

APPENDIX A

TECHNICAL MEMORANDUM FOR COLE'S BAYOU DATA MINING AND GAP ANALYSIS

Technical Memorandum for Cole's Bayou Data Mining and Gap Analysis

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Cole's Bayou Marsh Restoration Project (TV-63), Vermilion Parish, Louisiana
G.E.C., Inc. Contract No. 2503-12-21

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Executive Summary

Dynamic Solutions, LLC (DSLCC) performed data mining and gap analysis that included a comprehensive search for the most recent bathymetry, topography, aerial photography, water level, salinity, and sediment data available to support a hydrodynamic modeling study as part of the Cole's Bayou Marsh restoration project.

As part of this effort, DSLCC evaluated the capabilities of applicable multi-dimensional hydrodynamic modeling software codes and recommended the ADaptive Hydraulics (ADH) modeling software for the Cole's Bayou application. The ADH modeling software was chosen to simulate the hydrodynamics in and around the project area because of its capability to handle wetting and drying, complex flows associated with hydraulic structures, and intricate model domains. The ADH software is also open source, has been successfully used for a number of recent coastal marsh applications in Louisiana, and has broad acceptance by CPRA and Federal agencies.

In conclusion, the results of the data mining and data gap analysis indicated that sufficient bathymetric, hydrodynamic, salinity, and suspended sediment data do not currently exist to appropriately model conditions in the project area. A series of maps was prepared to illustrate the proposed locations of water level and salinity measurement stations as well as sediment sampling stations that will provide the data necessary to develop a representative hydrodynamic model of the study area.

Introduction

The Cole's Bayou Marsh Restoration site is located on the Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermilion Basin, immediately east of Freshwater Bayou Canal (**Figure 1**). Wetlands in Cole's Bayou are undergoing land loss at -0.42% per year based on 1983 to 2011 USGS data from the extended boundary. Wetland loss processes in this area include subsidence, sediment deficit, interior ponding and pond enlargement, and storm impacts resulting in rapid episodic losses. Additionally, significant interior marsh loss has resulted from salt water intrusion and hydrologic changes associated with increasing tidal influence. As hydrology in this area has been modified, habitats have shifted to more of a floatant marsh type, resulting in increased vulnerability to tidal energy and storm damages. Habitat shifts and hydrologic stress reduce marsh productivity, a critical component of vertical accretion in wetlands.

The specific goals of the project are: 1) create 365 acres of brackish marsh in recently formed shallow open water; 2) nourish 53 acres of existing brackish marsh; and 3) increase freshwater and sediment inflow into interior wetlands by improving project area hydrology.

A set of hydrodynamic model simulations (potentially 5-8) are planned to provide the information needed to support design of the project features and evaluate the hydraulic impacts of planned site modifications. In support of the hydrodynamic model development, a data mining and gap analysis task

was performed. This document provides the results of the data mining and gap analysis task and specifically provides:

- a description of the data identified and collected during the task,
- a recommended hydrodynamic modeling tool for the project,
- a description of gaps in the available data needed to support the hydrodynamic modeling effort, and
- a description of the type and locations of the additional data needed to support the hydrodynamic modeling effort.

Data Mining

The following section describes the data that were collected and evaluated as part of the data mining and gap analysis task.

Aerial Photography

Aerial photography has been collected from two sources, LSU ATLAS (LSU, 2005) for 2005 and the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) publications for 2008 (Coastal Wetlands Planning, 2008). These images are in DOQQ format that contain ortho-rectified aerial photography at a resolution of 1 meter. Since an orthophoto shows features that may be omitted on maps, they can be used as a base image to assemble, review, and make reasonable estimates of topography or bathymetry in areas where hard data is unavailable. Additionally, the resulting image provides visual information for the extraction and revision of base cartographic information.

Figure 2 is a set of paired DOQQ images showing significant land loss in the project area. While there is a trend of land loss on the east side of Freshwater Bayou, land gains can be seen on the west side of Freshwater Bayou from the project area, as shown in **Figure 3**. The land gain in that area can be explained by the benefits of ME-04 Freshwater Bayou Wetland Protection project detailed in CPRA (2008).

Topography and Bathymetry

The Louisiana State University (LSU) ATLAS database (LSU, 2005) is the primary source of topography and covers almost all land area in Vermilion Parish. Although this data set remains the most complete available, the 2005 data does not include any topographic or bathymetry changes from Hurricanes Katrina, Rita, Ike, or Gustav. Utilizing this data should be done with caution.

NOAA conducted LiDAR surveys in 2009 to assess the impacts of hurricanes Ike and Gustav on the area. In Vermilion Parish these LiDAR surveys did not cover the project area and are limited to the Gulf of Mexico shoreline.

Bathymetric data is not available for the wetland section of the project area or the adjacent reaches of the Freshwater Bayou. Bathymetry for Vermilion Bay is available via the NOAA database. The United States Army Corps of Engineers (USACE) regularly surveys the Freshwater Bayou Channel to monitor channel conditions and dredging requirements. The condition survey data can be found on USACE New Orleans District website (USACE, 2012). The USACE dataset does not provide bathymetric data of sufficient quality to rely upon solely because surveys are not done from bank to bank, thereby missing parts of the Canal at each cross-section. However, these surveys may yield valuable supplemental information to survey data collected, as they show the relative historical change in the Freshwater Bayou Canal. This information could be useful for assessing rates of erosion and deposition computed by the numerical model.

Tidal and Meteorological Data

Four NOAA NOS stations exist within the project area, shown in **Figure 4**. The details of the data available at each station are shown in **Table 1**. The Freshwater Canal Locks (FWL, NOS 8766072) station is presently active and records meteorological data. The Cypremort Point station (NOS 8765251) has verified water level data from 10/2005 – 10/2010 from NOAA, but is now active through the USGS as site 07387040, Vermilion Bay near Cypremort. Predicted tidal data exists for all stations.

Meteorological data for the project will be taken from the FWL station. The FWL station is located on the north side of the lock structure. The ongoing verified stage data at FWL and USGS 07387040 can be used as a water level calibration station and may be used to aid in developing the open water boundary condition for the model.

Water Levels

All available water level data available from USGS and SONRIS for Vermilion Parish is shown in **Figure 5**. **Table 2** shows the time period of collection and number of data points for each station. There is no water level data available within the boundaries of the project area. Data in open water near the project area would be useful for model calibration, but most of the SONRIS and CRMS stations are within marsh areas, not in open water. USGS station 07387050 (Vermilion Bay near Intracoastal City) is active and records water level information based on a known datum. Station CRMS0541 CR-H01 lies in open water near Southwest Pass and is active. It currently records hourly water level information and a survey was performed in 2009 to check the station datum. A USACE gage (76592) exists just upstream of the Freshwater Canal Locks that can provide water level information at the south end of Freshwater Bayou. These three stations will prove valuable for calibrating water levels near the project area.

Salinity

Salinity data available from USGS and SONRIS for Vermilion Parish can be seen in **Figure 6**. **Table 3** shows the time period of collection on number for data points for each station. There is no salinity data available within the boundaries of the project area. Data in open water near the project area could be useful for model calibration, but most of the SONRIS and CRMS stations are within marsh areas, not in open water. USGS station 07387050 (Vermilion Bay near Intracoastal City), USGS 07387040 (mentioned in the Tidal Data section), and station CRMS0541 CR-H01 lie in open water and actively collect salinity

data. The USACE stations near the Freshwater Canal Locks also record salinity data, and are active. These will prove useful for calibrating salinity in areas adjacent to Cole's Bayou.

Sediment Data

No suspended solid concentration data was found near the study area. The sediment data available is limited to soil pore water salinity and conductance parameters for one day only, October 4th 2007, at four locations in the northern portion of the study area (**Figure 7**). This data is not anticipated to be useful for modeling purposes.

Multi-Dimensional Hydrodynamic Model Selection

The following section provides a brief description of potentially applicable multi-dimensional hydrodynamic modeling software. **Table 4** provides a matrix of the models evaluated and their selected characteristics and capabilities.

ADCIRC

The ADvanced CIRCulation model (ADCIRC) is a 3-D depth integrated, barotropic time-dependent long-wave circulation model, and part of the Surface-water Modeling System (SMS). Water levels are calculated by the Generalized Wave-Continuity Equation and velocity using the momentum equations, both fully nonlinear. It is applicable for large open water (oceans and seas) and small estuarine systems. ADCIRC is particularly useful for modeling storm surge and wind-driven circulation. It is being used intensively by the USACE Engineering Research Development Center (ERDC) to estimate storm surge for the Atlantic and Gulf Coasts. The code is available for public use.

ADH

The ADaptive Hydraulics model (ADH) is a modern, multi-dimensional modeling system for saturated and unsaturated groundwater, overland flow, 3-D Navier-Stokes flow, and 2-D or 3-D shallow water problems. It is an open-source model that has been developed by the Coastal and Hydraulics Laboratory at the USACE's Engineer Research and Development Center. ADH can simulate the transport of conservative constituents, as well as sediment transport that is coupled to bed and hydrodynamic changes. The grid is automatically refined by normalizing results, computing an error quantity, and refining the grid based upon a user-specified error tolerance, drastically reducing computation time with little to no sacrifice in results (Tate et al., 2006). ADH models couple flow, salt transport, wetting and drying, wind effects, and are also able to simulate complex flows associated hydraulic structures. ADH is an open-source software.

Delft3-D

Delft3-D, created by Delft Hydraulics in the Netherlands, is a 3-D hydrodynamic, sediment transport, wave, water quality, and morphological development model for estuarine and coastal environments. It uses a curvilinear boundary-fitted grid with a constant number of layers. This model has been used throughout the world in coastal studies. It is a proprietary, closed source code.

EFDC

The Environmental Fluid Dynamics Code (EFDC) is a general-purpose modeling package for simulating 1-D, 2-D, or 3-D flow and transport in surface water systems including: rivers, lakes, estuaries, reservoirs, wetlands, and near-shore to shelf-scale coastal regions. The EFDC model was originally developed at the Virginia Institute of Marine Science for estuarine and coastal applications and is available as public domain software through the US EPA as part of the TMDL Toolkit.

The hydrodynamic model of EFDC accounts for the major physical processes that govern the barotropic and baroclinic components of water motion in natural water systems. State variables of EFDC include water temperature, salinity, water surface elevations, velocity/flow field, and sediment transport. Turbulent closure formulations are incorporated in the model to provide internal simulations of horizontal and vertical diffusion processes. The hydrodynamic model can be executed in two modes: (a) the results of the hydrodynamic model can be saved and used as input for the mass transport sub-models or (b) EFDC can be executed in a fully coupled mode with coupled simulations of hydrodynamics, sediment transport, toxic chemicals and water quality/eutrophication. EFDC has been extensively tested and documented and used in over 100 modeling studies.

MIKE 21/MIKE3 (DHI Models)

The MIKE 21 (2-D) and Mike 3 (3-D) models have been developed by the Danish Hydraulic Institute (DHI) for simulating hydrodynamics, waves, water quality, and sediment in both coastal and riverine environments. They have the ability to use flexible meshes (unstructured grids) to improve computational efficiency. These models have been used extensively throughout the world including studies by the USACE, USBR, and NASA. They are proprietary and closed source.

RMA2/RMA4

RMA2 is a 2-D depth-averaged finite element hydrodynamic model for computing unsteady water surface elevations and horizontal velocity for subcritical, free-surface flow. It solves the Reynolds form of the Navier-Stokes equations with eddy viscosity coefficients to define turbulence characteristics. RMA2 can simulate wetting and drying and marsh porosity and is therefore suited to computing hydrodynamics in tidal flats and wetlands. RMA4 is a companion constituent transport model that uses RMA2 hydrodynamics as input to a solution of the depth-averaged advection-diffusion equation. Meshes for the RMA code are unstructured and can contain both 1-D and 2-D elements. They are open-source. RMA models have been used to model alternatives for the Davis Pond Diversion.

RMA10/RMA11

RMA10 is a multi-dimensional hydrodynamic and sediment transport model with 1-D, 2-D, and 3-D capabilities within the same unstructured mesh to solve the shallow water form of the Reynolds/Navier-Stokes equations. It includes several optional turbulence closures and solves for the transport, deposition, and erosion of cohesive and non-cohesive sediment by currents and wave action. RMA11 is a companion constituent transport model that uses RMA10 hydrodynamics as input to a solution of the 3-D advection-diffusion equation with kinetics. The models are open-source.

Recommended Modeling Software

The ADH model software is recommended as the hydrodynamic modeling software best suited for the Cole's Bayou Marsh Restoration project. It utilizes an unstructured mesh that allows the model to handle complex and intricate domains of varying scales. This is particularly important for this application, as the model must cover vast areas of open water as well as small channels within Cole's Bayou itself. ADH has been proven to efficiently handle wetting and drying and has the ability to simulate flow through hydraulic structures, such as culverts and flap gates, which are specified in the scope of work. Also, ADH has been used for several models of Coastal Louisiana including sediment transport on the Mississippi River and Bird's Foot Delta and by CPRA (in conjunction with the USACE) for assessing alternative operations of the Caernarvon Diversion. The combination of these attributes and the fact that ADH is open-source make it a reliable model to accurately simulate the complex hydraulic conditions at the site.

Gap Analysis

A data gap analysis was performed on the collected data to determine if the data was sufficient to support development of a representative hydrodynamic model of the project area. Due to the lack of bathymetric, water level, salinity, and suspended solids data within and near the project area, a data collection program is required to support a development of a representative hydrodynamic and model of the project area. The data collected from this program will be used to provide bathymetric information, establish boundary conditions for the model, and provide water level and salinity data for model calibration. Only stations which are active, and will continue to be active over the Cole's Bayou data collection period, will be applicable for model calibration.

The following is a list of the data needed for model development and calibration.

Bathymetry

Bathymetric data collection is necessary in Freshwater Bayou, the canals running south into Cole's Bayou, the major channels within the Bayou, and for the open-water areas. **Figure 8** shows the locations of recommended transect surveys and characteristic elevation information needed from within the project area. The elevations should be reported in reference to the NAVD88 datum (orthometric heights). For the transect surveys, elevation data should be collected at the top and toe of the bank, at any significant breaks in bank slope, the channel thalweg, and at significant changes in elevation. Elevation change between points in a channel (banks are exempt from this requirement) should not exceed 0.5 feet. Over large open water areas within the project area, marked with triangles in Figure 8, transects running perpendicular to the primary axis of the water body should not exceed 250 feet, with points on transects not exceeding a 50 foot spacing. This information coupled with existing bathymetric data for the large open water areas of Vermilion Bay and the Gulf of Mexico, will provide a continuous elevation dataset for the project.

Perimeter Survey

As part of the effort to gather bathymetric data, a visual inspection of the entire perimeter of the project area should be completed to identify any connections with the adjacent waterways. A transect survey (as specified above) should be done at any direct connection found.

LiDAR Survey

While time and budget constraints do not permit the collection of new LiDAR data for the site, the 2005 LiDAR data will be evaluated and modified if possible based on existing aerial photography.

Vegetation Survey

A vegetation survey of the marsh within the project area is recommended to appropriately assign roughness parameters to the model. Photographs documenting typical vegetation throughout the study area should be taken by the field surveyors to assist modelers in selection of roughness parameters. Where photographs are taken, estimates of plant stem diameter, stem density (per square meter), stem height, photograph location, and orientation of the photograph should be recorded.

Water Level, Salinity, and Suspended Sediment Data

Water level, salinity, and suspended sediment concentration data within the project area are needed to support the evaluation of ecological benefits resulting from the project. **Figure 9** shows the six recommended stations. There is one sampling station in Freshwater Bayou east of the channel leading south into Cole's Bayou, station 2, which will allow for understanding of the flows transported in Freshwater Bayou. Another station (station 1) is recommended at the mouth of the natural inflow to Freshwater Bayou, which will likely have significantly different salinity and suspended solids concentrations. Waters at station 3 will be a mixture of water from Vermilion Bay and from stations 1 and 2. It is presumed that the composition of the water at station 3 will be similar to the water flowing from each of the project culverts into Cole's Bayou. Station 4 will yield water levels and composition within the marsh and station 5 will provide information on the composition of water leaving the marsh. Station 6 will provide conditions on the channel that runs along the south side of Cole's Bayou, which is essentially the downstream boundary condition for flow through the project area. This array of stations will allow the modeler to ensure the boundary conditions are properly forcing water through the areas leading to the entrance of Cole's Bayou. It is very important that the model can accurately simulate the stage and salinity concentrations at station 3. A cursory understanding of how water and sediment move from station 3 and through the marsh would be realized from this array as well.

It is recommended that hourly water level, salinity, and turbidity data be collected for a minimum of six months at each station. The best time period for collection would be in the winter and spring when large frontal passages occur, causing events of significant sediment redistribution in the coastal zone. Suspended sediment samples should be collected hourly over a full phase of the tide upon installation at stations 3, 4, and 5. A pump sampling apparatus, set up to pump from the middle of the water column, is recommended for collection of these samples. Additional collection of suspended sediment samples (hourly for one tidal cycle) should be taken at each station during at least one major frontal passage

event resulting in high water levels in Vermilion Bay and during at least one event where winds create a significant suspension of sediment in Vermilion Bay. These samples will allow for the development of a relationship between turbidity and suspended sediment concentration that can be analyzed for tidal and storm event effects. Collection of grain size distributions (percentage of sand, silt, and clay at a minimum) is recommended for at least one sample from each sampling period.

Nutrient and Soil Bulk Density Data

Nutrient data, specifically total nitrogen and phosphorus, and bed sediment bulk density information for the open-water areas within Cole's Bayou is necessary. These would potentially provide information to the SAND or Boustany models. The proposed location of these sites is shown in **Figure 10**. One bulk density sample at each location is sufficient. Water samples to extract nutrient data should be taken monthly.

References

Coastal Wetlands Planning, Protection and Restoration Act, "2008 Coastal Louisiana Aerial Photography," http://lacoast.gov/new/Pubs/Map_data/2008doqq/Default.aspx

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APPENDIX A – TABLES AND FIGURES

Table 1 – NOAA NOS station information

ID	Name	Met. Obs	Active	Verified Data	Predicted Data
8766072	Freshwater Canal Locks	Yes	Yes	1/06 - Present	Yes
8765251	Cypremort Point	No	No	10/05 - 10/10	Yes
8765551	Southwest Pass	No	No	None	Yes
8765568	Lighthouse Point	No	No	None	Yes

Table 2 – Water level data periods

Station ID	Data Period		Data Points
	Start	End	
CRMS0565-H01	2/7/08	5/21/12	33,528
CRMS0565-H01	2/7/08	1/31/12	30,868
CRMS0567-H01	2/6/08	6/6/12	34,132
CRMS0567-H01	2/6/08	5/8/12	33,436
CRMS0568-H01	2/7/08	5/21/12	35,664
CRMS0568-H01	2/7/08	1/31/12	33,003
CRMS0570-H01	2/7/08	6/15/12	33,854
CRMS0570-H01	2/7/08	5/14/12	33,084
CRMS0571-H01	1/21/08	6/29/12	37,943
CRMS0571-H01	1/21/08	5/14/12	36,826
CRMS0576-H01	2/12/08	6/4/12	37,640
CRMS0576-H01	2/12/08	5/7/12	36,980
CRMS0580-H01	2/19/08	5/21/12	32,644
CRMS0580-H01	2/19/08	8/16/11	30,018
CRMS0616-H01	6/15/06	6/29/12	47,428
CRMS0616-H01	6/15/06	5/14/12	46,451
CRMS0618-H01	6/15/06	6/29/12	46,110
CRMS0618-H01	6/15/06	5/14/12	45,001
CRMS0619-H01	1/21/08	6/29/12	34,047
CRMS0619-H01	1/21/08	5/14/12	33,059
CRMS0632-H01	8/9/07	6/29/12	27,757
CRMS0632-H01	8/9/07	5/16/12	26,689
CRMS0633-H01	8/6/07	5/21/12	35,217
CRMS0633-H01	8/6/07	2/1/12	32,579
CRMS1130-H01	3/5/08	5/21/12	28,628
CRMS1130-H01	3/5/08	1/31/12	25,967
CRMS1277-H01	2/6/08	5/21/12	34,925
CRMS1277-H01	2/6/08	1/31/12	32,264
ME04-06	4/24/97	9/26/06	78,658
ME04-143R	1/22/01	9/26/06	48,148
ME04-19	4/17/97	7/26/05	68,701
ME04-26R	4/16/97	9/26/06	75,259
ME04-29	4/17/97	9/25/06	77,218
ME04-36R	4/16/97	9/26/03	51,413
ME04-43R	4/16/97	9/26/06	68,340
ME04-50R	4/16/97	1/22/01	24,947
ME14-01	9/9/02	12/3/03	10,800
ME14-02R	9/9/02	12/3/03	10,800
CRMS0488-H01	11/7/06	6/18/12	48,333
CRMS0488-H01	11/7/06	5/31/12	47,905
CRMS0489-H01	6/6/06	6/29/12	45,156
CRMS0489-H01	6/6/06	4/30/12	43,717
CRMS0490-W01	3/27/07	6/29/12	42,703
CRMS0490-W01	3/27/07	4/26/12	41,154
CRMS0493-H01	11/5/07	6/29/12	35,594
CRMS0493-H01	11/5/07	4/24/12	34,014
CRMS0494-H01	11/8/06	6/29/12	45,949
CRMS0494-H01	11/8/06	4/30/12	44,833
CRMS0496-H01	2/4/08	6/29/12	35,864
CRMS0496-H01	2/4/08	3/20/12	34,410
CRMS0498-H01	4/17/07	6/27/12	44,208
CRMS0498-H01	4/17/07	5/15/12	43,177
CRMS0499-H01	4/18/07	6/27/12	38,243
CRMS0499-H01	4/18/07	5/15/12	37,213
CRMS0504-H01	4/17/07	6/27/12	42,734
CRMS0504-H01	4/17/07	5/15/12	41,703
CRMS0507-H01	2/20/08	6/29/12	37,340
CRMS0507-H01	2/20/08	5/16/12	36,270
CRMS0508-H01	2/20/08	6/29/12	36,800
CRMS0508-H01	2/20/08	5/16/12	35,743
CRMS0511-W01	2/11/08	6/25/12	36,146
USACE 76592	3/1/04	12/12/12	98% *
USGS 07387050	10/1/99	12/12/12	12,222

Station ID	Data Period		Data Points
	Start	End	
CRMS0511-W01	2/11/08	5/30/12	35,524
CRMS0514-H01	11/8/06	6/25/12	48,468
CRMS0514-H01	11/8/06	5/30/12	47,843
CRMS0517-H01	6/6/06	6/29/12	47,729
CRMS0517-H01	6/6/06	4/26/12	46,180
CRMS0520-H01	4/19/07	6/27/12	41,422
CRMS0520-H01	4/19/07	5/15/12	40,392
CRMS0523-H01	11/28/07	6/27/12	35,390
CRMS0523-H01	11/28/07	5/15/12	34,362
CRMS0524-W01	5/7/08	6/27/12	31,981
CRMS0524-W01	5/7/08	5/15/12	30,948
CRMS0527-H01	10/10/07	6/29/12	38,907
CRMS0527-H01	10/10/07	5/1/12	37,558
CRMS0528-H01	10/31/07	3/5/08	2,904
CRMS0528-H01	10/31/07	3/5/08	2,904
CRMS0529-H01	12/17/07	6/27/12	36,249
CRMS0529-H01	12/17/07	3/28/12	34,068
CRMS0530-W01	4/18/07	6/27/12	39,214
CRMS0530-W01	4/18/07	3/29/12	38,072
CRMS0531-H01	12/19/07	6/25/12	35,965
CRMS0531-H01	12/19/07	5/31/12	35,374
CRMS0532-H01	3/28/07	6/25/12	42,557
CRMS0532-H01	3/28/07	5/31/12	41,958
CRMS0535-H01	3/13/08	6/29/12	34,969
CRMS0535-H01	3/13/08	5/9/12	33,730
CRMS0536-W01	3/20/08	6/29/12	36,501
CRMS0536-W01	3/20/08	5/16/12	35,431
CRMS0541-H01	5/9/09	5/15/12	30,460
CRMS0542-H01	1/12/10	6/29/12	21,588
CRMS0542-H01	1/12/10	5/8/12	20,324
CRMS0542-W01	1/11/08	11/28/09	15,080
CRMS0542-W01	1/11/08	11/28/09	15,080
CRMS0543-H01	6/7/06	6/29/12	46,015
CRMS0543-H01	6/7/06	5/7/12	44,731
CRMS0544-H01	11/7/06	6/29/12	44,607
CRMS0544-H01	11/7/06	4/26/12	43,144
CRMS0545-H01	10/16/07	6/29/12	41,125
CRMS0545-H01	10/16/07	5/7/12	39,841
CRMS0547-H01	11/26/07	6/29/12	35,731
CRMS0547-H01	11/26/07	5/17/12	34,688
CRMS0549-H01	6/29/06	6/25/12	37,955
CRMS0549-H01	6/29/06	5/30/12	36,729
CRMS0550-H01	11/6/07	6/29/12	39,373
CRMS0550-H01	11/6/07	5/25/12	38,519
CRMS0551-H01	11/27/07	6/29/12	38,488
CRMS0551-H01	11/27/07	5/31/12	37,776
CRMS0552-H01	12/6/07	6/26/12	32,936
CRMS0552-H01	12/6/07	5/1/12	31,758
TV04-01R	6/19/97	11/23/04	52,797
TV04-02	6/19/97	8/20/02	40,908
TV04-03	6/19/97	8/2/06	71,973
TV04-04R	6/19/97	11/29/06	77,507
TV04-22	10/16/02	3/8/07	37,144
TV14-01	10/12/99	1/2/07	56,758
TV14-02	10/12/99	3/14/02	20,282
TV14-03R	10/12/99	1/2/07	57,730
TV14-04R	10/12/99	1/2/07	57,604
TV14-23	3/14/02	1/2/07	39,327
TV21CR01-H01	11/30/11	3/28/12	1,032
TV21CR02-H01	2/14/12	3/28/12	1,029
USACE 76593	3/1/04	12/12/12	58% *
USGS 0737040	10/23/97	12/12/12	15,211

Table 3 – Salinity data periods

Station ID	Data Period		Data Points
	Start	End	
CRMS0565-H01	2/7/08	5/21/12	33,153
CRMS0565-H01	2/7/08	1/31/12	30,517
CRMS0567-H01	2/6/08	6/6/12	34,364
CRMS0567-H01	2/6/08	5/8/12	33,668
CRMS0568-H01	2/7/08	5/21/12	35,734
CRMS0568-H01	2/7/08	1/31/12	33,072
CRMS0570-H01	2/7/08	6/15/12	33,843
CRMS0570-H01	2/7/08	5/14/12	33,073
CRMS0571-H01	1/21/08	6/29/12	37,973
CRMS0571-H01	1/21/08	5/14/12	36,856
CRMS0576-H01	2/12/08	6/4/12	37,587
CRMS0576-H01	2/12/08	5/7/12	36,927
CRMS0580-H01	2/19/08	5/21/12	32,608
CRMS0580-H01	2/19/08	8/16/11	29,982
CRMS0616-H01	6/15/06	6/29/12	47,814
CRMS0616-H01	6/15/06	5/14/12	46,813
CRMS0618-H01	6/15/06	6/29/12	47,544
CRMS0618-H01	6/15/06	5/14/12	46,435
CRMS0619-H01	1/21/08	6/29/12	34,124
CRMS0619-H01	1/21/08	5/14/12	33,136
CRMS0632-H01	8/6/07	6/29/12	28,696
CRMS0632-H01	8/6/07	5/16/12	27,628
CRMS0633-H01	8/6/07	5/21/12	34,940
CRMS0633-H01	8/6/07	2/1/12	32,302
CRMS1130-H01	3/5/08	5/21/12	27,945
CRMS1130-H01	3/5/08	1/31/12	25,408
CRMS1277-H01	2/6/08	5/21/12	34,814
CRMS1277-H01	2/6/08	1/31/12	32,156
ME04-06	4/15/96	9/26/06	85,774
ME04-143R	1/22/01	9/26/06	47,806
ME04-19	4/18/96	7/26/05	77,747
ME04-26R	4/18/96	9/26/06	83,391
ME04-29	4/18/96	9/26/06	84,744
ME04-36R	4/17/96	9/26/03	59,414
ME04-43R	8/14/96	9/26/06	79,346
ME04-50R	4/15/96	1/22/01	32,698
ME14-01	9/9/02	12/3/03	10,800
ME14-02R	9/9/02	12/3/03	10,800
CRMS0488-H01	11/7/06	6/18/12	48,275
CRMS0488-H01	11/7/06	5/31/12	47,847
CRMS0489-H01	6/6/06	6/29/12	47,393
CRMS0489-H01	6/6/06	4/30/12	45,942
CRMS0493-H01	11/5/07	6/29/12	35,624
CRMS0493-H01	11/5/07	4/24/12	34,041
CRMS0494-H01	11/8/06	6/29/12	47,548
CRMS0494-H01	11/8/06	4/30/12	46,432
CRMS0496-H01	2/4/08	6/29/12	37,081
CRMS0496-H01	2/4/08	4/30/12	35,627
CRMS0498-H01	4/17/07	6/27/12	43,893
CRMS0498-H01	4/17/07	5/15/12	42,862
CRMS0499-H01	4/18/07	6/27/12	38,197
CRMS0499-H01	4/18/07	5/15/12	37,167
CRMS0504-H01	4/17/07	6/27/12	43,448
CRMS0504-H01	4/17/07	5/15/12	42,417
CRMS0507-H01	2/20/08	6/29/12	37,300
USACE 76592	3/1/04	12/12/12	98% *
USGS 07387050	10/1/02	12/12/12	10,242

Station ID	Data Period		Data Points
	Start	End	
CRMS0507-H01	2/20/08	5/16/12	36,230
CRMS0508-H01	2/20/08	6/29/12	36,841
CRMS0508-H01	2/20/08	5/16/12	35,783
CRMS0514-H01	11/8/06	6/25/12	48,899
CRMS0514-H01	11/8/06	5/30/12	48,274
CRMS0517-H01	6/6/06	6/29/12	47,288
CRMS0517-H01	6/6/06	4/26/12	45,739
CRMS0520-H01	4/19/07	6/27/12	41,455
CRMS0520-H01	4/19/07	5/15/12	40,425
CRMS0523-H01	11/28/07	6/27/12	33,844
CRMS0523-H01	11/28/07	5/15/12	32,815
CRMS0527-H01	10/10/07	6/29/12	37,364
CRMS0527-H01	10/10/07	5/1/12	36,022
CRMS0528-H01	10/31/07	3/5/08	2,681
CRMS0528-H01	10/31/07	3/5/08	2,681
CRMS0529-H01	12/17/07	6/27/12	35,861
CRMS0529-H01	12/17/07	3/28/12	33,680
CRMS0531-H01	12/19/07	6/25/12	35,720
CRMS0531-H01	12/19/07	5/31/12	35,129
CRMS0532-H01	3/28/07	6/25/12	43,931
CRMS0532-H01	3/28/07	5/31/12	43,332
CRMS0535-H01	3/13/08	6/29/12	35,158
CRMS0535-H01	3/13/08	5/9/12	33,919
CRMS0541-H01	5/9/09	5/15/12	30,347
CRMS0542-H01	1/12/10	6/29/12	21,588
CRMS0542-H01	1/12/10	5/8/12	20,324
CRMS0543-H01	6/7/06	6/29/12	43,566
CRMS0543-H01	6/7/06	5/7/12	42,282
CRMS0544-H01	11/7/06	6/29/12	40,211
CRMS0544-H01	11/7/06	4/26/12	38,747
CRMS0545-H01	10/16/07	6/29/12	41,034
CRMS0545-H01	10/16/07	5/7/12	39,750
CRMS0547-H01	11/26/07	6/29/12	36,276
CRMS0547-H01	11/26/07	5/17/12	35,232
CRMS0549-H01	6/29/06	6/25/12	37,747
CRMS0549-H01	6/29/06	5/30/12	36,520
CRMS0550-H01	11/6/07	6/29/12	39,309
CRMS0550-H01	11/6/07	5/25/12	38,455
CRMS0551-H01	11/27/07	6/29/12	38,401
CRMS0551-H01	11/27/07	5/31/12	37,689
CRMS0552-H01	12/6/07	6/26/12	33,416
CRMS0552-H01	12/6/07	5/1/12	32,235
TV04-01R	6/19/97	1/12/05	54,409
TV04-02	6/19/97	8/20/02	40,908
TV04-03	6/19/97	8/2/06	71,137
TV04-04R	6/19/97	11/29/06	77,778
TV04-22	10/16/02	3/8/07	37,420
TV14-01	10/12/99	1/2/07	56,921
TV14-02	10/12/99	3/14/02	20,367
TV14-03R	10/12/99	1/2/07	58,204
TV14-04R	10/12/99	1/2/07	57,649
TV14-23	3/14/02	1/2/07	38,493
TV21CR01-H01	11/30/11	3/28/12	1,043
TV21CR02-H01	11/30/11	3/28/12	2,848
USACE 76593	3/1/04	12/12/12	58% *
USGS 0737040	10/1/02	12/12/12	9,921

Table 4 - Multi-dimensional hydrodynamic and sediment models

Model	Open Source	Dim	Time-Varying	Sediment Transport	Equations Solved	Solution Methods
ADCIRC	Y	2-D/3-D	Y	N	Surface Wave & Reynolds Equations, Hydrostatic	Finite Element
ADH	Y	2-D/3-D	Y	Y	Reynolds Equations, Hydrostatic or Non-hydrostatic, & Salinity, Temperature	Finite Element
Delft-3-D	N	3-D	Y	Y	Reynolds Equations, Hydrostatic & Salinity, Temperature	Finite Difference
EFDC	Y	2-D/3-D	Y	Y	Reynolds Equations, Hydrostatic, & Salinity, Temperature	Finite Difference
Mike-21	N	2-D	Y	Y	Depth averaged Reynolds Equations	Finite Difference
Mike-3	Y	2-D/3-D	Y	Y	Reynolds Equations, Hydrostatic or Non-hydrostatic, & Salinity, Temperature	Finite Difference
RMA10	Y	1-D/2-D/ 3-D	Y	Y	Reynolds Equations, Hydrostatic, & Salinity, Temperature	Finite Element
RMA2	Y	2-D	Y	Companion Model	Reynolds Equations & Salinity	Finite Element

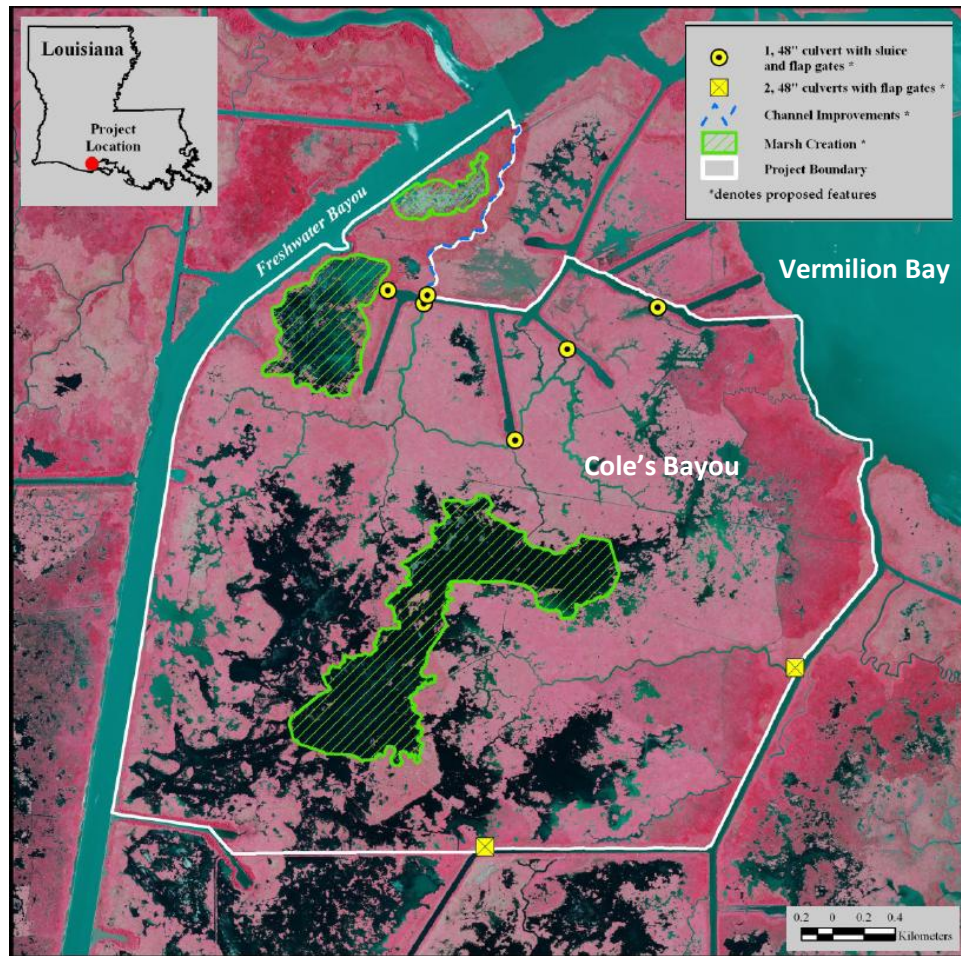


Figure 1 – Location of the project area

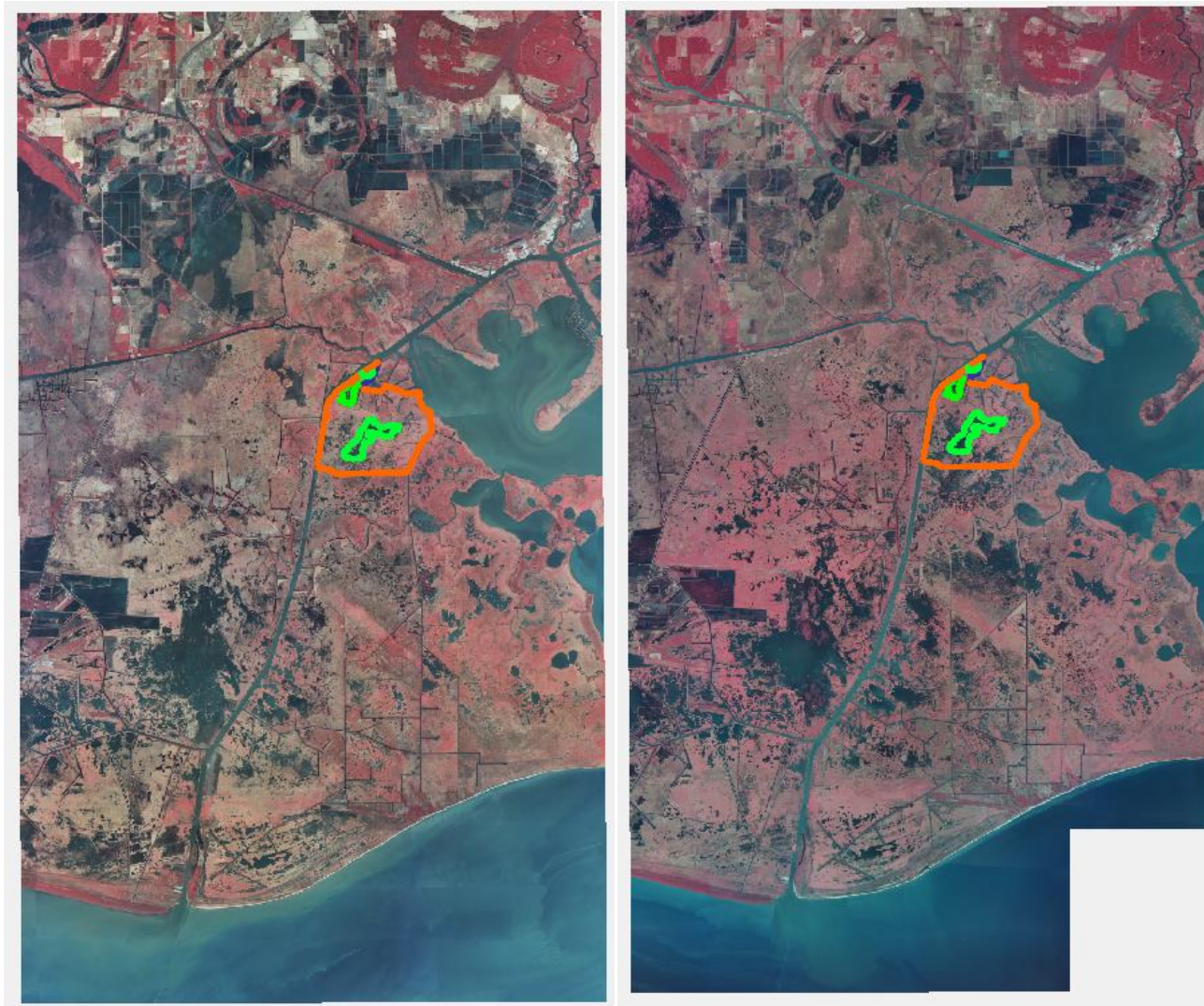


(a)



(b)

Figure 2 - DOQQ images of the project area taken in 2005 (a) and 2008 (b)



(a)

(b)

Figure 3 - DOQQ images of the Vermilion Parish taken in 2005 (a) and 2008 (b).
The project area is outlined in orange and open water areas within the project area in green



Figure 4 - Tidal data stations near Cole's Bayou



Figure 5 - Water level data in Vermilion Parish, stations highlighted with a red star are expected to be used for the modeling effort

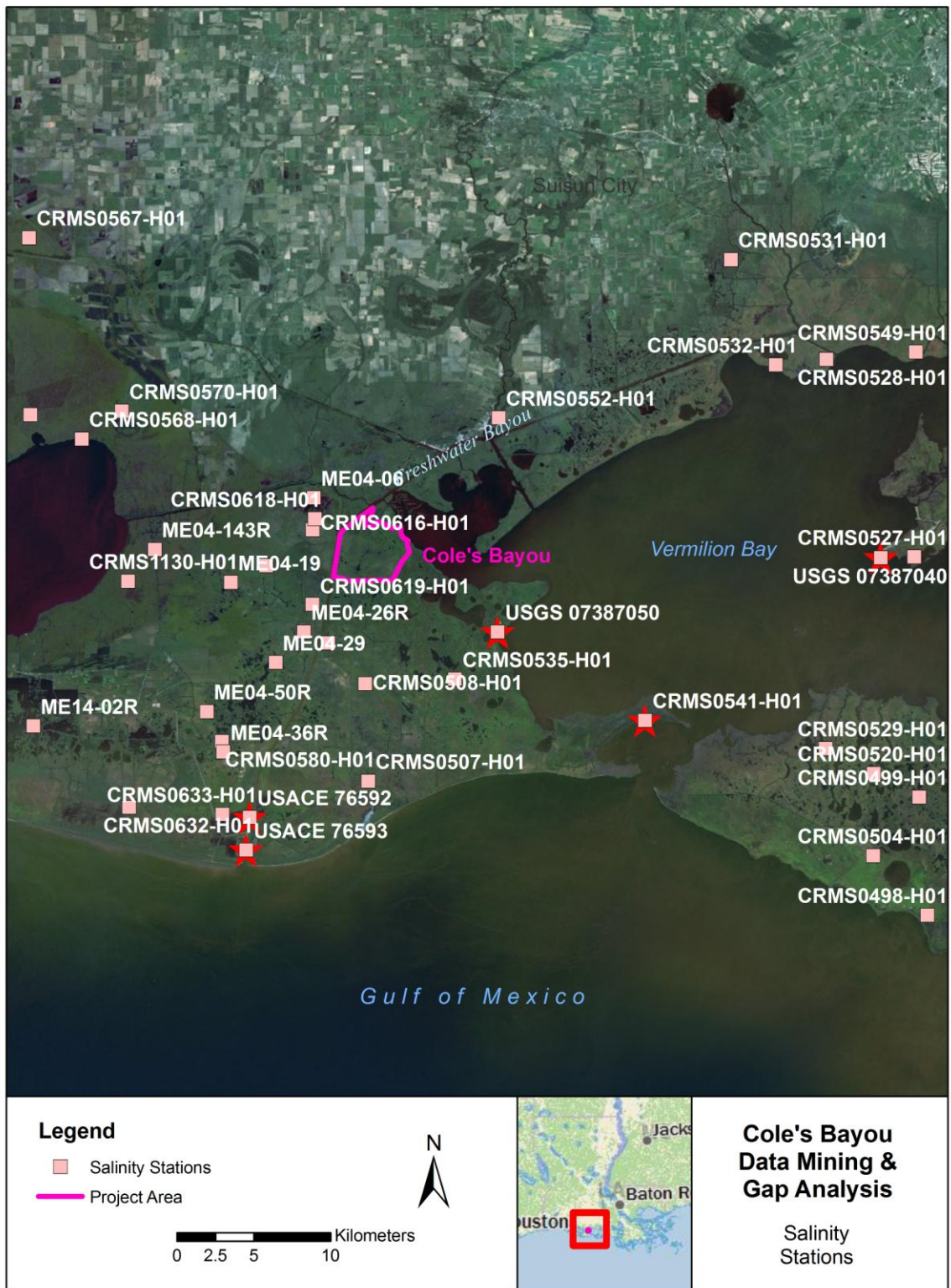


Figure 6 - Salinity data in Vermilion Parish, stations highlighted with a red star are expected to be used for the modeling effort



Figure 7 - 4 CRMS Stations for sediment data in the north of the study area

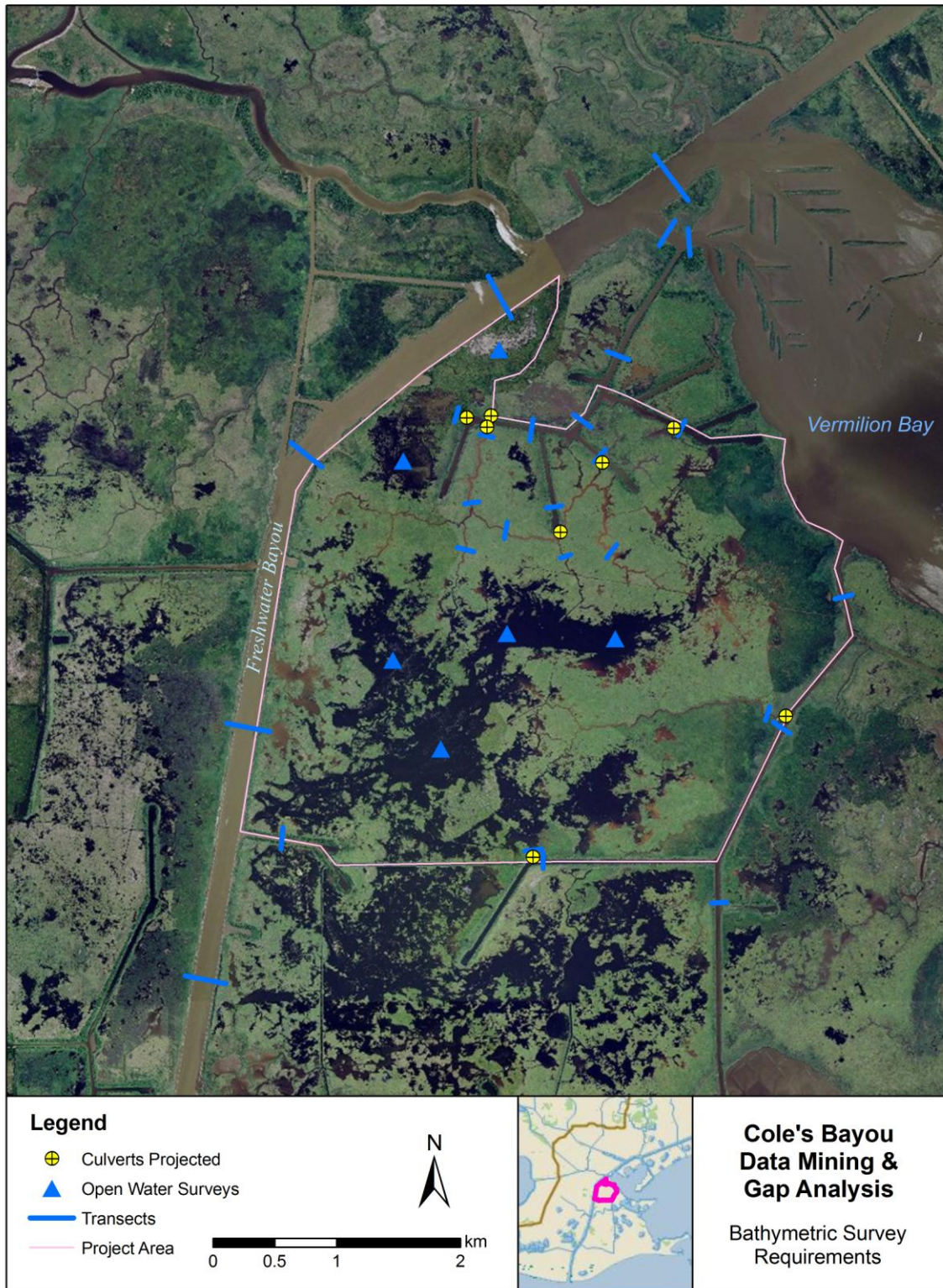


Figure 8 – Locations of required transect and open water surveys



Figure 9 – Location of sampling stations to record water level, salinity, turbidity, and suspended sediment



Figure 10 – Location of sampling stations for collecting nutrient data and bulk density samples

APPENDIX B

INSTALLATION OF DATA COLLECTION PLATFORMS FOR COLE'S BAYOU MARSH RESTORATION PROJECT (TV-63)

Installation of Data Collection Platforms for Cole's Bayou Marsh Restoration Project (TV-63)

Prepared for:

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ENCOS Project No. 13-0044

Prepared by:



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April 2013

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2. Construction details for TV63-02.
3. Construction details for TV63-03.
4. Construction details for TV63-04.
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6. Construction details for TV63-06.

FIGURES

Figure

1. Map of project area depicting data collection platforms (DCPs).

APPENDENCES

Appendix

- A. Report in Portable Document Format (PDF)

1.0 Introduction

ENCOS, Inc. (ENCOS) was contracted by G.E.C., Inc. (GEC) in February 2013 to provide data collection for a six-month period. This project supports the Louisiana Coastal Protection and Restoration Authority's (CPRA) Cole's Bayou Marsh Restoration Project (TV-63). ENCOS will provide data collection services associated with the monitoring of water level, salinity, turbidity, and suspended solid concentration. This data will then be used for the hydrologic model development of the Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin, immediately east of Freshwater Bayou Canal. This report documents the installation of the Data Collection Platforms (DCPs) and equipment.

2.0 Scope of Work

ENCOS was contracted by GEC to install and maintain six (6) DCPs for the six-month period. At each DCP, ENCOS installed a multi-parameter datasonde which records on an hourly basis. ENCOS will also collect nutrient and grain size samples at these DCPs once per month for the six-month period. ENCOS will visit each DCP on a monthly basis to recover data, clean the sensor, calibrate the sensors, and collect nutrient samples. In addition to the monthly DCPs servicing, ENCOS will collect monthly nutrient samples at six (6) locations within the project boundaries. A map of the project area (**Figure 1**) depicts the DCP locations and monthly nutrient sample locations.

3.0 Equipment

ENCOS installed a Yellow Spring Instrument (YSI) 6920 multiple parameter data sonde at each DCP. The YSI 6920s record water level in feet (ft), specific conductance in micro Siemens per centiliter ($\mu\text{S}/\text{cm}$), salinity in parts per thousand (ppt), turbidity in nephelometric turbidity units (NTU), and water temperature in degree Celsius ($^{\circ}\text{C}$) on an hourly interval set to Central Standard Time (CST).

4.0 Data Collection Platforms and ADCP

ENCOS designed and fabricated DCPs for the deployment of hydrographic instruments. The station location, exposure to environmental conditions, and boating traffic determined the design and materials used for the construction of each station. Each DCP is similar in construction but vary in length depending on water depth at the site location during the time of installation. The housing at each DCP for the YSI's is a monopole constructed from 3-inch schedule 40 aluminum pipe. The monopole has milled slots which, when installed near mid water depth, allow free exchange of water across the instruments' sensors. **Tables 1 through 6** include specifications at the time of install and WAAS GPS coordinates for the DCPs. The preliminary elevation to tie the water levels to NAVD 88 is included in the table for each station and since that survey elevation is preliminary, it may change once the final processing is complete.



5.0 Field Activities

A chronological summary below dictates the initial site visits to find optimal locations for placement and field activity for installing the DCPs.

February 27, 2013 – ENCOS personnel scouted placement locations for all DCPs.

March 20, 2013 – ENCOS personnel installed DCPs TV63-01 and TV63-03.

March 21, 2013 – ENCOS personnel installed DCPs TV63-04, TV63-05, and TV63-06.

April 02, 2013 – ENCOS personnel installed DCP TV63-02.

April 05, 2013 – ENCOS personnel installed and deployed all YSI 6920 multiple parameter data sondes at each DCP.

6.0 Access Rights and Rights of Entry

Randy Moertle approved access rights for sites TV63-01, TV63-02, TV63-03, TV63-04, TV63-05, and TV63-06.

7.0 Surveys

ENCOS met the Hydro Terra survey team on site at TV63-06 on April 5, 2013 and provided coordinates for each station. ENCOS instructed the survey team to remove the PVC cap on top of the pipe housing the water level instrument and survey to the top of the casing (TOC) for vertical control of water level. ENCOS will make the necessary adjustments to the water level data to adjust the water levels to North American Vertical Datum 1988 (NAVD 88) upon receipt of final survey data.

8.0 Conclusion

ENCOS was contracted by GEC to provide data collection, in which during the period of February 27, 2013 through April 05, 2013, six (6) DCPs were installed and began to collect hourly data. The hydrographic instruments' conductivity sensors were calibrated with a known conductivity standard representative of the deployed environment and the pressure sensors on the hydrographic instruments were calibrated to zero (0) feet at sea level. All of the hydrographic instruments record data hourly in Central Standard Time (CST). For a six-month period, ENCOS is contracted to service the instruments monthly, QAQC all collected data into an acceptable format for the modeler, and compose monthly trip reports.

TABLE 1 - Specifications and conditions at the time of install for TV63-01



STATION NAME:	TV63-01
LOCATION:	Schooner Bayou
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/20/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole, Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	5.84' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	3.95'
LATITUDE:	N29°45'07.4"
LONGITUDE:	W092°14'39.7"
MEASURED OVER ALL STATION LENGTH:	14.73'
MARK TO SENSOR DISTANCE:	8.68' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	5.78'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	3.95'
DISTANCE BELOW MUD LINE (MONOPOLE):	5.00'
BASE PLATE TO TOC (MONOPOLE):	9.73'
STOP PLATE TO TOC:	9.49'



TABLE 2 - Specifications and conditions at the time of install for TV63-02



STATION NAME:	TV63-02
LOCATION:	Freshwater Bayou
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	4/2/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	6.42' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	3.40'
LATITUDE:	N29°45'44.6"
LONGITUDE:	W092°11'35.9"
MEASURED OVER ALL STATION LENGTH:	15.05'
MARK TO SENSOR DISTANCE:	8.68' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	6.50'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	3.55'
DISTANCE BELOW MUD LINE (MONOPOLE):	5.00'
BASE PLATE TO TOC (MONOPOLE):	9.87'
STOP PLATE TO TOC:	9.49'



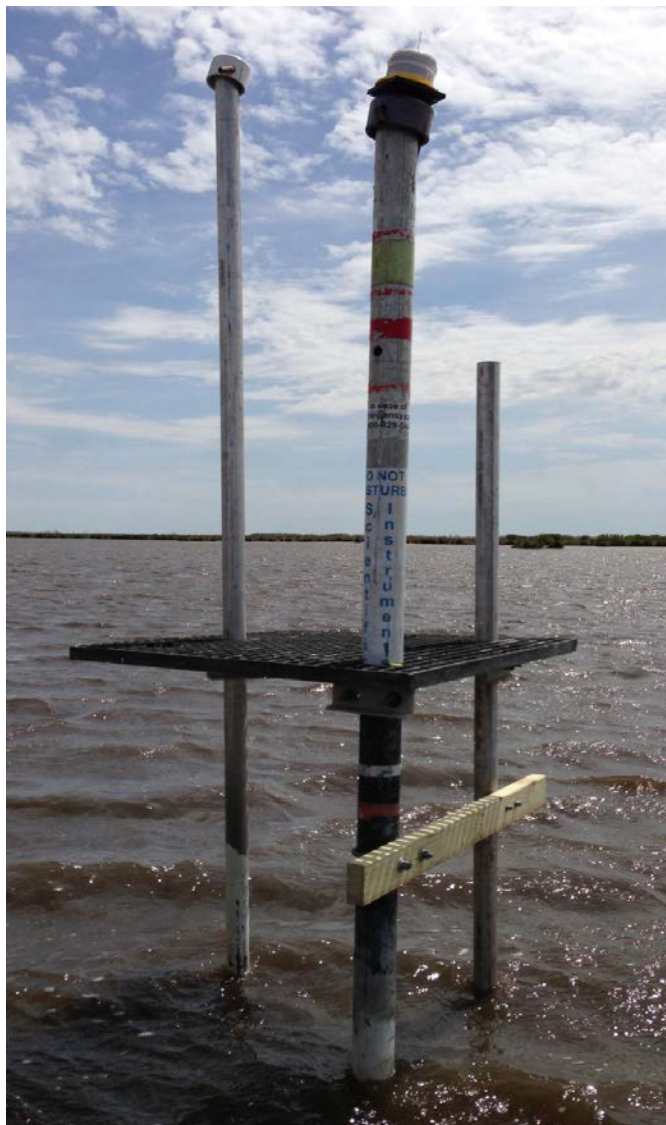
TABLE 3 - Specifications and conditions at the time of install for TV63-03



STATION NAME:	TV63-03
LOCATION:	Buck Point Gas Field Canal
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/20/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	6.27' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	3.40'
LATITUDE:	N29°44'12.1"
LONGITUDE:	W092°12'58.0"
MEASURED OVER ALL STATION LENGTH:	16.00'
MARK TO SENSOR DISTANCE:	8.67' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	6.60'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	3.40'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	10.00'
STOP PLATE TO TOC:	9.48'



TABLE 4 - Specifications and conditions at the time of install for TV63-04



STATION NAME:	TV63-04
LOCATION:	Charles Bayou North
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/21/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	8.09' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	1.75'
LATITUDE:	N29°43'03.6"
LONGITUDE:	W092°13'26.0"
MEASURED OVER ALL STATION LENGTH:	15.67'
MARK TO SENSOR DISTANCE:	8.68' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	7.67'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	2.00'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	9.67'
STOP PLATE TO TOC:	9.49'



TABLE 5 - Specifications and conditions at the time of install for TV63-05



STATION NAME:	TV63-05
LOCATION:	Charles Bayou South
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/21/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	9.07' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	1.65'
LATITUDE:	N29°42'06.1"
LONGITUDE:	W092°13'07.1"
MEASURED OVER ALL STATION LENGTH:	15.92'
MARK TO SENSOR DISTANCE:	8.69' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	8.37'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	1.55'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	9.92'
STOP PLATE TO TOC:	9.50'



TABLE 6 - Specifications and conditions at the time of install for TV63-06



STATION NAME:	TV63-06
LOCATION:	Belle Isle Bayou
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/21/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	5.96' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	4.10'
LATITUDE:	N29°42'01.6"
LONGITUDE:	W092°13'06.9"
MEASURED OVER ALL STATION LENGTH:	15.94'
MARK TO SENSOR DISTANCE:	8.67' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	5.84'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	4.10'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	9.94'
STOP PLATE TO TOC:	9.48'





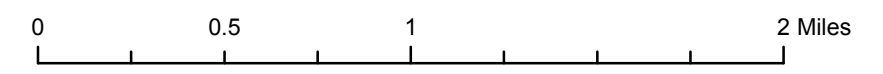
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community



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Figure 1
Hourly and Discrete Sample Locations
Coles Bayou (TV63) Project
ENCOS Project Number 13-0044

- ▲ Hourly Sampling Locations
- ✱ Monthly Discrete Locations



APPENDIX C

DECOMISSION REPORT FOR THE COASTAL PROTECTION AND RESTORATION AUTHORITY (CPRA) COLE'S BAYOU MARSH RESTORATION PROJECT (TV-63)

Decommissioning Report for the Coastal Protection and Restoration Authority (CPRA) Cole's Bayou Marsh Restoration Project (TV63)

Prepared for:
GEC, Inc.
8282 Goodwood Boulevard
Baton Rouge, LA 70806

ENCOS Project No. 13-0044



Prepared by:
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November 2013

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1. Location map of the water quality and ADCP stations.

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- A. Monthly trip reports
- B. Station Measurements and Photographs
- C. 24 Hour Suspended Sediment Sample Reports
- D. Hourly Water Level Graph
- E. Photo Log
- F. CD



1.0 Introduction

ENCOS, Inc. (ENCOS) was contracted by G.E.C., Inc. (GEC), in February 2013 to provide data collection for a six-month period to support the Louisiana Coastal Protection and Restoration Authority's (CPRA) Cole's Bayou Marsh Restoration Project (TV-63). ENCOS provided data collection services associated with the monitoring of water level, salinity, turbidity, and suspended solid concentration. This data supported the development of a hydrologic model for the Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin, immediately east of Freshwater Bayou Canal. This report summarizes the project and documents the field activities associated with the project conclusion.

2.0 Data Collection

ENCOS installed and maintained six (6) Data Collection Platforms (DCPs) for the six-month period. At each DCP, ENCOS installed a multi-parameter datasonde, which recorded on an hourly basis. ENCOS visited each DCP on a monthly basis to recover data, clean the sensor, and calibrate the sensors. Monthly trip reports are in **Appendix A**. In addition to the monthly DCP servicing, GEC collected nutrient and grain size samples once per month for the six-month period. A map of the project area (**Figure 1**) depicts the DCP locations and monthly nutrient sample locations. Station measurements and photographs are in **Appendix B**.

In addition to the hourly data collection, three (3) separate suspended sediment sample events took place during the six-month period at each DCP. The three (3) environmental triggers were a frontal passage, ambient conditions, and high wind event. The data was collected for a 24-hour period covering a full tidal cycle. The events took place as follows: April 24-26, 2013 frontal passage; July 23-25, 2013 ambient condition; October 5-7, 2013 high wind event. These trip reports are shown in **Appendix C**.

3.0 Data Summary

No data gaps were observed within the hourly water level and salinity measurements. Graphed water levels for all stations for the six-month period are shown in **Appendix D**.

Sampling frequency was disrupted during each 24 hour suspended sediment sampling event by environmental factors and equipment malfunctions. A detailed explanation provided in **Appendix C**.

4.0 Station Removal Field Activities

For the conclusion of this project, ENCOS extracted all equipment and associated structures from the project area over the span of two (2) days. In conjunction with the station decommissioning, ENCOS collected the remaining data from the instruments and obtained the in-situ instrument and calibration instrument readings prior to datasonde removal. The following is a chronological summary of the final data recovery trip and decommissioning field days.

October 22, 2013 - ENCOS personnel removed instruments and appurtenant structures associated with stations TV63-02, TV63-03, TV63-05, and TV63-06.

October 24, 2013 - ENCOS personnel removed instruments and appurtenant structures associated with stations TV63-01, and TV63-04.

Photo Log showing before and after removal photographs are in **Appendix E**.

5.0 Access Rights and Rights of Entry

ENCOS obtained rights of access for sites TV63-01, TV63-02, TV63-03, TV63-04, TV63-05, and TV63-06 from Randy Moertle and Timmy Vincent for station installation, monthly servicing, suspended sediment sampling events, and station decommissioning.

6.0 Conclusion

During the period from February 27, 2013 – October 24, 2013, ENCOS installed, serviced, and removed six (6) water level and salinity instruments in support of GEC and the Coastal Protection and Restoration Authority's (CPRA) Cole's Bayou Marsh Restoration Project (TV-63). ENCOS personnel serviced the instruments on a monthly basis and provided a six-month data set to GEC and CPRA for hydrologic model development by Dynamic Solutions. Station coordinates and measurements are shown in **Appendix A**. Copies of the monthly trip reports and 24-hour suspended sediment sampling events are included in **Appendix B** and **Appendix C**. **Appendix D** contains the graphed water levels converted to North American Vertical Datum 1988 (NAVD 88) for the six-month data collection period. Photos documenting the removal of each DCP are in **Appendix E**. A digital copy of this report and the electronic data set is included on the CD in **Appendix F**.



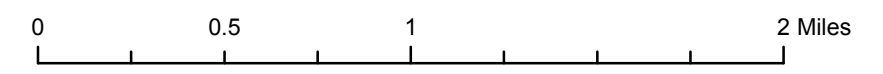
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community



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Figure 1
Hourly and Discrete Sample Locations
Coles Bayou (TV63) Project
ENCOS Project Number 13-0044

- ▲ Hourly Sampling Locations
- ✱ Monthly Discrete Locations





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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan and Stephen Meyers (ENCOS), Jennifer Lindquist (GEC), and Fauchaux Airboat Services

Date: April 29, 2013

Conditions: Skies: clear and sunny; Winds: SE 5kts; Temperature: 70-75 °F.

Logistical and Personnel:

Adam Trahan (ENCOS) and Stephen Meyers (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team met Jennifer Lindquist (GEC) at the boat launch to assist her in the collection of core, bulk density, and nutrient samples. The field team loaded the diagnostic, maintenance, and calibration equipment needed into the vessel to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-01, TV63-02, TV63-03, TV63-04, TV63-05, and TV63-06 for the April 2013 service event. At each DCP, the instruments were cleaned and the pressure sensor was calibrated. During this time, with Jennifer Lindquist (GEC), we visited sites TV63-07, TV63-08, TV63-09, TV63-10, TV63-11, and TV63-12 to collect core, bulk density, and discrete nutrient samples. All sites were visited during this event and all monthly data was recovered from the stations. Core and bulk density samples collected on this service event were relinquished to Ardaman Laboratories in Baton Rouge, LA and the analysis results will be sent to Jennifer Lindquist (GEC). Nutrient samples collected for this event were relinquished to Accutest Laboratories in Lafayette, LA, for phosphorous and total nitrogen analysis. The analysis results will be sent to Jennifer Lindquist (GEC).

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Steve Sanborn of Dynamic Solutions for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

The field team noted water levels by the DCPs were higher than at the beginning of April during instrument installation.

At DCP TV63-04, there was a buildup of mud and organic debris in the bottom of the sonde pipe. Further examination of the area surrounding the outside of the sonde pipe revealed a considerable amount of fine sediment and organic detritus accreted above the load plate located at the mud water interface. This sediment and organic material built up three (3) to four (4) inches above the slots that allow free exchange of water. The field team removed sediment in a one-foot diameter radius around the sonde pipe to allow free exchange of water over the sensors. The situation will be assessed at the office and measures will be available to remedy the situation if it still exists during the next service event or one of the next water sample events.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$ and the pressure was set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

When the difference between the specific conductivity readings from the calibrated instrument and the water-quality sonde readings are less than the 5% threshold, no calibrations are needed. The sonde conductivity deployed at TV63-01 was greater than the calibration threshold of 5% and required calibration after the sensors were cleaned. The sonde at TV63-02 was calibrated due to some bio-fouling on the conductivity sensor. All six sondes deployed were performing properly at the time of the service event.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Stephen Meyers (ENCOS) and Coklin Nguyen (ENCOS)

Date: May 29, 2013

Conditions: Skies: clear and sunny; Winds: S 5kts; Temperature: High 90 °F, Low 71 °F

Logistical and Personnel:

Stephen Meyers (ENCOS) and Coklin Nguyen (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team loaded the diagnostic, maintenance, and calibration equipment needed into the ENCOS vessel to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-01, TV63-02, TV63-03, and TV63-06 for the May 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. All sites were visited during this event and all monthly data was recovered from the stations.

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

No problems were encountered during the service run.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$.

When the difference between the cleaned specific conductivity readings from the calibrated instrument and the clean water-quality sonde readings are less than the 5% threshold, no calibrations are needed. The specific conductivity difference at TV63-02 was greater than the

calibration threshold of 5% and required calibration after the sensors were cleaned. The four sondes deployed were performing properly at the time of the service event.

All pressure sensors were set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. At TV63-02 the dirty Specific Conductivity difference was 9.22%, which exceeds the 5% threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Stephen Meyers and Coklin Nguyen (ENCOS), Jennifer Lindquist (GEC), and Faucheux Airboat Services

Date: May 30, 2013

Conditions: Skies: Partly Cloudy; Winds: SE 10-15kts; Temperature: High 92 °F, Low 76 °F

Logistical and Personnel:

Stephen Meyers (ENCOS) and Coklin Nguyen (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team met Jennifer Lindquist (GEC) at the boat launch to assist her in the collection of nutrient samples. The field team loaded the diagnostic, maintenance, and calibration equipment needed into the vessel to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-04 and TV63-05 for the May 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. During this time, with Jennifer Lindquist (GEC), we visited sites TV63-07, TV63-08, TV63-09, TV63-10, TV63-11, and TV63-12 to collect discrete nutrient samples. The sites mentioned above were visited during this event and all monthly data was recovered from TV63-04 and TV63-05. Nutrient samples collected for this event were relinquished to Accutest Laboratories in Lafayette, LA, for phosphorous and total nitrogen analysis. The analysis results will be sent to Jennifer Lindquist (GEC).

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager, for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

At DCP TV63-04, there was a buildup of mud and organic debris in the bottom of the sonde pipe. Further examination of the area surrounding the outside of the sonde pipe revealed a considerable amount of fine sediment and organic detritus accreted above the load plate located at the mud water interface. This sediment and organic material built up one (1) to two (2) inches in the sensor guard of the instrument. The field team removed sediment in a one-foot diameter radius around the sonde pipe to allow free exchange of water over the sensors.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$ and the pressure was set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

When the difference between the specific conductivity readings from the calibrated instrument and the water-quality sonde readings are less than the 5% threshold, no calibrations are needed. After cleaning the conductivity sensor, no instrument required calibration of the conductivity sensor. All sondes deployed were performing properly at the time of the service event.

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. At TV63-04, the dirty Specific Conductivity difference was 8.57%, which exceeds the 5% threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan (ENCOS), Jennifer Lindquist (GEC), and Faucheux Airboat Services

Date: June 26, 2013

Conditions: Skies: Sunny; Winds: SE ~5kts; Temperature: High 95 °F, Low 83 °F

Logistical and Personnel:

Adam Trahan (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team met Jennifer Lindquist (GEC) at the boat launch to assist her in the collection of nutrient samples. The field team loaded the diagnostic, maintenance, and calibration equipment needed into the vessel to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-04, TV63-05, and TV63-06 for the June 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. During this time, with Jennifer Lindquist (GEC), we visited sites TV63-07, TV63-08, TV63-09, TV63-10, TV63-11, and TV63-12 to collect discrete nutrient samples. The sites mentioned above were visited during this event and all monthly data was recovered from TV63-04, TV63-05, and TV63-06. Nutrient samples collected for this event were relinquished to Accutest Laboratories in Lafayette, LA, for phosphorous and total nitrogen analysis. The analysis results will be sent to Jennifer Lindquist (GEC).

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager, for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

At DCP TV63-04, there was a buildup of mud and organic debris in the bottom of the sonde pipe. Further examination of the area surrounding the outside of the sonde pipe revealed a considerable amount of fine sediment and organic detritus accreted above the load plate located at the mud water interface. This sediment and organic material built up one (1) to two (2) inches in the sensor guard of the instrument. The field team removed sediment in a one-foot diameter radius around the sonde pipe to allow free exchange of water over the sensors.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$ and the pressure was set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

When the difference between the specific conductivity readings from the calibrated instrument and the water-quality sonde readings are less than the 5% threshold, no calibrations are needed. After cleaning the conductivity sensor, no instrument required calibration of the conductivity sensor. All sondes deployed were performing properly at the time of the service event.

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. During this service event, none of the data was above that threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Stephen Meyers (ENCOS) and Adam Trahan (ENCOS)

Date: June 27, 2013

Conditions: Skies: clear and sunny; Winds: S 5kts; Temperature: High 94 °F, Low 87 °F

Logistical and Personnel:

Stephen Meyers (ENCOS) and Adam Trahan (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team loaded the diagnostic, maintenance, and calibration equipment needed into the ENCOS vessel to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-01, TV63-02, and TV63-03 for the June 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. All sites were visited during this event and all monthly data was recovered from the stations.

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

No problems were encountered during the service run.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$.

When the difference between the cleaned specific conductivity readings from the calibrated instrument and the clean water-quality sonde readings are less than the 5% threshold, no calibrations are needed. The specific conductivity difference at TV63-02 was greater than the calibration threshold of 5% and required calibration after the sensors were cleaned. The three sondes deployed were performing properly at the time of the service event.

All pressure sensors were set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. At TV63-02 the clean Specific Conductivity difference was 10.71%, which exceeds the 5% threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan and Coklin Nguyen (ENCOS)

Date: July 29, 2013

Conditions: Skies: clear and sunny; Winds: N-NW <5kts; Temperature: High 98 °F, Low 89 °F

Logistical and Personnel:

Adam Trahan and Coklin Nguyen (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team loaded the diagnostic, maintenance, and calibration equipment needed into the ENCOS vessel to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-01, TV63-02, TV63-03, and TV63-06 for the July 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. All sites were visited during this event and all monthly data was recovered from the stations.

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

No problems were encountered during the service run.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$. When the difference between the cleaned specific conductivity readings from the calibrated instrument and the clean water-quality sonde readings are less than the 5% threshold, no calibrations are needed. None of the instruments on this service event required calibration after the sensors were cleaned. The four sondes deployed were performing properly at the time of the service event.

All pressure sensors were set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. During this service event, none of the data was above that threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan and Coklin Nguyen (ENCOS), Jennifer Lindquist (GEC), and Faucheux Airboat Services

Date: July 30, 2013

Conditions: Skies: Sunny with few clouds in area; Winds: NE ~5kts; Temperature: High 96 °F, Low 89 °F

Logistical and Personnel:

Adam Trahan and Coklin Nguyen (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team met Jennifer Lindquist (GEC) at the boat launch to assist her in the collection of nutrient samples. The field team loaded the diagnostic, maintenance, and calibration equipment needed into the airboat to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-04 and TV63-05 for the July 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. During this time, with Jennifer Lindquist (GEC), we visited sites TV63-07, TV63-08, TV63-09, TV63-10, TV63-11, and TV63-12 to collect discrete nutrient samples. The sites mentioned above were visited during this event and all monthly data was recovered from TV63-04 and TV63-05. Nutrient samples collected for this event were relinquished to Accutest Laboratories in Lafayette, LA, for phosphorous and total nitrogen analysis. The analysis results will be sent to Jennifer Lindquist (GEC).

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager, for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

At DCP TV63-04, there was a buildup of mud and organic debris in the bottom of the sonde pipe. Further examination of the area surrounding the outside of the sonde pipe revealed a considerable amount of fine sediment and organic detritus accreted above the load plate located at the mud water interface. This sediment and organic material built up one (1) to two (2) inches

in the sensor guard of the instrument. The field team removed sediment in a one-foot diameter radius around the sonde pipe to allow free exchange of water over the sensors.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$ and the pressure was set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

When the difference between the specific conductivity readings from the calibrated instrument and the water-quality sonde readings are less than the 5% threshold, no calibrations are needed. After cleaning the conductivity sensor, no instrument required calibration of the conductivity sensor. All sondes deployed were performing properly at the time of the service event.

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. During this service event, none of the data was above that threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan and Stephen Meyers (ENCOS)

Date: August 26, 2013

Conditions: Skies: cloudy/ rainy; Winds: E 10kts; Temperature: High 94 °F, Low 89 °F

Logistical and Personnel:

Adam Trahan and Stephen Meyers (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team loaded the diagnostic, maintenance, and calibration equipment needed into the ENCOS vessel to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-01, TV63-02, TV63-03, and TV63-06 for the August 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. All sites were visited during this event and all monthly data was recovered from the stations.

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

No problems were encountered during the service run.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$. When the difference between the cleaned specific conductivity readings from the calibrated instrument and the clean water-quality sonde readings are less than the 5% threshold, no calibrations are necessary. However, at site TV63-01 the instrument had a percent difference of 11.48% and required calibration after the sensors were cleaned. The four sondes deployed were performing properly at the time of the service event.

All pressure sensors were set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. During this service event, TV63-01 data was above that threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan and Stephen Meyers (ENCOS), Jennifer Lindquist (GEC), and Faucheux Airboat Services

Date: August 27, 2013

Conditions: Skies: Sunny with few clouds in area; Winds: E 5kts; Temperature: High 92 °F, Low 89 °F

Logistical and Personnel:

Adam Trahan and Stephen Meyers (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team met Jennifer Lindquist (GEC) at the boat launch to assist her in the collection of nutrient samples. The field team loaded the diagnostic, maintenance, and calibration equipment needed into the airboat to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-04 and TV63-05 for the August 2013 service event. At each DCP, the instruments were cleaned and the pressure sensors were calibrated. During this time, with Jennifer Lindquist (GEC), we visited sites TV63-07, TV63-08, TV63-09, TV63-10, TV63-11, and TV63-12 to collect discrete nutrient samples. The sites mentioned above were visited during this event and all monthly data was recovered from TV63-04 and TV63-05. Nutrient samples collected for this event were relinquished to Accutest Laboratories in Lafayette, LA, for phosphorous and total nitrogen analysis. The analysis results will be sent to Jennifer Lindquist (GEC).

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager, for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

At DCP TV63-04, there was a buildup of mud and organic debris in the bottom of the sonde pipe. Further examination of the area surrounding the outside of the sonde pipe revealed a considerable amount of fine sediment and organic detritus accreted above the load plate located at the mud water interface. This sediment and organic material built up one (1) to two (2) inches

in the sensor guard of the instrument. The field team removed sediment in a one-foot diameter radius around the sonde pipe to allow free exchange of water over the sensors.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. When needed, the YSI 6920's conductivity sensors were calibrated with 20,000 $\mu\text{S}/\text{cm}$ and the pressure was set to zero (0) at the water surface before initiating data collection. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

When the difference between the specific conductivity readings from the calibrated instrument and the water-quality sonde readings are less than the 5% threshold, no calibrations are needed. After cleaning the conductivity sensor, no instrument required calibration of the conductivity sensor. All sondes deployed were performing properly at the time of the service event.

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. During this service event, none of the data was above that threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Decommissioning of the Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan and Joel Chaky (ENCOS), and Faucheux Airboat Services

Date: October 22, 2013

Conditions: Skies: Sunny with few clouds in area; Winds: SE 5-10kts; Temperature: High 85 °F, Low 75 °F

Logistical and Personnel:

Adam Trahan and Joel Chaky (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team loaded the diagnostic, maintenance, and calibration equipment needed into the airboat to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-02, TV63-03, TV63-05, and TV63-06 for the October 2013 service event. At each DCP, the instrument data was downloaded and all instruments removed. The sites mentioned above were visited during this event and all monthly data was recovered.

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager, for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

No problems were encountered during the service run.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. No calibrations were performed on the YSI 6920's conductivity and pressure sensors as each instrument was being removed. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. During this service event, none of the data was above that threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Monthly Data Collection of Hourly Water Level, Salinity, and Turbidity measurements

Personnel Involved: Adam Trahan and Joel Chaky (ENCOS), Jennifer Lindquist and Will Grant (GEC), and Faucheux Airboat Services

Date: October 24, 2013

Conditions: Skies: Sunny with few clouds in area; Winds: SE 5-10kts; Temperature: High 89 °F, Low 75 °F

Logistical and Personnel:

Adam Trahan and Joel Chaky (ENCOS) arrived at the Intracoastal City, LA boat launch on Hwy 333 to service the monitoring instruments for the Cole's Bayou 6 Month Monitoring Program (TV-63). The field team met Jennifer Lindquist and Will Grant (GEC) at the boat launch to assist in the collection of nutrient samples. The field team loaded the diagnostic, maintenance, and calibration equipment needed into the airboat to service and calibrate the water quality equipment at Data Collection Platforms (DCP) TV63-01 and TV63-04 for the October 2013 service event. At each DCP, the instrument data was downloaded and all instruments removed. During this time, with Jennifer Lindquist and Will Grant (GEC), we visited sites TV63-07, TV63-08, TV63-09, TV63-10, TV63-11, and TV63-12 to collect discrete nutrient samples. The sites mentioned above were visited during this event and all monthly data was recovered from TV63-01 and TV63-04. Nutrient samples collected for this event were relinquished to Accutest Laboratories in Lafayette, LA, for phosphorous and total nitrogen analysis. The analysis results will be sent to Jennifer Lindquist (GEC).

The field crew used survey data provided by HydroTerra Technologies to obtain a sensor elevation for the data sondes at all DCP's. Using this data, ENCOS adjusts the hourly water level data from the DCP's to the North American Vertical Datum of 1988 (NAVD 88).

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Timmy Vincent, Rainy Wildlife Refuge Manager, for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

At DCP TV63-04, there was a buildup of mud and organic debris in the bottom of the sonde pipe. Further examination of the area surrounding the outside of the sonde pipe revealed a considerable amount of fine sediment and organic detritus accreted above the load plate located at the mud water interface. This sediment and organic material built up one (1) to two (2) inches in the sensor guard of the instrument.

Calibrations:

ENCOS personnel calibrated an YSI 30, serial number 10F100947, with 20,000 $\mu\text{S}/\text{cm}$ calibration solution at the beginning of the day. This instrument served as the calibrated instrument. No calibrations were performed on the YSI 6920's conductivity and pressure sensors as each instrument was being removed. The instrument was set to record data hourly with a time and date stamp set to Central Standard Time (CST).

Data Shifts

When the difference between the dirty specific conductivity readings from the calibrated instrument and the dirty water-quality sonde readings are less than the 5% threshold, data are not shifted. During this service event, none of the data was above that threshold. In the spreadsheet supplied from past CPRA projects, a linear shift is applied to the raw data and then shown in the spreadsheet as shifted Specific Conductivity and since Salinity is derived from Specific Conductivity readings, those values are also shifted. The Master Excel sheet reflects the raw data and the shifted data. Currently, only the shifted data is graphed.



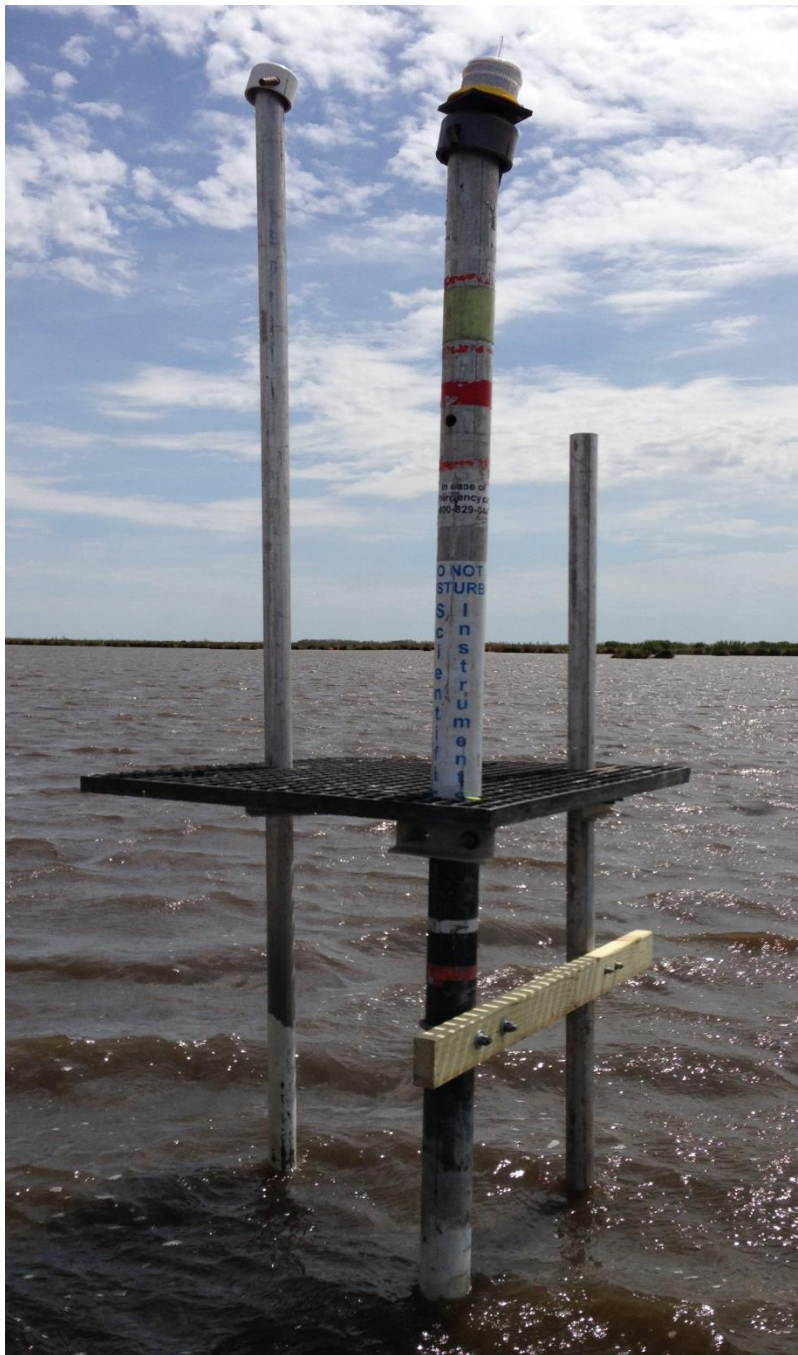
STATION NAME:	TV63-01
LOCATION:	Schooner Bayou
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/20/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole, Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	5.84' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	3.95'
LATITUDE:	N29°45'07.4"
LONGITUDE:	W092°14'39.7"
MEASURED OVER ALL STATION LENGTH:	14.73'
MARK TO SENSOR DISTANCE:	8.68' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	5.78'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	3.95'
DISTANCE BELOW MUD LINE (MONOPOLE):	5.00'
BASE PLATE TO TOC (MONOPOLE):	9.73'
STOP PLATE TO TOC:	9.49'



STATION NAME:	TV63-02
LOCATION:	Freshwater Bayou
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	4/2/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	6.42' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	3.40'
LATITUDE:	N29°45'44.6"
LONGITUDE:	W092°11'35.9"
MEASURED OVER ALL STATION LENGTH:	15.05'
MARK TO SENSOR DISTANCE:	8.68' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	6.50'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	3.55'
DISTANCE BELOW MUD LINE (MONOPOLE):	5.00'
BASE PLATE TO TOC (MONOPOLE):	9.87'
STOP PLATE TO TOC:	9.49'



STATION NAME:	TV63-03
LOCATION:	Buck Point Gas Field Canal
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/20/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	6.27' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	3.40'
LATITUDE:	N29°44'12.1"
LONGITUDE:	W092°12'58.0"
MEASURED OVER ALL STATION LENGTH:	16.00'
MARK TO SENSOR DISTANCE:	8.67' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	6.60'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	3.40'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	10.00'
STOP PLATE TO TOC:	9.48'



STATION NAME:	TV63-04
LOCATION:	Charles Bayou North
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/21/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	8.09' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	1.75'
LATITUDE:	N29°43'03.6"
LONGITUDE:	W092°13'26.0"
MEASURED OVER ALL STATION LENGTH:	15.67'
MARK TO SENSOR DISTANCE:	8.68' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	7.67'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	2.00'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	9.67'
STOP PLATE TO TOC:	9.49'



STATION NAME:	TV63-05
LOCATION:	Charles Bayou South
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/21/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	9.07' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	1.65'
LATITUDE:	N29°42'06.1"
LONGITUDE:	W092°13'07.1"
MEASURED OVER ALL STATION LENGTH:	15.92'
MARK TO SENSOR DISTANCE:	8.69' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	8.37'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	1.55'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	9.92'
STOP PLATE TO TOC:	9.50'



STATION NAME:	TV63-06
LOCATION:	Belle Isle Bayou
DESCRIPTION:	Data Collection Platform (DCP)
INSTALLATION DATE:	3/21/2013
INSTALLED BY:	A. Trahan, J. Chaky, S. Meyers
STATION TYPE:	3" Aluminum Monopole-Fibergrating
STOP PLATE TO PRESSURE SENSOR DISTANCE:	0.81'
SURVEY ELEVATION:	5.96' (Preliminary Data)
WATER LEVEL AT INSTALLATION:	4.10'
LATITUDE:	N29°42'01.6"
LONGITUDE:	W092°13'06.9"
MEASURED OVER ALL STATION LENGTH:	15.94'
MARK TO SENSOR DISTANCE:	8.67' (Preliminary Data)
DISTANCE OF STATION ABOVE WATER LINE (AT INSTALL):	5.84'
DISTANCE OF STATION WITHIN WATER COLUMN (AT INSTALL):	4.10'
DISTANCE BELOW MUD LINE (MONOPOLE):	6.00'
BASE PLATE TO TOC (MONOPOLE):	9.94'
STOP PLATE TO TOC:	9.48'



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Total Suspended Solids Data Collection

Personnel Involved: Adam Trahan, Joel Chaky, Paul Templet, and Stephen Meyers (ENCOS) and Faucheux Airboat Services

Date: April 24 and 26, 2013

Conditions: **April 24, 2013:** Skies: Cloudy and Showers; Temperature range: 70-80 °F; Winds: North-northeast 10-15kts

April 26, 2013: Skies: clear and sunny; Winds: SE 5kts; Temperature: 70-75 °F.

Logistical and Personnel:

On April 24, 2013, the above-mentioned personnel, composed of two field teams, arrived at the Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to deploy the Sigma 900 Standard Portable Samplers at the six (6) Cole's Bayou Data Collection Platforms. The reason for deploying these samplers at this time was to capture a major frontal passage with a strong north wind moving through the area. At the sites, ENCOS personnel programmed and calibrated the samplers to collect one 1000ml sample every hour for a 24-hour period. The collection started on April 24, 2013 at 3:00PM and stopped on April 25, 2013 at 3:00PM. **Table 1** below shows the installation parameters at each site.

Table 1

<u>Station Name</u>	<u>Water Depth (Feet)</u>	<u>Sample Collection</u> <u>Water Depth (Feet)</u>
TV63-01	5.4	2.7
TV63-02	4.6	2.3
TV63-03	5.3	2.65
TV63-04	2.0	1.0
TV63-05	2.0	1.0
TV63-06	5.2	2.6

On April 26, 2013, Adam Trahan and Stephen Meyers (ENCOS) along with Faucheux Airboat Services returned to Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to recover the Sigma 900 Standard Portable Samplers and the 1000ml samples at the 6 Cole's Bayou Data Collection Platforms. These samples were then relinquished to Accutest Laboratories in Scott, LA for analysis. Accutest will send the results to Jennifer Lindquist at G.E.C., Inc. for final analysis.

On April 26, 2013, the ENCOS field team also collected 30 gallons of water to extract suspended sediments for grain size analysis. These samples were collected at two sites, TV63-04 and within the Little Vermillion Bay area (N 29°44'06.8", W 092°11'57.8"), with 15 gallons being collected

at each site. These samples were then relinquished to Ardaman Laboratories in Baton Rouge, LA for analysis. The results will be sent to Jennifer Lindquist at G.E.C., Inc.

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Steve Sanborn of Dynamic Solutions for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

During the recovery event on April 26, 2013, ENCOS encountered problems with four (4) of the six (6) Sigma 900 samplers. The Sigma samplers that malfunctioned all had a bottle advance fault. Table 2 shows the sites and samples collected at each site. The field team brought the samplers back to ENCOS office for troubleshooting. The discharge tubing wrapping around the distribution arm of the sampler caused the bottle advance fault experienced by the four (4) samplers, TV63-02, TV63-03, TV63-04, and TV63-06. The factory tubing was installed on the wrong side of the distribution arm and wrapped around the distribution arm that restricted the advance of the arm past sample bottle 17 on three samplers and bottle 16 on one sampler. To correct the problem, ENCOS personnel relocated the discharge tubing on the correct side of the distribution arm as to keep the tubing from becoming wrapped around the arm as it rotates to each sample bottle. **Table 2** contains the site and number of samples collected at each site for this event.

Table 2

<u>Station Name</u>	<u>Sample Number/Sample Hour Collected</u>
TV63-01	24 samples collected
TV63-02	17 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 7:00am)
TV63-03	16 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 6:00am)
TV63-04	17 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 7:00am)
TV63-05	24 samples collected
TV63-06	17 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 7:00am)

Calibrations:

ENCOS personnel calibrated the Sigma 900 Standard Portable samplers to collect 1000ml of water per sample before initiating the event sampling.

Environmental Conditions

Strong southerly winds raised water levels above normal prior to the time of installation. Although the tides were above the normal on the exterior of the project area, the interior water levels were only slightly elevated. This was also the case for the installation of stations TV63-04, TV63-05, and TV63-06 on March 21, 2013.



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Total Suspended Solids Data Collection

Personnel Involved: Adam Trahan and Stephen Meyers (ENCOS) and Faucheux Airboat Services

Date: July 23 and 25, 2013

Conditions: July 23, 2013: Skies: Partly cloudy; Temperature range: 88-96 °F; Winds: NNW 5kts

July 25, 2013: Skies: Cloudy and showers; Temperature range: 75-95 °F; Winds: NW 5-10kts

Logistical and Personnel:

On July 23, 2013, the above-mentioned personnel arrived at the Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to deploy the Sigma 900 Standard Portable Samplers at the six (6) Cole's Bayou Data Collection Platforms. The reason for deploying these samplers at this time was to capture a baseline collection of the project area. At the sites, ENCOS personnel programmed and calibrated the samplers to collect one 1000ml sample every hour for a 24-hour period. The collection started July 24, 2013 at 6:00AM and stopped July 25, 2013 at 5:00AM. **Table 1** below shows the installation parameters at each site.

Table 1

<u>Station Name</u>	<u>Water Depth (Feet)</u>	<u>Sample Collection Water Depth (Feet)</u>
TV63-01	4.6'	2.3'
TV63-02	5.2'	2.6'
TV63-03	5.0'	2.5'
TV63-04	2.2'	1.1'
TV63-05	2.2'	1.1'
TV63-06	4.2'	2.1'

On July 25, 2013, Adam Trahan and Stephen Meyers (ENCOS) along with Faucheux Airboat Services returned to Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to recover the Sigma 900 Standard Portable Samplers and the 1000ml samples at the 6 Cole's Bayou Data Collection Platforms. These samples were relinquished to Accutest Laboratories in Scott, LA for analysis. Accutest will send the results to Jennifer Lindquist at G.E.C., Inc. for final analysis.

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Steve Sanborn of Dynamic Solutions for all activities of this event. ENCOS will continue to contact them for future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

During the recovery event on July 25, 2013, three (3) of the six (6) Sigma 900 samplers lacked a complete sample set. The probable cause was the water levels at these sites dropped below the intake tube of the samplers and water was not pumped into the collection bottles at the collection hour. **Table 2** shows the sites and samples not collected (skipped) at three (3) of the sites.

Table 2

<u>Station Name</u>	<u>Sample Number/Sample Hour Skipped</u>
TV63-01	Samples 07-13 (12:00PM-6:00PM)
TV63-04	Samples 06 (11:00AM), 08-09 (1:00PM-2:00PM), 14-17 (7:00PM-10:00PM)
TV63-06	Samples 15-16 (8:00PM-9:00PM)

Calibrations:

ENCOS personnel calibrated the Sigma 900 Standard Portable samplers to collect 1000ml of water per sample before initiating the event sampling.

Environmental Conditions

Calm winds and normal summer time water levels were encountered at the time of deployment and recovery..



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Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Total Suspended Solids Data Collection

Personnel Involved: Adam Trahan, Joel Chaky, Paul Templet, and Stephen Meyers (ENCOS) and Faucheux Airboat Services

Date: October 05 and 07, 2013

Conditions: October 05, 2013: Skies: Cloudy and Showers; Temperature range: 75-90 °F; Winds: East-Southeast ~15kts

October 07, 2013: Skies: clear and sunny; Winds: SE 5kts; Temperature: 70-85 °F.

Logistical and Personnel:

On October 05, 2013, the above-mentioned personnel, composed of two field teams, arrived at the Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to deploy the Teledyne ISCO Portable Samplers at the six (6) Cole's Bayou Data Collection Platforms. The reason for deploying these samplers at this time was to capture a major wind event with at least a 15 mph easterly wind moving through the area. At the sites, ENCOS personnel programmed and calibrated the samplers at sites TV63-03, TV63-04, TV63-05, and TV63-06 to collect one 1000ml sample every hour for a 24-hour period. A 24-hour composite sample was collected at TV63-01 and TV63-02. The collection started on October 06, 2013 at 8:00AM and stopped on October 07, 2013 at 7:00AM. **Table 1** below shows the installation water depths at each site.

Table 1

<u>Station Name</u>	<u>Water Depth (Feet)</u>	<u>Sample Collection Water Depth (Feet)</u>
TV63-01	6.0	4.0
TV63-02	6.0	4.0
TV63-03	5.7	3.85
TV63-04	3.0	2.0
TV63-05	3.0	2.0
TV63-06	6.0	4.0

On October 07, 2013, Adam Trahan and Joel Chaky (ENCOS) along with Faucheux Airboat Services returned to Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to recover the Teledyne ISCO Portable Samplers. These samples were relinquished to Accutest Laboratories in Scott, LA for analysis. Accutest will send the results to Jennifer Lindquist at G.E.C., Inc. for final analysis.

On October 07, 2013, the ENCOS field team also collected 30 gallons of water to extract suspended sediments for grain size analysis. These samples were collected at two sites, TV63-04

and within the Little Vermillion Bay area (N 29°44'06.8", W 092°11'57.8"), with 15 gallons being collected at each site. ENCOS relinquished the samples to Ardaman Laboratories in Baton Rouge, LA for analysis. Once the samples are desiccated, ENCOS will forward the sediment collected to William McAnally for Coulter Counter analysis.

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Steve Sanborn of Dynamic Solutions for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

During the recovery event on October 07, 2013, ENCOS encountered problems with two (2) of the six (6) Teledyne ISCO Portable Samplers. Table 2 shows the sites and samples collected at each site. The field team brought the samplers back to ENCOS office for troubleshooting. At site TV63-04, all samples were collected except bottles 22, 23, and 24 as the error message read "Distributor arm jammed". At site TV63-06, hourly sample bottles 1, 2, and 3 were the only samples collected. The distributor arm-retaining nut fell off the motor shaft and was unable to advance to subsequent sample bottles. The sampler did continue to sample filling up, overflowing bottle 9, and filling the base of the sampler with the rest of the 24-hour samples. ENCOS discussed the possibility of pumping out the base with Dynamic Solutions and using this as a composite sample and analyzing samples 1,2, and 3 as hourly samples. Dynamic Solutions agreed that this was an acceptable way to analyze the samples at TV63-06. **Table 2** contains the site and number of samples collected at each site for this event.

Table 2

<u>Station Name</u>	<u>Sample Number/Sample Hour Collected</u>
TV63-01	Complete composite sample
TV63-02	Complete composite sample
TV63-03	Complete 24 samples collected
TV63-04	21 samples collected (from 10/06/2013 @ 0800 to 10/07/2013 @ 0400)
TV63-05	Complete 24 samples collected
TV63-06	Samples 1,2, and 3 collected (from 10/06/2013 @ 0800 to 10/06/2013 @ 1000); Composite sample collected (from 10/06/2013 @ 1100 to 10/07/2013 @ 0700)

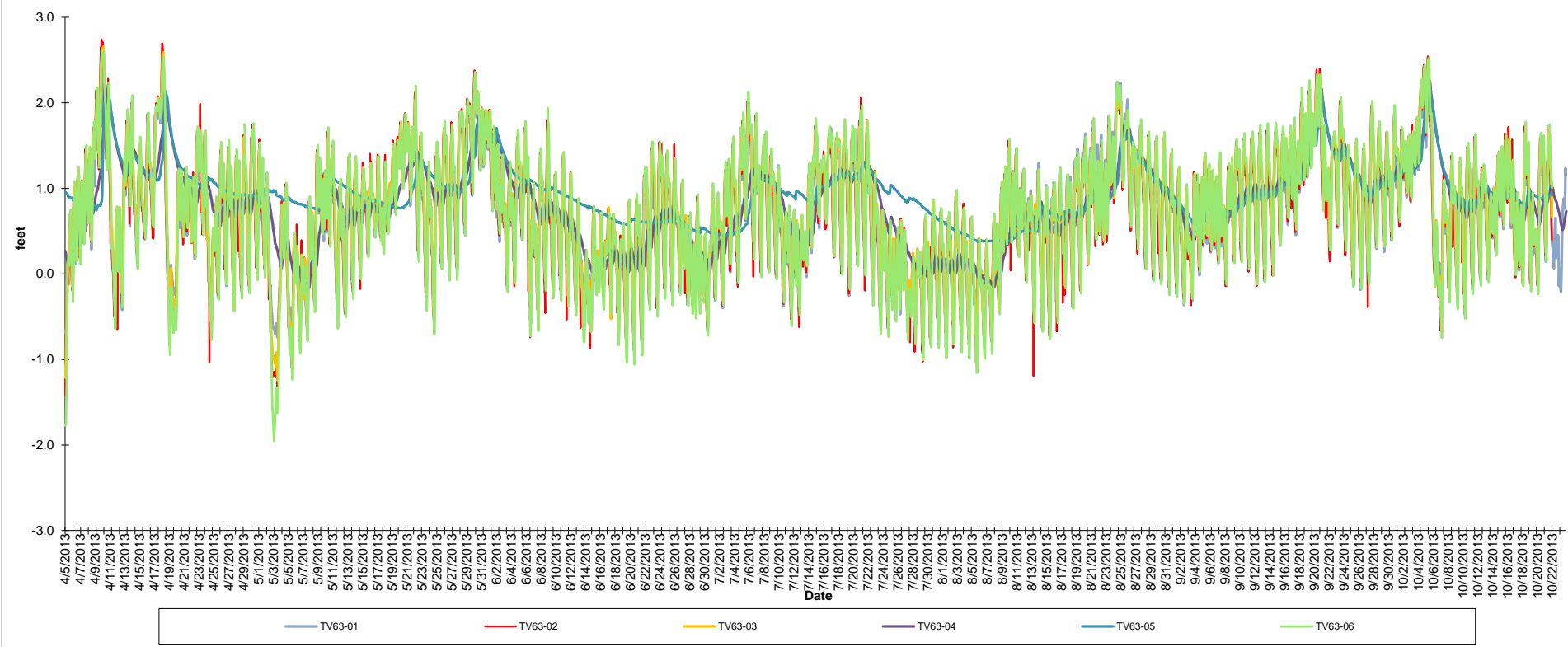
Calibrations:

ENCOS personnel calibrated the Teledyne ISCO Portable Samplers to collect 1000ml of water per sample before initiating the event sampling at sites TV63-03, TV63-04, TV63-05, and TV63-06. The field team calibrated the sample volume at sites TV63-01 and TV63-02 to collect 400 ml each hour for a 24-hour period.

Environmental Conditions

Strong easterly winds and a high tide event raised water levels above normal prior to the time of installation. The tides were above the normal on the exterior as well as the interior of the project area.

Cole's Bayou NAVD Water TV63-01, TV63-02, TV63-03, TV63-04, TV63-05, and TV63-06



TV63-01 - Schooner Bayou



TV63-02 - Freshwater Bayou



TV63-03 - Buck Point Gas Field Canal



TV63-04 - Charles Bayou North



TV63-05 - Charles Bayou South



TV63-06 - Belle Isle Bayou



APPENDIX D

TRIP REPORT (APRIL 24-26, FRONTAL EVENT)



Corporate Office:
727 Highlandia Drive
Suite A
Baton Rouge, LA 70810
Phone: 225/751-4200
Fax: 225/752-4208

Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Total Suspended Solids Data Collection

Personnel Involved: Adam Trahan, Joel Chaky, Paul Templet, and Stephen Meyers (ENCOS) and Faucheux Airboat Services

Date: April 24 and 26, 2013

Conditions: April 24, 2013: Skies: Cloudy and Showers; Temperature range: 70-80 °F; Winds: North-northeast 10-15kts

April 26, 2013: Skies: clear and sunny; Winds: SE 5kts; Temperature: 70-75 °F.

Logistical and Personnel:

On April 24, 2013, the above-mentioned personnel, composed of two field teams, arrived at the Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to deploy the Sigma 900 Standard Portable Samplers at the six (6) Cole's Bayou Data Collection Platforms. The reason for deploying these samplers at this time was to capture a major frontal passage with a strong north wind moving through the area. At the sites, ENCOS personnel programmed and calibrated the samplers to collect one 1000ml sample every hour for a 24-hour period. The collection started on April 24, 2013 at 3:00PM and stopped on April 25, 2013 at 3:00PM. **Table 1** below shows the installation parameters at each site.

Table 1

<u>Station Name</u>	<u>Water Depth (Feet)</u>	<u>Sample Collection Water Depth (Feet)</u>
TV63-01	5.4	2.7
TV63-02	4.6	2.3
TV63-03	5.3	2.65
TV63-04	2.0	1.0
TV63-05	2.0	1.0
TV63-06	5.2	2.6

On April 26, 2013, Adam Trahan and Stephen Meyers (ENCOS) along with Faucheux Airboat Services returned to Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to recover the Sigma 900 Standard Portable Samplers and the 1000ml samples at the 6 Cole's Bayou Data Collection Platforms. These samples were then relinquished to Accutest Laboratories in Scott, LA for analysis. Accutest will send the results to Jennifer Lindquist at G.E.C., Inc. for final analysis.

On April 26, 2013, the ENCOS field team also collected 30 gallons of water to extract suspended sediments for grain size analysis. These samples were collected at two sites, TV63-04 and within the Little Vermillion Bay area (N 29°44'06.8", W 092°11'57.8"), with 15 gallons being collected

at each site. These samples were then relinquished to Ardaman Laboratories in Baton Rouge, LA for analysis. The results will be sent to Jennifer Lindquist at G.E.C., Inc.

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Steve Sanborn of Dynamic Solutions for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

During the recovery event on April 26, 2013, ENCOS encountered problems with four (4) of the six (6) Sigma 900 samplers. The Sigma samplers that malfunctioned all had a bottle advance fault. Table 2 shows the sites and samples collected at each site. The field team brought the samplers back to ENCOS office for troubleshooting. The discharge tubing wrapping around the distribution arm of the sampler caused the bottle advance fault experienced by the four (4) samplers, TV63-02, TV63-03, TV63-04, and TV63-06. The factory tubing was installed on the wrong side of the distribution arm and wrapped around the distribution arm that restricted the advance of the arm past sample bottle 17 on three samplers and bottle 16 on one sampler. To correct the problem, ENCOS personnel relocated the discharge tubing on the correct side of the distribution arm as to keep the tubing from becoming wrapped around the arm as it rotates to each sample bottle. **Table 2** contains the site and number of samples collected at each site for this event.

Table 2

<u>Station Name</u>	<u>Sample Number/Sample Hour Collected</u>
TV63-01	24 samples collected
TV63-02	17 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 7:00am)
TV63-03	16 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 6:00am)
TV63-04	17 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 7:00am)
TV63-05	24 samples collected
TV63-06	17 samples/hours collected (from 04/24/13 @ 3:00pm to 04/25/13 @ 7:00am)

Calibrations:

ENCOS personnel calibrated the Sigma 900 Standard Portable samplers to collect 1000ml of water per sample before initiating the event sampling.

Environmental Conditions

Strong southerly winds raised water levels above normal prior to the time of installation. Although the tides were above the normal on the exterior of the project area, the interior water levels were only slightly elevated. This was also the case for the installation of stations TV63-04, TV63-05, and TV63-06 on March 21, 2013.

APPENDIX E

TRIP REPORT (JULY 23 – 25, SUMMER CONDITIONS)



Corporate Office:
727 Highlandia Drive
Suite A
Baton Rouge, LA 70810
Phone: 225/751-4200
Fax: 225/752-4208

Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Total Suspended Solids Data Collection

Personnel Involved: Adam Trahan and Stephen Meyers (ENCOS) and Fauchaux Airboat Services

Date: July 23 and 25, 2013

Conditions: July 23, 2013: Skies: Partly cloudy; Temperature range: 88-96 °F; Winds: NNW 5kts

July 25, 2013: Skies: Cloudy and showers; Temperature range: 75-95 °F; Winds: NW 5-10kts

Logistical and Personnel:

On July 23, 2013, the above-mentioned personnel arrived at the Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to deploy the Sigma 900 Standard Portable Samplers at the six (6) Cole's Bayou Data Collection Platforms. The reason for deploying these samplers at this time was to capture a baseline collection of the project area. At the sites, ENCOS personnel programmed and calibrated the samplers to collect one 1000ml sample every hour for a 24-hour period. The collection started July 24, 2013 at 6:00AM and stopped July 25, 2013 at 5:00AM. **Table 1** below shows the installation parameters at each site.

Table 1

<u>Station Name</u>	<u>Water Depth (Feet)</u>	<u>Sample Collection Water Depth (Feet)</u>
TV63-01	4.6'	2.3'
TV63-02	5.2'	2.6'
TV63-03	5.0'	2.5'
TV63-04	2.2'	1.1'
TV63-05	2.2'	1.1'
TV63-06	4.2'	2.1'

On July 25, 2013, Adam Trahan and Stephen Meyers (ENCOS) along with Fauchaux Airboat Services returned to Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to recover the Sigma 900 Standard Portable Samplers and the 1000ml samples at the 6 Cole's Bayou Data Collection Platforms. These samples were relinquished to Accutest Laboratories in Scott, LA for analysis. Accutest will send the results to Jennifer Lindquist at G.E.C., Inc. for final analysis.

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Steve Sanborn of Dynamic Solutions for all activities of this event. ENCOS will continue to contact them for future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

During the recovery event on July 25, 2013, three (3) of the six (6) Sigma 900 samplers lacked a complete sample set. The probable cause was the water levels at these sites dropped below the intake tube of the samplers and water was not pumped into the collection bottles at the collection hour. **Table 2** shows the sites and samples not collected (skipped) at three (3) of the sites.

Table 2

<u>Station Name</u>	<u>Sample Number/Sample Hour Skipped</u>
TV63-01	Samples 07-13 (12:00PM-6:00PM)
TV63-04	Samples 06 (11:00AM), 08-09 (1:00PM-2:00PM), 14-17 (7:00PM-10:00PM)
TV63-06	Samples 15-16 (8:00PM-9:00PM)

Calibrations:

ENCOS personnel calibrated the Sigma 900 Standard Portable samplers to collect 1000ml of water per sample before initiating the event sampling.

Environmental Conditions

Strong southerly winds raised water levels above normal prior to the time of installation. Although the tides were above the normal on the exterior of the project area, the interior water levels were only slightly elevated. This was also the case for the installation of stations TV63-04, TV63-05, and TV63-06 on March 21, 2013.

APPENDIX F

TRIP REPORT (OCTOBER 5 – 7, WIND EVENT)



Corporate Office:
727 Highlandia Drive
Suite A
Baton Rouge, LA 70810
Phone: 225/751-4200
Fax: 225/752-4208

Trip Report

Project: Cole's Bayou 6 Month Monitoring Program

Location: Gulf Coast of Louisiana in Vermillion Parish within the Teche/Vermillion Basin

Purpose: Total Suspended Solids Data Collection

Personnel Involved: Adam Trahan, Joel Chaky, Paul Templet, and Stephen Meyers (ENCOS) and Faucheux Airboat Services

Date: October 05 and 07, 2013

Conditions: October 05, 2013: Skies: Cloudy and Showers; Temperature range: 75-90 °F; Winds: East-Southeast ~15kts

October 07, 2013: Skies: clear and sunny; Winds: SE 5kts; Temperature: 70-85 °F.

Logistical and Personnel:

On October 05, 2013, the above-mentioned personnel, composed of two field teams, arrived at the Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to deploy the Teledyne ISCO Portable Samplers at the six (6) Cole's Bayou Data Collection Platforms. The reason for deploying these samplers at this time was to capture a major wind event with at least a 15 mph easterly wind moving through the area. At the sites, ENCOS personnel programmed and calibrated the samplers at sites TV63-03, TV63-04, TV63-05, and TV63-06 to collect one 1000ml sample every hour for a 24-hour period. A 24-hour composite sample was collected at TV63-01 and TV63-02. The collection started on October 06, 2013 at 8:00AM and stopped on October 07, 2013 at 7:00AM. **Table 1** below shows the installation water depths at each site.

Table 1

<u>Station Name</u>	<u>Water Depth (Feet)</u>	<u>Sample Collection Water Depth (Feet)</u>
TV63-01	6.0	4.0
TV63-02	6.0	4.0
TV63-03	5.7	3.85
TV63-04	3.0	2.0
TV63-05	3.0	2.0
TV63-06	6.0	4.0

On October 07, 2013, Adam Trahan and Joel Chaky (ENCOS) along with Faucheux Airboat Services returned to Intracoastal City, LA boat launch on Hwy 333 and loaded necessary equipment to recover the Teledyne ISCO Portable Samplers. These samples were relinquished to Accutest Laboratories in Scott, LA for analysis. Accutest will send the results to Jennifer Lindquist at G.E.C., Inc. for final analysis.

On October 07, 2013, the ENCOS field team also collected 30 gallons of water to extract suspended sediments for grain size analysis. These samples were collected at two sites, TV63-04

and within the Little Vermillion Bay area (N 29°44'06.8", W 092°11'57.8"), with 15 gallons being collected at each site. ENCOS relinquished the samples to Ardaman Laboratories in Baton Rouge, LA for analysis. Once the samples are desiccated, ENCOS will forward the sediment collected to William McAnally for Coulter Counter analysis.

ENCOS personnel coordinated field access with Randy Moertle and Associates, Inc. and Steve Sanborn of Dynamic Solutions for all activity during this event. ENCOS will continue to contact them for all future access and events pertaining to this project.

Environmental Conditions and Problems Encountered:

During the recovery event on October 07, 2013, ENCOS encountered problems with two (2) of the six (6) Teledyne ISCO Portable Samplers. Table 2 shows the sites and samples collected at each site. The field team brought the samplers back to ENCOS office for troubleshooting. At site TV63-04, all samples were collected except bottles 22, 23, and 24 as the error message read "Distributor arm jammed". At site TV63-06, hourly sample bottles 1, 2, and 3 were the only samples collected. The distributor arm-retaining nut fell off the motor shaft and was unable to advance to subsequent sample bottles. The sampler did continue to sample filling up, overflowing bottle 9, and filling the base of the sampler with the rest of the 24-hour samples. ENCOS discussed the possibility of pumping out the base with Dynamic Solutions and using this as a composite sample and analyzing samples 1,2, and 3 as hourly samples. Dynamic Solutions agreed that this was an acceptable way to analyze the samples at TV63-06. **Table 2** contains the site and number of samples collected at each site for this event.

Table 2

<u>Station Name</u>	<u>Sample Number/Sample Hour Collected</u>
TV63-01	Complete composite sample
TV63-02	Complete composite sample
TV63-03	Complete 24 samples collected
TV63-04	21 samples collected (from 10/06/2013 @ 0800 to 10/07/2013 @ 0400)
TV63-05	Complete 24 samples collected
TV63-06	Samples 1,2, and 3 collected (from 10/06/2013 @ 0800 to 10/06/2013 @ 1000); Composite sample collected (from 10/06/2013 @ 1100 to 10/07/2013 @ 0700)

Calibrations:

ENCOS personnel calibrated the Teledyne ISCO Portable Samplers to collect 1000ml of water per sample before initiating the event sampling at sites TV63-03, TV63-04, TV63-05, and TV63-06. The field team calibrated the sample volume at sites TV63-01 and TV63-02 to collect 400 ml each hour for a 24-hour period.

Environmental Conditions

Strong easterly winds and a high tide event raised water levels above normal prior to the time of installation. The tides were above the normal on the exterior as well as the interior of the project area.