OFFICE OF
Coastal Protection and Restoration

Office of Coastal Protection and Restoration
450 Laurel Street, Suite 1200
P.O. Box 44027
Baton Rouge, LA 70804-4027

LDNR Contract No. 2503-10-46 / OCR Contract No 435-00789
Engineering Services for Coastal Restoration Projects

SURVEY METHODOLOGY REPORT

for

GRAND LIARD MARSH AND RIDGE RESTORATION (BA-68)
Topographic & Bathymetric Survey
Plaquemines Parish

STATE OF LOUISIANA
ROBERT JOSEPH LEAR, JR.
REG. No. 29394
REGISTERED PROFESSIONAL ENGINEER IN CIVIL ENGINEERING

11/22/10

Robert J. Lear, Jr., P.E.
Project Manager

November 22, 2010

STATE OF LOUISIANA
M. GREGORY BREAUX
REG. No. 4618
REGISTERED PROFESSIONAL LAND SURVEYOR

11/22/10

M. Gregory Breaux, P.E., PLS
Survey Manager

SIGMA CONSULTING GROUP, INC.

SIGMA CONSULTING GROUP, INC.
10305 Airline Highway
Baton Rouge, LA 70816
(225) 298-0800

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SURVEY METHODOLOGY REPORT

PROJECT DESCRIPTION

The Grand Liard Marsh and Ridge Restoration (BA-68) project is funded by the Coastal Wetlands Planning, Protection, and Restoration Act under Priority Project List 18. The Office of Coastal Protection and Restoration (OCPR), in partnership with the National Marine Fisheries Service (NMFS), have been authorized to execute Phase 1 (Engineering and Design) of BA-68. The proposed project will create/restore over 500 acres of marsh and ridge habitat along the eastern bank of Bayou Grand Liard.

The BA-68 project area has experienced tremendous wetland loss due to a variety of forces including subsidence, salt-water intrusion, a lack of sediment supply, and oil and gas activities. The Bastion Bay and Grand Liard mapping units were historically structured by a series of north south bayous and associated ridges (i.e., Bayou Long, Dry Cypress Bayou). Over the preceding decades the majority of these bayou ridges and the marshes flanking them have disappeared. Ridge loss combined with interior wetland loss has resulted in large expanses of open water. The Grand Liard ridge is the most prominent remaining ridge, and separates the open bays of the Bastian Bay and Grand Liard mapping units. Land loss projections suggest that the remaining bayou bank wetlands will be completely converted to open water by 2050.

The BA-68 project site is located in Plaquemines Parish, Louisiana, near the communities of Buras and Triumph, along the western bank of the Mississippi River, within the Bastian Bay and Grand Liard mapping units. The approximate coordinates of the center of the project area (ridge and marsh) are as follows: X=3,874,074, Y=293,045 (NAD 83 Louisiana State Plane, South Zone, U.S. survey feet).

The proposed project will create approximately 328 acres of marsh habitat, nourish approximately 140 acres of existing marsh, and create approximately 20,000 linear feet (34 acres) of maritime ridge habitat along the eastern bank of Bayou Grand Liard. These features will be constructed using hydraulically dredged and pumped sediment from the Mississippi River. The marsh creation fill areas will be formed by constructing earthen containment dikes around the boundaries the designated sites. The scope of services for this survey involves the completion of topographic, bathymetric, and magnetometer surveys of the proposed fill areas, Bayou Grand Liard, and other portions of the project area.

PERMISSION & ACCESS

Prior to performing any field work, Sigma requested permission to access the survey site from the landowners as provided by OCPR. A certified letter was sent to the landowners describing the work to be performed. Copies of the permission letters are included in Appendix A of this report.

HORIZONTAL AND VERTICAL CONTROL

NGS Monument N 367 was used as primary control for the entire survey. The datasheet is included in Appendix B of this report. In order to maintain full GPS RTK coverage, LDNR Monument CRMSBA-SM-14 was surveyed relative to monument N 367 and used as a RTK reference point. In order to set control at CRMSBA-SM-14, a GPS static network survey was performed. NGS Monuments C 279, J 370 and N 367 were used as primary benchmarks for the control survey. Observations of 4 hour duration were simultaneously collected on these 3 monuments along with CRMSBA-SM-14. Observations were observed on different days at different times to ensure different satellite geometry. The following table shows the published and utilized coordinates for N 367 and the adjusted coordinates for CRMSBA-SM-14.

PROJECT PRIMARY CONTROL POINTS

Mark	*LA State Plane (NAD83)*		*Latitude*	*Longitude*	*NAVD88 Elevation (US Feet)*
	Northing (US Feet)	*Easting (US Feet)*			
N 367	314,850.54	3,878,540.64	29˚21’08.29719”N	089˚27’25.67584”W	0.97
CRMSBA-SM-14	275,747.43	3,881,961.64	29˚14’40.68730”N	089˚26’54.29218”W	1.83

STAFF GAGE

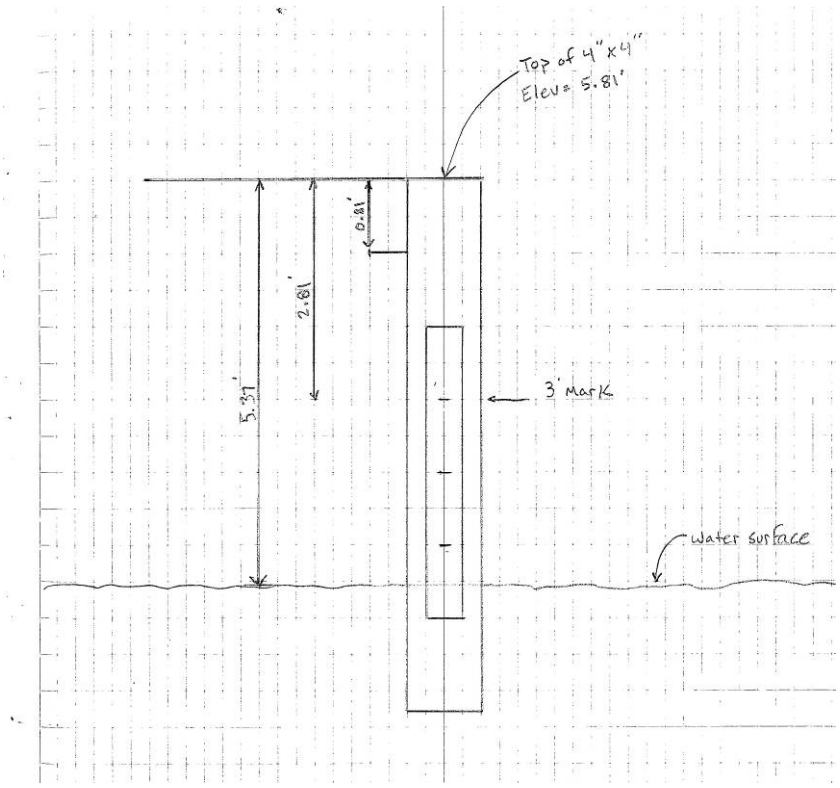
A staff gage was established near the north end of the project at 29˚19'00.8818"N, 089˚28'52.7953"W. The gage plate is a fiberglass plate attached to a 4" x 4" treated timber post. The gage was surveyed into the SLCW Secondary Network using N 367 as the reference point. The gage was established as a means of monitoring Mean High Water (MHW) and Mean Low Water (MLW) elevations throughout the duration of the survey effort. The table below shows gage readings during the survey effort.

STAFF GAGE DATA

Date	*AM Reading*		*PM Reading*		*Weather*
	Elev. (ft)	*Time*	*Elev. (ft)*	*Time*	
8-21-10	1.86	7:00 am	0.85	5:00 pm	Clear
8-22-10	1.65	7:23 am	1.00	5:00 pm	Clear
8-23-10	1.30	7:00 am	1.10	4:30 pm	Clear
8-25-10	1.30	9:00 am	1.20	5:00 pm	Clear & Windy
8-26-10	1.10	7:00 am	-	-	Cloudy, Rain after 9:30 am
8-30-10	1.00	10:15 am	0.90	5:15 pm	Partly Cloudy / AM Rain
8-31-10	1.40	7:00 am	0.70	5:30m	Partly Cloudy / Windy / Rainy
9-01-10	1.85	7:30 am	0.70	6:00 pm	Partly Cloudy
9-02-10	2.20	8:00 am	2.70	11:30 am	Partly Cloudy
9-08-10	1.70	11:00 am	-	-	Partly Cloudy
9-09-10	1.55	12:15 pm	1.50	4:45 pm	Partly Cloudy
9-10-10	1.10	8:00 am	1.60	5:30 pm	Partly Cloudy / Rainy
9-11-10	1.15	8:00 am	0.85	3:00 pm	Partly Cloudy
9-13-10	0.65	9:20 am	0.00	3:30 pm	Partly Cloudy
9-14-10	1.50	7:00 am	0.40	4:30 pm	AM Clear / PM Cloudy
9-15-10	1.60	7:30 am	0.50	5:15 pm	Partly Cloudy
9-16-10	1.90	7:30 am	1.00	2:30 pm	Clear
9-17-10	2.10	8:00 am	1.30	1:00 pm	Clear
9-22-10	1.80	8:00 am	1.50	4:30 pm	Partly Cloudy / Rainy
9-23-10	1.80	7:30 am	-	-	Clear

Staff Gauge

Staff Gauge



Staff Gauge Field Notes / Elevations

MARSH ELEVATION SURVEYS

Average marsh elevation survey shots were taken at three locations as identified by the OCPR. Twenty (20) shots were taken at each location. Shots were taken such that the tip of the rod was resting at the vegetation roots. GPS positions were collected using the Leica System 1200 GPS receivers in RTK mode Locations of the marsh elevation surveys are shown in the drawings included in Appendix C.

MARSH SITE 1			
Point No.	**Northing**	**Easting**	**Elev.**
2446	298,102.41	3,870,773.01	1.53
2447	298,069.21	3,870,766.92	1.40
2448	298,049.82	3,870,764.08	1.59
2449	298,030.27	3,870,760.73	1.18
2450	298,008.61	3,870,756.41	0.57
2451	298,137.82	3,870,775.46	1.10
2452	298,162.93	3,870,778.67	1.06
2453	298,182.67	3,870,782.20	1.48
2454	298,203.28	3,870,785.45	1.62
2455	298,062.51	3,870,851.94	1.40
2456	298,066.98	3,870,819.72	1.82
2457	298,075.56	3,870,809.19	1.77
2458	298,092.25	3,870,788.15	1.45
2459	298,108.09	3,870,757.84	1.06
2460	298,113.78	3,870,742.59	1.25
2461	298,091.63	3,870,729.84	1.69
2462	298,076.34	3,870,712.05	1.44
2463	298,058.10	3,870,689.53	1.58
2464	298,078.05	3,870,663.21	1.23
2465	298,112.94	3,870,661.04	1.60
2466	298,158.40	3,870,677.92	1.44
Average	**298,097.22**	**3,870,754.57**	**1.39**

MARSH SITE 2			
Point No.	**Northing**	**Easting**	**Elev.**
2425	292,262.22	3,873,558.32	1.18
2426	292,257.05	3,873,538.60	1.41
2427	292,245.08	3,873,519.54	1.41
2428	292,222.69	3,873,519.20	1.02
2429	292,201.60	3,873,516.22	1.22
2430	292,264.60	3,873,520.59	1.46
2431	292,286.63	3,873,521.23	1.24
2432	292,283.74	3,873,538.72	1.23
2433	292,285.38	3,873,560.00	1.46
2434	292,305.75	3,873,559.08	1.12
2435	292,294.47	3,873,579.68	1.17
2436	292,308.28	3,873,591.83	0.51
2437	292,282.35	3,873,596.80	0.83
2438	292,317.59	3,873,537.57	1.32
2439	292,326.88	3,873,508.64	1.29
2440	292,348.19	3,873,484.78	1.55
2441	292,196.85	3,873,560.03	1.70
2442	292,175.38	3,873,549.40	1.03
2443	292,193.24	3,873,587.44	1.13
2444	292,200.10	3,873,605.56	1.39
2445	292,183.54	3,873,620.51	1.12
Average	**292,259.12**	**3,873,551.13**	**1.23**

MARSH SITE 3			
Point No.	**Northing**	**Easting**	**Elev.**
602	289,603.09	3,875,803.58	1.26
603	289,614.54	3,875,815.73	0.82
604	289,610.35	3,875,829.47	0.97
605	289,622.92	3,875,818.08	0.63
606	289,591.05	3,875,792.80	0.57
607	289,589.16	3,875,819.96	0.22
608	289,573.01	3,875,850.40	1.40
609	289,523.30	3,875,895.00	0.68
610	289,586.72	3,875,926.08	0.76
611	289,628.09	3,875,927.41	0.64
612	289,668.25	3,875,929.12	0.47
613	289,686.53	3,875,907.80	0.30
614	289,698.17	3,875,854.18	0.75
615	289,691.55	3,875,814.32	0.16
616	289,657.76	3,875,782.62	0.39
617	289,622.75	3,875,761.70	0.82
618	289,586.25	3,875,740.92	0.76
619	289,565.57	3,875,688.72	0.62
620	289,606.08	3,875,683.47	0.15
621	289,671.63	3,875,660.17	0.42
622	289,715.52	3,875,663.76	0.79
623	289,760.01	3,875,664.26	0.75
Average	**289,630.56**	**3,875,801.34**	**0.65**

MARSH SITE 4			
Point No.	**Northing**	**Easting**	**Elev.**
582	281,094.11	3,873,780.71	1.09
583	281,109.06	3,873,769.69	0.95
584	281,125.89	3,873,756.84	1.11
585	281,151.55	3,873,742.33	0.86
586	281,162.84	3,873,760.28	1.06
587	281,143.88	3,873,775.90	1.14
588	281,127.53	3,873,789.19	1.10
589	281,107.11	3,873,800.75	0.96
590	281,088.60	3,873,811.29	0.93
591	281,065.84	3,873,818.23	0.88
592	281,046.58	3,873,825.72	0.64
593	281,037.62	3,873,805.17	1.09
594	281,058.57	3,873,798.38	0.95
595	281,077.40	3,873,791.08	0.94
596	281,068.53	3,873,769.38	1.28
597	281,087.30	3,873,758.61	1.31
598	281,104.56	3,873,748.86	1.13
599	281,120.55	3,873,739.08	1.03
600	281,074.93	3,873,755.65	1.13
601	281,107.52	3,873,818.09	1.01
Average	**281,098.00**	**3,873,780.76**	**1.03**

TRANSECT / BATHYMETRIC SURVEY

Cross section transects were run as directed by OCPR and are shown in the project drawings in Appendix C. Forty One (41) marsh transects, fifty-five (55) bayou transects, twenty (20) additional transects including existing ridge and spoil bank profiles, six (6) ideal ridge cross sections were surveyed by Sigma. Bathymetric data was collected using an Odom Hydrotrac Portable Echosounder (No. 10584) and 2000KHz Transducer (No. TR.6618). GPS positioning was collected using Leica System 1200 GPS receivers in RTK mode. Overbank portions of transects and areas of shallow water were collected using the Leica System 1200 GPS receivers in RTK mode.

Shots were taken at 25 foot minimum intervals, with additional shots collected at grade breaks.

Transect coordinates are shown in individual data sets identified by Transect No. and are included in Appendix D.

MISCELLANEOUS TOPOGRAPHY

General features and potential obstructions for the marsh and ridge restoration project were surveyed in the field. These features are shown in the Topography Survey (Sheet 2 of 2) drawing shown in Appendix C.

MAGNETOMETER SURVEY

A magnetometer survey for the Grand Liard Marsh and Ridge Restoration project was conducted to identify potential existing pipelines and other obstructions within the project area. A GEOMETRICS-858 Cesium magnetometer on board a 28’ Aluminum Hull Survey vessel along with a 17’ Gator Tail vessel for the shallow water areas were used to conduct the survey. The Magnetometer survey was conducted along pre-established grid lines, which are shown on the attached map, and all anomalies shown were investigated by means of a 25’ radius surveyed around the anomaly and by manual probing methods for pipelines. Horizontal positions for the survey were derived utilizing the C-NAV 2050 DGPS with stated sub-meter accuracy. A map of the magnetometer survey transect lines, magnetometer hits, and located pipelines is included in Appendix C. Points identified as “Mag Hit” indicate that a magnetic anomaly was detected; however, the anomaly was too deep to locate with a probe.

AERIAL PHOTOGRAPHY OVERLAY

The 2008 Digital Orthographic Quarter Quads for the Triumph and Pass Tante Phine quadrangle maps were used as background photography for the survey maps included in this report. Sigma has projected these photographs to the Louisiana Coordinate System of 1983 (NAD83) – South Zone (1702) in US Feet. A combined mosaic of these raster images was generated and is provided in the electronic deliverables.

ELECTRONIC DELIVERABLES

As defined in the scope of work, Sigma is submitting the following electronic data on a CD:

- Survey Methodology Report
- Survey Plan View Drawings
- Transect Cross Sections Drawings
- Data Sets Separated by Transect (PNEZD Comma Delimited ASCII Files)

Also included in the electronic deliverables is an AutoDesk Land Development Desktop XML Report of all points, point groups, alignments, cross sections and digital terrain models prepared by Sigma during the course of the project. This data may be imported into the LDNR Land Development Desktop / Civil 3D software to seamlessly transfer the survey data into the design project.

Appendix A

PERMISSION & ACCESS LETTERS

Appendix B

PROJECT CONTROL DATASHEETS

Appendix C

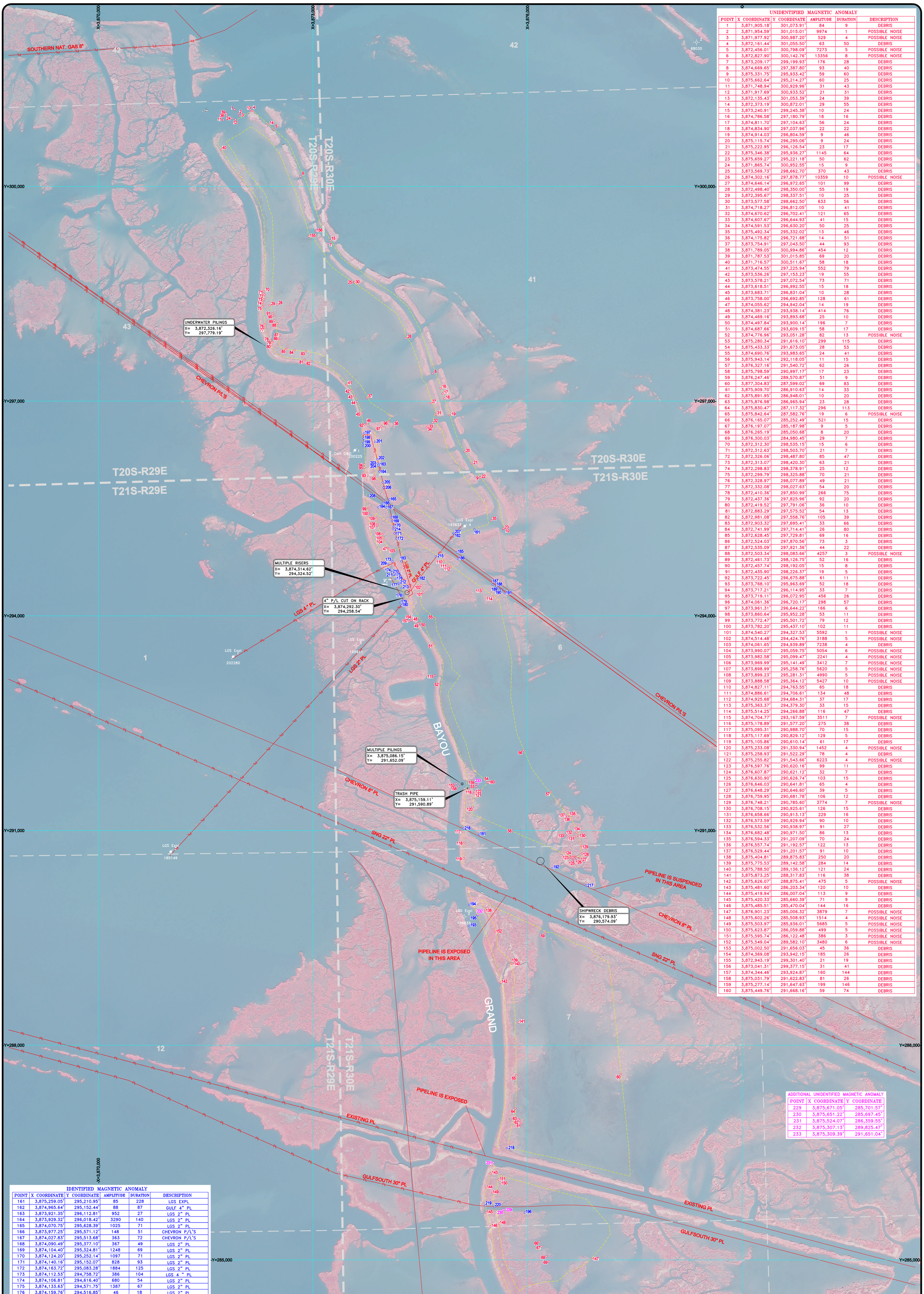
Project Drawings

Appendix D

Survey Data Sets

Appendix E

Field Notes



UNIDENTIFIED MAGNETIC ANOMALY

POINT	X COORDINATE	Y COORDINATE	AMPLITUDE	DURATION	DESCRIPTION
1	3,871,905.18'	301,073.91'	84	9	DEBRIS
2	3,871,954.59'	301,015.01'	9974	1	POSSIBLE NOISE
3	3,871,977.92'	300,987.20'	529	4	POSSIBLE NOISE
4	3,872,161.44'	301,055.50'	63	50	DEBRIS
5	3,872,456.01'	300,798.09'	7273	5	POSSIBLE NOISE
6	3,872,827.90'	300,142.76'	13356	8	POSSIBLE NOISE
7	3,873,209.17'	299,199.93'	176	28	DEBRIS
8	3,874,669.65'	297,387.80'	93	40	DEBRIS
9	3,875,331.75'	295,933.42'	59	60	DEBRIS
10	3,875,662.64'	295,214.27'	60	25	DEBRIS
11	3,871,748.94'	300,929.96'	31	43	DEBRIS
12	3,871,917.69'	300,933.52'	21	31	DEBRIS
13	3,872,135.43'	301,053.39'	24	39	DEBRIS
14	3,872,373.19'	300,872.01'	29	55	DEBRIS
15	3,873,240.91'	299,245.38'	10	24	DEBRIS
16	3,874,786.58'	297,180.79'	18	16	DEBRIS
17	3,874,811.70'	297,104.63'	56	24	DEBRIS
18	3,874,834.90'	297,037.96'	22	22	DEBRIS
19	3,874,914.03'	296,804.59'	9	46	DEBRIS
20	3,875,115.74'	296,295.06'	9	24	DEBRIS
21	3,875,222.95'	296,126.54'	23	17	DEBRIS
22	3,875,346.38'	295,936.27'	1145	64	DEBRIS
23	3,875,659.27'	295,221.18'	50	62	DEBRIS
24	3,871,865.74'	300,952.55'	15	9	DEBRIS
25	3,873,569.73'	298,662.70'	370	43	DEBRIS
26	3,874,302.16'	297,878.77'	10359	10	POSSIBLE NOISE
27	3,874,646.14'	296,972.65'	101	99	DEBRIS
28	3,872,498.40'	298,350.00'	55	19	DEBRIS
29	3,872,395.67'	298,337.51'	10	25	DEBRIS
30	3,873,577.58'	298,662.50'	633	56	DEBRIS
31	3,874,718.27'	296,812.05'	10	41	DEBRIS
32	3,874,670.62'	296,702.41'	121	65	DEBRIS
33	3,874,607.67'	296,644.93'	41	15	DEBRIS
34	3,874,591.53'	296,630.20'	50	25	DEBRIS
35	3,875,492.34'	295,332.02'	13	46	DEBRIS
36	3,874,175.82'	296,721.68'	14	51	DEBRIS
37	3,873,754.91'	297,043.50'	44	93	DEBRIS
38	3,871,789.05'	300,994.86'	454	12	DEBRIS
39	3,871,787.53'	301,015.85'	69	20	DEBRIS
40	3,871,716.57'	300,511.67'	58	18	DEBRIS
41	3,873,474.55'	297,225.94'	552	79	DEBRIS
42	3,873,536.26'	297,153.23'	19	55	DEBRIS
43	3,873,578.21'	297,072.54'	73	71	DEBRIS
44	3,873,618.51'	296,992.55'	15	18	DEBRIS
45	3,873,683.71'	296,831.04'	10	28	DEBRIS
46	3,873,758.00'	296,692.85'	128	61	DEBRIS
47	3,874,055.62'	294,942.04'	14	19	DEBRIS
48	3,874,381.23'	293,938.14'	414	76	DEBRIS
49	3,874,469.16'	293,893.68'	25	10	DEBRIS
50	3,874,497.84'	293,900.14'	196	7	DEBRIS
51	3,874,687.66'	293,609.15'	58	17	DEBRIS
52	3,874,776.96'	293,051.28'	82	13	POSSIBLE NOISE
53	3,875,280.34'	291,616.10'	299	115	DEBRIS
54	3,875,433.33'	291,673.05'	28	53	DEBRIS
55	3,874,690.76'	293,983.65'	24	41	DEBRIS
56	3,875,943.14'	292,118.05'	11	15	DEBRIS
57	3,876,327.16'	291,540.72'	62	26	DEBRIS
58	3,875,798.59'	290,997.17'	17	23	DEBRIS
59	3,876,247.46'	289,570.87'	51	9	DEBRIS
60	3,877,304.83'	287,599.02'	69	83	DEBRIS
61	3,875,909.70'	286,910.63'	14	33	DEBRIS
62	3,875,891.95'	286,948.01'	10	20	DEBRIS
63	3,875,876.98'	286,965.94'	23	28	DEBRIS
64	3,875,830.47'	287,117.32'	296	113	DEBRIS
65	3,875,842.64'	287,582.76'	19	6	POSSIBLE NOISE
66	3,876,165.07'	285,252.49'	521	15	DEBRIS
67	3,876,197.07'	285,187.98'	9	5	DEBRIS
68	3,876,265.19'	285,050.68'	8	20	DEBRIS
69	3,876,300.03'	284,980.45'	29	7	DEBRIS
70	3,872,312.30'	298,535.15'	15	6	DEBRIS
71	3,872,312.63'	298,503.70'	21	7	DEBRIS
72	3,872,326.06'	298,487.80'	85	47	DEBRIS
73	3,872,313.07'	298,420.30'	63	21	DEBRIS
74	3,872,298.83'	298,378.91'	25	12	DEBRIS
75	3,872,299.79'	298,325.88'	70	21	DEBRIS
76	3,872,328.97'	298,077.89'	49	21	DEBRIS
77	3,872,332.08'	298,027.63'	54	20	DEBRIS
78	3,872,410.36'	297,850.99'	266	75	DEBRIS
79	3,872,437.36'	297,825.96'	92	20	DEBRIS
80	3,872,419.52'	297,791.06'	36	10	DEBRIS
81	3,872,883.29'	297,575.52'	54	13	DEBRIS
82	3,872,981.08'	297,558.76'	105	39	DEBRIS
83	3,872,903.32'	297,695.41'	33	66	DEBRIS
84	3,872,741.99'	297,714.41'	26	80	DEBRIS
85	3,872,628.45'	297,729.81'	69	16	DEBRIS
86	3,872,524.03'	297,870.56'	73	3	DEBRIS
87	3,872,535.09'	297,921.36'	44	22	DEBRIS
88	3,872,503.34'	298,083.66'	4257	3	POSSIBLE NOISE
89	3,872,461.73'	298,126.75'	52	16	DEBRIS
90	3,872,457.74'	298,192.05'	15	8	DEBRIS
91	3,872,435.90'	298,226.37'	19	5	DEBRIS
92	3,873,722.45'	296,675.88'	61	11	DEBRIS
93	3,873,768.10'	295,963.69'	52	18	DEBRIS
94	3,873,717.21'	296,114.95'	33	7	DEBRIS
95	3,873,719.11'	296,072.95'	456	26	DEBRIS
96	3,874,061.36'	296,720.17'	298	57	DEBRIS
97	3,873,961.31'	296,644.22'	166	6	DEBRIS
98	3,873,860.64'	295,952.28'	53	11	DEBRIS
99	3,873,772.47'	295,501.72'	79	12	DEBRIS
100	3,873,782.20'	295,437.10'	102	11	DEBRIS
101	3,874,540.27'	294,327.53'	5592	1	POSSIBLE NOISE
102	3,874,514.48'	294,424.76'	3188	5	POSSIBLE NOISE
103	3,874,061.65'	294,939.89'	7238	4	DEBRIS
104	3,873,990.07'	295,059.75'	5054	6	POSSIBLE NOISE
105	3,873,982.58'	295,099.47'	2241	4	POSSIBLE NOISE
106	3,873,969.99'	295,141.49'	3412	7	POSSIBLE NOISE
107	3,873,898.99'	295,258.76'	5620	5	POSSIBLE NOISE
108	3,873,899.23'	295,281.31'	4990	5	POSSIBLE NOISE
109	3,873,888.58'	295,364.12'	5427	10	POSSIBLE NOISE
110	3,874,827.11'	294,763.55'	65	18	DEBRIS
111	3,874,886.61'	294,706.61'	134	48	DEBRIS
112	3,874,925.68'	294,684.31'	37	17	DEBRIS
113	3,875,363.37'	294,379.30'	33	15	DEBRIS
114	3,875,514.25'	294,266.88'	116	47	DEBRIS
115	3,874,704.77'	293,167.59'	3511	7	POSSIBLE NOISE
116	3,875,178.89'	291,577.20'	275	38	DEBRIS
117	3,875,095.31'	290,988.70'	70	15	DEBRIS
118	3,875,117.69'	290,829.12'	129	5	DEBRIS
119	3,875,105.86'	290,610.14'	61	17	DEBRIS
120	3,875,233.08'	291,330.94'	1452	4	POSSIBLE NOISE
121	3,875,258.93'	291,522.29'	78	4	DEBRIS
122	3,875,255.82'	291,543.66'	6223	4	POSSIBLE NOISE
123	3,876,597.76'	290,620.16'	99	11	DEBRIS
124	3,876,607.87'	290,621.12'	32	7	DEBRIS
125	3,876,630.90'	290,626.74'	103	15	DEBRIS
126	3,876,646.03'	290,641.81'	65	4	DEBRIS
127	3,876,648.29'	290,646.60'	39	5	DEBRIS
128	3,876,759.95'	290,681.78'	106	12	DEBRIS
129	3,876,748.21'	290,785.60'	3774	7	POSSIBLE NOISE
130	3,876,708.15'	290,925.61'	126	15	DEBRIS
131	3,876,658.66'	290,913.13'	229	16	DEBRIS
132	3,876,573.59'	290,929.94'	90	10	DEBRIS
133	3,876,532.56'	290,938.97'	91	27	DEBRIS
134	3,876,682.48'	290,971.50'	86	13	DEBRIS
135	3,876,594.33'	291,207.09'	70	24	DEBRIS
136	3,876,557.74'	291,192.57'	122	13	DEBRIS
137	3,876,529.44'	291,201.57'	91	10	DEBRIS
138	3,875,404.81'	289,875.83'	250	20	DEBRIS
139	3,875,775.53'	289,142.58'	284	14	DEBRIS
140	3,875,788.50'	289,136.12'	121	24	DEBRIS
141	3,875,873.25'	288,317.83'	116	38	DEBRIS
142	3,875,626.07'	288,875.41'	475	5	POSSIBLE NOISE
143	3,875,481.60'	286,203.34'	120	10	DEBRIS
144	3,875,419.94'	286,007.04'	113	9	DEBRIS
145	3,875,420.33'	285,660.39'	71	9	DEBRIS
146	3,875,485.51'	285,470.04'	144	16	DEBRIS
147	3,876,901.23'	285,006.32'	3879	7	POSSIBLE NOISE
148	3,875,602.26'	285,508.93'	1514	4	POSSIBLE NOISE
149	3,875,503.97'	285,936.01'	5685	5	POSSIBLE NOISE
150	3,875,623.87'	286,059.88'	499	5	POSSIBLE NOISE
151	3,875,595.74'	286,122.48'	386	3	POSSIBLE NOISE
152	3,875,549.04'	289,582.10'	3480	6	POSSIBLE NOISE
153	3,875,002.50'	291,656.03'	45	36	DEBRIS
154	3,874,369.08'	293,942.15'	185	26	DEBRIS
155	3,872,943.19'	299,301.40'	21	19	DEBRIS
156	3,873,041.31'	299,377.15'	31	41	DEBRIS
157	3,874,344.46'	293,924.87'	160	144	DEBRIS
158	3,875,031.79'	291,622.83'	81	26	DEBRIS
159	3,875,277.14'	291,647.63'	199	146	DEBRIS
160	3,875,449.76'	291,668.16'	59	74	DEBRIS

ADDITIONAL UNIDENTIFIED MAGNETIC ANOMALY

POINT	X COORDINATE	Y COORDINATE
229	3,875,671.05'	285,701.57'
230	3,875,651.22'	285,697.45'
231	3,875,524.07'	286,359.55'
232	3,875,307.13'	289,825.47'
233	3,875,309.39'	291,651.04'

IDENTIFIED MAGNETIC ANOMALY

POINT	X COORDINATE	Y COORDINATE	AMPLITUDE	DURATION	DESCRIPTION
161	3,875,259.05'	295,210.95'	85	228	LGS EXPL
162	3,874,965.64'	295,152.44'	88	87	GULF 4" PL
163	3,873,921.35'	296,112.81'	952	27	LGS 2" PL
164	3,873,929.32'	296,018.42'	3290	140	LGS 2" PL
165	3,874,070.75'	295,628.39'	1025	71	LGS 2" PL
166	3,873,977.25'	295,571.12'	148	51	CHEVRON P/L'S
167	3,874,027.83'	295,513.68'	363	72	CHEVRON P/L'S
168	3,874,090.49'	295,377.10'	367	49	LGS 2" PL
169	3,874,104.40'	295,324.81'	1248	69	LGS 2" PL
170	3,874,124.20'	295,252.14'	1097	71	LGS 2" PL
171	3,874,140.16'	295,152.07'	828	93	LGS 2" PL
172	3,874,163.72'	295,083.28'	1884	125	LGS 2" PL
173	3,874,112.53'	294,758.72'	386	104	LGS 4 " PL
174	3,874,106.81'	294,616.40'	680	54	LGS 2" PL
175	3,874,133.63'	294,571.75'	1387	67	LGS 2" PL
176	3,874,159.76'	294,516.85'	46	18	LGS 2" PL
177	3,874,195.02'	294,447.61'	423	69	LGS 2" PL
178	3,874,261.46'	294,290.16'	245	84	GULF 4" PL
179	3,874,223.06'	294,180.40'	90	31	LGS 2" PL
180	3,874,237.96'	294,140.37'	745	85	LGS 2" PL
181	3,875,325.07'	290,940.91'	703	72	CHEVRON 8" PL
182	3,874,476.08'	294,509.60'	239	32	GULF 4" PL
183	3,874,238.19'	294,764.18'	2234	132	LGS 2" PL
184	3,873,914.65'	295,513.59'	528	26	LGS 2" PL
185	3,875,014.56'	294,887.27'	698	67	CHEVRON P/L'S
186	3,875,028.67'	294,795.32'	1196	117	CHEVRON P/L'S
187	3,875,514.72'	294,438.16'	578	67	CHEVRON P/L'S
188	3,875,565.47'	294,411.05'	1646	48	CHEVRON P/L'S
189	3,875,594.11'	294,389.01'	1715	43	CHEVRON P/L'S
190	3,875,635.12'	294,361.01'	4768	68	CHEVRON P/L'S
191	3,875,680.36'	294,318.13'	2913	115	CHEVRON P/L'S
192	3,876,349.85'	290,476.28'	33	94	SHIP WRECK DEBRIS
193	3,875,191.02'	289,666.70'	36589	171	LGS EXPL 189835
194	3,875,185.71'	289,961.70'	69	27	LGS EXPL 189835
195	3,875,300.66'	289,815.17'	1147	189	LGS EXPL
196	3,875,962.03'	285,661.77'	1133	88	GULFSOUTH 30" PL
197	3,873,715.00'	296,549.46'	918	50	CARL O&G
198	3,873,709.23'	296,477.81'	1173	97	CARL O&G
199	3,873,706.44'	296,414.45'	1832	32	CARL O&G 200225
200	3,873,703.72'	296,373.02'	1998	141	CARL O&G 200225
201	3,873,865.16'	296,432.53'	156	63	LGS 2" PL
202	3,873,901.64'	296,189.26'	459	45	LGS 2" PL
203	3,873,905.12'	296,128.47'	246	45	LGS 2" PL
204	3,873,911.21'	296,099.29'	184	36	LGS 2" PL
205	3,873,974.21'	295,865.58'	2068	65	LGS 2" PL
206	3,873,989.79'	295,790.76'	2141	29	LGS 2" PL
207	3,874,965.78'	295,157.16'	130	45	GULF 4" PL
208	3,873,768.25'	295,673.50'	141	5	CHEVRON P/L'S
209	3,874,048.81'	294,727.13'	1214	59	LGS 4 " PL
210	3,874,108.38'	294,607.33'	1142	40	LGS 2" PL
211	3,874,127.68'	294,575.23'	976	55	CARL O&G 188441
212	3,874,199.61'	294,458.82'	373	69	LGS 2" PL
213	3,874,238.43'	294,389.91'	53	23	LGS 2" PL
214	3,874,119.68'	295,216.39'	884	62	LGS 2" PL
215	3,874,717.12'	294,832.87'	111	29	GULF 4" PL
216	3,875,099.79'	291,028.77'	134	52	CHEVRON 8" PL
217	3,876,817.42'	290,230.70'	357	37	CHEVRON 8" PL
218	3,875,712.39'	286,561.30'	96	12	EXISTING PL
219	3,875,409.51'	285,760.59'	415	63	GULFSOUTH 30" PL
220	3,875,541.25'	285,739.22'	515	118	GULFSOUTH 30" PL
221	3,874,792.40'	281,715.22'	104	57	HVL PL
222	3,874,817.92'	281,360.92'	1689	98	HVL PL
223	3,874,803.67'	281,511.68'	858	108	HVL PL
224	3,874,778.01'	281,807.52'	773	78	HVL PL
225	3,874,770.31'	281,881.20'	432	58	HVL PL
226	3,874,757.78'	282,074.95'	1060	72	HVL PL
227	3,874,744.66'	282,195.97'	3049	113	HVL PL
228	3,874,716.12'	282,490.92'	1073	97	HVL PL

HVL PL

POINT	X COORDINATE	Y COORDINATE	WATER DEPTH	COVER
1	3,874,799.15'	281,562.69'	2.5'	5.5'
2	3,874,794.94'	281,608.86'	5.1'	4.0'
3	3,874,783.43'	281,739.61'	10.1'	9.7'
4	3,874,778.98'	281,803.59'	3.3'	5.4'
5	3,874,758.04'	282,059.27'	4.0'	2.3'

LAMBERT GRID NORTH
NAD 1983 LA. S.Z.

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600' 0' 600'
SCALE IN FEET

SIGMA CONSULTING GROUP 10305 Airline highway Baton Rouge, LA 70816		MAGNETOMETER SURVEY Bayou Grand Liard Field Plaquemines Parish, Louisiana	
PREPARED BY C&C Technologies SURVEY SERVICES 730 E. KALISTE SALOOM ROAD, LAFAYETTE, LA. (337) 261-0660 LA. REGISTRATION NUMBER: 330	JOB NO. 120173 DWG: PBH CHK: BCH FILENAME: L:\20s30e\120173\120173-83.dwg	REVISED:	DATE: 04/18/2012 SHEET 1 OF 1