



BAYOU DE CADE RIDGE AND MARSH CREATION PROJECT
(TE-0138)
SURVEY PROJECT REPORT
OII-LND-186333-RPT-01

Client:	Coastal Protection and Restoration Authority
Client Document Number:	TE-0138
Project Name:	BAYOU DECADE RIDGE AND MARSH CREATION PROJECT
Vessel:	
Location:	Terrebonne Parish, Louisiana

Rev	Reason For Issue	Author	Reviewed	Approved	Rev Date
1	SURVEY REPORT	VIT	AO	AN	5/25/2018

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1.0 INTRODUCTION

1.1 Project Description

Oceaneering International, Inc. was contracted by the State of Louisiana, Office of Coastal Protection and Restoration (herein referred to as CPRA) to provide survey services for the Bayou De Cade Ridge and Marsh Creation Project (TE-0138). This entailed providing a detailed topographic, bathymetric and magnetometer survey of the proposed borrow area as well as the proposed marsh creation areas as shown on the drawings outlined in Appendix "D" of the original Scope of Work provided by CPRA. The project site is located in Terrebonne Parish, approximately 12 miles West of Dulac, LA, immediately West of Lake De Cade and located at approximately Lat. 29°22'37.23" N and Long. 90°05'0.39" W (NAD).

Landowner information was provided to Oceaneering by CPRA in the Scope of Work under subsection 4.1 Permission and Access. In accordance with the Scope of Work Oceaneering contacted the landowner (Apache Louisiana Minerals LLC, c/o: Tim Allen) and secured the necessary permission for access throughout the project.

Notice to Proceed was received by Oceaneering in late September 2017. Permission and landowner access work began shortly thereafter. Field data acquisition began on October 5, 2017 and ran through November 3, 2017 then was temporarily suspended from November 4, 2017 through December 3, 2017 due to duck hunting season. Field data acquisition resumed on December 4, 2017 and ran through December 28, 2017. Due to unforeseen circumstances that came up throughout the course of the project additional funding was required to complete the project. Field crews were unable to work 4 days due to fog. Field crews also had 4 extra days investigating magnetometer anomalies in the marsh portion of the project due to the amount trash and debris in the marsh and along the banks of the canals. After additional funding was approved by CPRA, field data acquisition resumed on February 19, 2018 and ran through February 28, 2018. A total of 48 days for the field surveys were estimated in the initial proposal and the survey was actually completed in 52 days.

These surveys required that mud line elevations and bathymetry be collected at 25 ft. intervals along the transects or where elevation changes of greater than 0.5 ft. would occur. Data points were to be taken along pre-determined survey grid lines provided by CPRA. In addition, Magnetometer readings were to be taken along these and other pre-determined lines. A 25 ft. closed loop path was ran around each anomaly discovered in the designated magnetometer area. In addition, any surface obstructions were to be surveyed and water surface elevations recorded during field operations.

Surface features adjacent to the project area where surveyed as per the scope of work subsection 4.6. This included but was not limited to existing camps, utilities infrastructure, trees, signage and any other surface and underground features located during the duration of the project.



1.2 Vicinity Map (Overview)

2.0 EQUIPMENT & METHODOLOGY

2.1 Magnetometer & Topographic Surveys (Fill Area)

The survey was performed on board an airboat, shallow draft flat bottom jon boat and by foot. All data collected for the field surveys was done so using the Lambert Conformal Conic Projection. Horizontal coordinates referenced to Louisiana State Plane Coordinate System South Zone (1702), NAD 83 (2011) while all elevations referenced to The North American Vertical Datum of 1988 (Geoid 12a).



A Geometrics G-858 cesium vapor magnetometer integrated with a Leica Geosystems Real-Time Kinematics (RTK) Global Positioning System (GPS) was the primary survey equipment utilized for field data acquisition. The tow fish was mounted on a plastic kayak and pulled from the stern of the airboat/jon boat at a distance (layback) of 89.8' along the predetermined mag lines to prevent any interference from the vessel. RTK GPS data from the Leica GS14 was input into Hypack data collection software to correlate the vessel position with the towfish. Leica's GS14 system was used at base station(s) and also used for the rovers obtaining field shots.



2.2 Bathymetric & Magnetometer Survey (Borrow Area)

Water depths were collected utilizing a 26' aluminum hull survey vessel with an Odom Echotrac 3200 digital fathometer. Incoming data from the Echotrac was uploaded real time into the Hypack vessel navigation software so that water depths would be recorded and merged with the Leica RTK position at each 25' event (fix). While the majority of the borrow area maintained an average water depth of -3.9 we did record a high and low depth of -2.7' and -6.6' within the survey area.



A Geometrics 882 Cesium Vapor Marine Magnetometer was used to conduct the magnetometer portion of the borrow area survey. The tow fish was pulled from the stern of the vessel at a distance (layback) of 81' along the provided transect lines to prevent any interference from the vessel. RTK GPS data from the Leica GS14 was input into Hypack data collection software to correlate the vessel position with the towfish.

2.3 Survey Control

The first phase of the Marsh Creation survey was to verify the Horizontal and Vertical position of the Secondary Monuments provided in the Scope of Work being designated as "TE34 SM 01" and "TE28 SM A" which would be used as the primary benchmarks for the survey. As part of this task order Oceaneering was instructed to update the positions of these monuments and provide new datasheets based on our static observations performed (see Appendix B). This was accomplished by running a series of independent static sessions each consisting of a minimum of four hours on different days with different satellite constellations on the monuments. Data collection for this and all phases of the Marsh Creation survey was performed using a Leica GS14 RTK GPS. The data was then post processed individually utilizing Online Positioning User Service (OPUS). The results of this process with the published information, individual OPUS solutions and the average OPUS solution is shown below.

Base Point 1	PT#	X	Diff X	Y	Diff Y	Elev	Diff Elev	Data Source
TE34-SM-01		3408657.28		315518.71		0.82		Monument datasheet
OPUS 10/09/2017		3408657.36	-0.08	315518.79	-0.08	0.39	0.43	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/11/2017		3408657.40	-0.12	315518.80	-0.09	0.40	0.42	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/11/2017		3408657.41	-0.13	315518.79	-0.08	0.37	0.45	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/12/2017		3408657.41	-0.13	315518.79	-0.08	0.38	0.44	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/13/2017		3408657.41	-0.13	315518.77	-0.06	0.36	0.46	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/14/2017		3408657.41	-0.13	315518.80	-0.09	0.42	0.40	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/15/2017		3408657.45	-0.17	315518.80	-0.09	0.51	0.31	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/16/2017		3408657.40	-0.12	315518.79	-0.08	0.37	0.45	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/17/2017		3408657.41	-0.13	315518.78	-0.07	0.38	0.44	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/18/2017		3408657.41	-0.13	315518.79	-0.08	0.33	0.49	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/19/2017		3408657.41	-0.13	315518.78	-0.07	0.34	0.48	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/20/2017		3408657.40	-0.12	315518.78	-0.07	0.34	0.48	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/21/2017		3408657.55	-0.27	315518.76	-0.05	0.29	0.53	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/22/2017		3408657.40	-0.12	315518.79	-0.08	0.33	0.49	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/24/2017		3408657.40		315518.78			0.82	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
Average Solution		3408657.41	-0.13	315518.79	-0.08	0.37	0.47	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)

Base Point 2	PT#	X	Diff X	Y	Diff Y	Elev	Diff Elev	Data Source
TE28-SM-A		3408054.70		324457.88		1.53		Monument Datasheet (Geoid 12A height)
OPUS 10/05/2017		3408054.71	-0.01	324457.90	-0.02	0.96	0.57	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/11/2017		3408054.70	0.00	324457.82	0.07	1.44	0.09	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/12/2017		3408054.67	0.03	324457.87	0.01	1.53	0.00	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/16/2017		3408054.70	0.00	324457.85	0.03	1.50	0.03	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS 10/17/2017		3408054.71	-0.01	324457.84	0.04	1.53	0.00	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)Precise
OPUS Average Solution		3408054.70	0.00	324457.85	-8939.07	1.39	0.14	Ref Frame: NAD_83 (2011) (EPOCH: 2010)(GEOID12B)



TOP OF WATER SHOTS	Point#	X	Y	Elev	Comment
10/09/2017 (C Bullard)JD-282	860-450	3416675.65	331230.58	2.03	WBY WATER_SURFACE CANAL 1000
10/09/2017 (C Bullard)JD-282	860-781	3416548.25	330790.53	2.24	WBY WATER_SURFACE CANAL 1200
10/09/2017 (C Bullard)JD-282	860-966	3416683.79	331231.19	1.95	WBY WATER_SURFACE CANAL 1400
10/10/2017 (C Bullard)JD-283	860-969	3408068.56	324457.50	2.22	WBY WATER_SURFACE CANAL 0754
10/10/2017 (C Bullard)JD-283	860-2066	3416692.86	331224.77	2.01	WBY WATER_SURFACE CANAL 1153
10/10/2017 (C Bullard)JD-283	860-2613	3408074.99	324462.86	2.00	WBY WATER_SURFACE CANAL 1505
10/10/2017 (J Marks)JD-283	876-1403	3408091.08	324458.79	2.27	WBY WATER_SURFACE CANAL 0755
10/10/2017 (J Marks)JD-283	876-2826	3416579.11	320839.99	1.96	WBY WATER_SURFACE CANAL 1403
10/10/2017 (J Marks)JD-283	876-2827	3408072.26	324461.23	1.92	WBY WATER_SURFACE CANAL 1505
10/11/2017 (C Bullard)JD-284	860-2617	3408071.12	324459.72	1.93	WBY WATER_SURFACE CANAL 0759
10/11/2017 (C Bullard)JD-284	860-3603	3415651.69	327470.68	1.86	WBY WATER_SURFACE CANAL 1244
10/11/2017 (C Bullard)JD-284	860-3939	3415650.08	327488.92	1.83	WBY WATER_SURFACE CANAL 1412
10/11/2017 (J Marks)JD-284	876-2830	3408071.06	324459.50	2.21	WBY WATER_SURFACE CANAL 0800
10/11/2017 (J Marks)JD-284	876-3218	3408064.67	324454.35	1.80	WBY WATER_SURFACE CANAL 1500
10/12/2017 (C Bullard)JD-285	860-3942	3408071.02	324450.86	2.02	WBY WATER_SURFACE CANAL 0757
10/12/2017 (C Bullard)JD-285	860-3943	3416009.34	327720.43	1.97	WBY WATER_SURFACE CANAL 0828
10/12/2017 (C Bullard)JD-285	860-4803	3415758.44	327596.06	1.92	WBY WATER_SURFACE CANAL 1300
10/12/2017 (C Bullard)JD-285	860-5113	3408067.93	324455.20	1.69	WBY WATER_SURFACE CANAL 1430
10/12/2017 (J Marks)JD-285	876-3221	3408071.11	324450.89	1.99	WBY WATER_SURFACE CANAL 0800
10/12/2017 (J Marks)JD-285	876-3747	3416802.73	322914.03	1.82	WBY WATER_SURFACE CANAL 1258
10/13/2017 (C Bullard)JD-286	860-5116	3408065.04	324455.72	1.96	WBY WATER_SURFACE CANAL 0758
10/13/2017 (C Bullard)JD-286	860-5117	3415998.13	327715.78	1.89	WBY WATER_SURFACE CANAL 0825
10/13/2017 (C Bullard)JD-286	860-5933	324460.13	324460.13	1.92	WBY WATER_SURFACE CANAL 1200
10/13/2017 (J Marks)JD-286	876-4086	3408064.68	324454.38	1.90	WBY WATER_SURFACE CANAL 0800
10/13/2017 (J Marks)JD-286	876-4367	3408072.30	324460.30	1.99	WBY WATER_SURFACE CANAL 1200
10/14/2017 (C Bullard)JD-287	860-5936	3408064.30	324455.14	1.91	WBY WATER_SURFACE CANAL 0806
10/14/2017 (C Bullard)JD-287	860-5937	3416019.06	327716.47	1.82	WBY WATER_SURFACE CANAL 0830
10/14/2017 (C Bullard)JD-287	860-6578	3415928.99	324095.65	1.86	WBY WATER_SURFACE CANAL 1305
10/14/2017 (C Bullard)JD-287	860-6840	3408064.58	324452.42	1.87	WBY WATER_SURFACE CANAL 1433
10/14/2017 (J Marks)JD-287	876-4370	3408064.61	324454.26	1.91	WBY WATER_SURFACE CANAL 0807
10/14/2017 (J Marks)JD-287	876-4881	3414742.31	318390.74	1.51	WBY WATER_SURFACE CANAL 1005
10/14/2017 (J Marks)JD-287	876-4882	3415680.26	322319.18	1.31	WBY WATER_SURFACE CANAL 1015-INSIDE MARSH
10/14/2017 (J Marks)JD-287	876-5014	3408075.69	324461.01	1.72	WBY WATER_SURFACE CANAL 1433
10/15/2017 (C Bullard)JD-288	860-6843	3408064.59	324455.59	1.90	WBY WATER_SURFACE CANAL 0811
10/15/2017 (C Bullard)JD-288	860-6844	3415751.38	324280.57	1.95	WBY WATER_SURFACE CANAL 0827
10/15/2017 (C Bullard)JD-288	860-7463	3415751.54	324259.25	2.01	WBY WATER_SURFACE CANAL 1238
10/15/2017 (C Bullard)JD-288	860-7575	3408053.68	324448.88	2.18	WBY WATER_SURFACE CANAL 1336
10/15/2017 (J Marks)JD-288	876-5018	3408064.98	324454.96	1.89	WBY WATER_SURFACE CANAL 0.811
10/15/2017 (J Marks)JD-288	876-5194	3408064.18	324457.05	2.09	WBY WATER_SURFACE CANAL 1330
10/16/2017 (C Bullard)JD-289	860-7576	3408064.38	324452.16	1.76	WBY WATER_SURFACE CANAL 0749
10/16/2017 (C Bullard)JD-289	860-7577	3415754.40	324267.22	1.68	WBY WATER_SURFACE CANAL 0835
10/16/2017 (C Bullard)JD-289	860-8003	3414657.39	321242.33	1.52	WBY WATER_SURFACE CANAL 1255



10/16/2017 (C Bullard)JD-289	860-8100	3408065.39	324451.97	1.31	WBY EDGE_OF_WATER CANAL 1443
10/16/2017 (J Marks)JD-289	876-5197	3408060.36	324447.67	1.766	WBY WATER_SURFACE CANAL 0751
10/16/2017 (J Marks)JD-289	876-5521	3408063.80	324450.69	1.305	WBY WATER_SURFACE CANAL 1500
10/17/2017 (C Bullard)JD-290	860-8103	3408062.97	324449.26	1.17	WBY WATER_SURFACE CANAL 0804
10/17/2017 (C Bullard)JD-290	860-8104	3414654.71	321241.63	1.27	WBY WATER_SURFACE CANAL 0836
10/17/2017 (C Bullard)JD-290	860-8522	3414657.00	321243.05	1.36	WBY WATER_SURFACE CANAL 1247
10/17/2017 (C Bullard)JD-290	860-8708	3408063.94	324451.15	1.40	WBY WATER_SURFACE CANAL 1435
10/17/2017 (J Marks)JD-290	876-5524	3408062.76	324447.95	1.18	WBY WATER_SURFACE CANAL 0805
10/17/2017 (J Marks)JD-290	876-5959	3408064.22	324451.60	1.41	WBY WATER_SURFACE CANAL 1450
10/18/2017 (C Bullard)JD-291	860-8710	3408063.52	324451.03	1.57	WBY WATER_SURFACE CANAL 0746
10/18/2017 (C Bullard)JD-291	860-8711	3416172.42	323265.07	1.48	WBY WATER_SURFACE CANAL 0817
10/18/2017 (C Bullard)JD-291	860-9210	3408063.97	324451.11	1.28	WBY WATER_SURFACE CANAL 1314
10/18/2017 (J Marks)JD-291	876-5961	3408062.01	324449.60	1.62	WBY WATER_SURFACE CANAL 0755
10/18/2017 (J Marks)JD-291	876-6256	3408066.87	324454.28	1.32	WBY WATER_SURFACE CANAL 1345
10/19/2017 (J Marks)JD-292	876-6258	3408063.99	324451.60	1.60	WBY WATER_SURFACE CANAL 0752
10/19/2017 (J Marks)JD-292	876-6864	3408065.19	324452.10	1.47	WBY WATER_SURFACE CANAL 1415
10/20/2017 (J Marks)JD-293	876-6867	3408063.85	324451.68	1.52	WBY WATER_SURFACE CANAL 0745
10/20/2017 (J Marks)JD-293	876-7096	3408063.87	324450.96	1.38	WBY WATER_SURFACE CANAL 1445
10/21/2017 (J Marks)JD-294	876-7097	3408063.11	324457.31	2.01	WBY WATER_SURFACE CANAL 0745
10/21/2017 (J Marks)JD-294	876-7738	3408063.09	324451.42	1.85	WBY WATER_SURFACE CANAL 1430
10/22/2017 (J Marks)JD-295	876-7740	3408062.34	324457.86	2.12	WBY WATER_SURFACE CANAL 0745
10/22/2017 (J Marks)JD-295	876-8239	3408068.81	324453.52	1.87	WBY WATER_SURFACE CANAL 1315
10/22/2017 (J Marks)JD-295	876-8240	3408069.00	324453.57	1.81	WBY WATER_SURFACE CANAL 1316
10/23/2017 (J Hardy)JD-296	872-661	3408065.46	324452.28	1.49	WBY WATER_SURFACE CANAL 0811
10/23/2017 (J Hardy)JD-296	872-1351	3417458.38	324896.00	1.36	WBY WATER_SURFACE CANAL 1307
10/23/2017 (J Hardy)JD-296	872-1586	3408064.79	324451.14	1.27	WBY WATER_SURFACE CANAL 1446
10/24/2017 (J Marks)JD-297	876-8758	3408067.85	324452.77	1.57	WBY WATER_SURFACE CANAL 0826
10/24/2017 (J Marks)JD-297	876-9578	3408067.11	324454.46	1.19	WBY WATER_SURFACE CANAL 1431
10/24/2017 (J Hardy)JD-297	872-1589	3408064.66	324451.90	1.50	WBY WATER_SURFACE CANAL 0824
10/24/2017 (J Hardy)JD-297	872-2111	3408066.83	324454.34	1.24	WBY WATER_SURFACE CANAL 1430
10/25/2017 (J Marks)JD-298	876-9580	3408063.78	324449.83	0.99	WBY WATER_SURFACE CANAL 0758
10/25/2017 (J Marks)JD-298	876-9790	3408063.89	324449.59	0.91	WBY WATER_SURFACE CANAL 1034
10/25/2017 (J Hardy)JD-298	872-2113	3408071.62	324458.15	0.91	WBY WATER_SURFACE CANAL 0757
10/25/2017 (J Hardy)JD-298	872-2337	3408063.83	324449.78	0.87	WBY WATER_SURFACE CANAL 1033
10/30/2017 (C Bullard)JD-303	860-9213	3408072.80	324450.15	0.75	WBY WATER_SURFACE CANAL 0940
10/30/2017 (C Bullard)JD-303	860-9214	3408074.70	324457.63	0.73	WBY WATER_SURFACE CANAL 1402
10/31/2017 (C Bullard)JD-304	860-9217	3408064.48	324448.97	0.66	WBY WATER_SURFACE CANAL 0828
10/31/2017 (C Bullard)JD-304	860-9218	3408574.18	313867.72	0.54	WBY WATER_SURFACE CANAL 1233
10/31/2017 (C Bullard)JD-304	860-9220	3408066.94	324450.74	0.59	WBY WATER_SURFACE CANAL 1359
11/01/2017 (C Bullard)JD-305	860-9222	3408073.25	324449.92	0.87	WBY WATER_SURFACE CANAL 0828
11/01/2017 (C Bullard)JD-305	860-9223	3408073.89	324448.61	0.86	WBY WATER_SURFACE CANAL 1135
11/02/2017 (J Hardy)JD-306	872-2382	3408068.18	324454.25	0.77	WBY WATER_SURFACE CANAL 0814
11/02/2017 (J Hardy)JD-306	872-2383	3408069.01	324454.49	0.59	WBY WATER_SURFACE CANAL 1430
11/03/2017 (J Hardy)JD-307	872-2385	3408072.70	324450.70	0.40	WBY WATER_SURFACE CANAL 0816
11/03/2017 (J Hardy)JD-307	872-2388	3408072.79	324450.92	0.32	WBY WATER_SURFACE CANAL 1200
11/04/2017 (J Hardy)JD-310	872-2390	3408066.83	324453.86	1.02	WBY WATER_SURFACE CANAL 0741
11/04/2017 (J Hardy)JD-310	872-2392	3408064.04	324450.18	0.54	WBY WATER_SURFACE CANAL 1430

11/07/2017 (J Hardy)JD-311	872-2394	3408067.28	324452.50	1.00	WBY WATER_SURFACE CANAL 0757
11/07/2017 (J Hardy)JD-311	872-2395	3408072.87	324450.47	0.19	WBY WATER_SURFACE CANAL 1500
11/08/2017 (J Hardy)JD-312	872-2398	3408067.09	324452.38	0.78	WBY WATER_SURFACE CANAL 0800
11/08/2017 (J Hardy)JD-312	872-2400	3408068.65	324454.59	1.16	WBY WATER_SURFACE CANAL 1037
11/08/2017 (J Hardy)JD-312	872-2401	3408073.17	324449.95	0.85	WBY WATER_SURFACE CANAL 1500
11/09/2017 (J Hardy)JD-313	872-2404	3408068.84	324454.20	1.01	WBY WATER_SURFACE CANAL 0821
11/09/2017 (J Hardy)JD-313	872-2501	3408072.95	324450.39	0.80	WBY WATER_SURFACE CANAL 1300
11/10/2017 (J Hardy)JD-314	872-2504	3408073.00	324450.17	1.13	WBY WATER_SURFACE CANAL 0754
11/10/2017 (J Hardy)JD-314	872-2530	3408068.81	324454.55	1.03	WBY WATER_SURFACE CANAL 1030
11/20/2017 (J Hardy)JD-324	872-2533	3408063.88	324449.45	0.78	WBY WATER_SURFACE CANAL - 0730
11/20/2017 (J Hardy)JD-324	872-2534	3421357.08	322917.02	0.56	WBY WATER_SURFACE CANAL - 1229
11/20/2017 (J Hardy)JD-324	872-2536	3408067.89	324450.20	0.56	WBY WATER_SURFACE CANAL - 1332
			Avg=	1.46	

2.4 Staff Gages, Marsh Creation, Average Marsh Elevation

Staff Gages

As instructed in the Scope of Work, a project Staff Gage was set inside of the marsh fill area and one was also set outside of the fill area. Both gages were established with “gage zero” at an elevation of 0.0’ NAVD88 (Geoid 12A). The gages were set referenced to the published datasheet information for monument “TE34 SM 01” dated May 2014, established by John Chance Land Surveys, Inc. The locations of the gages are listed and shown in the pictures below.



Gage #1	
X=	3414732.88
Y=	318395.58



Gage #2	
X=	3411271.96
Y=	317915.76

Marsh Creation Fill Area Surveys

In order to conduct the Topographic survey along the transect lines provided, the beginning and ending line data was exported out of Cad into an ascii format so that it could be uploaded into a handheld data collector. With the use of an airboat, Leica RTK GPS and Monument TE-34 for horizontal and vertical control, the survey crew began the task of collecting data along the transect lines within the fill area. Data points consisting of position, elevation and water depth (where applicable) were stored at 25' intervals. A fixed height survey pole with a 6" round foot was used.

Average Marsh Elevation Surveys

Average Marsh Elevation Surveys were conducted on November 9 & 10 2017 on five pre-determined sites provided by CPRA. The results of these surveys along with photographs of each site are shown as follows:

Station:	Marsh Site #1			
Date:	11/9/2018			
Monument:	TE-34 SM01			
	315518.71	3408657.28	0.82	Monument datasheet
	Northing	Easting	Elev. FT	
Point Number	LA SZ NAD83 FT	LA SZ NAD83 FT	NAVD88	Code



872-2426	329427.19	3415861.5	0.90	OTH TOP ROOTS
872-2425	329404.72	3415829.71	0.84	OTH TOP ROOTS
872-2422	329348.15	3415818.94	0.81	OTH TOP ROOTS
872-2421	329375.26	3415850.14	0.79	OTH TOP ROOTS
872-2420	329404.2	3415881.02	0.91	OTH TOP ROOTS
872-2419	329434.37	3415913.4	0.94	OTH TOP ROOTS
872-2413	329356.05	3415931.5	0.92	OTH TOP ROOTS
872-2412	329324.19	3415902.55	0.98	OTH TOP ROOTS
872-2411	329295.77	3415875.61	0.84	OTH TOP ROOTS
872-2410	329267.5	3415912.39	0.85	OTH TOP ROOTS
872-2409	329301.37	3415941.33	0.77	OTH TOP ROOTS
872-2423	329353.51	3415765.08	0.79	OTH TOP ROOTS
872-2424	329378.23	3415794.95	0.75	OTH TOP ROOTS
872-2408	329330.48	3415965.7	0.75	OTH TOP ROOTS
872-2407	329357.75	3415988.51	0.82	OTH TOP ROOTS
872-2414	329390.17	3415963.29	1.01	OTH TOP ROOTS
872-2405	329417.61	3416039.86	0.86	OTH TOP ROOTS
872-2416	329448.67	3416012.95	0.85	OTH TOP ROOTS
872-2417	329480.76	3415968.15	0.71	OTH TOP ROOTS
872-2428	329485.45	3415929.38	0.99	OTH TOP ROOTS
872-2418	329456.96	3415940.28	0.89	OTH TOP ROOTS
872-2427	329456.92	3415896.54	0.83	OTH TOP ROOTS
872-2415	329419.93	3415987.37	1.02	OTH TOP ROOTS
872-2406	329388.01	3416013.43	0.80	OTH TOP ROOTS
Avarage Marsh Elevation Site #1			0.85	

Station:	Marsh Site #2			
Date:	11/9/2018			
Monument:	TE-34 SM01			
	315518.71	3408657.28	0.82	Monument datasheet
	Northing	Easting	Elev. FT	
Point Number	LA SZ NAD83 FT	LA SZ NAD83 FT	NAVD88	Code
872-2452	3413968.36	327193.02	0.79	OTH TOP ROOTS
872-2451	3413988.94	327229.24	0.90	OTH TOP ROOTS
872-2450	3414009.08	327261.52	0.83	OTH TOP ROOTS
872-2449	3414026.19	327290.93	0.78	OTH TOP ROOTS
872-2448	3414048.62	327322.39	0.75	OTH TOP ROOTS
872-2447	3414078.87	327347.08	0.65	OTH TOP ROOTS
872-2446	3414049.61	327367.08	0.82	OTH TOP ROOTS



872-2445	3414024.53	327335.52	0.76	OTH TOP ROOTS
872-2444	3414005.04	327310.67	0.78	OTH TOP ROOTS
872-2443	3413989.53	327275.43	0.87	OTH TOP ROOTS
872-2442	3413974.23	327243.03	0.83	OTH TOP ROOTS
872-2441	3413953.18	327216.78	0.81	OTH TOP ROOTS
872-2440	3413923.39	327232.38	0.96	OTH TOP ROOTS
872-2439	3413939.69	327261.09	0.76	OTH TOP ROOTS
872-2438	3413958.98	327290.98	0.70	OTH TOP ROOTS
872-2437	3413981.42	327322.62	0.78	OTH TOP ROOTS
872-2436	3414002.81	327355.46	0.95	OTH TOP ROOTS
872-2435	3414017	327390.76	0.95	OTH TOP ROOTS
872-2434	3413996.54	327406.09	0.84	OTH TOP ROOTS
872-2433	3413976.55	327374.88	0.90	OTH TOP ROOTS
872-2432	3413956.72	327344.48	0.77	OTH TOP ROOTS
872-2431	3413937.54	327312.65	0.88	OTH TOP ROOTS
872-2430	3413917.98	327279.51	0.85	OTH TOP ROOTS
872-2429	3413899.09	327252.89	0.77	OTH TOP ROOTS
Avarage Marsh Elevation Site #2			0.82	

Station:	Marsh Site #3			
Date:	11/10/2018			
Monument:	TE-34 SM01			
	315518.71	3408657.28	0.82	Monument datasheet
	Northing	Easting	Elev. FT	
Point Number	LA SZ NAD83 FT	LA SZ NAD83 FT	NAVD88	Code
872-2529	3416407.26	325660.82	0.98	OTH TOP ROOTS
872-2528	3416392.35	325630.25	0.91	OTH TOP ROOTS
872-2527	3416377.59	325595.34	0.70	OTH TOP ROOTS
872-2519	3416347.11	325591.98	0.56	OTH TOP ROOTS
872-2518	3416366.33	325630.75	0.52	OTH TOP ROOTS
872-2517	3416370.31	325662.89	0.66	OTH TOP ROOTS
872-2516	3416309.07	325668.27	0.75	OTH TOP ROOTS
872-2515	3416299.56	325635.94	0.79	OTH TOP ROOTS
872-2514	3416289.47	325598.86	0.76	OTH TOP ROOTS
872-2507	3416312.33	325588.43	0.66	OTH TOP ROOTS
872-2506	3416323.15	325622.94	0.67	OTH TOP ROOTS
872-2505	3416333.7	325659.59	0.88	OTH TOP ROOTS
872-2526	3416365.39	325561.7	0.55	OTH TOP ROOTS
872-2525	3416358.44	325524.64	1.02	OTH TOP ROOTS



872-2521	3416328.33	325527.57	0.60	OTH TOP ROOTS
872-2520	3416337.3	325560.34	0.48	OTH TOP ROOTS
872-2524	3416345.75	325501.21	0.91	OTH TOP ROOTS
872-2512	3416261.5	325521.04	0.71	OTH TOP ROOTS
872-2511	3416248.26	325484.01	0.56	OTH TOP ROOTS
872-2510	3416277.04	325479.04	0.70	OTH TOP ROOTS
872-2509	3416289.14	325513.46	0.79	OTH TOP ROOTS
872-2522	3416312.75	325488.04	0.64	OTH TOP ROOTS
872-2523	3416331.51	325470.01	0.67	OTH TOP ROOTS
872-2513	3416276.67	325559.65	0.59	OTH TOP ROOTS
872-2508	3416301.98	325551.74	0.58	OTH TOP ROOTS
Average Marsh Elevation Site #3			0.70	

Station:	Marsh Site #4			
Date:	11/9/2018			
Monument:	TE-34 SM01			
	315518.71	3408657.28	0.82	Monument datasheet
	Northing	Easting	Elev. FT	
Point Number	LA SZ NAD83 FT	LA SZ NAD83 FT	NAVD88	Code
872-2476	3412683.27	324145.91	0.77	OTH TOP ROOTS
872-2475	3412668.68	324176.86	0.70	OTH TOP ROOTS
872-2474	3412655.71	324206.23	0.79	OTH TOP ROOTS
872-2473	3412634.88	324232.58	0.75	OTH TOP ROOTS
872-2472	3412615.94	324261.6	0.79	OTH TOP ROOTS
872-2471	3412594.99	324287.96	0.84	OTH TOP ROOTS
872-2470	3412579.28	324317.27	0.83	OTH TOP ROOTS
872-2469	3412564.97	324342.16	0.93	OTH TOP ROOTS
872-2468	3412537.63	324333.26	0.85	OTH TOP ROOTS
872-2467	3412557.89	324303.79	0.86	OTH TOP ROOTS
872-2466	3412573.9	324277.33	0.70	OTH TOP ROOTS
872-2465	3412592.98	324248.34	0.71	OTH TOP ROOTS
872-2464	3412617.89	324216.32	0.72	OTH TOP ROOTS
872-2463	3412636.67	324186.91	0.84	OTH TOP ROOTS
872-2462	3412649.61	324156.63	0.75	OTH TOP ROOTS
872-2461	3412664.42	324120.59	0.71	OTH TOP ROOTS
872-2460	3412623.05	324139.2	0.71	OTH TOP ROOTS
872-2459	3412602.37	324172.73	0.78	OTH TOP ROOTS
872-2458	3412584.89	324203.6	0.84	OTH TOP ROOTS
872-2457	3412565.94	324235.82	0.72	OTH TOP ROOTS



872-2456	3412544.59	324268.46	0.65	OTH TOP ROOTS
872-2455	3412521.98	324301.97	0.67	OTH TOP ROOTS
872-2454	3412497.89	324336.92	0.71	OTH TOP ROOTS
872-2453	3412477.57	324364.6	0.66	OTH TOP ROOTS
Avarage Marsh Elevation Site #4			0.76	

Station:	Marsh Site #5			
Date:	11/9/2018			
Monument:	TE-34 SM01			
	315518.71	3408657.28	0.82	Monument datasheet
	Northing	Easting	Elev. FT	
Point Number	LA SZ NAD83 FT	LA SZ NAD83 FT	NAVD88	Code
872-2500	3410450.09	318022.02	0.89	OTH TOP ROOTS
872-2499	3410468.32	318051.36	1.00	OTH TOP ROOTS
872-2498	3410488.82	318076.73	0.95	OTH TOP ROOTS
872-2497	3410511.37	318102.38	0.95	OTH TOP ROOTS
872-2496	3410530.4	318124.31	0.92	OTH TOP ROOTS
872-2495	3410550.57	318147.71	1.08	OTH TOP ROOTS
872-2494	3410593.25	318147.46	0.88	OTH TOP ROOTS
872-2493	3410569.22	318119.93	0.83	OTH TOP ROOTS
872-2492	3410551.84	318094.83	1.00	OTH TOP ROOTS
872-2491	3410533.21	318070.02	1.01	OTH TOP ROOTS
872-2490	3410509.04	318045.57	0.89	OTH TOP ROOTS
872-2489	3410491.75	318022.15	0.92	OTH TOP ROOTS
872-2488	3410511.93	318009.2	1.21	OTH TOP ROOTS
872-2487	3410532.7	318033.37	0.96	OTH TOP ROOTS
872-2486	3410554.7	318056.87	0.93	OTH TOP ROOTS
872-2485	3410574.52	318082.29	0.88	OTH TOP ROOTS
872-2484	3410595.15	318106.45	0.86	OTH TOP ROOTS
872-2483	3410617.5	318130.85	1.38	OTH TOP ROOTS
872-2482	3410537.22	317983.41	1.06	OTH TOP ROOTS
872-2481	3410560.57	318010.66	0.90	OTH TOP ROOTS
872-2480	3410582.06	318035.75	1.26	OTH TOP ROOTS
872-2479	3410605.83	318065.86	1.14	OTH TOP ROOTS
872-2478	3410626.28	318092.86	1.06	OTH TOP ROOTS
872-2477	3410645.35	318119.4	1.00	OTH TOP ROOTS
Avarage Marsh Elevation Site #5			0.99	





2.5 Magnetometer Survey Results

The magnetometer recorded three hundred and ninety-seven (397) unidentified magnetic anomalies in the study area (See Drawing Sheet 2). Two hundred sixty eight (268) of which were within the fill area and one hundred and five (105) were in the borrow area. The magnetometer also recorded 24 anomalies that were identified from previous data. All of the initial unidentified magnetic anomalies were investigated in the field. A number of the unidentified magnetic anomalies were determined to be existing pipelines and were hand probed to determine the depth of burial (See Drawings Sheets 3-4 and depth of cover csv files are found under PRELIMINARY SUBMITTAL 04-10-2018). The remaining unidentified magnetic anomalies do not correlate to known existing infrastructure and are likely associated with ferrous man-made objects, geologic in origin, or noise. Additionally, the unidentified magnetic anomalies are probably buried or underwater, since the ferrous objects were not found during the field investigation.

The amplitude and duration of a magnetic anomaly are dependent on several factors such as the ferromagnetic content of the object, its shape, size, and distance from the sensor. The nomogram in Illustration 1 below provides a visual reference between a ferrous source and amplitude of the magnetic anomaly generated when the sensor distance is known. Additionally, the unidentified magnetic anomalies with a larger duration distance suggest a greater distance between the ferrous object and the magnetic sensor. Several unidentified magnetic anomalies are located on the banks of the bayou and canals surrounding the fill area of the project area and have a magnetic intensity greater than 30 gammas. Each of the unidentified magnetic anomaly position, contact no., amplitude, and duration are mapped and listed in a table on the enclosed Map (See Drawings Sheets 2). The locations of all magnetic anomalies should be taken into consideration during the planned dredging-related activities and investigated or avoided as deemed appropriate by CPRA.

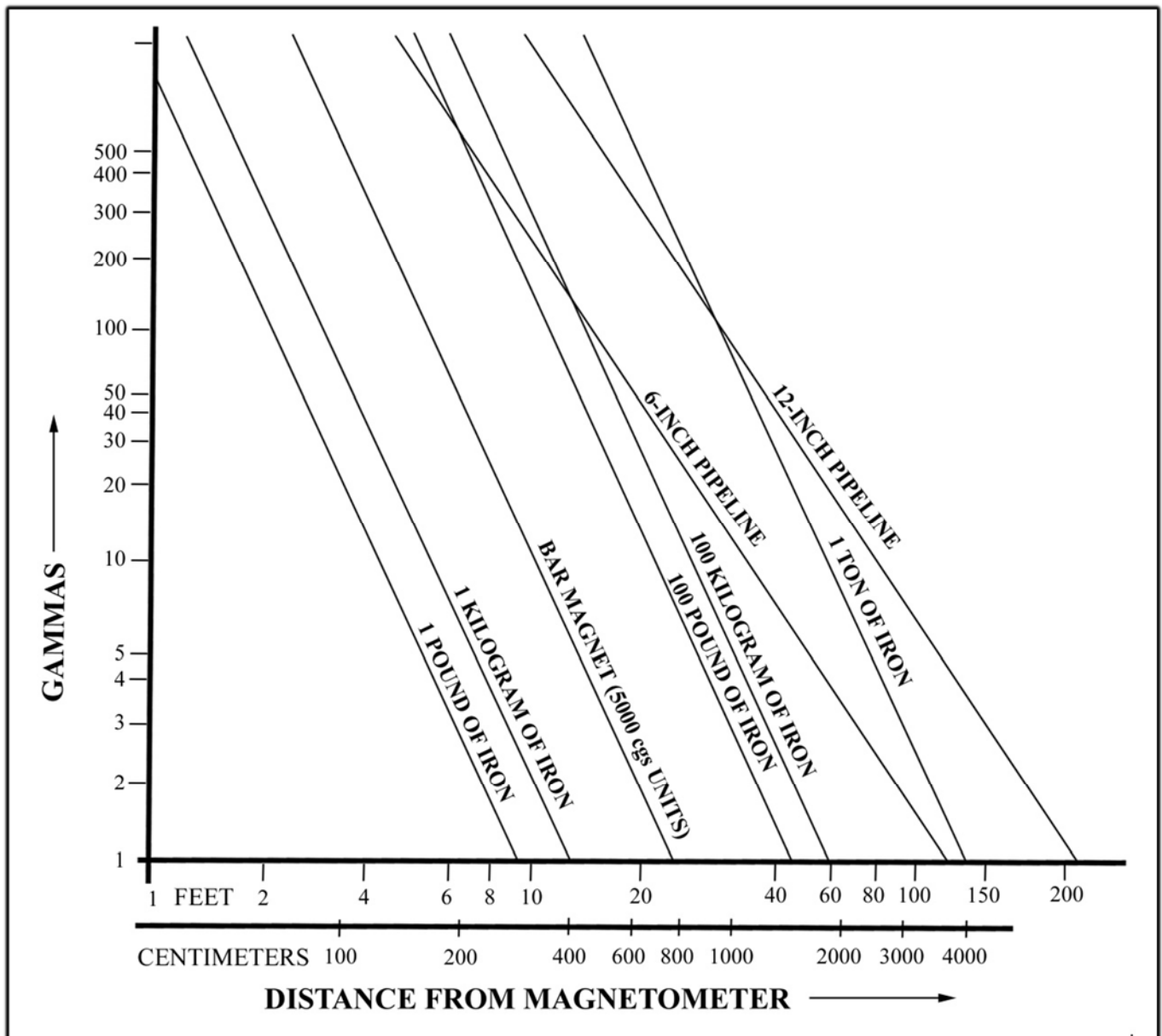


Illustration 1. Nomogram showing the magnetic intensity is proportional to the weight of the ferrous object, at a given distance (Breiner Nomogram, 1973).

Table 1: Referenced Documents

Ref. #	Document Number	Document Title	Rev.
1	<i>Project drawings</i>		
2	<i>Survey Control sheets and opus reports</i>		
3	<i>Survey Field notes</i>		
4			

3.0 PERSONNEL AND EQUIPMENT

Table 2: Survey Personnel

Position	Name
Sr. Manager	Ralph Coleman
Professional Land Surveyor	Michael J. Breaux
Project Manager	Adam Olivier
Asst. Project Manager	Vanessa Torres
Party Chief	James Marks
Party Chief	Justin Hardy
Party Chief	Cory Bullard

Table 3: Client Representation

Position	Name
Project Manager	April Newman
Project Manager	Chris Allen
Project Engineer	Travis Byland

4.0 GEODETIC CONTROL

4.1 Project Datum

Table 5: Horizontal Datum Parameters

Horizontal Datum Parameters	
Datum Name:	LA State Plane NAD83
Zone:	Louisiana South
Vertical Datum:	NAVD 88 (Geoid 12A)

5.0 CERTIFICATION

**X**

M. J. BREAUX
PROFESSIONAL LAND SURVEYOR

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