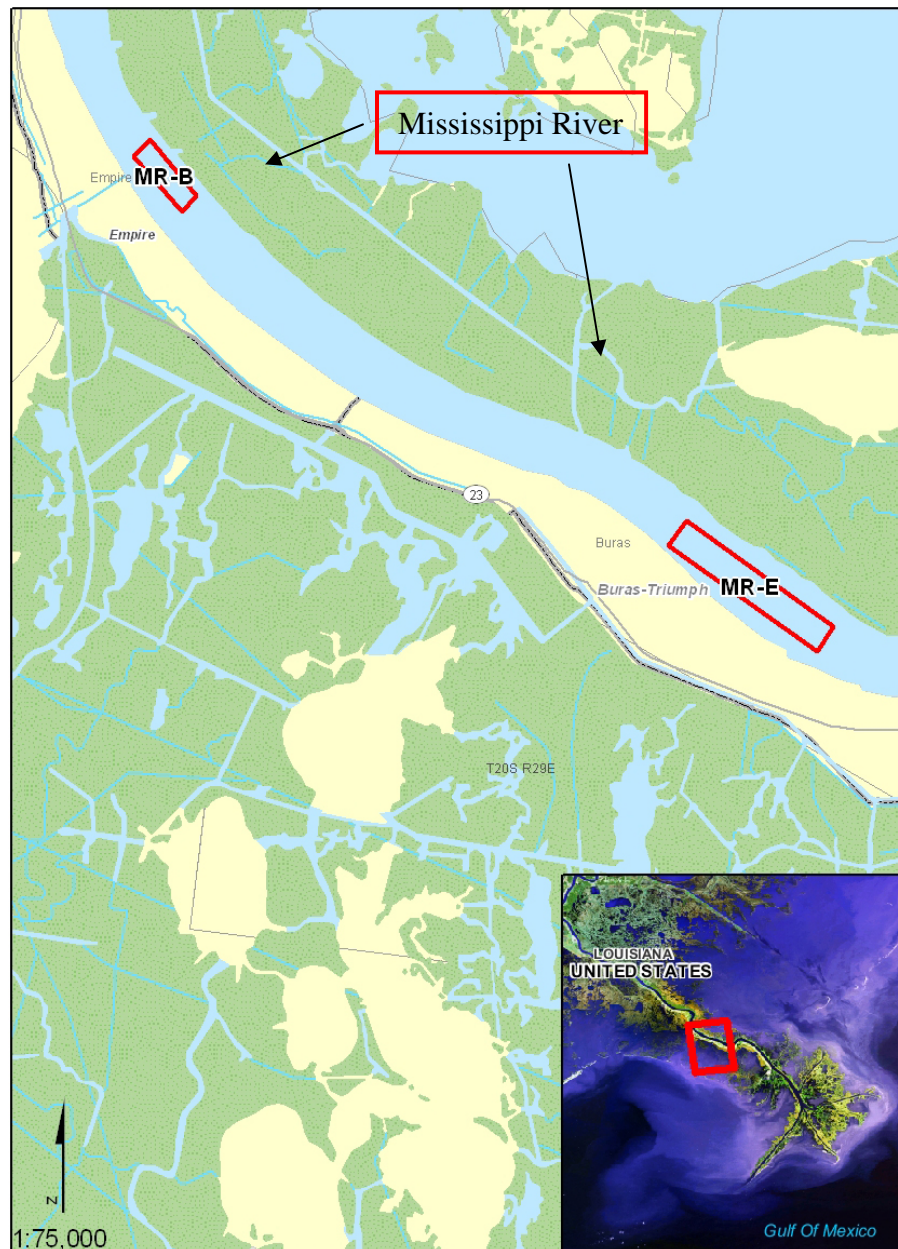


Figure 1: Locator Map showing MR-B and MR-E Sand Borrow Areas



Figure 2: MV Laney

3.3 Navigation System

Real time kinematic (RTK) satellite navigation was provided by Fenstermaker. The RTK system used a base station receiver with mobile units which marked their position relative to a fixed base station located at a nearby benchmark. The base station was referenced to North American Vertical Datum of 1988 (NAVD88). Typical nominal accuracy for this system is approximately 1cm horizontally and 2cm vertically and provides real time tidal corrections.

3.4 Bathymetry

Bathymetry was acquired using an Innerspace model 456 single beam echo sounder. Bathymetry data was corrected for RTK tides, draft and sensor offsets and recorded using Hypack Max software. Bathymetry data was processed and contoured in 2 foot intervals for review.

3.5 Side Scan Sonar

Side scan sonar data was acquired using a Klein 3000 dual frequency tow fish and Sonar Pro acquisition software. The data was acquired at both 100 and 500 kHz at either 50 or 100 meter range per channel to maximize coverage throughout both survey areas. These settings were sufficient for locating debris and mapping sediment character within the

borrow areas. The side scan tow fish was operated at or very near a height equal to 10% of its range to maintain optimum tow geometry. Variations in cable out were recorded with a digital cable counter which sent layback information to the sonar computer. Changes in layback were automatically applied to the tow fish position using a dynamic layback change algorithm within the Sonar Pro sonar acquisition software. This method provides the highest precision and accuracy positioning of the tow fish available in relatively shallow water. Side scan sonar data was reviewed, interpreted, and processed using Coda GeoSurvey software. Geo-referenced sonar mosaics of each borrow area were created for further analysis.

3.6 Magnetometer

A Marine Magnetics SeaSpy Overhauser magnetometer was used for the surveys. Magnetometer data was collected within the southern half of MR-B-09 to confirm or disprove the presence of two reportedly removed pipelines crossing near Empire locks. Magnetometer data was collected throughout MR-E-09. The magnetometer was operated at 2-Hz cycle rate within 20 feet of the seabed whenever possible. These settings optimized the detection of buried metallic objects. Layback values were entered into SeaLink; software used for magnetic data acquisition. SeaLink stores the layback values and calculates the tow fish position based on the amount of cable out. The data was processed using MagPick software. Magnetic anomalies were identified and plotted on a magnetic residual anomaly map in terms of their location and amplitude for MR-B-09 and MR-E-09. Processing the data and producing magnetic residual anomaly images is useful because it eliminates the effects of the local and regional magnetic field. The resulting image clearly reveals discrete anomalies and increases overall interpretability of the magnetic data.

3.7 Subbottom Profiler

A Benthos model Chirp III gimble-mounted subbottom profiling system was used during the survey. This system is ideally suited for this type of survey, providing high resolution imaging of the upper 10's of meters of sediment. Subbottom data was recorded with Chesapeake Sonar Map software and processed using Coda GeoSurvey. The data was acquired at 15 pings per second, or 67millisecond range with the dominant frequency between 2-7 kHz to provide the most resolution of the upper 10 meters of sediment possible. Vertical scale lines were plotted at 25-foot intervals of two-way travel time, based on an average sound velocity of 1600 m/s (5249 ft/s).

Chirp data was processed using Coda GeoSurvey. A flexible line plan was used in the field which allowed changes to be made to the survey grid based on the conditions and to optimize the required data coverage. As a result, time-based event (fix) marks were

initially generated from the Chirp data every 30 seconds along line during post processing. During later post processing, a new set of fix marks were generated at a distance interval closer to 200 feet. These new fix marks are plotted on the basic survey navigation charts included as Charts 1 and 2 in Appendix 1. This presentation allows easy correlation between a survey plan view with events and the Chirp data profiles.

4.0 DATA PRESENTATION AND DISCUSSION

4.1 Bathymetry

MR-B-09

Water depths ranged from 18 ft in the northeastern corner of MR-B-09 to about 84 feet in the western edge of the central portion of MR-B-09. The riverbed is generally flat along the borrow area averaging about 50 feet deep but shoals dramatically in portions approaching the eastern riverbank. The borrow area only exceeds 70-foot water depth in portions of the southwestern edge of MR-B-09. A plot of the bathymetric contours for the MR-B-09 area is included in the Appendix 1 as Chart 3.

MR-E-09

Water depths ranged from approximately 36 feet along the southwestern edge of the central portion of the borrow area to about 66 feet at the northern corner. The riverbed along the borrow area is gently undulating around 46 feet deep. The riverbed shoals dramatically just shoreward of the southwestern limits of the borrow area. A plot of the bathymetric contours for the MR-E-09 area is included in the Appendix 1 as Chart 4.

4.2 Magnetometer Results

MR-B-09

Numerous magnetic anomalies were found within the survey area (Figure 3) suggesting abundant scattered debris is concentrated in this area. Although only one anomaly (#91) clearly correlates with a sonar target (#11), it is likely most of these anomalies are related to debris. No clear linear correlation was found among the anomalies suggesting the presence of a pipeline. Scattered debris may naturally collect in this area. A full size version of this figure is included in the Appendix 1 as Chart 5.

MR-E-09 Numerous scattered magnetic anomalies were found within the survey area, as shown on Figure 4. None of the anomalies show a definitive alignment. The size and character of most of the anomalies is consistent with small scattered debris. Magnetic anomaly #33 aligns with side scan target #38 (Table 2 and 3), which is very close to and likely related to the green channel marker buoy (anomaly #19 and #109). No large magnetic anomalies were found within the survey area. Although no large anomalies were detected, it does not rule out the possibility of larger debris being present at depth or

between survey lines. Abundant scattered debris is expected throughout the entire area. A full size version of this figure is included in the Appendix 1 as Chart 6.

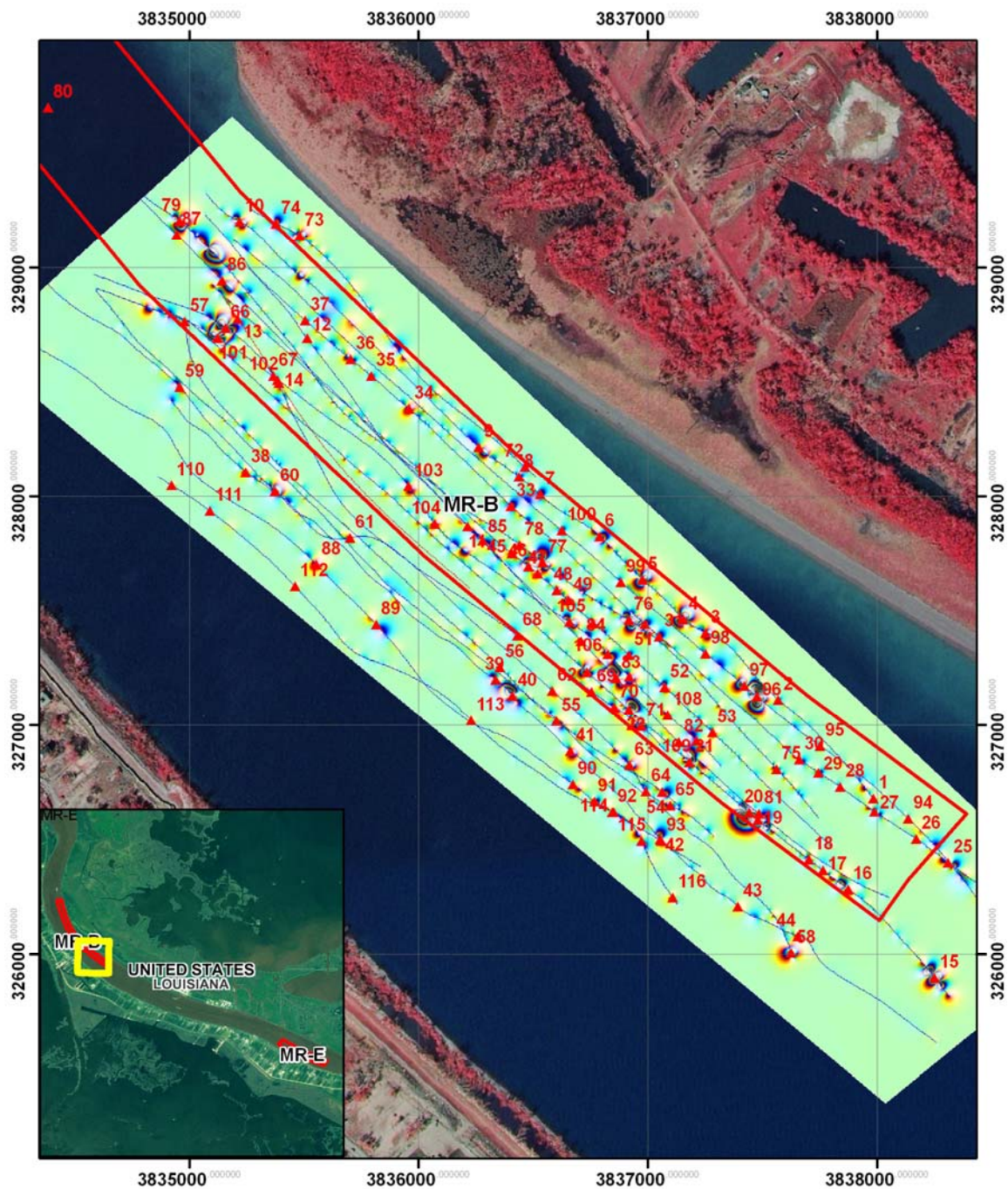


Figure 3: MR-B-09 Magnetic Anomalies

Anomalies superimposed over a residual magnetic anomaly map showing the magnetometer tracklines (blue) and the MR-B-09 preliminary boundary (red). Anomaly numbers correlate with the MR-B-09 magnetic anomaly list (Table 1).

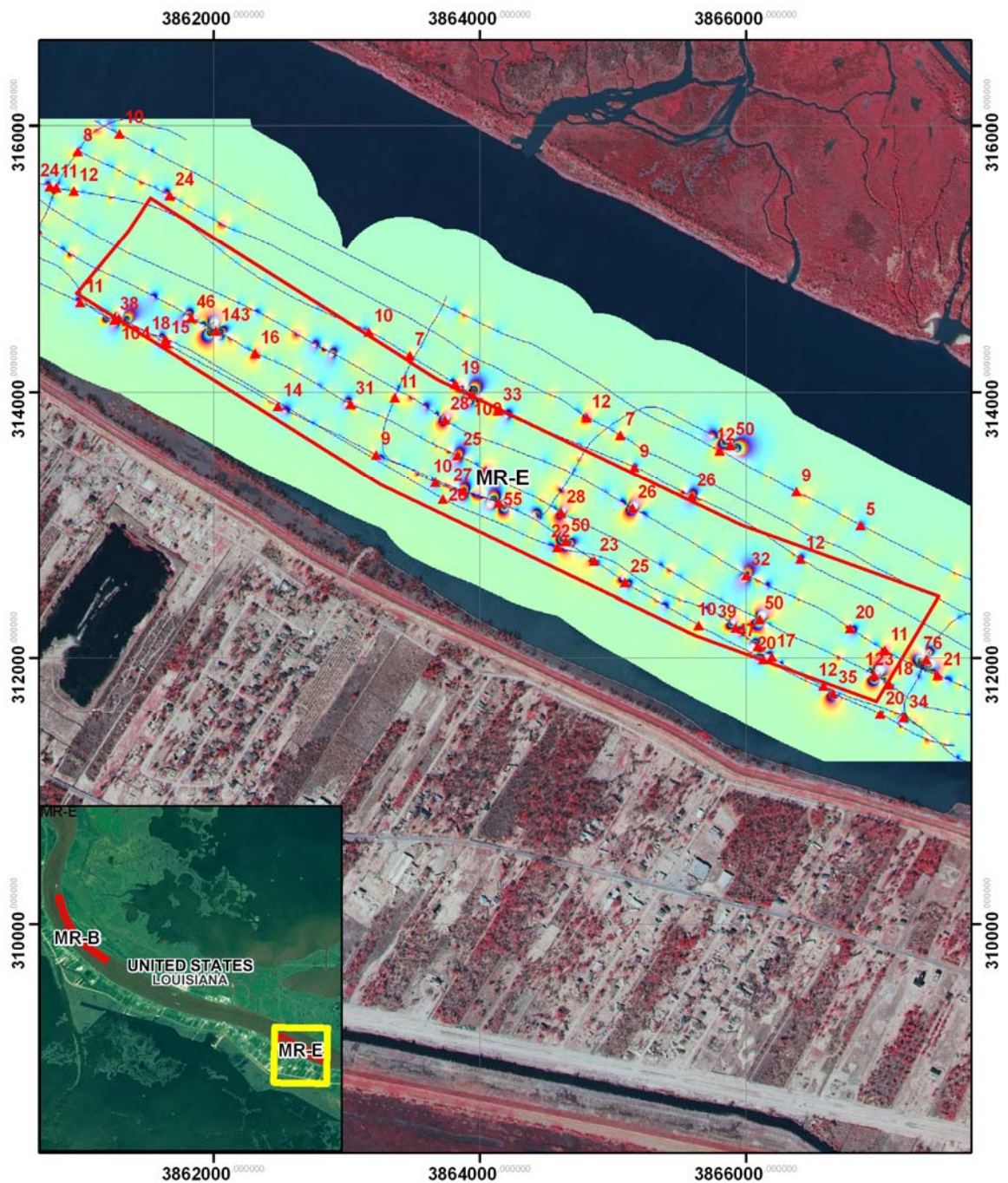


Figure 4: MR-E-09 Magnetic Anomalies

Anomalies superimposed over a residual magnetic anomaly map showing the magnetometer survey tracklines (blue) and the MR-E-09 preliminary boundary (red). Anomaly numbers correlate with the MR-E-09 magnetic anomaly list (Table 2).

4.3 Side Scan Sonar Results

MR-B-09

Side scan sonar data was acquired in the southern portion of MR-B-09. The side scan was used to identify any hazards to sand mining operations on the riverbed and to determine whether there were any exposed portions of two reportedly removed pipelines near the Empire locks.

No exposed pipelines or segments of pipe were found within the survey area. Twenty-eight side scan targets were found within the survey area (Table 3). Of these, the largest target (#72) is 36 ft x 25 ft x 0.5 ft. This object is within 100 feet of magnetic anomalies #73 and #74, but it is unclear whether or not they are related. It's possible this target is naturally made and not debris related. A cluster of scattered debris (#s 58-62) and target #3 is found at or near magnetic anomaly #10. Numerous linear features were found within the survey area. However, the linear targets are generally aligned with the predominant current direction or riverbed morphology. It's unclear whether these features are man-made or of natural origin. As a result, they are classified in this report as linear targets (Table 4). Sand waves with wavelengths 10-40 feet long are found throughout the survey area. No other significant features or hazards were found within MR-B-09. A full size version of the side scan mosaic is included in the Appendix 1 as Chart 7. Given that the larger side scan targets were predominantly a single linear target, it is not likely that these are related to an archaeological target, so no buffer area is plotted around these targets.

MR-E-09

Side scan sonar data was acquired throughout the entire MR-E-09 borrow area. Sandwaves 30-40 feet in wavelength are found throughout most of MR-E except near the southwestern edge. Forty-four sonar targets, both discrete and scattered, were found within the survey area (Table 3). Sixteen linear targets were also found within the survey area (Table 4). A large linear target aligns with magnetic anomaly #10 but this is located out beyond the northern limit of the borrow area. The most significant hindrance to sand mining within MR-E-09 is marked by a large linear target and magnetic anomalies #26 and 27 where there appears to be a large "Y"-shaped section of pipe or other object approximately 300 feet long (Table 2 and 4). This object is located at or near the surface. A green marker buoy was located with the side scan at 3863869.7 feet East, 314072.4 feet North. Other than relatively small miscellaneous debris, no other hazards were found with the side scan in MR-E-09. A full size version of this figure is included in the Appendix 1 as Chart 8. The navigation fix marks generated for the sub-bottom data are shown for reference.

4.4 Chirp Subbottom Profiler Results

MR-B-09

The subbottom seismic profile data from the MR-B-09 survey area is characterized by significant variations in the nature of the seismic reflectors. These changes occur both horizontally and vertically along each line, and correspond to changes in sediment type within a given core and between adjacent cores. The core locations have been plotted on the trackline map for reference. Summaries of the geological logs of the cores have been plotted on portions of the geophysical survey data collected near each core. These sections of the data for MR-B-09 are presented in Charts 9 and 10 in the Appendix 1. The sections are located as labeled on Charts 1 and 2 in the Appendix 1.

Based on the side scan sonar data, the bathymetric data and the river bottom morphology as observed on the subbottom data, the main sand body is covered in megaripples 1-2 feet in relief and with 10-40 foot wavelengths. Mega-ripples are generally classified as having heights of less than 1 to 3 feet and wavelengths of usually 5 to 12 times the feature height. The sediments are cross-bedded due to active bedform migration in the down-current direction. The variation of bedform morphology along and across current suggests sediment transport may be significantly episodic and modulated by topographic variations along the borrow area. The sediment deposition and transport appears to be most stable along the southwestern flank of the borrow area in over 65 feet of water.

Section B1 of the subbottom data from MR-B-09, including fix marks 492-497, is located in the northern end of the area, and is near Vibracore MRB-VC-07, as shown on the section. Sand ridges and cross bedded reflectors are also apparent on other portions of the seismic section between fixes 492-495.

Section B2 includes Vibracore MRB-VC-07 between navigation fixes 498-502. The seismic reflectors present near the core are relatively flat-lying, indicative of interbedded sands and silts. However, between fixes 499 and 500, an obvious reflector dipping slowly toward the middle of the river appears to mark an erosional surface with sands predominant above, indicative of a thicker sand sequence down the middle of the survey area.

Section B3 includes a U-shaped survey line with its turn near Vibracore MRB-VC-02, between fixes 519 and 527. There is a faint horizontal reflector at a depth of about 4-5 feet below the river bottom near the core. This horizontal reflector correlates with a shallow peat layer in the core. The reflector appears to end at the river bottom within 200 feet of the core as the section continues toward the middle of the river. Note the distinct reflector at a depth of about 22 feet at the core site. This reflector marks the top of a peat ledge which drops in elevation rapidly toward the middle of the river.

The seismic reflectors in the deeper water portions of the profile are interpreted as being indicative of cross bedded sediments, which are generally sandy.

Section B4, which extends perpendicular to the riverbank, includes fixes 227-232. There are no cores near this line. There are no distinct seismic reflectors in this section, and this uniformity in the geophysical record is generally indicative of uniform sediments, which are likely to be sandy, given the sandwave features present on the river bottom in this area.

Section B5 runs parallel to the shoreline, and includes Vibracores MRB-VC-05 and MRB-VC-06. The sediments in those two cores are similar, being composed mostly of thicker sand units with some thin clay layers. The seismic reflectors on this line are mostly relatively flat-lying, corresponding to the interbedded sands and silts in the cores.

Section B6 extends away from the riverbank to the east of Vibracore MRB-VC-06. The nearshore end of the section includes a few horizontal reflectors, while the mid-river portion is characterized by several irregularly dipping reflectors, more indicative of cross-bedded sandy sediments. This corresponds with the sandwaves present on the river bottom in this area.

There is also a faint but detectable reflector between fixes 472 and 476. This reflector dips down rapidly toward the middle of the river, and may correspond to an old erosional surface, with sandy sediments above and older, perhaps more silty sediments below.

MR-E

The subbottom profile data collected within Borrow Area MR-E-09 are similar to the data from Borrow Area MR-B-09 in that there are significant vertical and horizontal changes in the nature of the reflectors along most of the survey lines. Geological summaries of the sediments present in most of the cores in this area have been plotted on the nearest geophysical profile. These sections of the data for MR-E-09 are presented in Charts 11 and 12 in the Appendix 1. The sections are located as labeled on Chart 2 in the Appendix 1.

The surface sediments in much of the borrow area consists of sand with 1-2 foot high megaripples migrating downstream.

Section E1 extends from the nearshore side of the borrow area on the west end of the profile toward the middle of the river at the east end of the profile. Fix 395, near the west end of this section, is located Section E2. The distinct reflector at a depth of about 26 feet

below river bottom at fix 395 corresponds to a similar reflector at fix 127.5 on Section E2. This reflector marks the top of either a peat layer or an older erosional surface.

The variable subbottom reflectors in the mid-river portion of Section 1 are indicative of cross-bedded sediments and correspond to the area of large sandwaves on the river bottom in this portion of the borrow area.

Section E2 is located parallel to and near the shoreline edge of the Borrow Area MR-E-09. There are strong reflectors at depths between 20 to 25 feet below the river bottom on this profile. These reflectors generally dip down to the northwest on the profile up to the area of fix 128 on the profile, and then the slope down is much more distinct, with additional shallower reflectors shown above the main reflectors. Based on the description of the sediments in core MRE-VC-09, taken along this section, the basic group of reflectors are indicative of either the top of a significant peat layer or an older erosional surface, based on the yellow coloration of the sediments. The majority of the sediments above this strong reflector are composed of recent sands and silts near shore.

Section E3 is a shore-normal line. The reflectors present on the west end of the line correspond to the peat layer in Section E2. There is a distinct change in the nature of the reflectors on this line east beyond fix 104. Beyond this point, the reflectors become more irregular, interpreted as being indicative of large scale cross bedded sands. This correlates well with the surficial sandwaves present in this portion of Borrow Area MR-E-09.

Section E4 is a short shore-parallel section with strong reflectors indicative of the peat and silty sediments found in this portion of the borrow site on other nearby survey lines.

Section E5 is similar to E1, with the reflector marking the peat layer being present on the west end, while toward the east end, the reflectors are much more irregular in the sandwave area, indicative of sandy sediments. A core taken in this area by others as part of a previous project contained all sandy sediments.

Section E6 is a shore parallel line which is a continuation to the southeast of Section E4. Note the strong reflector dipping down to the left or northwest near core MRE-VC-11, which corresponds to the top of distinct yellow silt sediment unit in the core. Sediments below this reflector are likely to be more silty than those above the reflector.

Section E7 is a shore normal line. The distinct reflector near 25 feet below river bottom on the west end of the line corresponds to the yellow silt surface. This reflector

disappears toward the center of the river, where the sandy crossbedded sediments predominate.

In summary of the MR-E-09 sediments, the distribution of sand is generally uniform along the center and east portions of borrow area, with the main sand body thinning to silt and clay at the southwestern edge of the borrow area as the seabed rapidly shoals. The sand body thickens rapidly heading away from southwestern shoreline inside the limits of the borrow area. The sand body continues northward outside of the borrow limits to the mapped extents of this survey in over 70 feet of water.

5.0 CONCLUSIONS

A geophysical and bathymetric survey was performed within Borrow Areas MR-B-09 and MR-E-09 Buras and Empire Louisiana. The magnetometer and side scan sonar data suggests that a large amount of small scattered debris exists within each area with only a few potentially significant hazards. No pipeline or cable crossings were identified within either survey area. Both MR-B-09 and MR-E-09 are abundant sources of sand which will likely replenish through time. No hazards were identified which would prohibit sand mining operations within either area.

6.0 TABLES

Table 1: MR-B-09 Magnetic Anomalies

#	X	Y	GAMMA
1	3837985.63	326679.48	14
2	3837570.25	327110.66	23
3	3837253.50	327403.61	51
4	3837155.75	327461.63	604
5	3836977.25	327636.55	430
6	3836790.63	327825.44	47
7	3836531.30	328008.90	30
8	3836438.50	328086.36	29
9	3836262.13	328216.63	27
10	3835219.88	329200.33	56
11	3836214.75	327868.48	17
12	3835514.50	328690.47	14
13	3835211.50	328774.84	25
14	3835392.13	328496.67	9
15	3838251.72	325896.52	140
16	3837874.25	326283.67	47
17	3837764.25	326365.78	24
18	3837703.50	326412.53	88
19	3837480.75	326586.52	111
20	3837443.85	326617.54	617
21	3837183.25	326837.86	512
22	3836917.22	327066.94	319
23	3836735.38	327231.53	138
24	3838716.13	326045.41	15
25	3838310.63	326399.72	53
26	3838171.38	326502.66	8
27	3837989.75	326621.03	26
28	3837840.00	326728.81	7
29	3837744.38	326792.28	39
30	3837662.50	326848.23	13
31	3837050.26	327388.12	26
32	3836988.85	327442.26	44
33	3836404.20	327957.85	38
34	3835959.98	328382.35	26
35	3835793.50	328526.25	11
36	3835704.75	328599.31	32
37	3835506.13	328767.72	9

#	X	Y	GAMMA
38	3835247.45	328106.79	18
39	3836337.63	327198.64	34
40	3836411.13	327127.31	163
41	3836662.63	326886.84	32
42	3837053.88	326500.03	70
43	3837393.72	326208.20	8
44	3837655.25	326079.69	16
45	3836408.00	327749.17	28
46	3836481.75	327692.28	50
47	3836520.45	327661.66	33
48	3836603.00	327589.97	93
49	3836653.63	327544.52	61
50	3836763.25	327444.97	29
51	3836919.04	327305.85	13
52	3837075.00	327164.80	78
53	3837282.63	326968.05	30
54	3837063.13	326707.97	29
55	3836602.63	327018.30	26
56	3836355.50	327252.58	16
57	3834980.25	328763.66	39
58	3837626.72	326006.84	53
59	3834958.88	328477.73	17
60	3835375.52	328021.84	39
61	3835702.48	327818.30	14
62	3836585.00	327149.02	11
63	3836920.00	326823.75	90
64	3836993.00	326710.44	19
65	3837098.50	326647.92	25
66	3835159.75	328735.95	114
67	3835368.50	328525.80	9
68	3836432.75	327391.78	8
69	3836756.00	327144.39	11
70	3836854.50	327076.13	24
71	3836971.38	326995.97	124
72	3836464.89	328130.63	18
73	3835481.75	329138.03	251
74	3835378.60	329191.45	49
75	3837563.50	326807.63	47
76	3836918.50	327458.97	156
77	3836542.25	327710.05	176
78	3836441.88	327787.92	33

#	X	Y	GAMMA
79	3834959.00	329200.61	106
80	3834385.00	329698.88	28
81	3837485.13	326612.88	27
82	3837136.00	326925.64	33
83	3836862.75	327205.56	83
84	3836710.15	327367.73	7
85	3836280.25	327806.70	14
86	3835144.00	328942.56	33
87	3834945.00	329141.42	6
88	3835554.33	327702.38	18
89	3835815.75	327439.55	18
90	3836674.63	326740.02	18
91	3836768.50	326665.78	38
92	3836846.38	326620.19	17
93	3837059.63	326493.80	13
94	3838137.13	326590.56	12
95	3837752.75	326906.95	9
96	3837476.63	327124.61	1667
97	3837421.38	327172.19	77
98	3837252.38	327312.44	16
99	3836883.75	327624.45	16
100	3836626.81	327850.76	24
101	3835123.13	328692.20	88
102	3835386.25	328509.25	15
103	3835956.88	328044.03	35
104	3836070.55	327879.36	34
105	3836658.88	327449.86	85
106	3836826.88	327310.92	59
107	3836920.25	327211.27	53
108	3837087.75	327043.06	15
109	3837213.50	326932.66	28
110	3834923.13	328048.34	10
111	3835090.50	327936.67	12
112	3835461.50	327606.16	15
113	3836230.88	327018.91	9
114	3836851.25	326619.63	6
115	3836973.00	326493.25	27
116	3837109.38	326247.08	31

Table 2: MR-E-09 Magnetic Anomalies

#	X	Y	GAMMA
1	3860264.00	315055.61	22
2	3860523.00	314900.83	13
3	3860675.63	315223.50	4
4	3860772.25	315545.06	24
5	3860818.00	315536.17	11
6	3860950.54	315510.18	12
7	3860981.13	315810.25	8
8	3861000.50	314670.70	11
9	3861255.64	314538.77	38
10	3861293.43	315939.06	10
11	3861289.19	314550.34	104
12	3861640.61	314393.32	18
13	3861642.00	314362.95	15
14	3861672.00	315477.41	24
15	3861834.38	314556.06	46
16	3862017.88	314455.44	143
17	3862314.51	314287.92	16
18	3862484.75	313895.91	14
19	3863029.75	313909.95	31
20	3863167.00	314449.69	10
21	3863221.78	313529.48	9
22	3863361.20	313959.95	11
23	3863475.52	314273.37	7
24	3863665.99	313323.70	10
25	3863738.72	313791.82	28
26	3863724.25	313195.25	26
27	3863832.74	313525.37	25
28	3863818.50	314061.70	19
29	3863879.31	313252.87	27
30	3863941.13	313984.53	109
31	3864049.64	313409.13	17
32	3864140.75	313162.72	55
33	3864137.08	313861.01	33
34	3864582.38	312829.13	22
35	3864612.79	313088.38	28
36	3864647.13	312874.98	50
37	3864803.99	313809.99	12
38	3864862.63	312727.89	23
39	3865058.25	313675.68	7

#	X	Y	GAMMA
40	3865092.75	312564.88	25
41	3865147.58	313127.32	26
42	3865164.76	313435.17	9
43	3865593.34	313217.41	26
44	3865644.53	312244.12	10
45	3865803.48	313559.40	12
46	3865885.02	313602.73	50
47	3865924.75	312227.09	39
48	3866002.25	312619.51	32
49	3866103.91	312290.75	50
50	3866090.50	312085.56	47
51	3866131.36	311988.06	20
52	3866194.13	312008.28	17
53	3866379.38	313248.89	9
54	3866409.78	312743.40	12
55	3866585.34	311788.90	12
56	3866655.62	311731.79	35
57	3866783.65	312222.24	20
58	3866863.93	312992.70	5
59	3866964.66	311868.72	123
60	3867010.25	311575.47	20
61	3867046.45	312057.60	11
62	3867080.00	311798.06	18
63	3867187.64	311548.38	34
64	3867355.63	311986.88	76
65	3867444.31	311868.96	21
66	3868071.06	312012.54	23
67	3868594.87	311657.71	143

Table 3: Side Scan Sonar Targets

nmh = No measurable height

#	NAME	Length (ft)	Width (ft)	Height (ft)	EASTING	NORTHING
1	Target	2.9	2.5	0.3	3834527.47	329486.50
2	Target	17.2	12.4	nmh	3834984.63	328204.52
3	Target	12.2	2.9	1.7	3835164.64	329169.71
4	Target	12.1	3.1	2.4	3835430.27	328908.37
5	Target	10.4	6.2	1.2	3835521.17	328669.17
6	Target	25.9	11.6	nmh	3835622.19	328635.77
7	Target	9.4	1.8	2.1	3835628.04	328806.31
8	Target	9.9	4.0	1.6	3835712.33	328461.89
9	Target	7.6	2.1	0.8	3835836.26	328372.10
10	Target	8.9	6.1	nmh	3836601.29	326774.80
11	Target	6.6	10.0	nmh	3836749.52	326643.47
12	Target	2.1	8.1	nmh	3836779.84	326621.53
13	Target	13.7	2.6	nmh	3836874.58	326501.48
14	Target	16.9	9.2	nmh	3837024.84	326430.52
15	Target	10.5	4.8	1.8	3837283.51	327123.86
16	Target	10.9	2.9	nmh	3837657.72	326806.21
17	Target	76.0	83.1	nmh	3859612.74	315589.17
18	Target	12.8	2.9	1.4	3859746.83	316254.29
19	Target	14.8	5.1	nmh	3860290.45	315905.84
20	Target	6.0	4.5	nmh	3861035.87	315677.41
21	Target	21.0	32.0	nmh	3861183.85	314319.18
22	Target	16.5	10.9	1.3	3861371.65	314188.50
23	Target	7.5	1.6	nmh	3861721.96	315650.65
24	Target	11.8	6.1	nmh	3861792.25	314145.60
25	Target	7.9	10.3	nmh	3861819.67	314090.26
26	Target	9.4	7.2	0.4	3861857.86	314104.58
27	Target	26.6	2.8	0.4	3861961.90	314032.86
28	Target	16.4	2.9	0.2	3862024.61	314045.62
29	Target	13.1	1.3	0.8	3862025.78	314726.53
30	Target	2.8	3.4	0.3	3862166.64	313760.92
31	Target	22.8	12.6	nmh	3862277.68	314577.65
32	Target	5.1	2.8	nmh	3862772.04	313905.81
33	Target	11.7	0.7	0.9	3862902.66	313378.27
34	Target	11.0	2.4	nmh	3862950.33	313419.83
35	Target	18.1	1.8	nmh	3862962.40	313485.05
36	Target	13.3	14.6	nmh	3863073.71	313389.76
37	Target	48.2	46.3	36.5	3863872.32	314070.94
38	Target	8.5	0.7	nmh	3864132.70	313873.90

#	NAME	Length (ft)	Width (ft)	Height (ft)	EASTING	NORTHING
39	Target	7.0	5.3	nmh	3864250.65	313261.79
40	Target	20.4	10.3	nmh	3864266.25	312825.40
41	Target	19.1	2.8	nmh	3864314.05	312740.99
42	Target	6.8	0.8	1.6	3864509.81	314194.37
43	Target	11.4	1.5	nmh	3864609.19	312632.05
44	Target	16.1	8.2	nmh	3864684.50	313306.51
45	Target	9.0	6.9	2.9	3865015.86	313493.32
46	Target	5.3	3.9	nmh	3865034.54	313482.23
47	Target	4.6	1.9	nmh	3865077.18	312486.98
48	Target	28.2	7.8	0.2	3865088.96	312569.07
49	Target	31.3	18.3	0.6	3865103.99	312534.73
50	Target	4.8	3.5	nmh	3866435.48	312623.27
51	Target	14.9	13.8	nmh	3866893.69	312477.92
52	Target	11.4	9.3	nmh	3866908.09	312398.59
53	Target	6.9	6.5	nmh	3866930.69	312501.47
54	Target	6.9	7.1	nmh	3867899.07	312405.32
55	Target	3.0	3.5	nmh	3868039.16	312084.76
56	Target	3.9	1.8	nmh	3868272.82	311854.65
57	Target	4.0	1.4	nmh	3868552.17	312109.34
58	Scattered	nmh	nmh	nmh	3835160.24	329283.91
59	Scattered	nmh	nmh	nmh	3835165.49	329249.00
60	Scattered	nmh	nmh	nmh	3835167.52	329199.60
61	Scattered	nmh	nmh	nmh	3835178.23	329215.16
62	Scattered	nmh	nmh	nmh	3835196.59	329196.11
63	Scattered	nmh	nmh	nmh	3835307.28	329009.93
64	Scattered	nmh	nmh	nmh	3835908.09	327556.77
65	Scattered	nmh	nmh	nmh	3836702.47	326456.93
66	Scattered	nmh	nmh	nmh	3836739.31	326526.93
67	Scattered	nmh	nmh	nmh	3836836.36	326551.71
68	Scattered	nmh	nmh	nmh	3838172.79	326256.00
69	Scattered	nmh	nmh	nmh	3861835.83	314059.39
70	Scattered	nmh	nmh	nmh	3861899.60	314016.49
71	Scattered	nmh	nmh	nmh	3862006.18	313944.36
72	Target	36.0	25.0	0.5	3835401.84	329091.55

Table 4: Linear Side Scan Sonar Targets
 Little or no measurable height or significant width

#	NAME	Length (ft)	EASTING	NORTHING
1	Linear Target	52	3835407.00	329089.56
2	Linear Target	33	3835420.76	328541.12
3	Linear Target	28	3834672.50	328617.21
4	Linear Target	30	3835522.56	328106.57
5	Linear Target	14	3835466.67	328170.55
6	Linear Target	18	3835466.44	328083.14
7	Linear Target	23	3835468.86	328115.64
8	Linear Target	12	3835478.43	328139.20
9	Linear Target	32	3835440.52	328136.92
10	Linear Target	58	3836433.78	327892.11
11	Linear Target	99	3836428.46	327641.03
12	Linear Target	43	3836704.08	327769.28
13	Linear Target	43	3836884.13	327397.99
14	Linear Target	288	3837073.96	327441.37
15	Linear Target	20	3836892.94	326683.45
16	Linear Target	14	3836543.01	326687.32
17	Linear Target	73	3836544.60	326774.02
18	Linear Target	21	3837377.21	326836.82
19	Linear Target	32	3860465.80	314855.50
20	Linear Target	25	3861125.73	314415.96
21	Linear Target	8	3861121.70	314423.22
22	Linear Target	17	3861134.46	314417.88
23	Linear Target	509	3861345.46	316055.03
24	Linear Target	76	3861277.94	316067.76
25	Linear Target	65	3861717.99	314778.31
26	Linear Target	20	3862119.75	313932.34
27	Linear Target	9	3862059.04	313963.15
28	Linear Target	44	3862712.90	313972.16
29	Linear Target	95	3863872.10	314011.67
30	Linear Target	228	3863781.92	313151.73
31	Linear Target	75	3863874.99	313177.05
32	Linear Target	75	3863832.28	313229.08
33	Linear Target	84	3863924.34	313120.24
34	Linear Target	27	3864139.95	313310.21
35	Linear Target	24	3864727.97	312673.61
36	Linear Target	13	3865420.81	313329.88
37	Linear Target	40	3865305.80	312447.39
38	Linear Target	143	3865087.20	312506.64
39	Linear Target	22	3866429.58	311555.13

#	NAME	Length (ft)	EASTING	NORTHING
40	Linear Target	20	3867660.94	312678.06
41	Linear Target	51	3867655.51	311326.65
42	Linear Target	19	3868523.29	311972.81

APPENDICES

Appendix 1 – Survey Charts

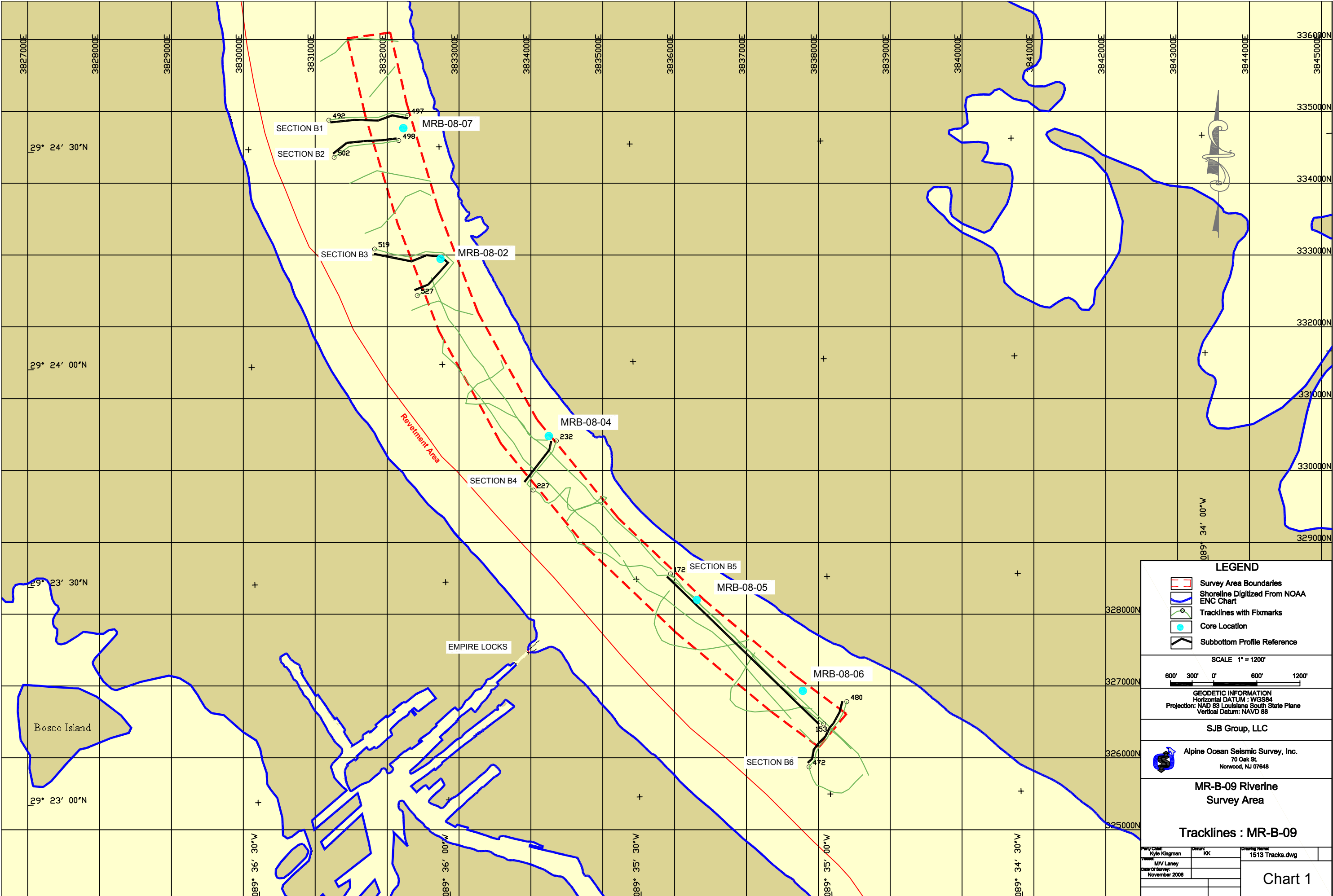
Chart 1	MR-B-09 Trackline Map
Chart 2	MR-E-09 Trackline Map
Chart 3	MR-B-09 Bathymetric Contours
Chart 4	MR-E-09 Bathymetric Contours
Chart 5	MR-B-09 Magnetometer Targets
Chart 6	MR-E-09 Magnetometer Targets
Chart 7	MR-B-09 Side Scan Sonar Targets
Chart 8	MR-E-09 Side Scan Sonar Targets
Chart 9	MR-B-09 Sub Bottom Profiles (Sections B1 – B4)
Chart 10	MR-B-09 Sub Bottom Profiles (Sections B5 – B6)
Chart 11	MR-E-09 Sub Bottom Profiles (Sections E1 – E4)
Chart 12	MR-E-09 Sub Bottom Profiles (Sections E5 – E7)

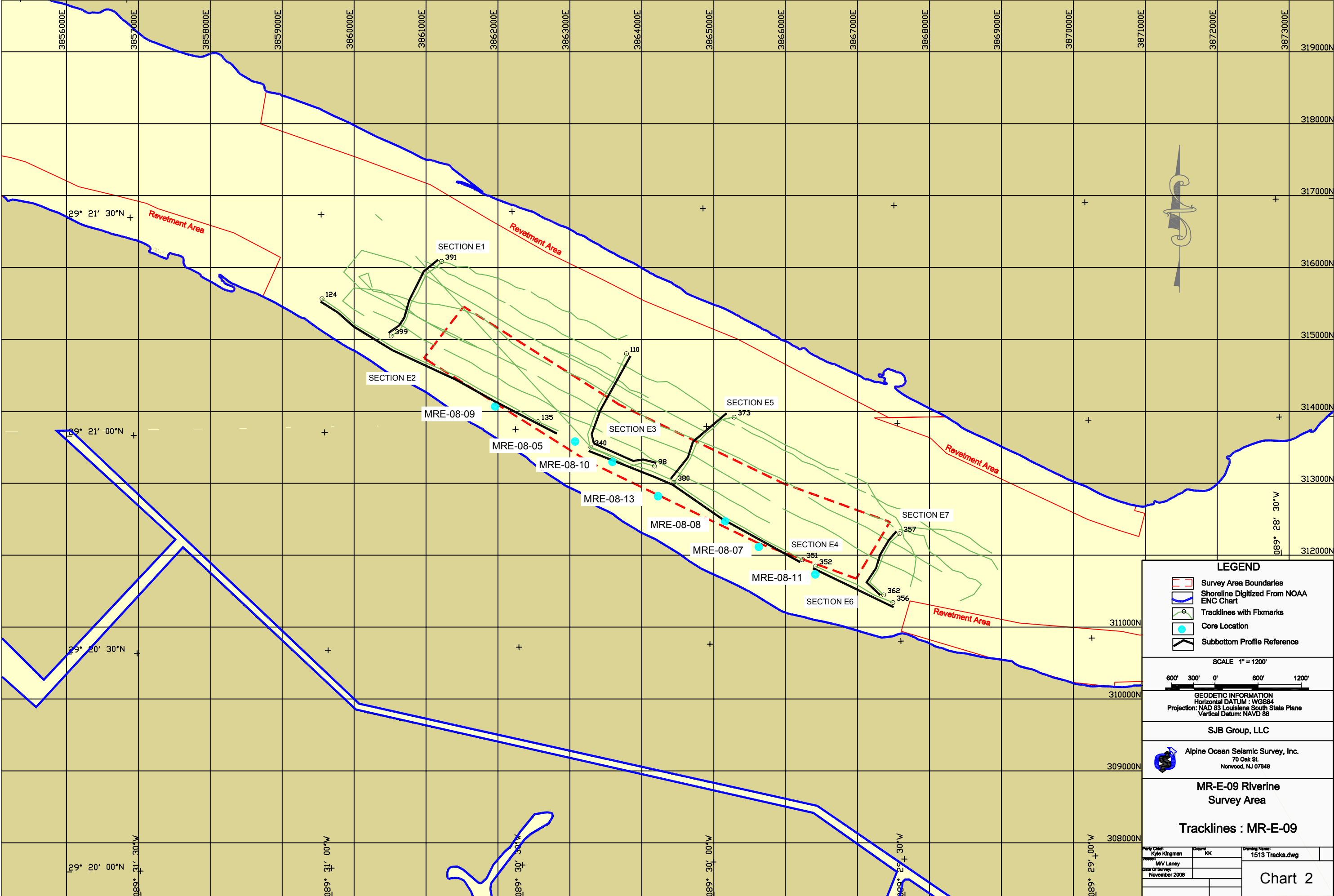
Appendix 2 – MR-B-09 Chirp Profiles, as Tiff files (Electronic file)

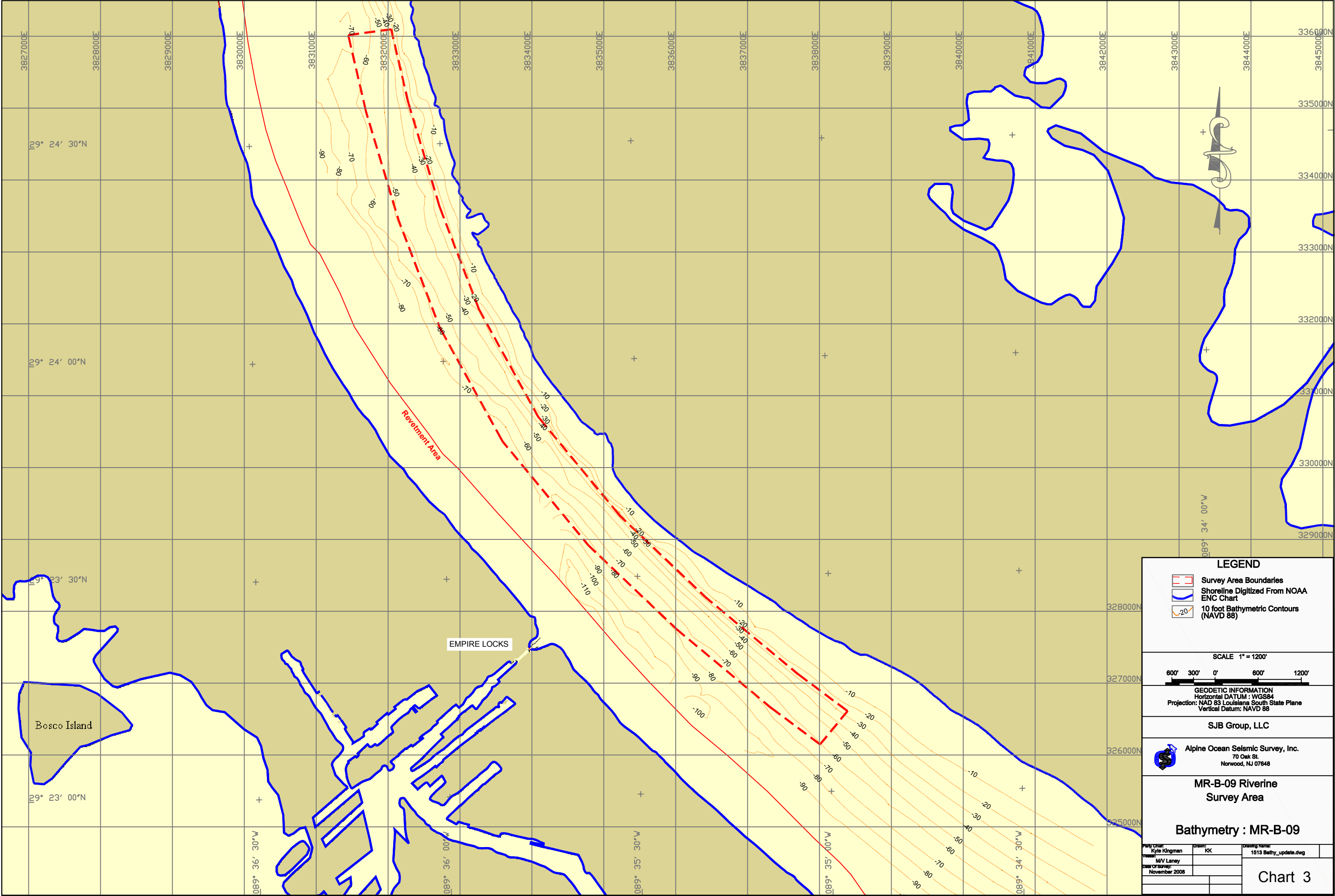
Appendix 3 – MR-E-09 Chirp Profiles, as Tiff Files (Electronic file)

APPENDIX 1

Survey Charts







LEGEND

- Survey Area Boundaries
- Shoreline Digitized From NOAA ENC Chart
- 10 foot Bathymetric Contours (NAVD 88)

SCALE 1" = 1200'

GEODETTIC INFORMATION
Horizontal DATUM : WGS84
Projection: NAD 83 Louisiana South State Plane
Vertical Datum: NAVD 88

SJB Group, LLC

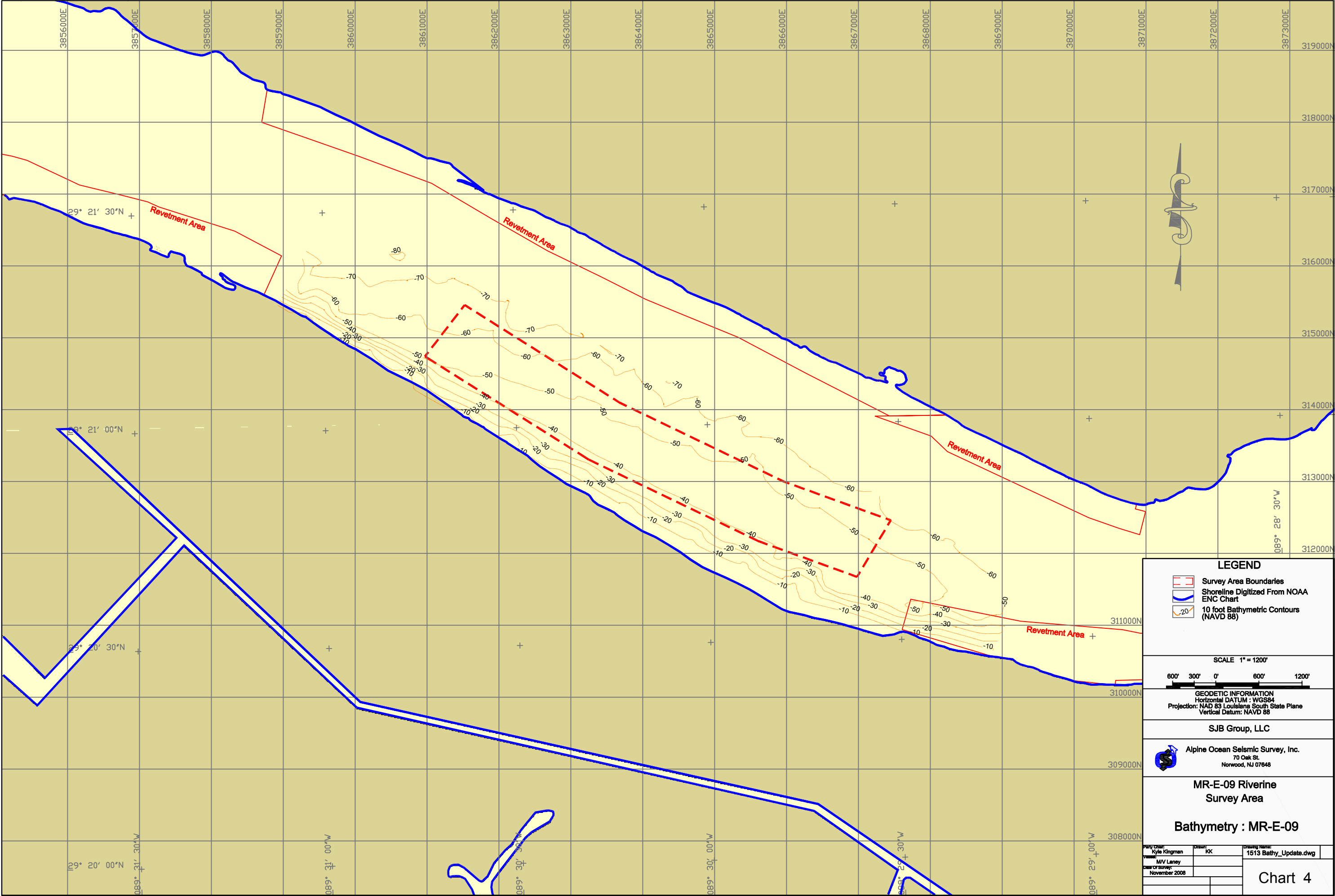
Alpine Ocean Seismic Survey, Inc.
70 Oak St.
Norwood, NJ 07648

**MR-B-09 Riverine
Survey Area**

Bathymetry : MR-B-09

Party Chief: Kyle Kingman	Drawn: KCK	Drawing Name: 1513 Bathy_update.dwg
Client: M/V Laney		
Date of Survey: November 2008		

Chart 3



LEGEND

- Survey Area Boundaries
- Shoreline Digitized From NOAA ENC Chart
- 10 foot Bathymetric Contours (NAVD 88)

SCALE 1" = 1200'

600' 300' 0' 600' 1200'

GEODETTIC INFORMATION
Horizontal DATUM : WGS84
Projection: NAD 83 Louisiana South State Plane
Vertical Datum: NAVD 88

SJB Group, LLC

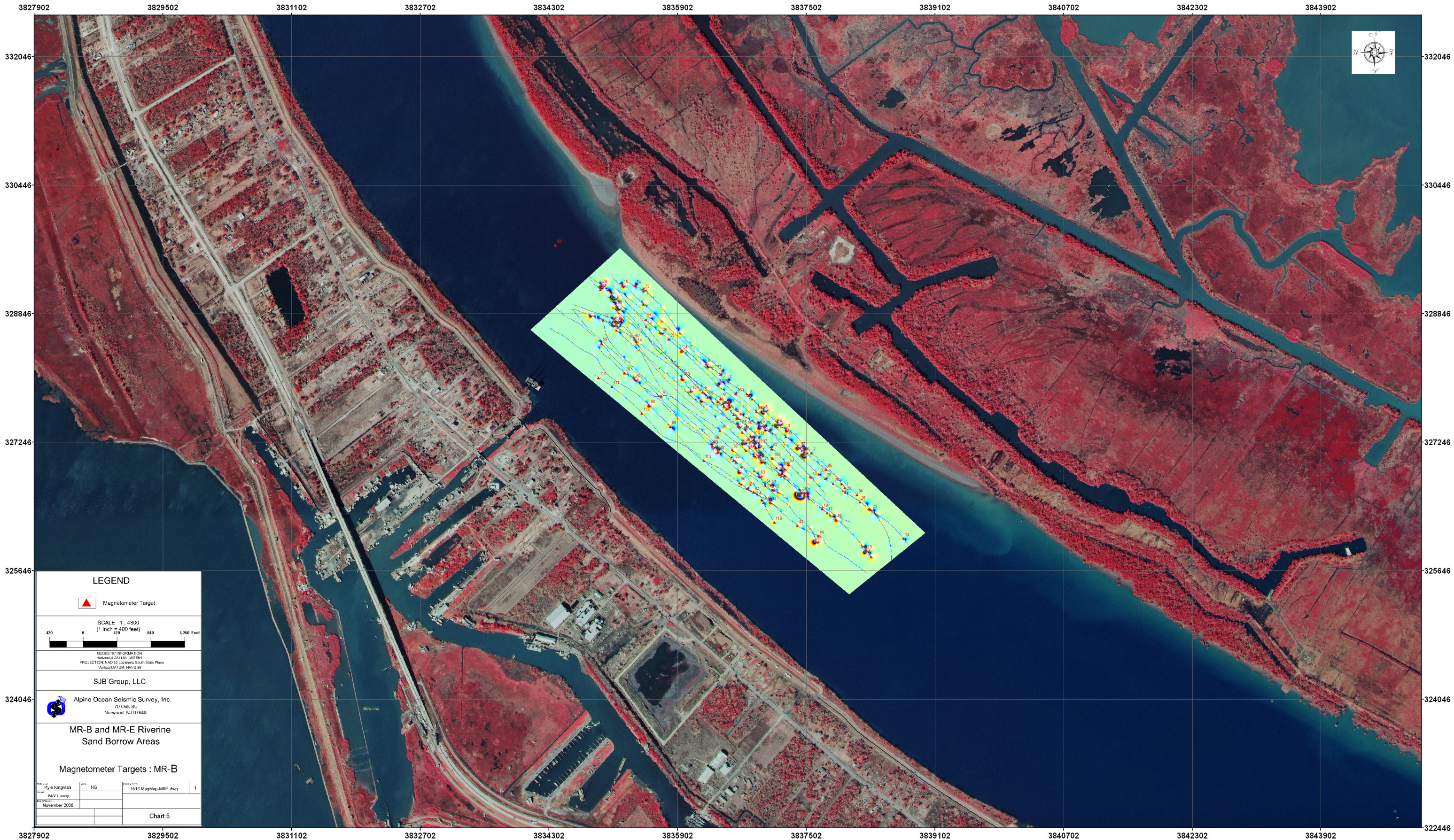
Alpine Ocean Seismic Survey, Inc.
70 Oak St.
Norwood, NJ 07648

**MR-E-09 Riverine
Survey Area**


Bathymetry : MR-E-09

Project Chief: Kyle Kingman	Drawn: KK	Drawing Name: 1513 Bathy_Update.dwg
Vehicle: MV Laney		
Date of Survey: November 2008		

Chart 4



LEGEND


 Magnetometer Target

SCALE 1 : 4800
(1 inch = 400 feet)

420 0 420 840 1,260 Feet

GEODEIC INFORMATION
Horizontal D.A.U.M. : WGS81
PROJECTION: NAD 83 Louisiana South State Plane
Vertical DATUM: NAVD 88

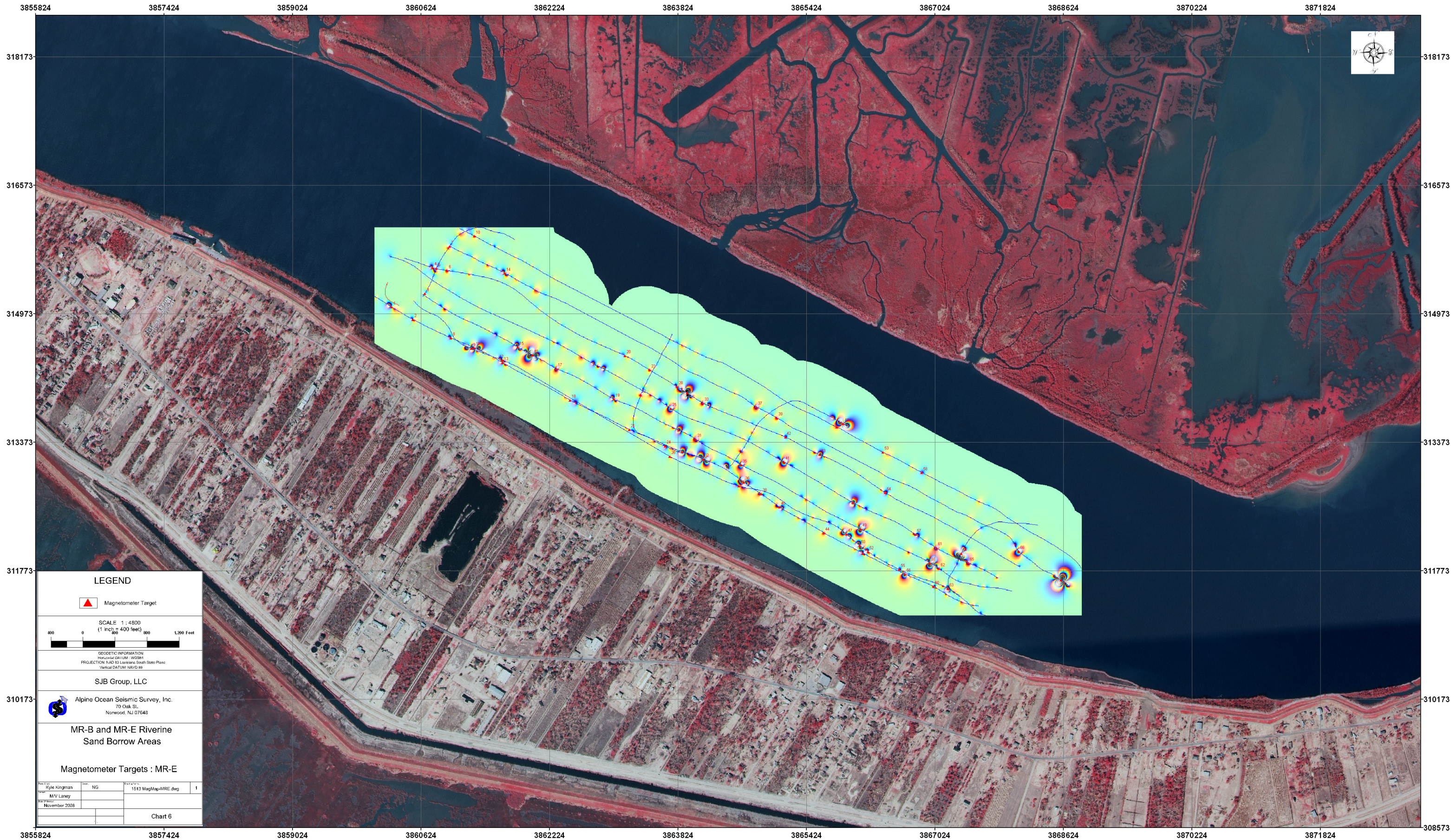
SJB Group, LLC

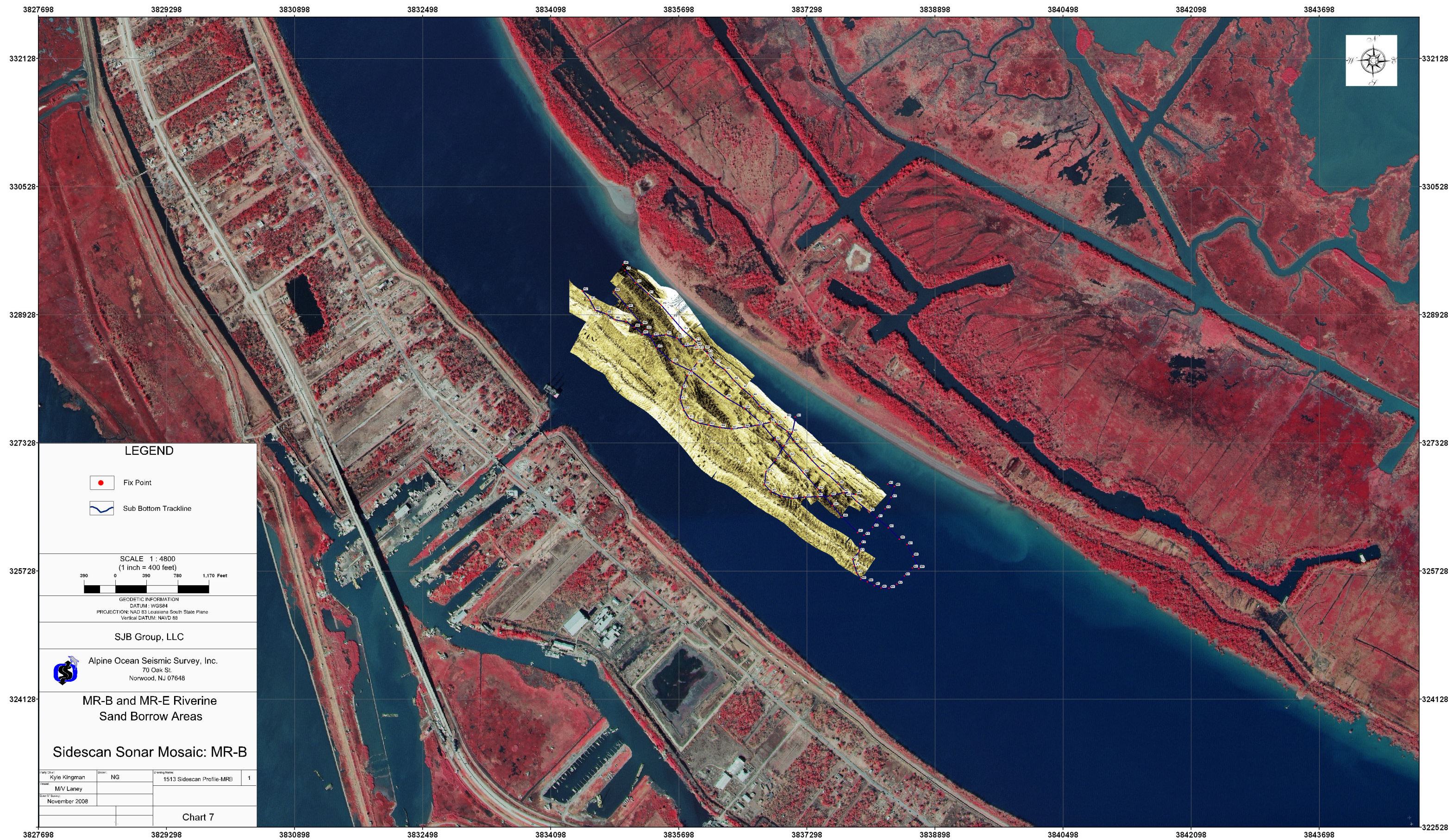
 Alpine Ocean Seismic Survey, Inc.
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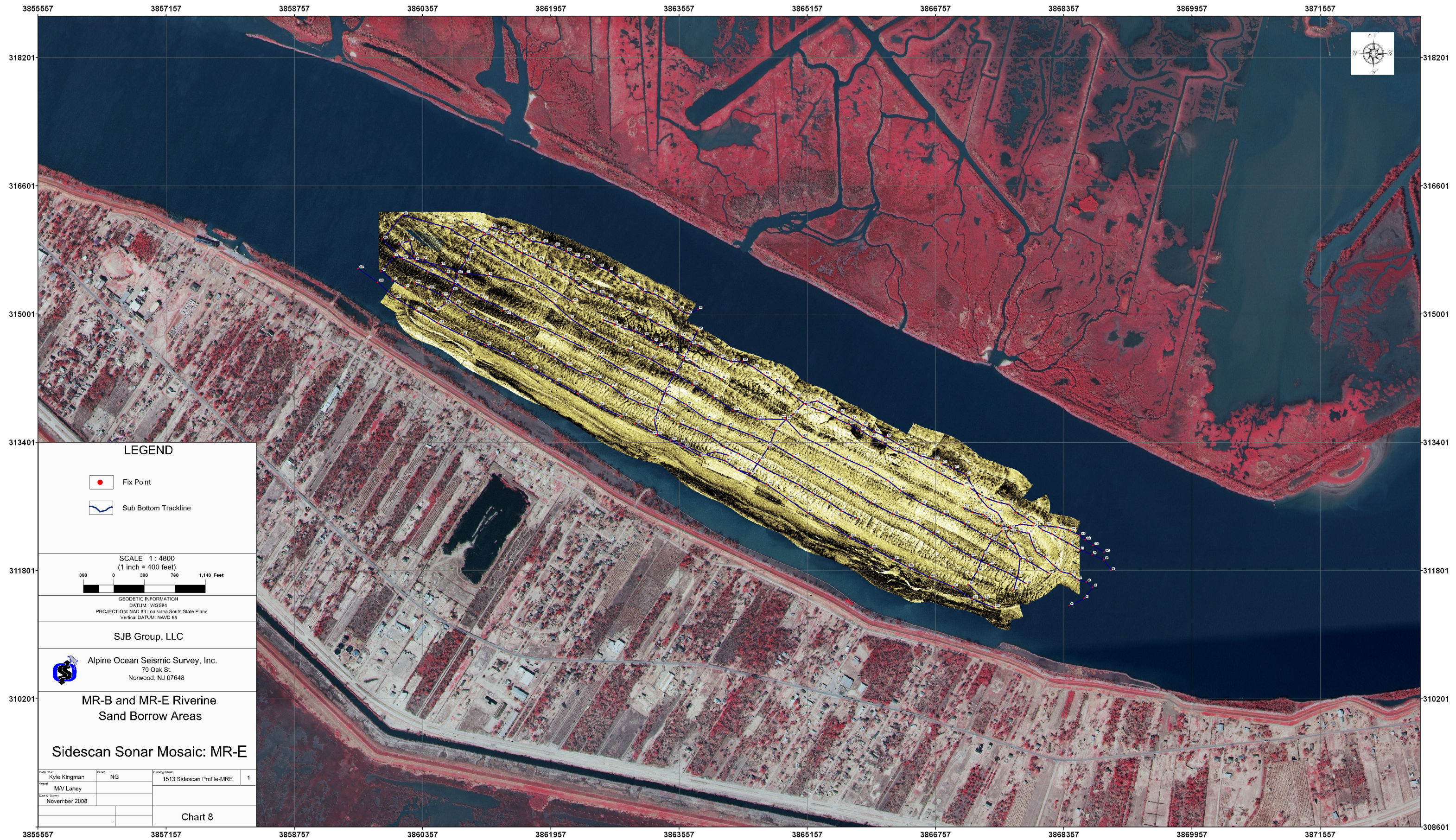
**MR-B and MR-E Riverine
Sand Borrow Areas**

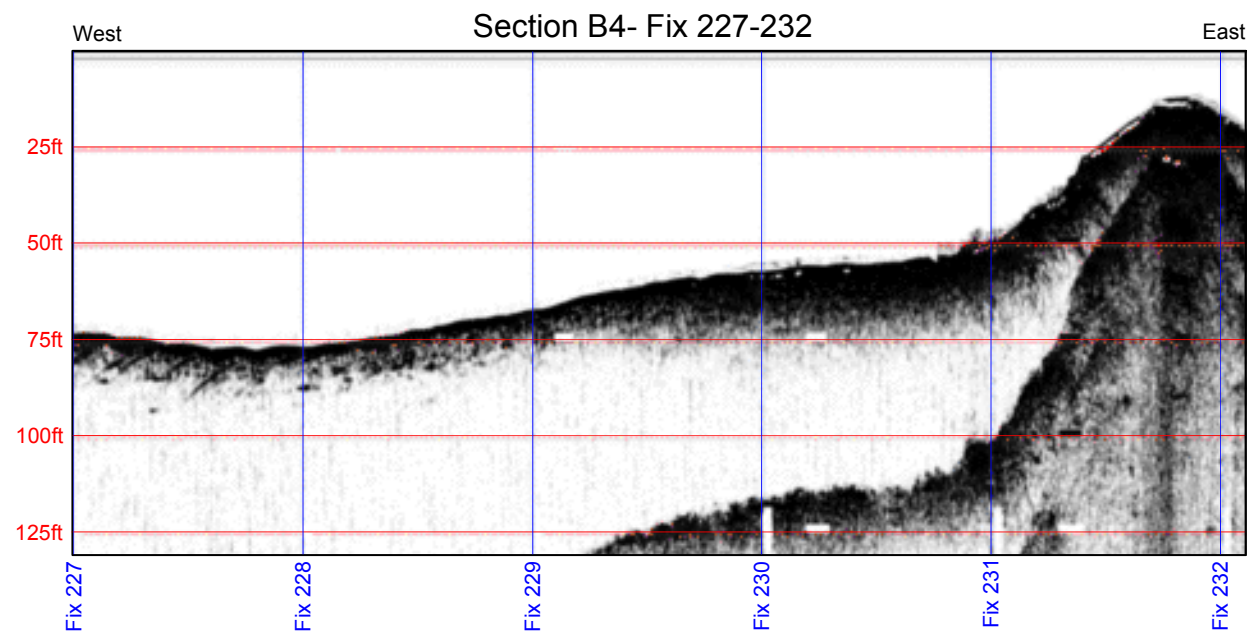
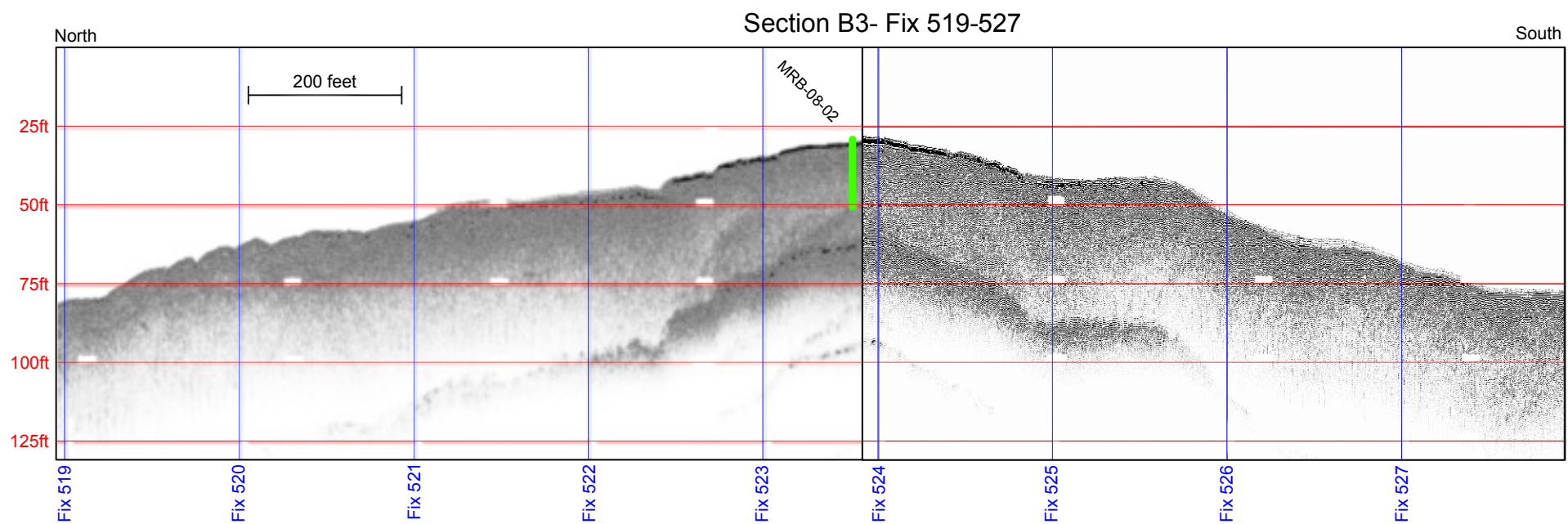
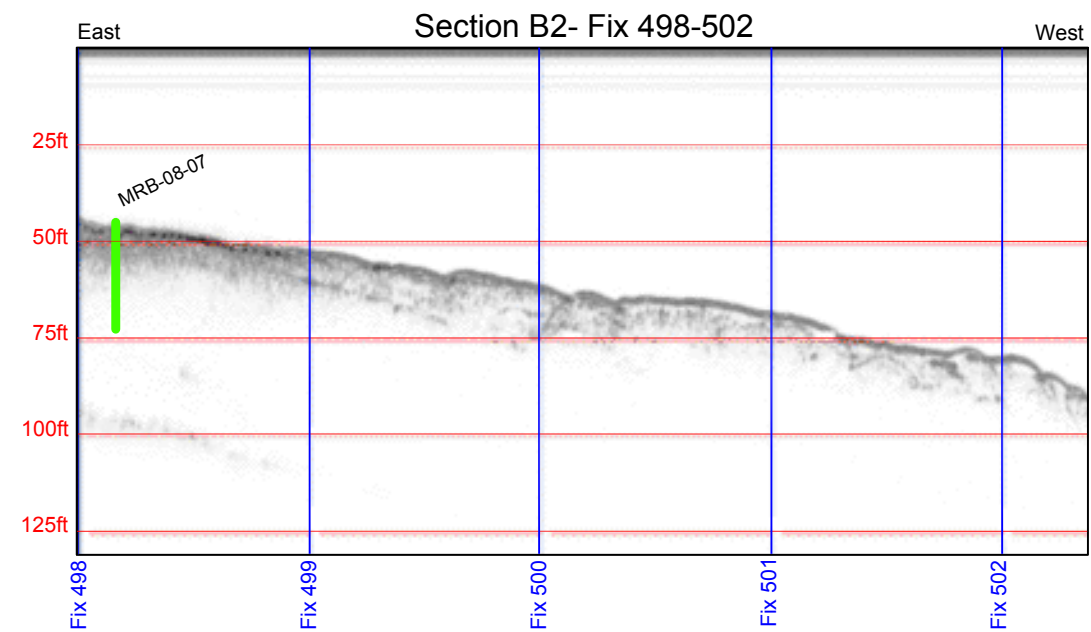
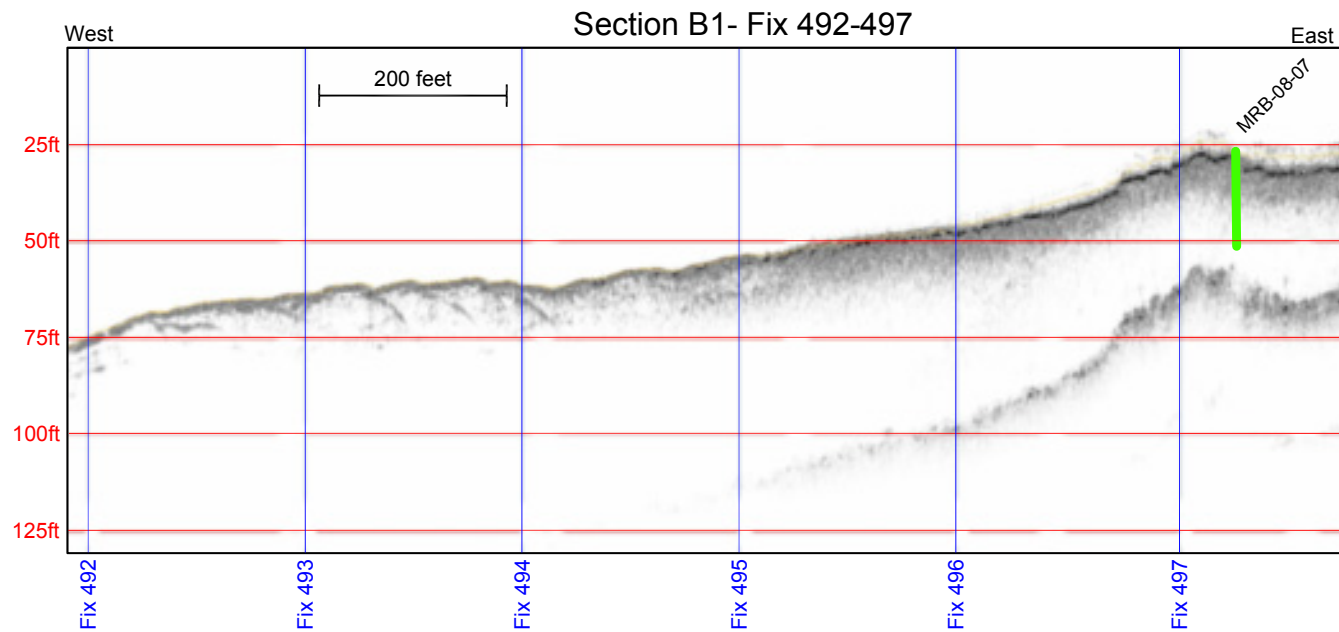
Magnetometer Targets : MR-B

Project	Kyle Kingman	Date	NG	Drawn by	1513 MagMap-MRB.dwg	1
Client	M/V Lacey					
Revised	November 2008					
Chart 5						












MRB-08-07	
Core Depth(ft)	Sediment Description
0 - 4.3	Mud
4.3 - 16.4	Interbedded Silt & Sand Layers
16.4 - 19.8	Peat
19.8 - 23.5	Interbedded Silt & Sand Lenses

MRB-08-02	
Core Depth(ft)	Sediment Description
0 - 3.9	Sand and Mud
3.9 - 5.8	Peat
5.8 - 12.4	Layers of Sand & Silt
12.4 - 19	Peat
19 - 22.4	Layers of Sand & Mud
22.4 - 23	Sandy Peat

LEGEND

-  Vibracore Location
-  Fix Mark
-  Water Depth Mark

VERTICAL SCALE
(1 inch = 50 feet)



Horizontal Scale as Shown

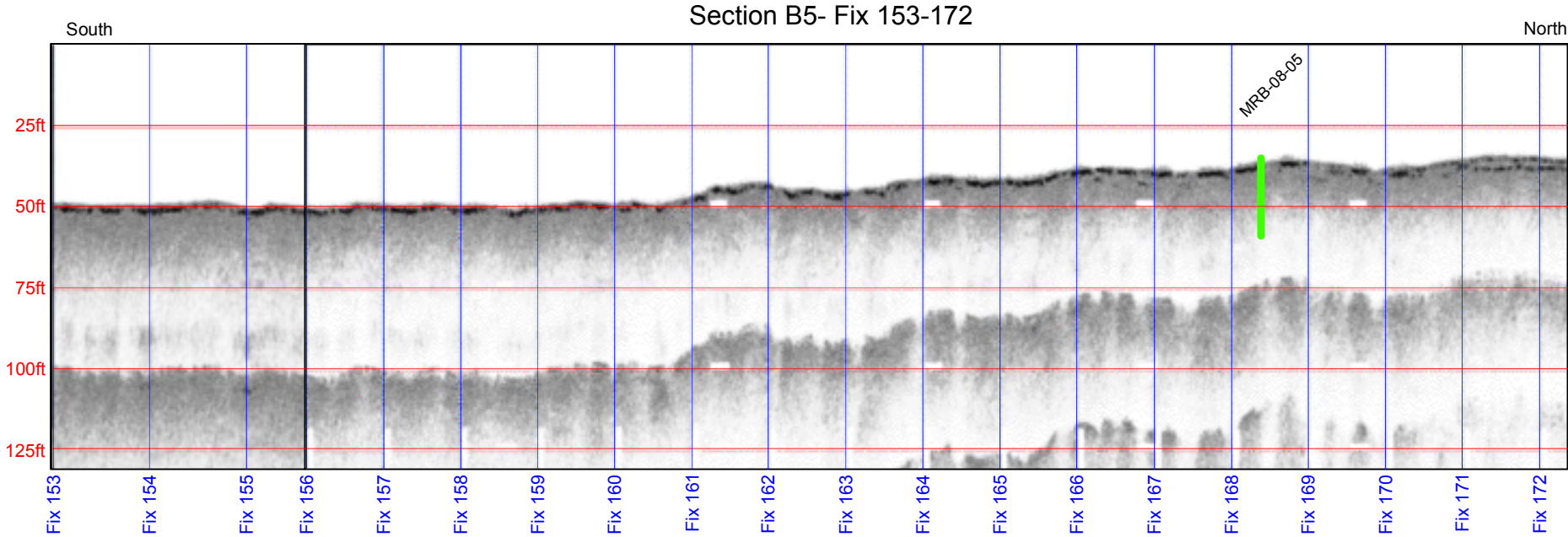
SJB Group, LLC



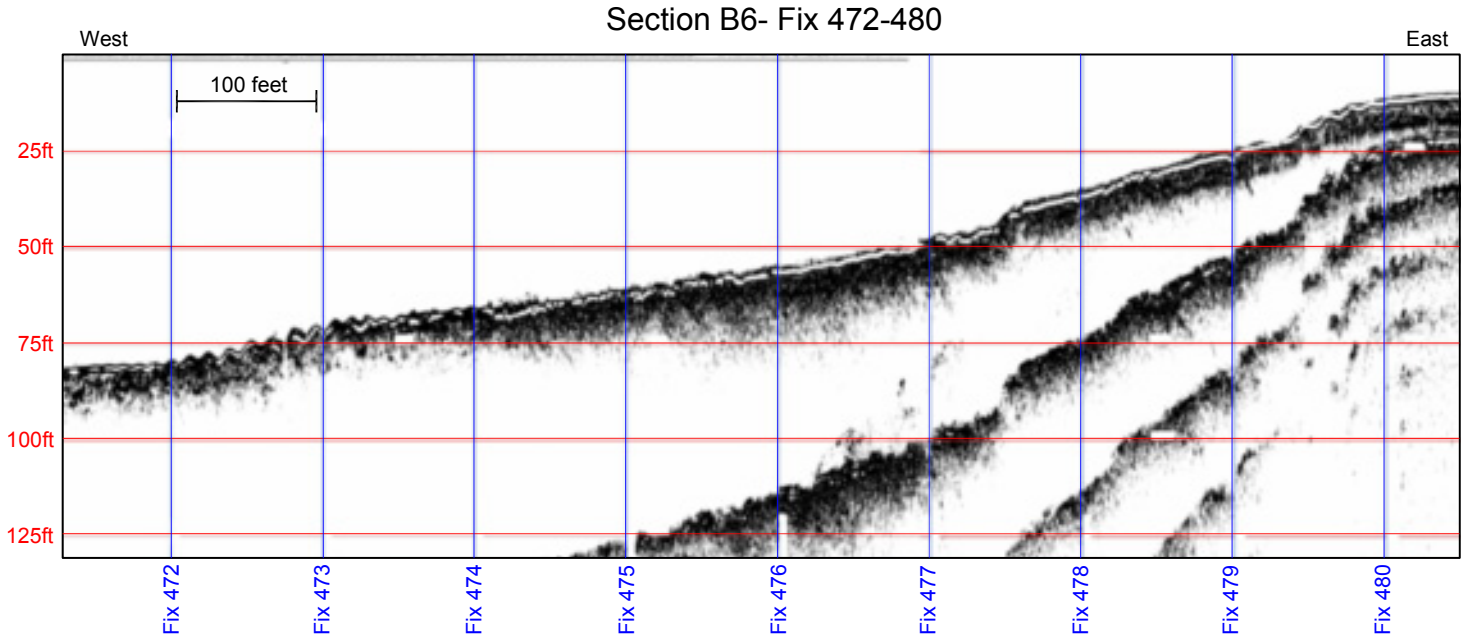
Alpine Ocean Seismic Survey, Inc.
70 Oak St.
Norwood, NJ 07648

**MR-B-09 Riverine
Survey Area
Subbottom Profiles: MR-B-09**

Party Chief: Kyle Kingman	Drawn: NG	Drawing Name: 1513 Profiles.dwg	1
Vessel: M/V Laney		Chart 9	
Date of Survey: November 2008			



MRB-08-05	
Core Depth(ft)	Sediment Description
0 - 5.5	Sand & Mud Layers
5.5 - 14.9	Fine to Coarse Sand
14.9 - 16.8	Mud
16.8 - 20.5	Fine Sand



LEGEND

- Vibracore Location
- Fix Mark
- Water Depth Mark

VERTICAL SCALE
(1 inch = 50 feet)

Horizontal Scale as Shown

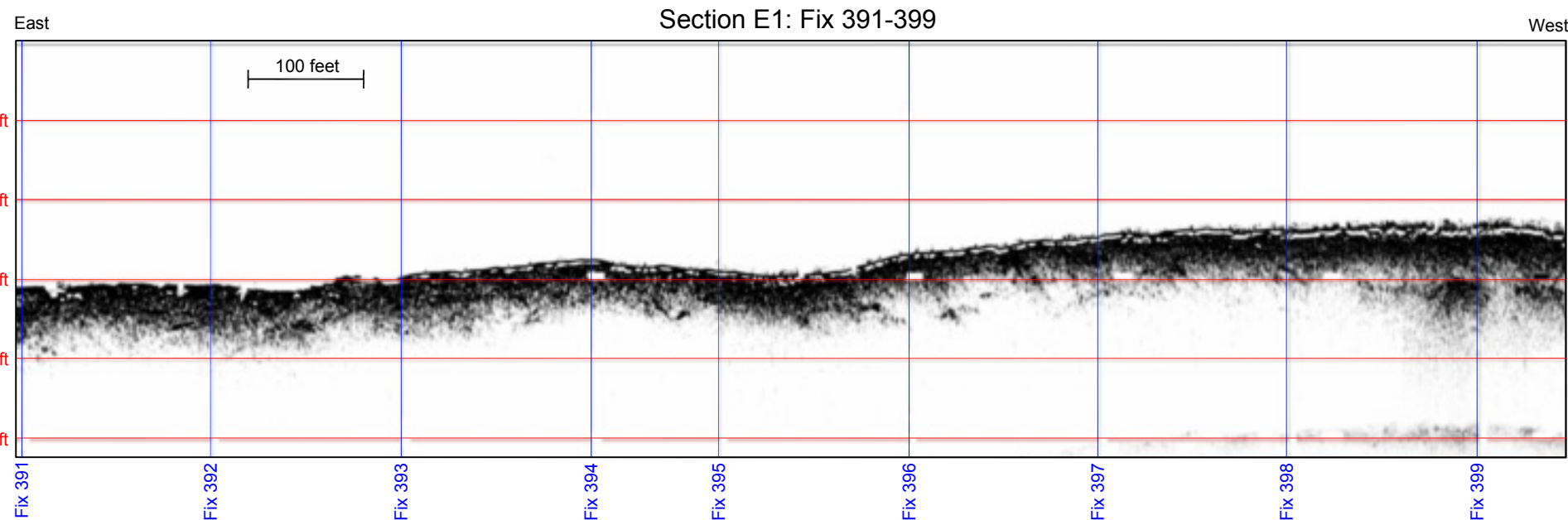
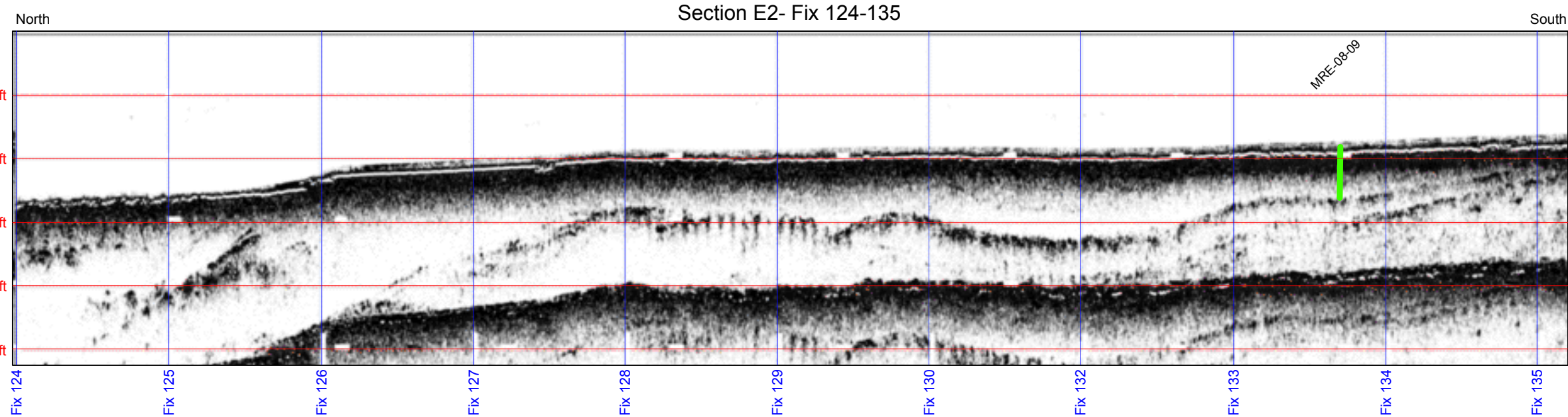
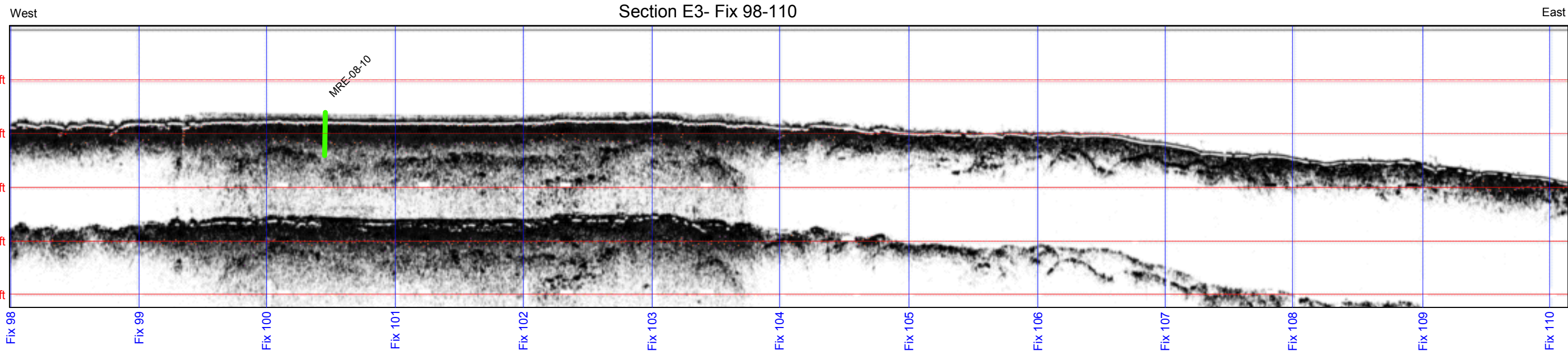
SJB Group, LLC

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Norwood, NJ 07648

**MR-B-09 Riverine
Survey Area
Subbottom Profiles: MR-B-09**

Party Chief: Kyle Kingman	Drawn: NG	Drawing Name: 1513 Profiles.dwg	1
Vessel: M/V Laney			
Date of Survey: November 2008			

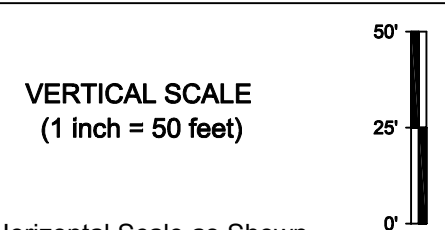
Chart 10



MRE-08-09	
Core Depth(ft)	Sediment Description
0 - 5	Mud
5 - 8	Fine Sand
8 - 9.7	Sand w/ Abundant Peat
9.7 - 12.9	Sand
12.9 - 18	Muddy Sand w/ Peat

MRE-08-10	
Core Depth(ft)	Sediment Description
0 - 3	Mud
3 - 17	Fine Sand
17 - 18.3	Silty Fine Sand & Mud Lenses - Yellow Brown at 15 feet

- LEGEND**
- Vibracore Location
 - Fix Mark
 - Water Depth Mark



Horizontal Scale as Shown

SJB Group, LLC

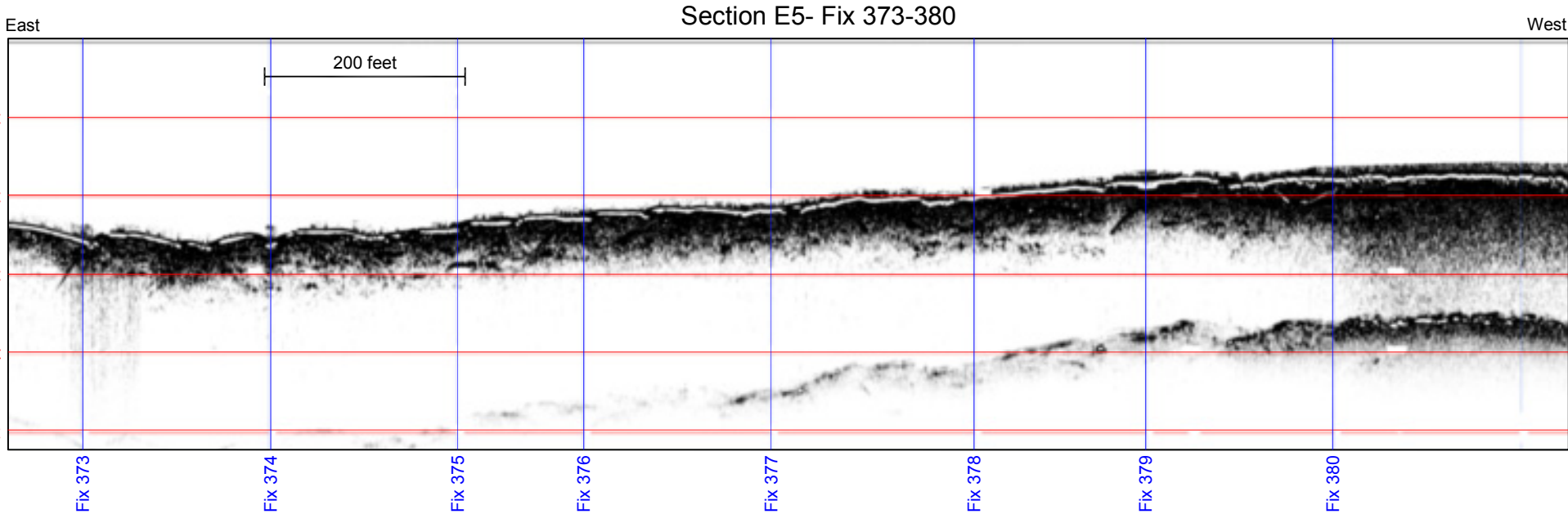
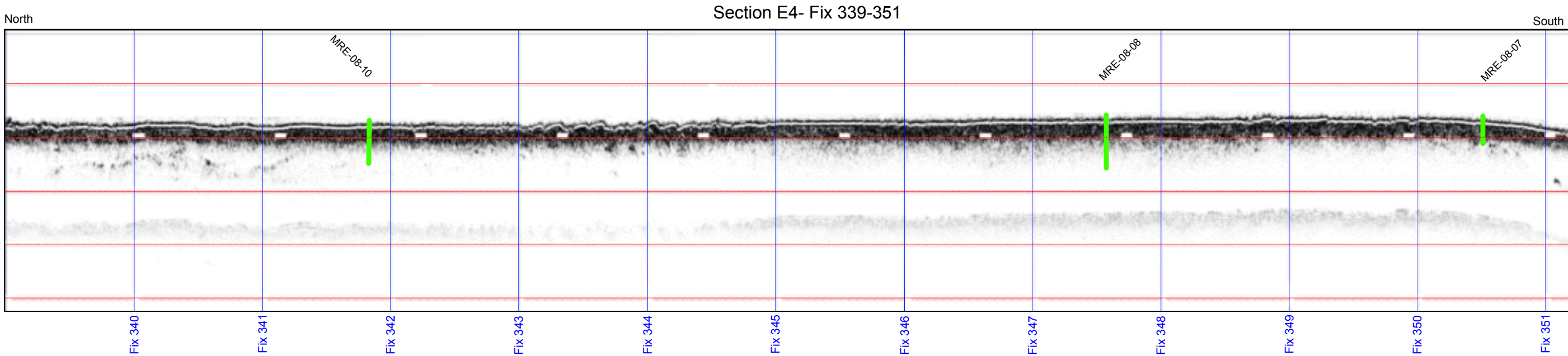


Alpine Ocean Seismic Survey, Inc.
70 Oak St.
Norwood, NJ 07648

**MR-E-09 Riverine
Survey Area
Subbottom Profiles: MR-E-09**

Party Chief: Kyle Kingman	Drawn: NG	Drawing Name: 1513 Profiles.dwg	1
Vessel: M/V Laney			
Date of Survey: November 2008			

Chart 11

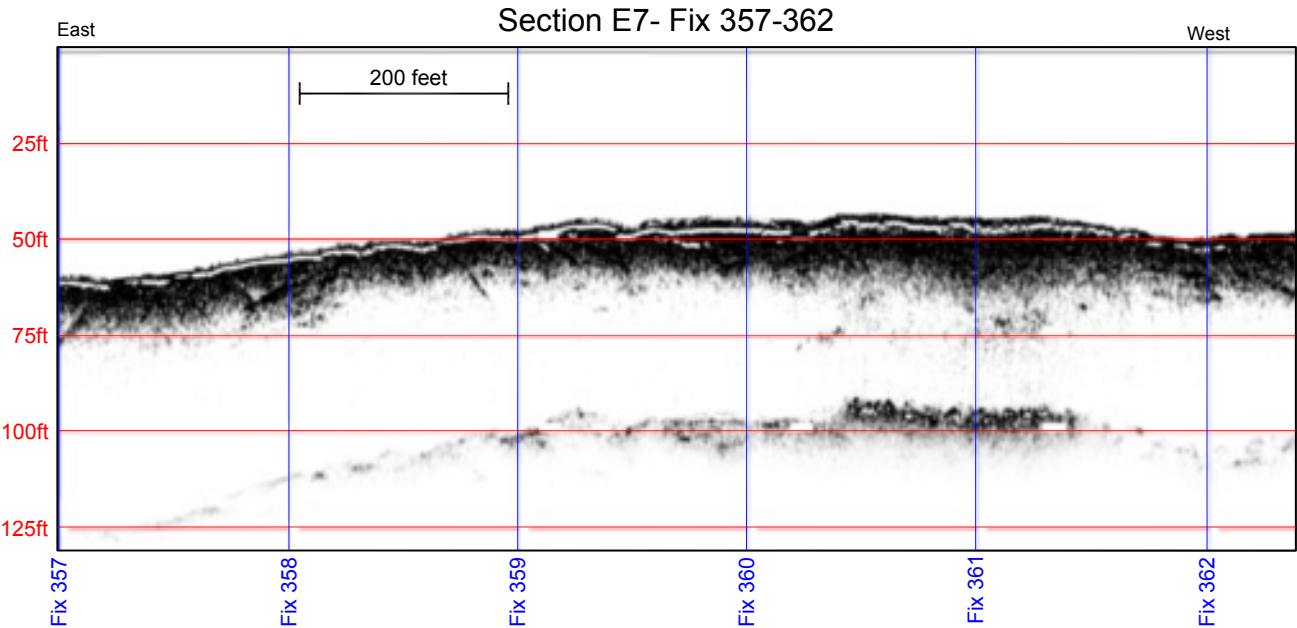
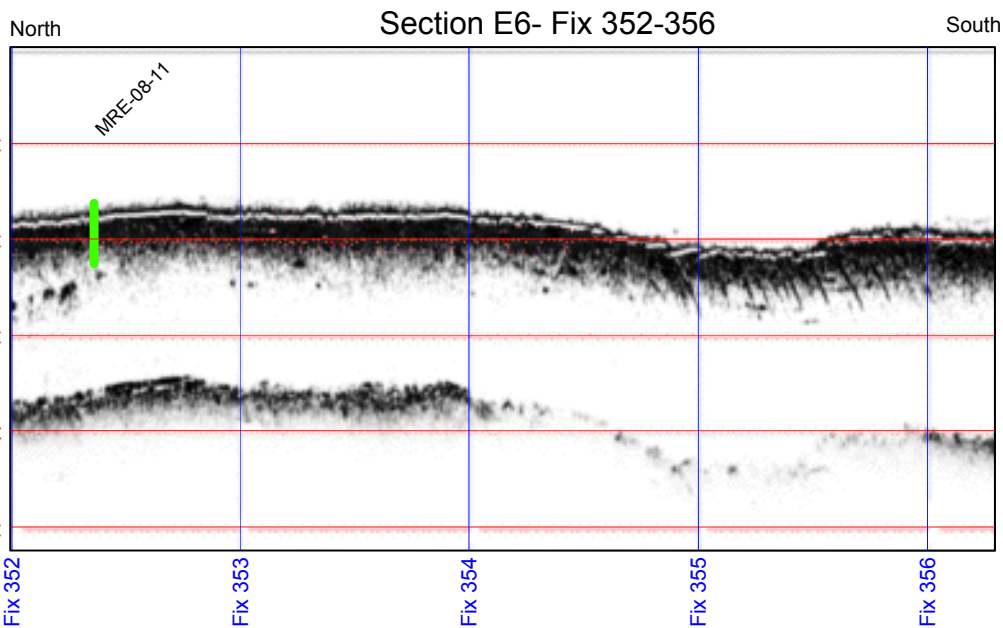


MRE-08-07	
Core Depth(ft)	Sediment Description
0 - 1.8	Mud
1.8 - 9.5	Sand
9.5 - 16.3	Interbedded Silt & Sand Layers




MRE-08-08	
Core Depth(ft)	Sediment Description
0 - 10.4	Interbedded Mud & Sand Layers
10.4 - 14.2	Peat in a Sandy Mud Matrix
14.2 - 21.3	Mud
21.3 - 25	Sand

MRE-08-11	
Core Depth(ft)	Sediment Description
0 - 2.3	Silt & Silty Sand
2.3 - 13.3	Fine Sand
13.3 - 17	Fine Sand & Mud Lenses - Yellow Brown at 15 feet

MRE-VC-09 - See Chart 11
MRE-VC-10 - See Chart 11



LEGEND

-  Vibracore Location
-  Fix Mark
-  Water Depth Mark

VERTICAL SCALE
(1 inch = 50 feet)



Horizontal Scale as Shown

SJB Group, LLC



Alpine Ocean Seismic Survey, Inc.
70 Oak St.
Norwood, NJ 07648

**MR-E-09 Riverine
Survey Area
Subbottom Profiles: MR-E-09**

Party Chief:
Kyle Kingman

Drawn:
NG

Drawing Name:
1513 Profiles.dwg

1

Vessel:
M/V Laney

Date of Survey:
November 2008

Chart 12