

Supplement to the Most Feasible Plan for Evaluation/Remediation

Vermilion Parish School Board (VPSB) Property
Section 16 T15S, R01E
East White Lake Oilfield
Vermilion Parish, Louisiana
State of Louisiana and the Vermilion Parish School Board v. Louisiana Land and
Exploration, et al.
Docket No. 82,162, Division “D”
15th Judicial District Court, Parish of Vermilion (the “VPSB Litigation”)

MP&A Project No. 07-47

Prepared for:

**Louisiana Department of Natural Resources
Office of Conservation**

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Table of Contents

1.0	Introduction.....	1
2.0	Site Setting and Hydrogeology	2
3.0	Applicable Remediation Standards.....	4
3.1	Soil	4
3.2	Groundwater	5
3.3	LAC 43:XIX.319 Exceptions.....	5
4.0	Summary of Supplemental Investigation (November 2015 – February 2016).....	7
4.1	Updated Soil and Sediment Quality.....	7
4.2	Updated Groundwater Quality	8
5.0	Modifications to the Most Feasible Plan	14
5.1	Justification for the Feasible Plan.....	14
6.0	Modifications to the Schedule	16
7.0	Reporting.....	17

Supplement to the Most Feasible Plan for Evaluation/Remediation

Vermilion Parish School Board (VPSB) Property
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Table of Contents (continued)

List of Figures

1	Site Location
2	Supplemental Soil/Sediment Sampling Locations (11/2015-02/2016)
3	Soil/Sediment Sampling Locations
4	Soil/Sediment Sampling Locations – Northeast Quadrant
5	Soil/Sediment Sampling Locations – Northwest Quadrant
6	Soil/Sediment Sampling Locations – Southeast Quadrant
7	Soil/Sediment Sampling Locations – Southwest Quadrant
8	Supplemental Groundwater Sampling Locations (12/2015-02/2016)
9	Groundwater Sampling Locations
10	Statewide Order 29-B Standard Exceedances – Soil/Sediment
11	RECAP Direct Contact Screening Standard Exceedances - Soil/Sediment
12	RECAP Groundwater Protection Screening Standard Exceedances - Soil/Sediment
13	Groundwater Barium Concentrations - Peat Zone
14	Groundwater Chloride Concentrations - Peat Zone
15	Groundwater TPH Concentrations - Peat Zone
16	Groundwater Radium-226/-228 Concentrations - Peat Zone
17	Groundwater Barium Concentrations – 40 to 60 foot zone
18	Groundwater Chloride Concentrations – 40 to 60 foot zone
19	Groundwater Benzene Concentrations – 40 to 60 foot zone
20	Groundwater Radium-226/-228 Concentrations – 40 to 60 foot zone
21	RECAP GW2 40 to 60 foot zone
22	Groundwater Barium Concentrations – 70 to 90 foot zone
23	Groundwater Chloride Concentrations – 70 to 90 foot zone
24	Groundwater Radium-226/-228 Concentrations – 70 to 90 foot zone
25	Groundwater Barium Concentrations – 90 to 250 foot zone
26	Groundwater Chloride Concentrations – 90 to 250 foot zone
27	Groundwater Radium-226/-228 Concentrations – 90 to 250 foot zone
28	Groundwater Chloride Concentrations – 250 to 300 foot zone
29	Groundwater Barium, Benzene, & TPH Concentrations – 250 to 300 foot zone
30	Groundwater Radium-226/-228 Concentrations – 250 to 300 foot zone
31	Groundwater Barium Concentrations – Chicot Aquifer (>460 feet)

Supplement to the Most Feasible Plan for Evaluation/Remediation

Vermilion Parish School Board (VPSB) Property
Section 16 T15S, R01E
East White Lake Oilfield
Vermilion Parish, Louisiana

Table of Contents (Continued)

List of Figures (Continued)

32	Groundwater Chloride Concentrations – Chicot Aquifer (>460 feet)
33	Groundwater Radium-226/-228 Concentrations – Chicot Aquifer (>460 feet)
34	Deep Sections of ICON Electric Logs in Freshwater Portion of Chicot Aquifer
35	Stiff Diagrams – Background Wells
36	Piper Diagram – Background Wells
37	Stiff Diagrams – Chicot Wells (460-650')
38	Piper Diagram – Chicot Wells (460-650')

List of Tables

1	Soil/Sediment Analytical Data
2	Groundwater Analytical Data – All Zones
3	References

List of Appendices

A	MP&A Field Notes (November 11, 2015 through February 9, 2016)
B	MP&A Photographs and Photologs (November 11, 2015 through February 9, 2016)
C	Laboratory Analytical Reports (November 2015 through February 2016)

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1.0 Introduction

On behalf of Union Oil Company of California (UNOCAL), Michael Pisani & Associates (MP&A) is submitting this Supplement to the Most Feasible Plan for Evaluation/Remediation (Most Feasible Plan Supplement) of the Vermilion Parish School Board Property (VPSB – See Figure 1) to the Louisiana Department of Natural Resources (LDNR) Office of Conservation. This Most Feasible Plan Supplement addresses additional data that have been collected since the submission of the Most Feasible Plan for Evaluation/Remediation by MP&A on October 1, 2015. ICON Environmental Services Inc.'s (ICON) recent field investigation program extended through February 9, 2016 and final laboratory reports from ICON's sampling, as well as some of the split groundwater samples collected by MP&A have not yet been received.

The supplemental data collected since submittal of MP&A's Most Feasible Plan includes testing results from soil/sediment and groundwater samples collected from soil borings and monitoring wells installed by ICON. Split samples of soil/sediment and groundwater were also collected for analysis by MP&A.

Other experts (Angela Levert/ERM, Dr. Barbara Beck/Gradient, Dr. John Rodgers, and Dr. John Frazier) have prepared supplemental reports, including human health and ecological risk evaluations which incorporate the new data. The results of these additional evaluations have been utilized in the formulation of this Supplement to the Most Feasible Plan.

This Supplement does not repeat all information from the Most Feasible Plan, but only presents and evaluates the new data collected after MP&A's October 1, 2015 submission. Based on the supplemental data collected, the Most Feasible Plan presented on October 1, 2015 remains the appropriate approach to address impacts on the property, with very minor modifications, as presented and discussed in Section 4.

2.0 Site Setting and Hydrogeology

The property is located in Vermilion Parish, Louisiana and consists of Section 16 of Township 15 South, Range 01 East. The property measures approximately 5,367 feet east to west and 9,718 feet north to south. The property is situated within the East White Lake Oil and Gas Field approximately 0.5 miles east of White Lake.

The property is located within a normally inundated natural marsh environment with a natural land surface elevation ranging from below to slightly above mean sea level (MSL). The land adjacent to constructed canals is elevated to as high as four feet above MSL as a consequence of historic placement of dredge spoils from construction of the canals. Access to the property is only achieved by boat via the Schooner Bayou Canal and/or oilfield canals.

The property has historically been mapped as a freshwater marsh but the most recent mapping indicates that a large portion of the property has transitioned to an intermediate marsh. The potential for flooding, along with extremely-limited property access, restricts the reasonably anticipated future development of the property.

The region and the property are underlain by thick multi-layered sequences of unconsolidated sediments that alternate between clay, silt, sand, and gravel (in deeper layers). The soils and sediments on the property are continually submerged under the natural fresh to brackish surface waters on the property and in the region. As such, the water within the soils and sediments (referred to as porewater) will mirror the natural surface waters in salt composition, i.e., soluble chlorides ranging from less than 15 mg/L to over 5,000 mg/L.

Vertical movement (i.e., leakage) of the natural surface water and porewater into the uppermost shallow sand aquifer has been documented in the region by the United States Geological Survey (USGS). U.S. Army Corps of Engineers' dredging of Schooner Bayou removed a portion of the clay within the upper confining unit overlying the shallow sand aquifer and amplified surface water communication with the underlying shallow sand aquifer.

The natural movement of surface water into the shallow sand aquifer in the area has caused chloride concentrations to increase and to exceed the US EPA Secondary Drinking Water Standards for chlorides and total dissolved solids (TDS). The natural increase of chlorides and dissolved solids in the shallow sand aquifer has occurred and will continue to occur regardless of oil and gas production in the region.

The soil borings and monitoring wells recently installed to depths of approximately 500 feet below the ground surface (bgs) confirm the following:

- Presence of additional clay stringers/layers at depths of approximately 40 to 170 bgs which will limit vertical groundwater movement;

- The groundwater in the approximate 35 to 300 feet depth bgs interval is naturally salty and poor quality and would require extensive treatment to provide a fresh, potable water supply;
- The groundwater beginning at a depth of approximately 35 feet bgs is susceptible to degradation in the future as a result of the natural infiltration of brackish surface water through the thin, surficial clay layer;
- An over 100 foot thick clay aquitard, beginning at a depth of approximately 300 feet bgs and extending to over 400 feet bgs, confines and protects the Upper Sand of the Chicot Aquifer, which is the only fresh water aquifer, underlying the property;
- The groundwater present in the Upper Sand of the Chicot Aquifer at depths of approximately 460 to 650 feet is the only Class 1 fresh groundwater underlying the property and surrounding area that can serve as a source of potable water for a public water supply without requiring extensive treatment with reverse osmosis technology; and,
- From a practical standpoint, the cost of the installation and operation and maintenance of a water well for non-potable purposes in the naturally salty basal portion of the shallow sand zone at depths below approximately 250 feet is not substantially different than the cost of a water well installed in the freshwater portion of the Upper Sand of the Chicot Aquifer.

3.0 Applicable Remediation Standards

None of the data collected since submittal of the Most Feasible Plan has resulted in a change to any of the applicable remediation standards for any media at the property. This section is presented in its entirety from the Most Feasible Plan (October 1, 2015) for clarity and completeness.

The property is located within a normally inundated natural marsh environment and has been primarily an active oil and gas field since its initial development in 1940. In addition, the property is used for recreational hunting and fishing. Other than these uses, there was/is little potential for development or other economic use of the property. There is no access road to the property; access is via surface water by boat via the Schooner Bayou Canal and/or oilfield canals.

The oil and gas Exploration and Production (E&P) operations that have been conducted on the property are regulated by the LDNR Office of Conservation. LDNR rules for environmental protection are presented in Louisiana Administrative Code, Title 43, Part xix (LAC 43:XIX), Subpart I, commonly referred to as Statewide Order 29-B. Environmental damage, as defined by Louisiana Revised Statute 30:29 (La. R.S. 30:29, commonly referred to as Act 312 of 2006), means “any actual or potential impact, damage, or injury to environmental media caused by “contamination” resulting from activities associated with oilfield sites or exploration and production sites. Environmental media shall include but not be limited to soil, surface water, groundwater, or sediment.”

The LDNR defines contamination in *Title 43, Natural Resources, Part, XIX, Subpart 1, Statewide Order No. 29-B, Chapter 3; Pollution Control - Onsite Storage, Treatment and Disposal of Nonhazardous Oil field Waste (NOW) Generated from Drilling and Production of Oil and Gas Wells (Oil field Pit Regulations)* as follows: “the introduction of substances or contaminants into a groundwater aquifer, a USDW or soil in such quantities as to render them unusable for their intended purposes.” With minor exceptions (discussed in Section 4), the environmental conditions on the property do not meet this definition, in that the residual constituent concentrations do not render the environmental media (i.e. wetland soil and naturally salty groundwater) unusable or unsuitable for their current or reasonably anticipated future purposes.

3.1 Soil

The applicable standards within Statewide Order No. 29-B for soils addressed in this Most Feasible Plan are those prescribed in *Title 43, Part, XIX, Subpart 1, Statewide Order No. 29-B, Chapter 3; Pollution Control - Onsite Storage, Treatment and Disposal of Nonhazardous Oil field Waste (NOW) Generated from Drilling and Production of Oil and Gas Wells (Oil field Pit Regulations- Section 313 A-D)*.

Specifically, the soil data gathered from the property have been compared to the following Statewide Order 29-B criteria (adopted in 1986):

1. Range of pH: 6-9
2. Total metals (mg/kg wet weight)

Arsenic	10
Barium	20,000 (Submerged or Elevated Wetland Area)
Cadmium	10
Chromium	500
Lead	500
Mercury	10
Selenium	10
Silver	200
Zinc	500
3. Oil and Grease <1 percent (dry weight)
4. Electrical Conductivity No standard (Submerged Wetland)
5. Sodium Adsorption Ratio No standard (Submerged Wetland)
6. Exchangeable Sodium No standard (Submerged Wetland)

The property is characterized as an inundated or submerged wetland, with the possible exception of man-made elevated spoil banks that resulted from the construction of the navigation canals. There are no salt standards (EC, SAR or ESP) for submerged wetlands.

The sediment data, and where appropriate, soil data have also been compared to RECAP standards. A complete RECAP evaluation has been prepared by others and the results are utilized in the design of the remedy for the property.

3.2 Groundwater

Since there are no published numerical standards for groundwater in Statewide Order 29-B, MP&A has compared the available groundwater data to the United States Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) and Secondary Maximum Contaminant Level (SMCL) standards and the LDEQ RECAP standards, where applicable. The EPA MCLs and LDEQ RECAP standards are health-based standards. The EPA SMCL standards are aesthetic-based standards.

3.3 LAC 43:XIX.319 Exceptions

The appropriate exceptions to Statewide Order 29-B Chapter 3 standards included as part of this Supplement to the Most Feasible Plan include the use of LDEQ's RECAP procedures and standards for addressing soils and groundwater. The information provided herein, along with the RECAP evaluation provided by Angela Levert (ERM) and the human health and ecological risk assessments completed by other experts (Dr. Beck and Dr. Rodgers) demonstrate proof of good cause that the constituent concentrations above the Statewide Order 29-B Chapter 3 numeric standards are

protective of human health and the environment in accordance with the RECAP regulation. RECAP evaluation is recognized by LDNR and LDEQ as the “statewide environmental and health risk-based soil and groundwater evaluation and remediation standards and protocol” (as discussed in the LDNR/LDEQ Memorandum of Understanding, February 2011) (“2011 MOU”).

RECAP is predicated on preventing unacceptable risk to human health and the environment. Compliance with the Chapter 3 standards for these constituents and media is not necessary to achieve public health protection objectives or compliance with applicable regulatory requirements under the RECAP regulation and, therefore, is not the most feasible way to protect human health and the environment in accordance with Act 312.

Furthermore, good cause exists for a RECAP exception because strict application of a Statewide Order 29-B plan (fully discussed in Appendix D of the Most Feasible Plan) is (1) unnecessary given the current condition of the property, which meets RECAP and USEPA human health and ecological standards and that the property continues to be used for its highest and best use; (2) is technically impracticable because it would result in significantly more damage than benefit to the environment and public health; (3) will disrupt current E&P operations on the property; (4) ignores LDNR’s approval of risk-based standards in the 2011 MOU; and (5) is not the most feasible plan to protect the health, safety and welfare of the people of Louisiana.

4.0 Summary of Supplemental Investigation (November 2015 – February 2016)

The following additional site assessment activities were performed on the property between November 11, 2015 and February 9, 2016:

1. Collection of soil/sediment samples from 10 locations using a hand auger or sediment sampler. The soil/sediment sample locations are shown in the following figures:
 - a. Figure 2 – Supplemental Soil/Sediment Sample Locations (November-December 2015);
 - b. Figure 3 – All Soil/Sediment Sample Locations (including historical locations);
 - c. Figures 4 through 7 – All Soil/Sediment Sample Locations (labeled and depicted by quadrant);
2. Completion of soil borings/monitoring wells at 14 locations using mud rotary drilling techniques. Soil samples were also collected from 4 borings that were ultimately completed as monitoring wells. Soil sample locations are shown in Figures 2-7.
3. Development, purging and sampling of groundwater from 14 monitoring wells. Wells were completed from depths ranging from 25 feet below ground surface to approximately 486 feet below ground surface. The locations of groundwater monitoring wells are shown in the following figures:
 - a. Figure 8 – Supplemental Groundwater Sampling Locations (December 2015 – February 2016);
 - b. Figure 9 – All Groundwater Sampling Locations (Updated)

MP&A recorded field notes and photographs of the supplemental assessment activities and these are included in Appendices A and B. MP&A also prepared photograph logs that provide a description of each photograph and these are also included in Appendix B.

Details of sampling methodologies employed by MP&A for historical sampling were presented in the Most Feasible Plan (October 1, 2016). Pertinent observations regarding ICON's sampling methodologies associated with the new field work are described in MP&A field notes (Appendix A). MP&A collected split soil and groundwater samples from each soil boring and well sampled by ICON. The MP&A soil and groundwater split samples were analyzed by the same LELAP-certified laboratories as previous samples collected by MP&A.

4.1 Updated Soil and Sediment Quality

A total of approximately 475 samples of soil and/or sediment have been collected from approximately 145 locations by MP&A and/or ICON during the 2006 through 2016 site investigations. This includes approximately 42 samples from 14 locations during ICON's recent sampling (and MP&A split samples). A summary of the soil and sediment analytical data from the sampling performed in late 2015 and early 2016 (MP&A split samples and ICON data, where available) is presented in Table 1. Laboratory analytical

reports that have been received as of the date of this report are included in Appendix C. Laboratory reports that are still pending will be forwarded to LDNR upon receipt.

The soil/sediment concentrations reported above Statewide Order 29-B standards for pit closure are shown on Figure 10. The only 29-B exceedances reported in the recent sampling are Oil and Grease (O&G) concentrations above 1% in samples from locations SS-26 (0-2' and 2-4'), SS-21 (0-2'), and SS-22 (0-2' and 4-6').

Soil and sediment concentrations were also compared to RECAP standards and the results are shown on Figure 11 (for RECAP Direct Contact Screening Standards) and Figure 12 (RECAP Groundwater Protection Screening Standards). The following RECAP Screening Standard exceedances were reported in the recent sampling:

- The soil sample from the 0-2' interval at location SS-26 exceeded the RECAP Direct Contact Screening Standard for three TPH fractions (Figure 11);
- The soil sample from the 0-2' interval at location SS-26 exceeded the RECAP Groundwater Protection Screening Standard for the TPH aliphatic >C16-C35 fraction (Figure 12); and
- The soil sample from the 4-6' interval at location SS-17 exceeded the RECAP Groundwater Screening Standard for barium (Figure 12).

MP&A recommends that SS-26 be re-sampled and analyzed for PAHs to fully characterize this area under RECAP.

No exceedances of RECAP Site-specific MO-3 Standards (calculated by others), were reported in the recent soil and sediment sampling. Exceedances of MO-3 RECAP aesthetic standards for historic sampling were shown in Figure 45 of the October 1, 2015 Most Feasible Plan and are not repeated herein.

4.2 Updated Groundwater Quality

A total of 14 new monitoring wells were installed and sampled by ICON from November 2015 through February 2016. Approximately 54 groundwater monitoring wells, existing wells, and hydro-punch sample locations have been installed and/or sampled by MP&A and ICON to date.

The recent monitoring wells were completed and screened as follows (depths are reported by ICON):

- One well in the peat zone [TBB-3S screened at 14-24' below ground surface (bgs)]
- Two wells in the approximate 40 to 60 foot sand zone [TBB-1S (33-43') and TBB-2M (49-59')];
- Five wells in the approximate 70 to 90-foot sand zone beneath clay lenses [TBB-1D (65-75'), TBB-2D (81-91'), TBB-3D (66-76'), TBA-1D (75-85'), and TBA-2 (69-79')];

- Two wells in the approximate 90 to 250-foot sand zone [MC-1 (161-181') and MC-2 (139-159')]
- Three wells in the approximate 250 to 300-foot sand zone [BC-2 (279-289'), BC-3 (279-299'), and BC-4 (270-290')]; and
- One well in the freshwater portion of the Chicot Aquifer [BC-1 (469-489')].

A summary of the groundwater data for the recent groundwater sampling of these 14 wells is presented in Table 2. Laboratory analytical reports that have been received to date are included in Appendix C. Laboratory reports that are still pending will be forwarded to LDNR upon receipt.

Groundwater barium, chloride, TPH, radium-226/228 concentrations for the Peat Zone are presented in Figures 13 through 16. Figures 17 through 20 present the barium, chloride, benzene, and radium-226/228 groundwater concentrations in the 40 to 60 foot sand zone. Figure 21 identifies the locations that exceed the RECAP GW2 risk-based groundwater standards in the 40 to 60 foot sand zone.

Figures 22 through 27 present the barium, chloride and radium-226/228 groundwater concentrations in the 70 to 90 foot and 90 to 250 foot sand zones. The chloride, barium, benzene, TPH, and radium concentrations for the 250 to 300 foot sand zone are presented on Figures 28 through 30. Figures 31 through 33 present the barium, chloride, and radium-226/228 concentrations in the freshwater portion of the Chicot Aquifer (>460 feet).

Summary of Findings

The recent data are shown in blue highlighted boxes on Figures 13 through 33 along with the historic data that were presented in the October 1, 2015 Most Feasible Plan. Based on the recent groundwater data and ERM's RECAP assessment, Areas of Interest (AOIs) have not been modified from the October 2015 Most Feasible Plan. Only barium and benzene are present at concentrations above the RECAP GW2 risk-based standards and only in three isolated areas. Potential AOIs have been identified in the Tank Battery B (TBB-1S and TBB-1M) and BC-2 areas, pending confirmation. Key findings are presented below.

40 to 60 Foot Sand Zone

Benzene was recently detected in one well, TBB-1S, in the 40-60 foot sand zone (33-43' screen interval) at a concentration of 0.007 mg/L, which is just above the detection limit of 0.005 mg/L. Because of the drilling and sampling methods employed by ICON (including not properly casing off potentially impacted shallow soils and drilling through the shallow soils inside the conductor casing that was installed), the TBB-1S result is suspect. Therefore, MP&A recommends, at a minimum, redevelopment and re-sampling of this well to attempt to confirm this very low-level detection of benzene. As shown on Figure 19, benzene has been previously detected in the SB-1, MW-1 and in HP-MPA-09-T at low ug/L concentrations. The MP&A October 1, 2015 Most Feasible Plan proposes

to complete delineation of the MW-1 area, conduct three years of quarterly monitoring, and remediate the benzene, if ultimately required by the LDNR.

70 to 90 Foot Sand Zone

The reported TPH-DRO and Polycyclic Aromatic Hydrocarbon (PAH) exceedances of RECAP screening standards in the groundwater sample collected from TBB-3D (from 66-76 feet) are most likely related to ICON's installation of this monitoring well, in which ICON drilled the well directly through a creosote-containing piling. MP&A collected a sample of the drilling mud from the mud pit after ICON drilled through the piling and analyzed for PAHs. The PAHs detected in the groundwater sample are similar to those detected in a sample of the drilling mud and are characteristic of creosote (Nestler, 1974, Rosenfeld and Plumb, 1981, Emsbo-Mattingly, et al, 2001, and Murphy and Brown, 2005). A single location, TBA-2, slightly exceeded the RECAP GW2 risk-based standard for barium.

90 to 250 Foot Sand Zone

The barium, chloride and radium-226/228 concentrations reported in the two new monitoring wells, MC-1 and MC-2, installed in the 90 to 250 foot sand zone are either below RECAP and/or EPA MCLs or are generally consistent with background concentrations.

250 to 300 Foot Sand Zone

The detections of chloride, benzene, barium, and TPH Aromatic >C8-C10 fraction reported above RECAP and/or EPA MCLs/SMCLs in the BC-2 through BC-4 wells screened in the 250 to 300 foot sand zone are shown on Figures 28 through 30. The radium-226/228 data are not yet available because the samples were collected on February 3-9, 2016. Benzene was detected in BC-2 (279-299'), at the base of the shallow sand zone at a concentration of 0.200E mg/L during the recent sampling. MP&A observations recorded during the drilling and installation of monitor well BC-2 identified well construction, development, and sampling issues that may have resulted in data that are not representative of the sampled interval; therefore, MP&A recommends re-sampling of this location. Benzene was not detected in the two shallower wells, TBA-2 and MC-2, at the BC-2 location.

The very bottom portion of the electric log completed to a depth of approximately 500 feet in the BC-2 borehole (before the bottom of the borehole was plugged and the BC-2 well was installed) documents that the underlying Chicot Aquifer is fresh and protected by an over 100-foot thick clay aquitard. MP&A recommends developing and re-sampling the BC-2, BC-3, and BC-4 locations to confirm the results that were received just prior to the due date of this report. As recorded in the field notes and photographs (Appendices A and B), there are well construction and development issues associated with the BC-2 location.

Upper Sand of Chicot Aquifer

The groundwater data collected from BC-1 (which is screened in the freshwater portion of the Chicot Aquifer at depths of approximately 469 to 489 feet bgs), WW-1, Guidry well, and electric logs completed in BC-1, BC-2, and BC-4 to approximately 500-feet demonstrate that the freshwater portion of the Upper Sand of the Chicot Aquifer that is best suited and currently used for potable water production at the property is not impacted. This new data confirms MP&A's prior conclusions in the October 1, 2015 submission.

Portions of the electrical logs recorded in the three, approximate 500 foot deep soil borings recently installed by ICON are presented on Figure 34. Figure 34 also shows the locations of the former salt water disposal wells (SWDs) that are located in the immediate vicinity of the deep boring/well locations. The electric logs and the groundwater samples collected from WW#1, BC-1, and the Guidry well and other water wells in the area demonstrate that the groundwater in the Upper Sand of the Chicot aquifer (~450 to 650 foot zone) is fresh, potable and meets RECAP standards and EPA MCLs and SMCLs for chloride and TDS.

Discussion of Background and Upper Sand of Chicot Aquifer Water Quality

To visually depict the natural groundwater quality underlying the property and surrounding area Piper and Stiff diagrams have been prepared utilizing historical through 2015-2016 laboratory analyses of the naturally occurring cations and anions present in the groundwater (Figures 35-38). Stiff and Piper diagrams are a graphical plotting technique widely utilized to visually depict water chemistry variations which result from variable concentrations of cations (sodium, potassium, calcium and magnesium) and anions (chloride, bicarbonate, and sulfate) naturally present in groundwater.

A Stiff diagram provides a way to plot cation and anion data from an individual water sample on a diagram as a polygon. The shape of the polygon indicates the general concentration of the cations and anions present in the water and provides a way to evaluate and compare different samples of water based upon their natural chemical composition. A Piper diagram provides a way to compare cation and anion data from multiple water samples on the same diagram. An examination of the grouping of the individual sample results on the Piper diagram provides a way to evaluate general water types as well as differences between different water types.

Figure 35 displays stiff diagrams for the groundwater samples MP&A has identified as representative of natural background water quality within the shallow sand zones (~40 to 90 feet) underlying the property and for groundwater samples from five water wells (50-90 feet) ICON has identified as representative of background water quality in Little Prairie. The polygon shapes of the Stiff diagrams constructed from the MP&A sample data from the property are distinctly different than those constructed from the ICON background sample data as a result of differences in the proportions of cations and anions naturally present in groundwater.

The Piper diagram provided as Figure 36 also plot the same water sample data as Figure 35. The separate clusters of light blue and purple symbols in two different areas on Figure 36 indicates that the natural groundwater quality underlying the property is different than the natural groundwater quality underlying Little Prairie. Both of these figures demonstrate differences in the natural groundwater quality underlying the property and Little Prairie. These differences are directly attributable to site location, hydrogeologic setting, and water quality differences as follows:

- Little Prairie is located on a naturally elevated upland ridge over two miles from the School Board property. Little Prairie is underlain by geologically distinct, Pleistocene age sediments comprised of the Avoyelles Alloformation consisting of meander belt deposits of the late Pleistocene Mississippi River (White Lake Quadrangle, 2006).
- The School Board property is underlain by the Mermentau Alloformation which consists of complexly interfingering and interbedded, dark-colored marine muds, sandy and shelly beach deposits, organic marsh clays, and lacustrine and bay muds (White Lake Quadrangle, 2006).
- The School Board property is located in a submerged, fresh to intermediate wetland environment which is bisected by Schooner Bayou and canals dredged to depths up to approximately 17 feet that allow for the ongoing transmission of surface water (from Schooner Bayou) with chloride concentrations exceeding 4,000 mg/L. The US Corps of Engineers dredging of Schooner Bayou and the initial installation of the canals on the property have reduced the thickness of the natural clay confining layer underlying the property at some locations. Therefore, the shallow groundwater zone underlying the School Board property is more susceptible to recharge/infiltration by brackish surface water. These existing hydrologic conditions are technically and economically impracticable to reverse.
- The shallow groundwater underlying the School Board property is naturally saltier than the groundwater underlying Little Prairie due to the natural conditions identified above. The presence of sulfate detected in surface water samples collected from Schooner Bayou and the canals on the property and in some of the shallow groundwater samples underlying the property are indicative of sea water infiltration/intrusion. Sulfate has not been reported to be present and/or only reported to be present in low mg/L (ppm) concentrations in historic produced water samples from oil and gas wells located on the property; however, it is present in seawater at concentrations much greater than 2,000 mg/L (Hem, 1989 - USGS Water Supply Paper 2254).

Figures 34, 37 and 38 demonstrate that the natural water quality in the confined, freshwater portion of the Upper Sand Unit of the Chicot Aquifer underlying property at

depths of approximately 450 to 650 feet below the ground surface has been unaffected by Exploration and Production activities that have been conducted on the property. The essentially identical polygon shapes demonstrated by the Stiff diagrams shown on Figure 37 for the facility water well, WW-1, the Guidry water well, and the BC-1 monitoring well as well as for samples collected from five water wells located up to eight miles distant from the site demonstrate that the natural groundwater quality underlying the property has not been affected by E&P activities. The freshwater portion of the Upper Sand Unit of the Chicot Aquifer is separated from the naturally brackish shallower groundwater underlying the property by an over 100 foot clay aquitard at depths extending from approximately 300 feet bgs to greater than 400 feet bgs. Groundwater in this fresh portion of the Upper Sand Unit of the Chicot Aquifer underlying the property is the only available fresh, potable groundwater that can be used in the future for oil and gas operations and any hypothetical uses such as a public supply for a hunting and fishing camp, marina, restaurant, etc.

5.0 Modifications to the Most Feasible Plan

The Most Feasible Plan developed by MP&A on behalf of UNOCAL in our October 1, 2015 report is not materially changed by the data generated during ICON's recent (November 2015 – February 2016) assessment activities. The only modifications to the Most Feasible Plan that are recommended are as follows:

- Redevelop and resample TBB-1S to determine whether the low-level detection of benzene is spurious;
- Redevelop and resample TBB-2M, BC-2, BC-3, and BC-4 to confirm the detections recently reported;
- Resample the SS-26 location for PAHs to evaluate these RECAP Table D-1 constituents against the RECAP standards, and delineate if necessary; and,
- Allocate approximately \$100,000 to \$350,000 to conduct the above re-sampling activities and any additional delineation of soil/sediment and/or groundwater that that may ultimately be requested by the LDNR, including soil/sediment delineation in the vicinity of the SS-26 location and/or groundwater delineation and monitoring in the vicinity of the BC-2 location.

The remainder of the October 2015 Most Feasible Plan is still the most appropriate response plan. This plan included the following elements:

- Re-closure of the former Tank Battery B pit area;
- Installation of three additional monitoring wells to approximate depths of 60 feet to complete assessment of benzene detected in the shallow groundwater and conduct three years of quarterly groundwater monitoring and reporting to demonstrate that groundwater conditions are continuing to improve and stabilize over different seasons; and
- If ultimately deemed necessary by LDNR, installation and operation of a groundwater pump and disposal system to address benzene in the shallow groundwater zone (approximate well depths of 60 feet) which will include the conversion of an existing Salt Water Disposal Well (SWD) or drilling a new SWD, if required, and installing the necessary piping and tankage. [If the benzene detections are confirmed in the TBB-1S and BC-2 locations and remediation is ultimately required by the LDNR, then this same type of remediation technology/system may be suitable.]

The cost estimate for the implementation of the Most Feasible Plan remains unchanged from our October 1, 2015 submittal with the exception of the additional cost (approximately \$100,000 - \$350,000) for re-sampling, delineation, and monitoring, if required, as discussed above.

5.1 Justification for the Feasible Plan

MP&A believes that the remediation, assessment and monitoring activities identified above represent the Most Feasible Plan for the property based upon the following”

- The existing soil, sediment, surface water and groundwater quality has not affected the intended use of the property;
- The extensive, site-specific Human Health and Ecological Risk Assessment and Crab and Forage Fish Studies demonstrate that the site does not pose unacceptable risks to human health and the environment due to the presence of residual substances in the sediment, soil and groundwater;
- The availability of a fresh, potable water source starting at approximately 450 feet below ground surface;
- The reasonably anticipated future uses of the property;
- Potential future risks are addressed in accordance with RECAP, which is accepted by LDNR and LDEQ as an appropriate manner in which to design response activities at E&P sites; and
- There exists just cause for the use of exceptions and/or alternate standards under Statewide Order 29-B.

The discussions that MP&A provided in the October 1, 2015 Most Feasible Plan regarding the need for and infeasibility of massive remediation efforts for shallower soils and sediments and unused groundwater are still valid for the property.

6.0 Modifications to the Schedule

The schedule presented for the implementation of the MOST Feasible Plan remains unchanged except as follows:

- Redevelopment and re-sampling of well TBB-1S, TBB2M, BC-2, BC-3, and BC-4 can be performed in less than a month after LDNR approval;
- Re-sampling of SS-26, and delineation, if required, can be performed concurrent with the above groundwater sampling;
- Further delineation activities, if required, can be complete in approximately 3 months after LDNR approval and receipt of Coastal Use and/or Wetlands Permits.

7.0 Reporting

The following additional reporting would be performed under these modifications to the Most Feasible Plan.

A report on the re-sampling of TBB-1S, TBB-2M, BC-2, BC-3, BC-4, and SS-26 will be submitted within one month of the receipt of final analytical results from the laboratory. The report will include the following information:

- Tabulated results of resampling; and
- Copies of laboratory analytical reports;

A soil/sediment and/or groundwater delineation letter report, if required, will be prepared and submitted to LDNR within 60 days of receipt of final laboratory reports. The report will include the following:

- A brief discussion of the sampling methodology and results;
- A summary of field measurements recorded at the time of sampling, as appropriate;
- Photographs and photographic log documenting field activities;
- A tabulation of laboratory analytical data; and
- Laboratory data reports.

Other reporting under the Most Feasible Plan would be unchanged.

Figures

Supplement to the Most Feasible Plan for Evaluation/Remediation

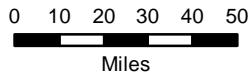
Vermilion Parish School Board (VPSB) Property

Section 16 T15S, R01E

East White Lake Oilfield

Vermilion Parish, Louisiana

*State of Louisiana and the Vermilion Parish School Board v. Louisiana
Land and Exploration, et al.*



3

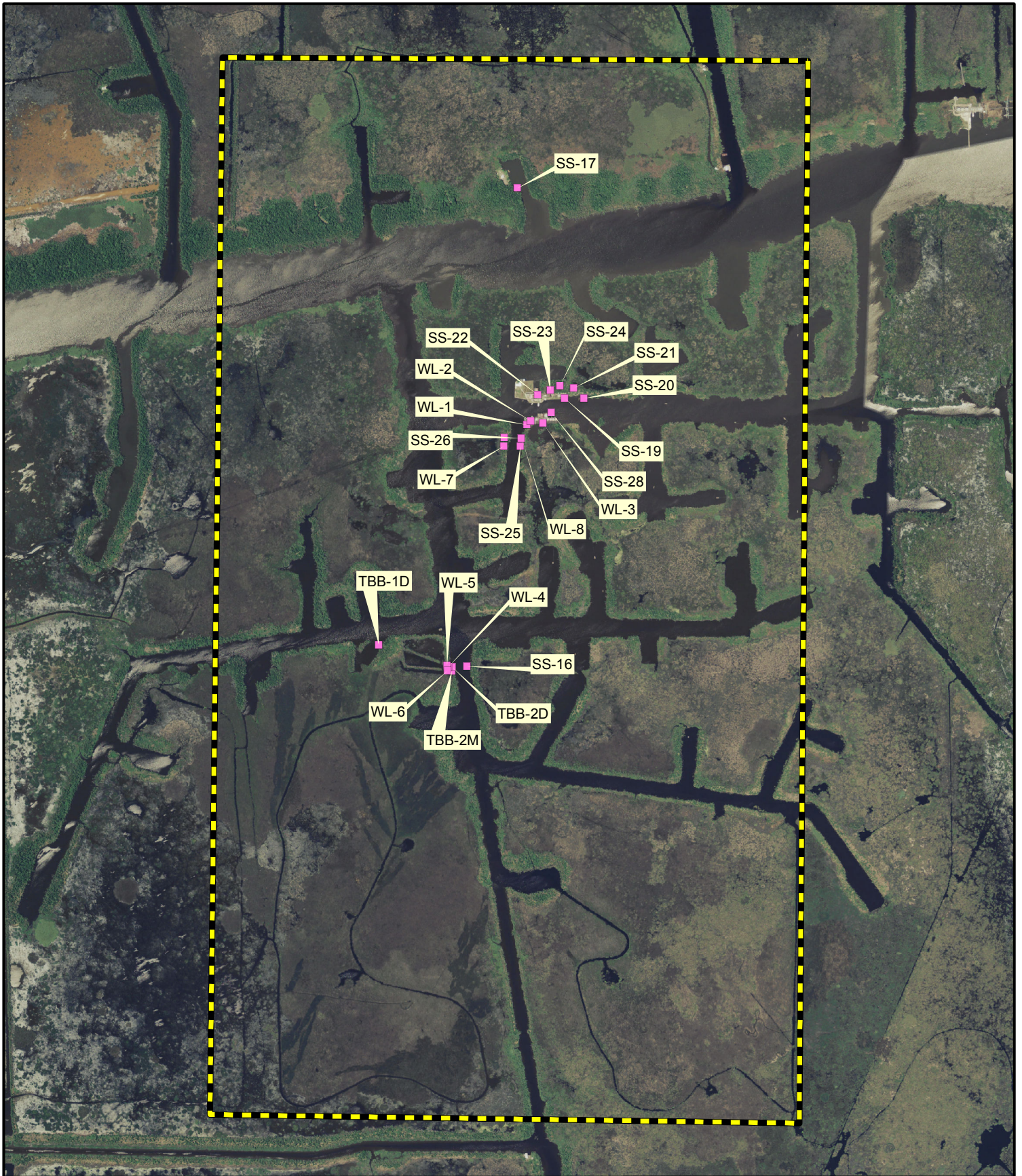
**Figure 1
Site Location**

*East White Lake Oil & Gas Field
Vermilion Parish, Louisiana*



MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

Drawn: MMH | Checked: MMH | Date: 2/15/2016 | Project: 07-47



Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Soil Boring Locations

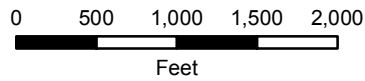


Figure 2
Supplemental Soil/Sediment Sampling Locations (11/2015-02/2016)

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*

MICHAEL PISANI & ASSOCIATES, INC.

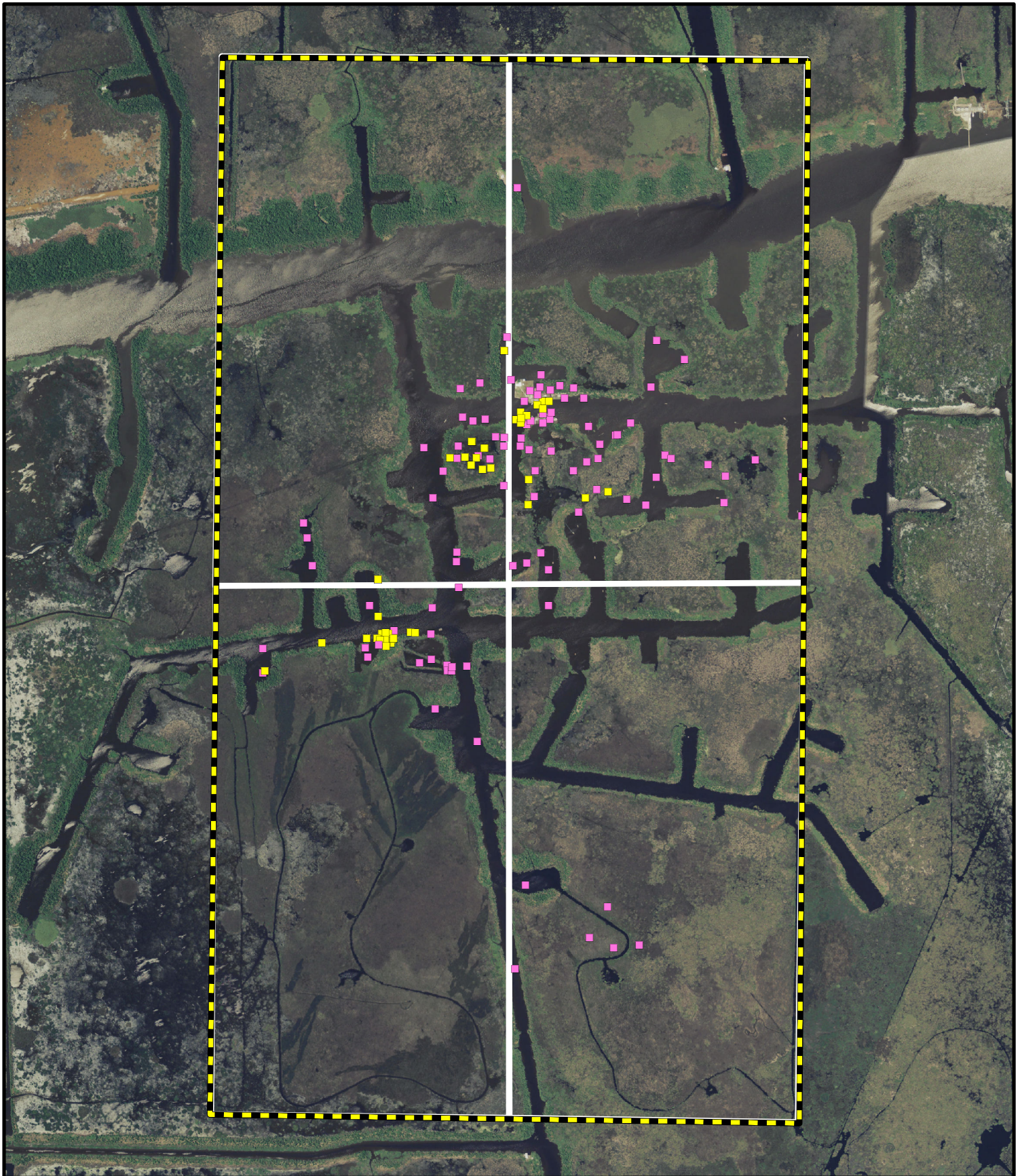
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Drawn: MMH




Checked: DGA

Date: 2/15/2016

Project: 07-47



Legend

-  Section 16 Township 15 S Range 01 E
-  ICON Sample Location
-  MP&A Sample Location

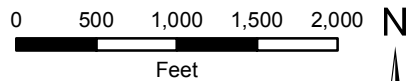


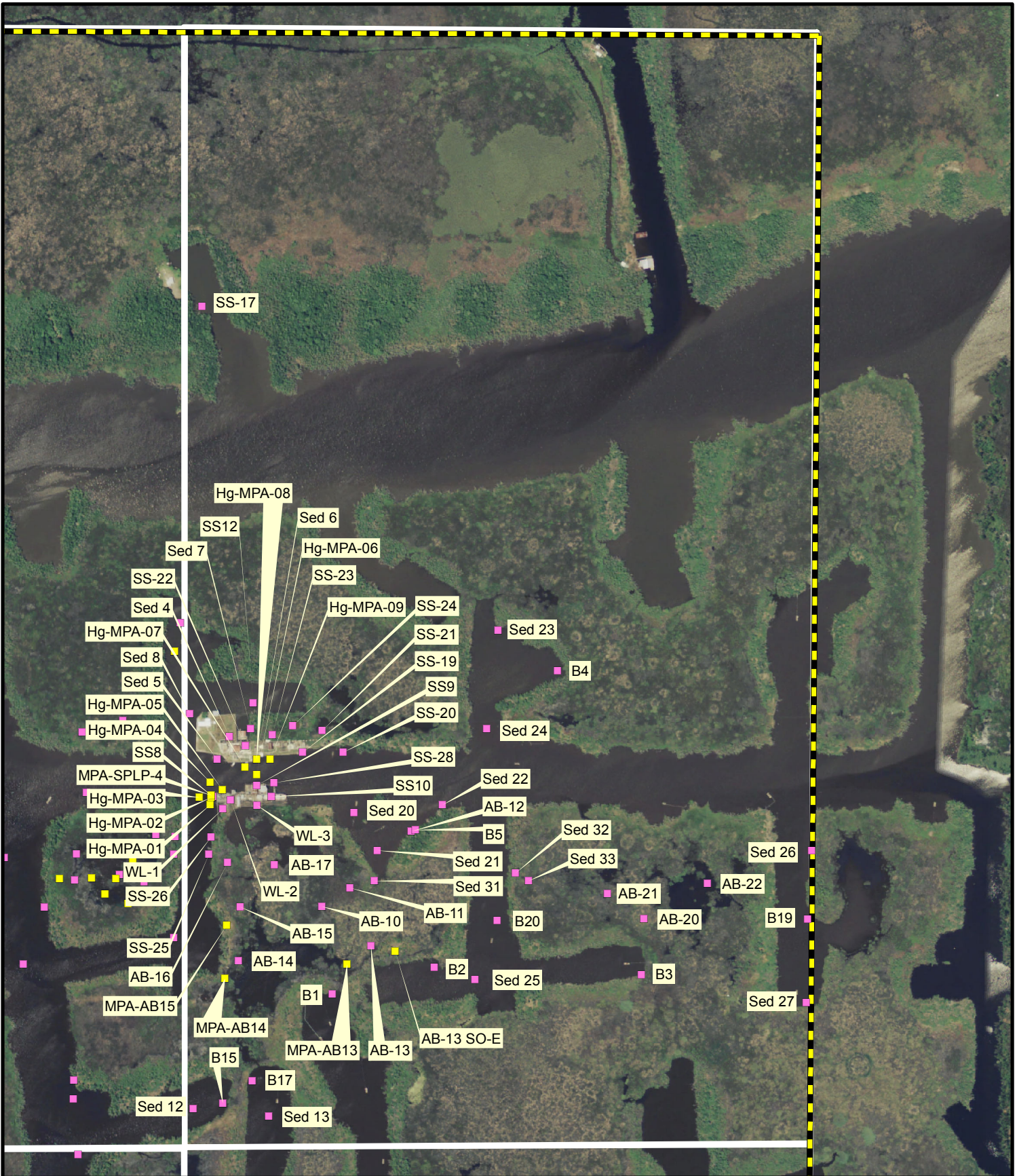
Figure 3
Soil/Sediment Sampling Locations

*East White Lake Oil & Gas Field
Vermilion Parish, Louisiana*

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Baton Rouge, LA New Orleans, LA Houston, TX

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Legend

- Section 16 Township 15 S Range 01 E
- ICON Sample Location
- MP&A Sample Location

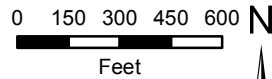


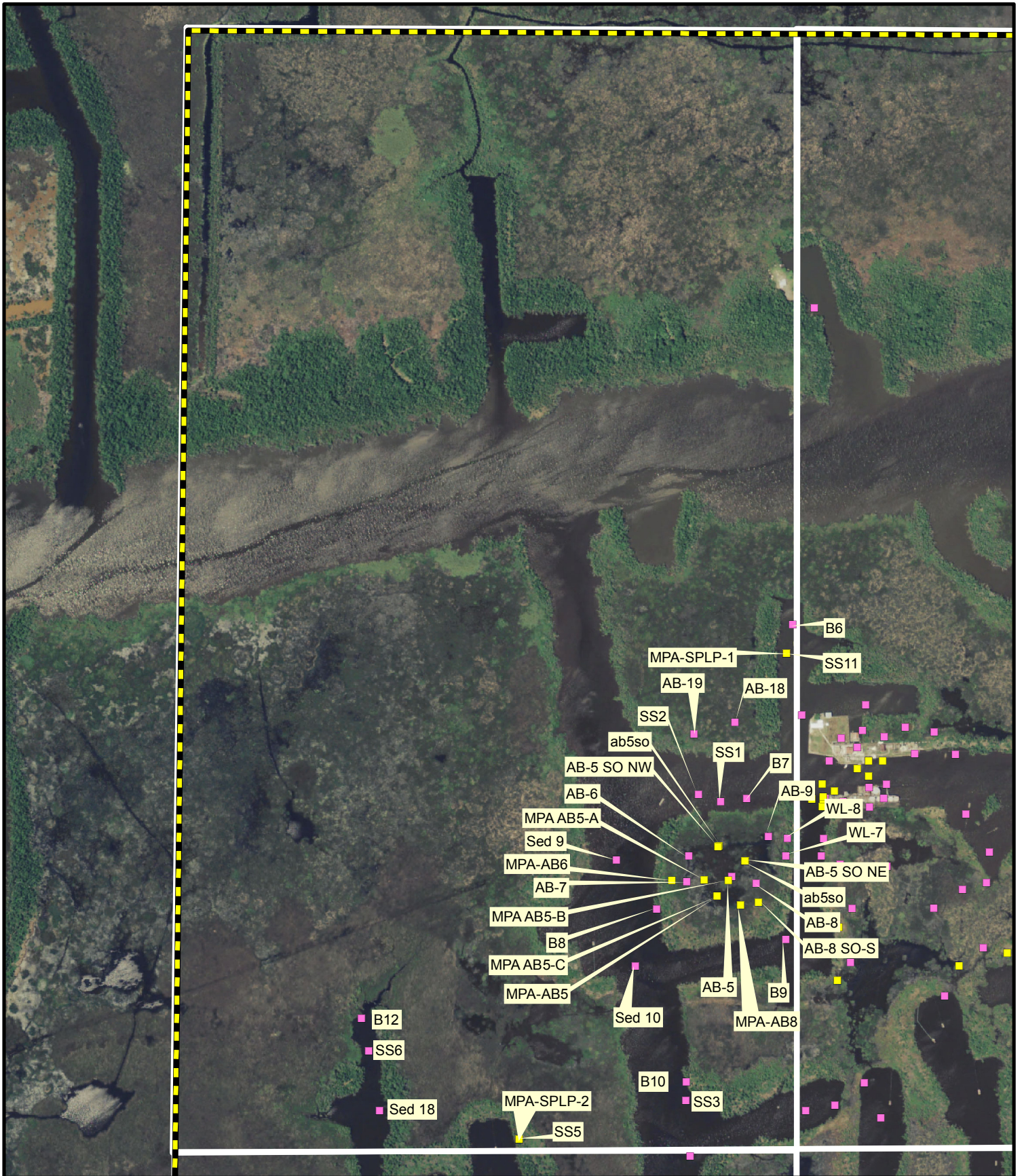
Figure 4
Soil/Sediment Sampling Locations -
Northeast Quadrant

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana




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Legend

-  Section 16 Township 15 S Range 01 E
-  ICON Sample Location
-  MP&A Sample Location

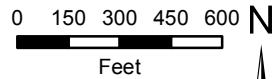


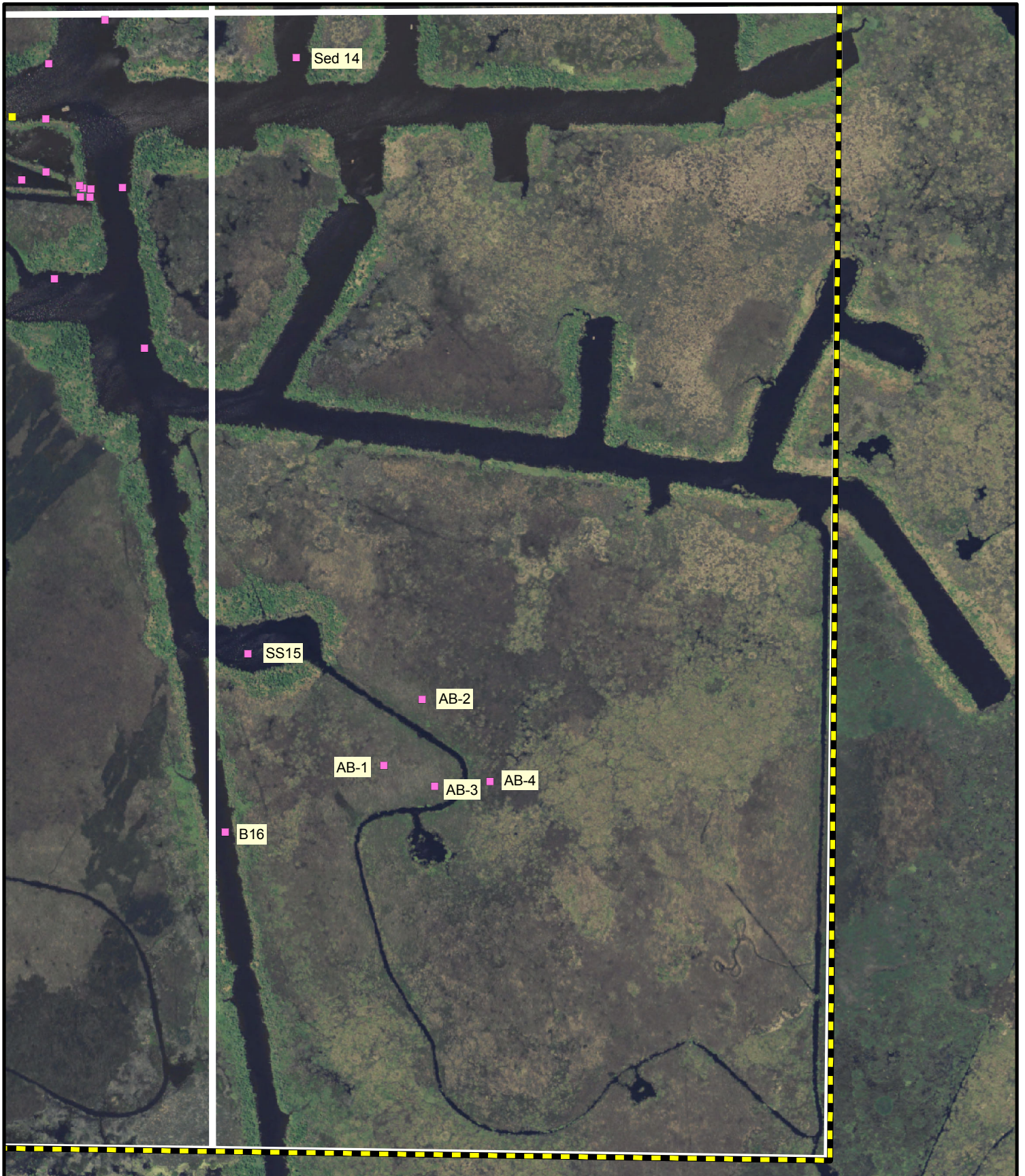
Figure 5
Soil/Sediment Sampling Locations - Northwest Quadrant

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*




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Legend

-  Section 16 Township 15 S Range 01 E
-  ICON Sample Location
-  MP&A Sample Location

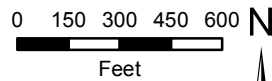


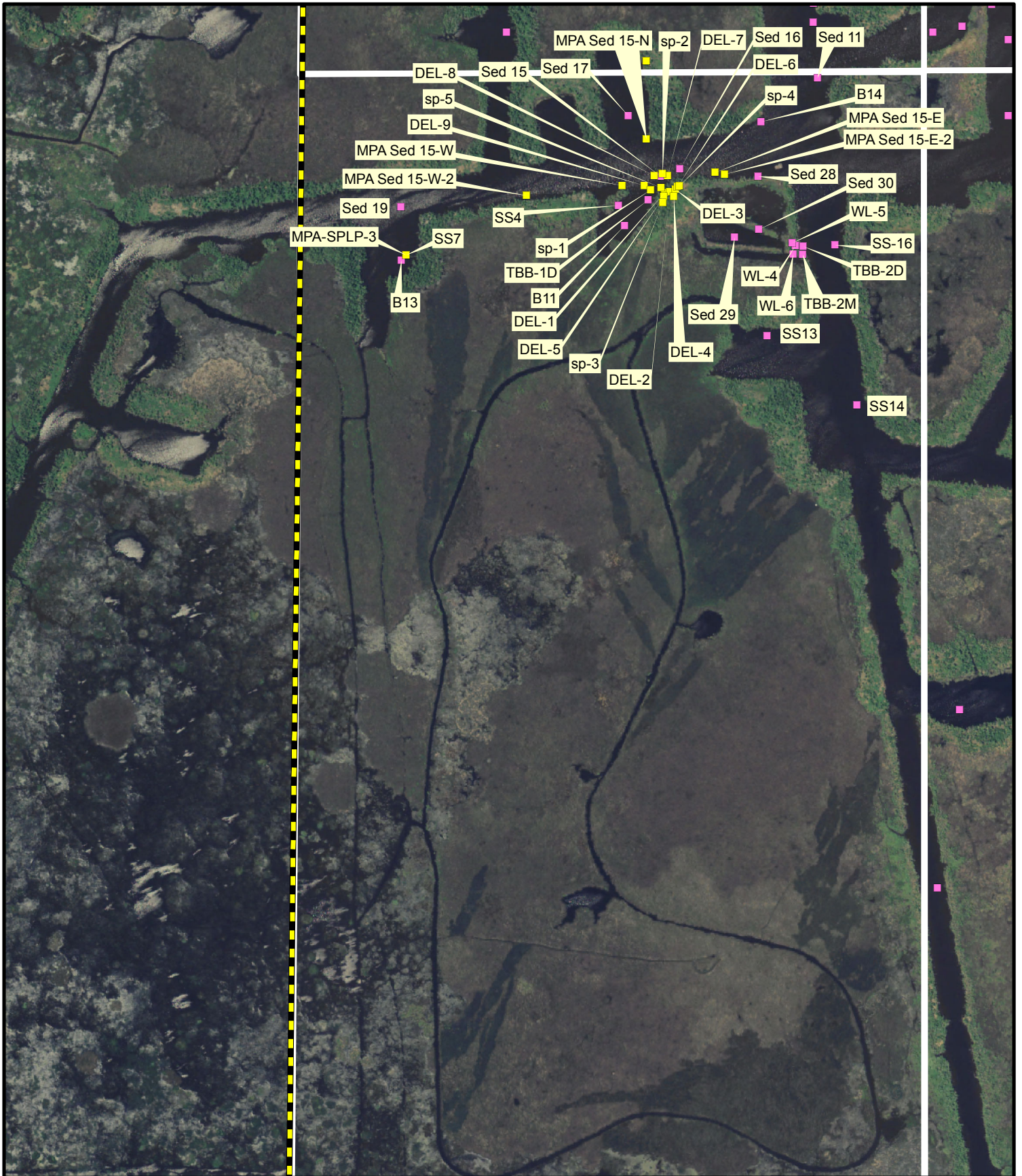
Figure 6
Soil/Sediment Sampling Locations -
Southeast Quadrant

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana




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Drawn: MMH Checked: DGA Date: 2/15/2016 Project: 07-47



Legend

-  Section 16 Township 15 S Range 01 E
-  ICON Sample Location
-  MP&A Sample Location

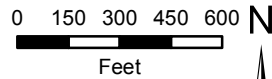


Figure 7
Soil/Sediment Sampling Locations - Southwest Quadrant

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*



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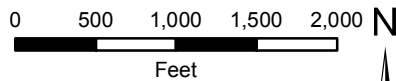
Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX

Drawn: MMH | Checked: DGA | Date: 2/15/2016 | Project: 07-47



Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Monitoring Well Location



Notes:
Source: USDA 2013 aerial

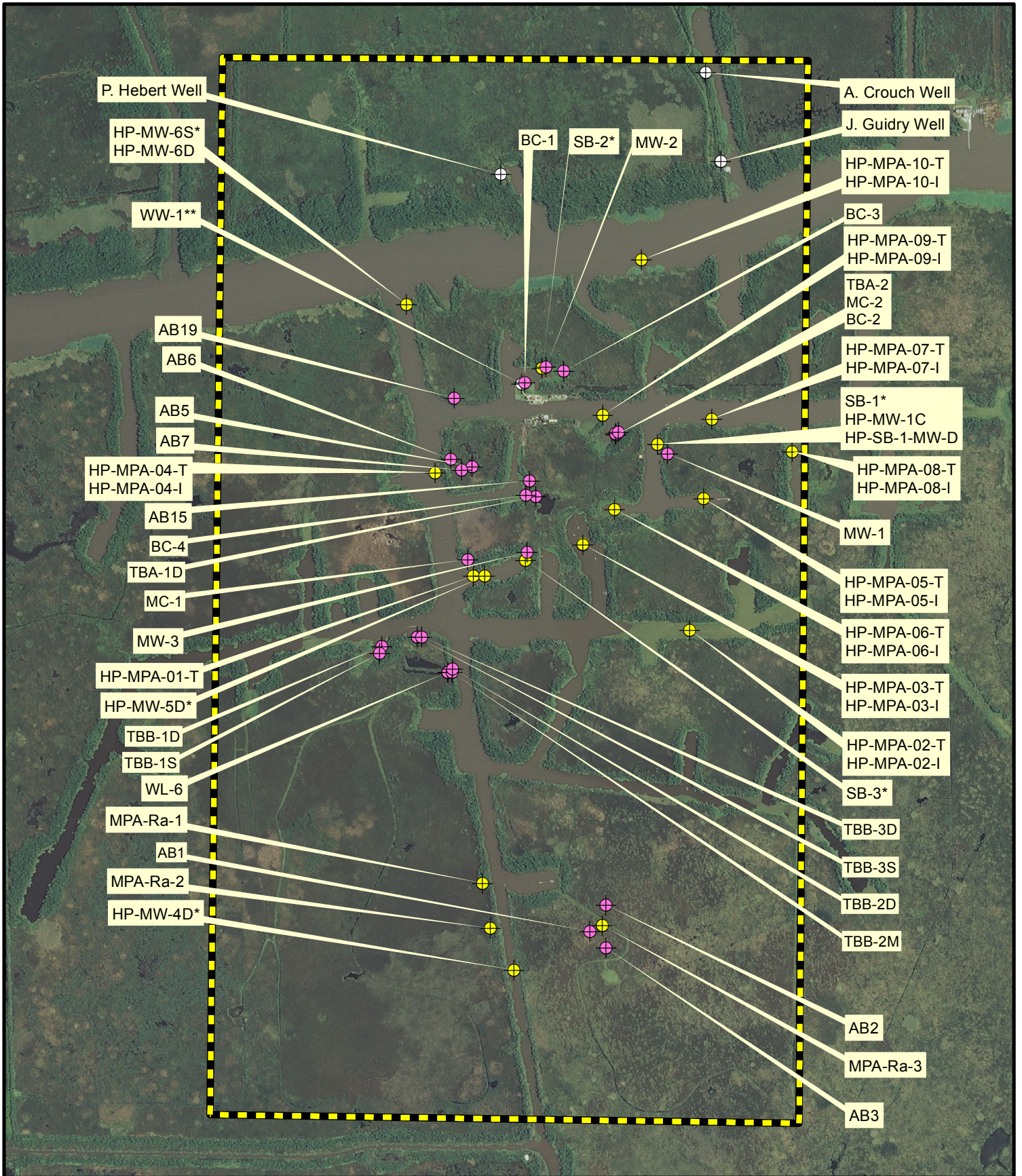
Figure 8
Supplemental Groundwater Sampling Locations (12/2015-02/2016)

*East White Lake Oil & Gas Field
Vermilion Parish, Louisiana*





MICHAEL PISANI & ASSOCIATES, INC.

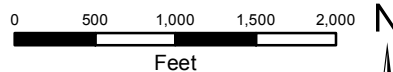
Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

Drawn: MMH	Checked: DGA	Date: 2/15/2016	Project: 07-47
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Legend

-  Section 16 Township 15 S Range 01 E
-  ICON Sample Location
-  MP&A Sample Location
-  Existing Water Well; Upper Sand of Chicot Aquifer



* Soil borings identified as MPA-SB-#
 ** Also referred to as AWW1

Source: 2013 Aerial from USDA

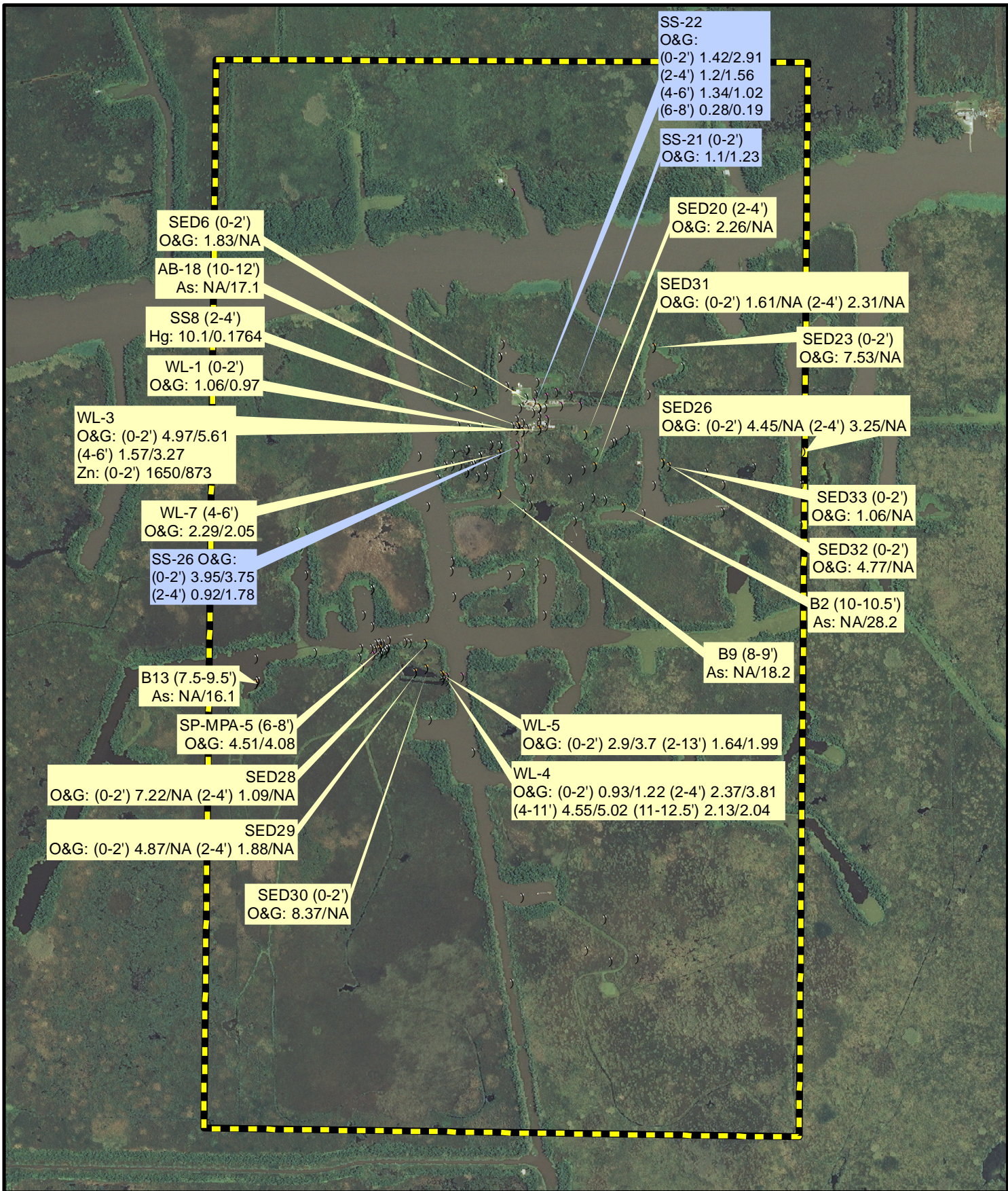
Figure 9
Groundwater Sampling Locations

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*

MICHAEL PISANI & ASSOCIATES, INC.

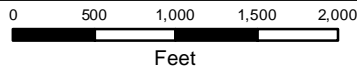
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Legend

- Section 16 Township 15 S Range 01 E
- ICON 2015 Soil Boring Location
- Soil/Sediment Exceedance
- Soil/Sediment Sample Location



Notes:
 29-B Exceedances: MP&A result / ICON result
 NA- Not analyzed
 O&G- HEM O&G (%-dry)
 As-Arsenic (mg/kg-wet)
 Hg-Mercury (mg/kg-wet)
 Zn-Zinc (mg/kg-wet)
 Blue callouts indicate supplemental location (11/15-2/16)
 Source: USDA 2013 Aerial

3

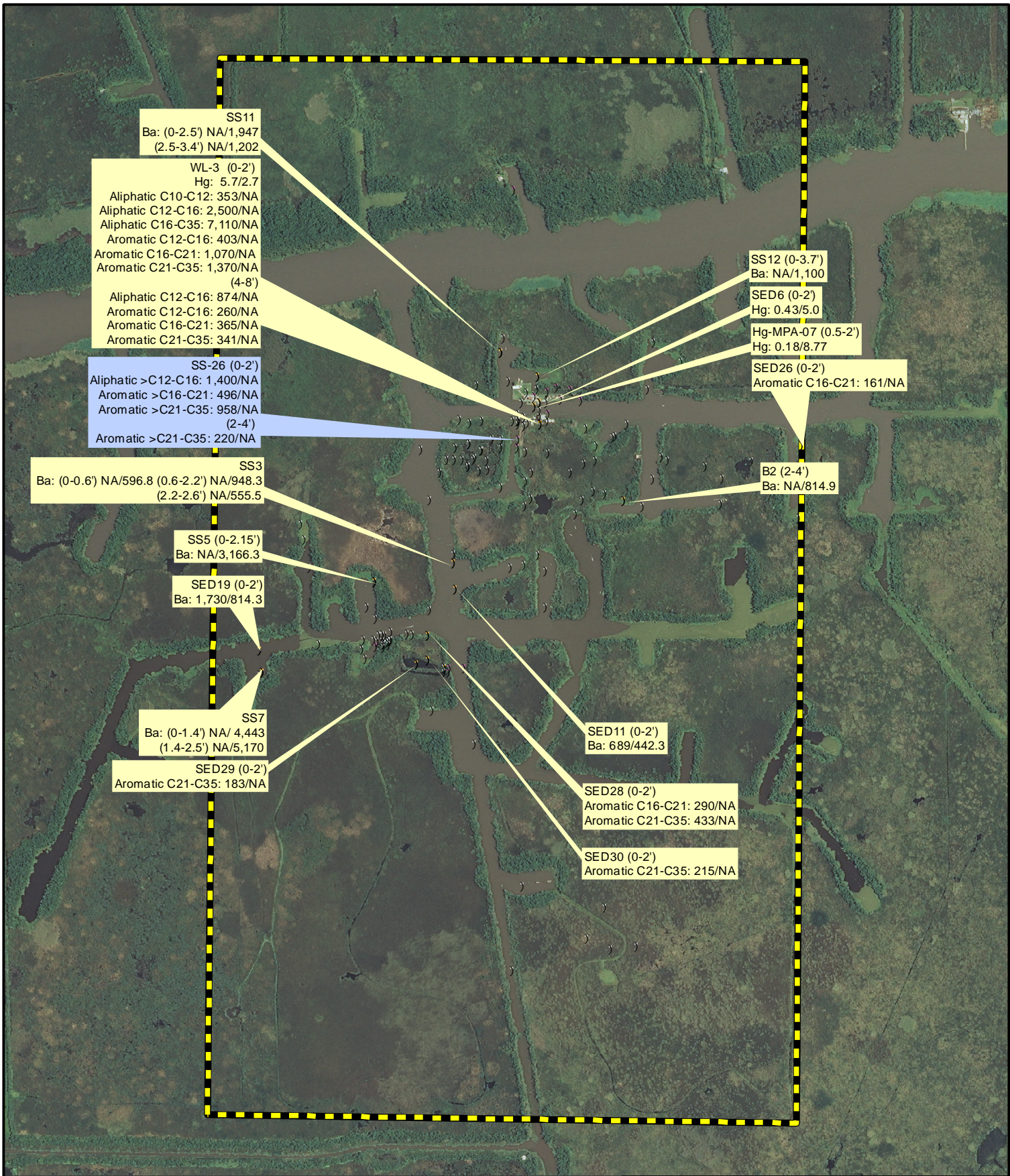
Figure 10
Statewide Order 29-B Standard Exceedances - Soil/Sediment

East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana

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SS11
Ba: (0-2.5') NA/1,947
(2.5-3.4') NA/1,202

WL-3 (0-2')
Hg: 5.7/2.7
Aliphatic C10-C12: 353/NA
Aliphatic C12-C16: 2,500/NA
Aliphatic C16-C35: 7,110/NA
Aromatic C12-C16: 403/NA
Aromatic C16-C21: 1,070/NA
Aromatic C21-C35: 1,370/NA

(4-8')
Aliphatic C12-C16: 874/NA
Aromatic C12-C16: 260/NA
Aromatic C16-C21: 365/NA
Aromatic C21-C35: 341/NA

SS-26 (0-2')
Aliphatic >C12-C16: 1,400/NA
Aromatic >C16-C21: 496/NA
Aromatic >C21-C35: 958/NA

(2-4')
Aromatic >C21-C35: 220/NA

SS3
Ba: (0-0.6') NA/596.8 (0.6-2.2') NA/948.3
(2.2-2.6') NA/555.5

SS5 (0-2.15')
Ba: NA/3,166.3

SED19 (0-2')
Ba: 1,730/814.3

SS7
Ba: (0-1.4') NA/ 4,443
(1.4-2.5') NA/5,170

SED29 (0-2')
Aromatic C21-C35: 183/NA

SS12 (0-3.7')
Ba: NA/1,100

SED6 (0-2')
Hg: 0.43/5.0

Hg-MPA-07 (0.5-2')
Hg: 0.18/8.77

SED26 (0-2')
Aromatic C16-C21: 161/NA

B2 (2-4')
Ba: NA/814.9

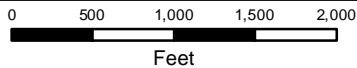
SED11 (0-2')
Ba: 689/442.3

SED28 (0-2')
Aromatic C16-C21: 290/NA
Aromatic C21-C35: 433/NA

SED30 (0-2')
Aromatic C21-C35: 215/NA

Legend

- Section 16 Township 15 S Range 01 E
- ICON 2015 Soil Boring Location
- Soil/Sediment Exceedance
- Soil/Sediment Sample Location



Notes:
 RECAP Exceedances: MP&A result / ICON result
 NA- Not analyzed
 Ba-Barium (mg/kg-wet)
 Hg-Mercury (mg/kg-wet)
 Blue callout indicates supplemental location (11/15-2/16)
 Source: USDA 2013 Aerial

3

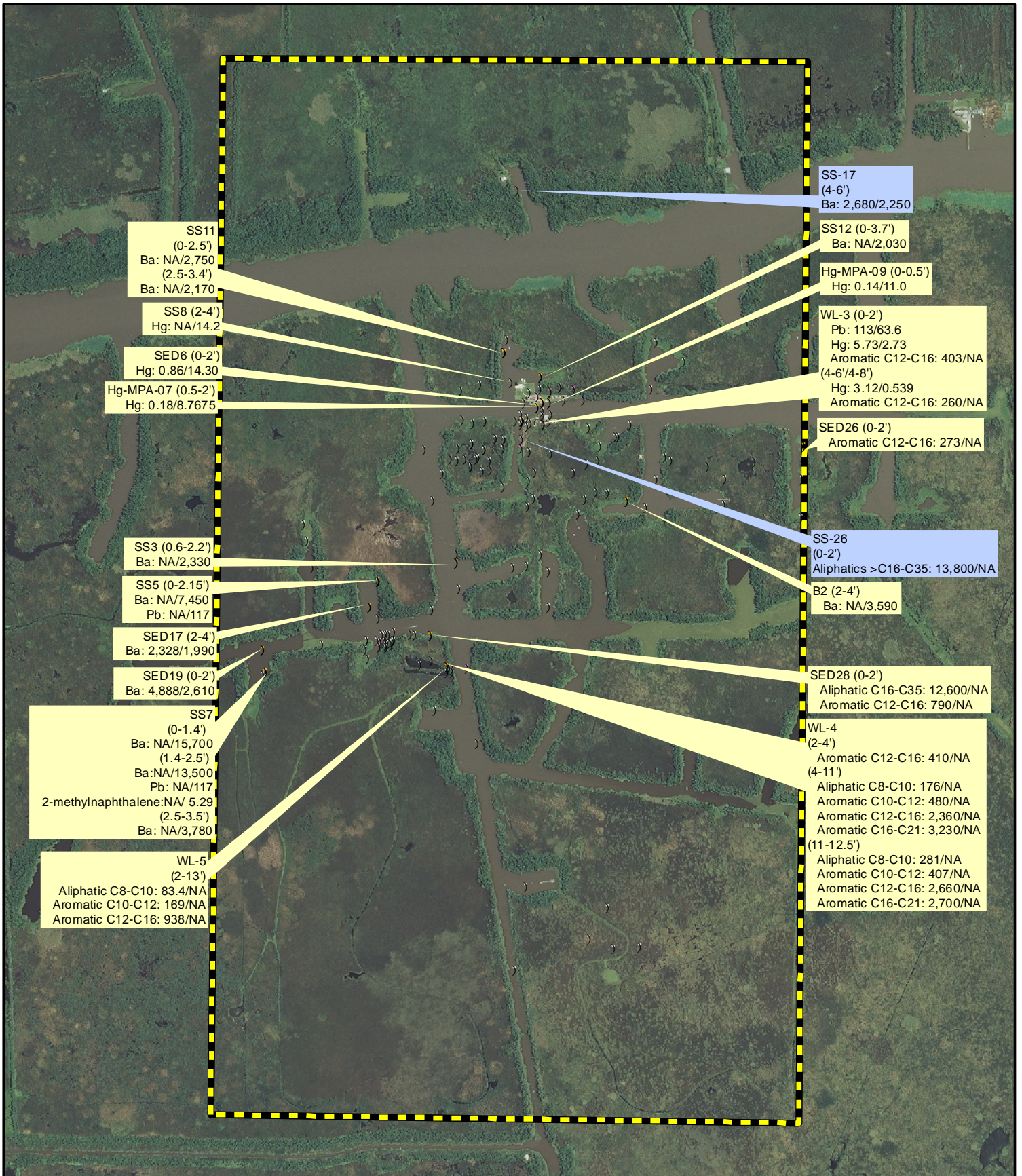
Figure 11
RECAP Direct Contact Screening Standard Exceedances - Soil/Sediment

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*

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SS11
(0-2.5')
Ba: NA/2,750
(2.5-3.4')
Ba: NA/2,170

SS8 (2-4')
Hg: NA/14.2

SED6 (0-2')
Hg: 0.86/14.30

Hg-MPA-07 (0.5-2')
Hg: 0.18/8.7675

SS3 (0.6-2.2')
Ba: NA/2,330

SS5 (0-2.15')
Ba: NA/7,450
Pb: NA/117

SED17 (2-4')
Ba: 2,328/1,990

SED19 (0-2')
Ba: 4,888/2,610

SS7
(0-1.4')
Ba: NA/15,700
(1.4-2.5')
Ba: NA/13,500
Pb: NA/117
2-methylnaphthalene: NA/ 5.29
(2.5-3.5')
Ba: NA/3,780

WL-5
(2-13')
Aliphatic C8-C10: 83.4/NA
Aromatic C10-C12: 169/NA
Aromatic C12-C16: 938/NA

SS-17
(4-6')
Ba: 2,680/2,250

SS12 (0-3.7')
Ba: NA/2,030

Hg-MPA-09 (0-0.5')
Hg: 0.14/11.0

WL-3 (0-2')
Pb: 113/63.6
Hg: 5.73/2.73
Aromatic C12-C16: 403/NA
(4-6'/4-8')
Hg: 3.12/0.539
Aromatic C12-C16: 260/NA

SED26 (0-2')
Aromatic C12-C16: 273/NA

SS-26
(0-2')
Aliphatics >C16-C35: 13,800/NA

B2 (2-4')
Ba: NA/3,590

SED28 (0-2')
Aliphatic C16-C35: 12,600/NA
Aromatic C12-C16: 790/NA

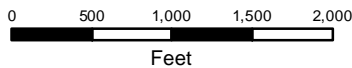
WL-4
(2-4')
Aromatic C12-C16: 410/NA
(4-11')
Aliphatic C8-C10: 176/NA
Aromatic C10-C12: 480/NA
Aromatic C12-C16: 2,360/NA
Aromatic C16-C21: 3,230/NA
(11-12.5')
Aliphatic C8-C10: 281/NA
Aromatic C10-C12: 407/NA
Aromatic C12-C16: 2,660/NA
Aromatic C16-C21: 2,700/NA

Legend



Section 16 Township 15 S Range 01 E

-) ICON 2015 Soil Boring Location
-) Soil/Sediment Exceedance
-) Soil/Sediment Sample Location



Notes:
RECAP Exceedances: MP&A result / ICON result
NA- Not Analyzed
Ba-Barium, Hg-Mercury, Pb-Lead
Blue callouts indicate supplemental
locations (11/15-2/16)
ICON metals reported in mg/kg-dry weight
Source: USDA 2013 Aerial

3

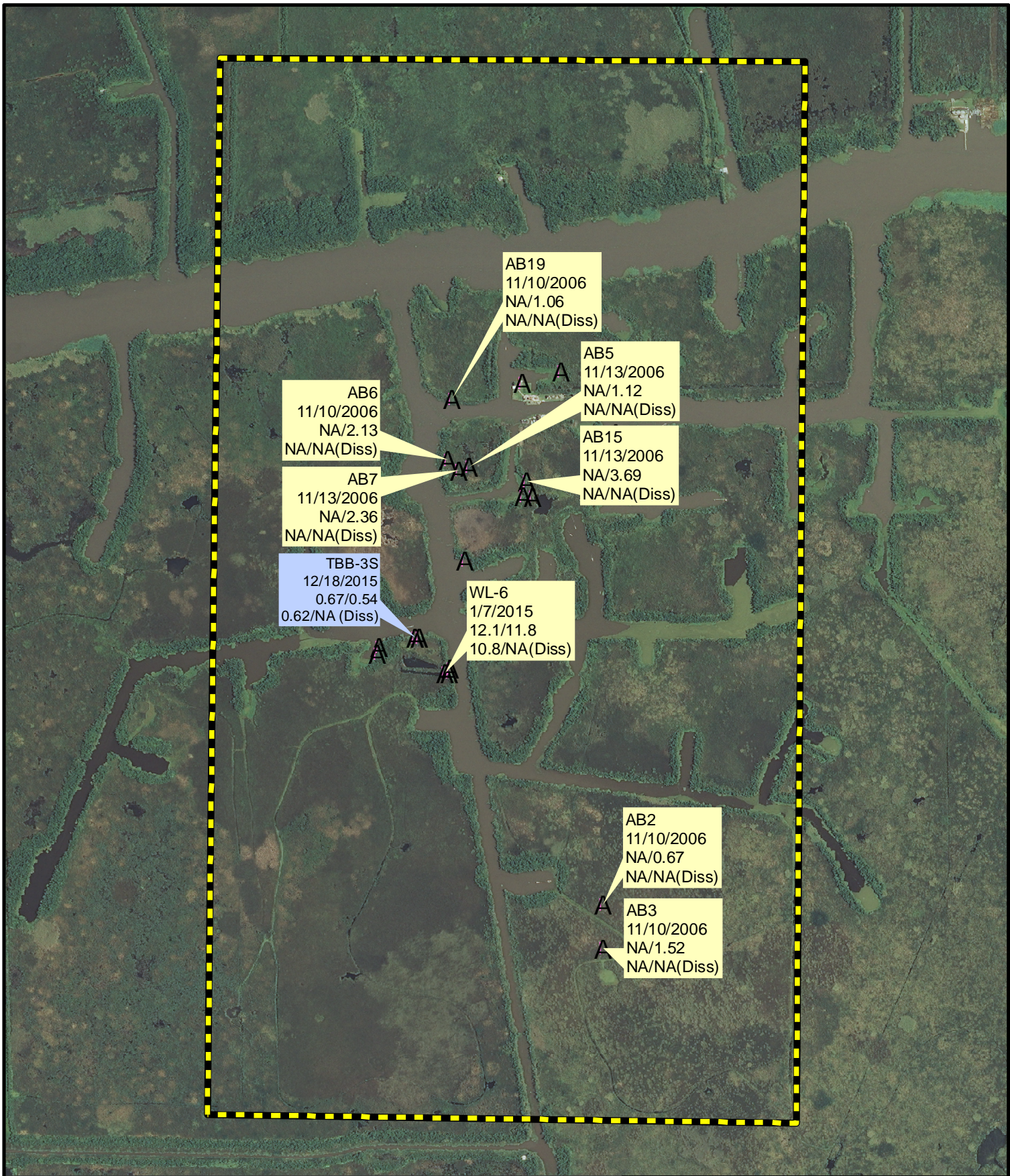
Figure 12
RECAP Groundwater Protection Screening
Standard Exceedances - Soil/Sediment

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

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Baton Rouge, LA New Orleans, LA Houston, TX

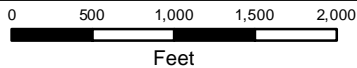
Drawn: DAM Checked: DGA Date: 2/15/2016 Project: 07-47



Legend

Section 16 Township 15 S Range 01 E

ICON Sample Location



Notes:
 Labels show MP&A result (mg/L)/ICON result (mg/L)
 (Diss) Refers to dissolved results
 NA - Not analyzed
 Blue callout indicates supplemental well (11/15-2/16)
 Source: 2013 Aerial from USDA

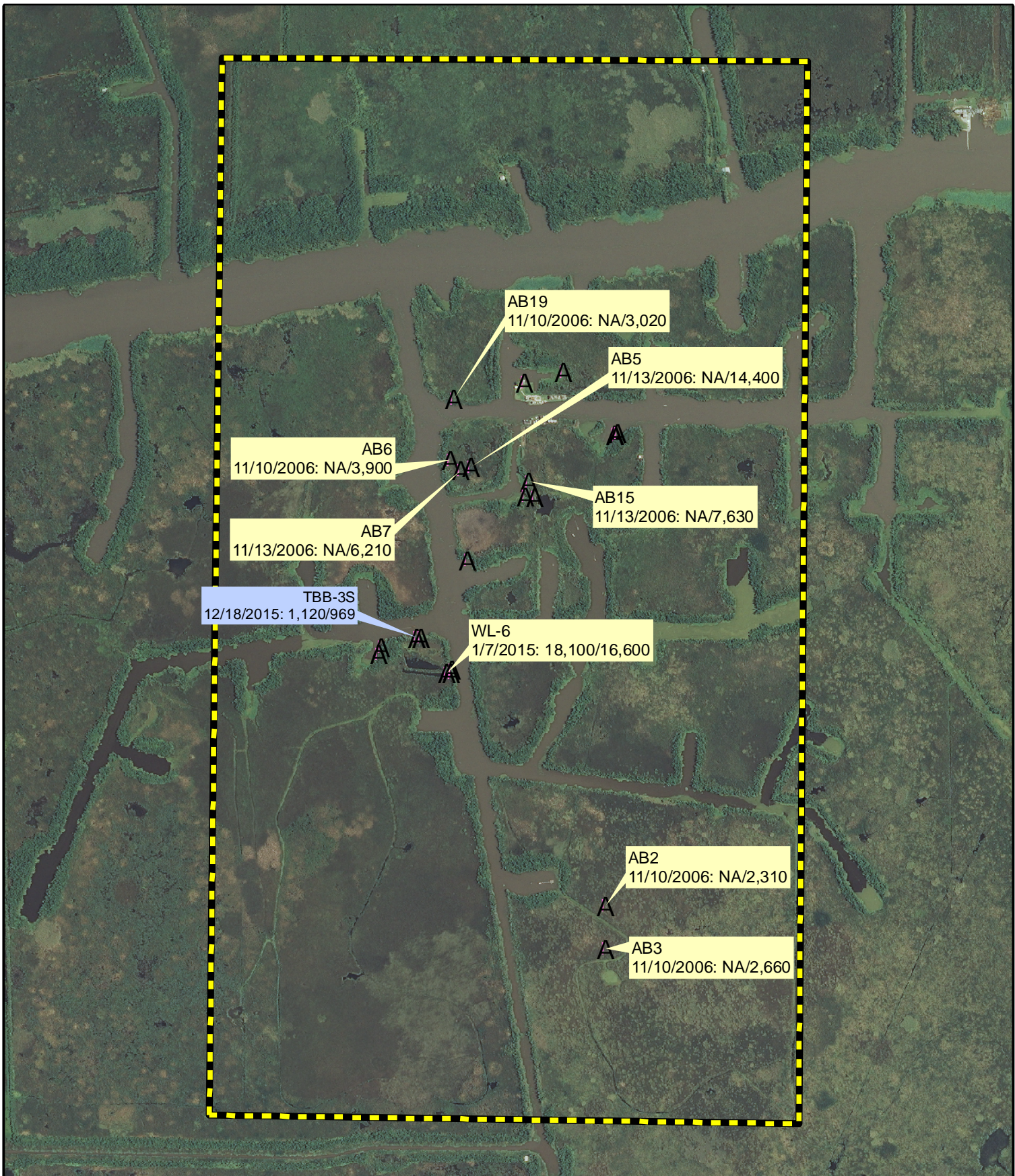
3

Figure 13
Groundwater Barium Concentrations -
Peat Zone



East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

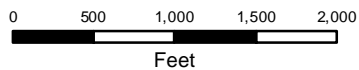
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Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



Legend

-  Section 16 Township 15 S Range 01 E
-  ICON Sample Location



Notes:
 Labels show MP&A result (mg/L)/ICON result (mg/L)
 NA - Not analyzed
 Blue callout indicates supplemental well (11/15-2/16)
 Source: 2013 Aerial from USDA

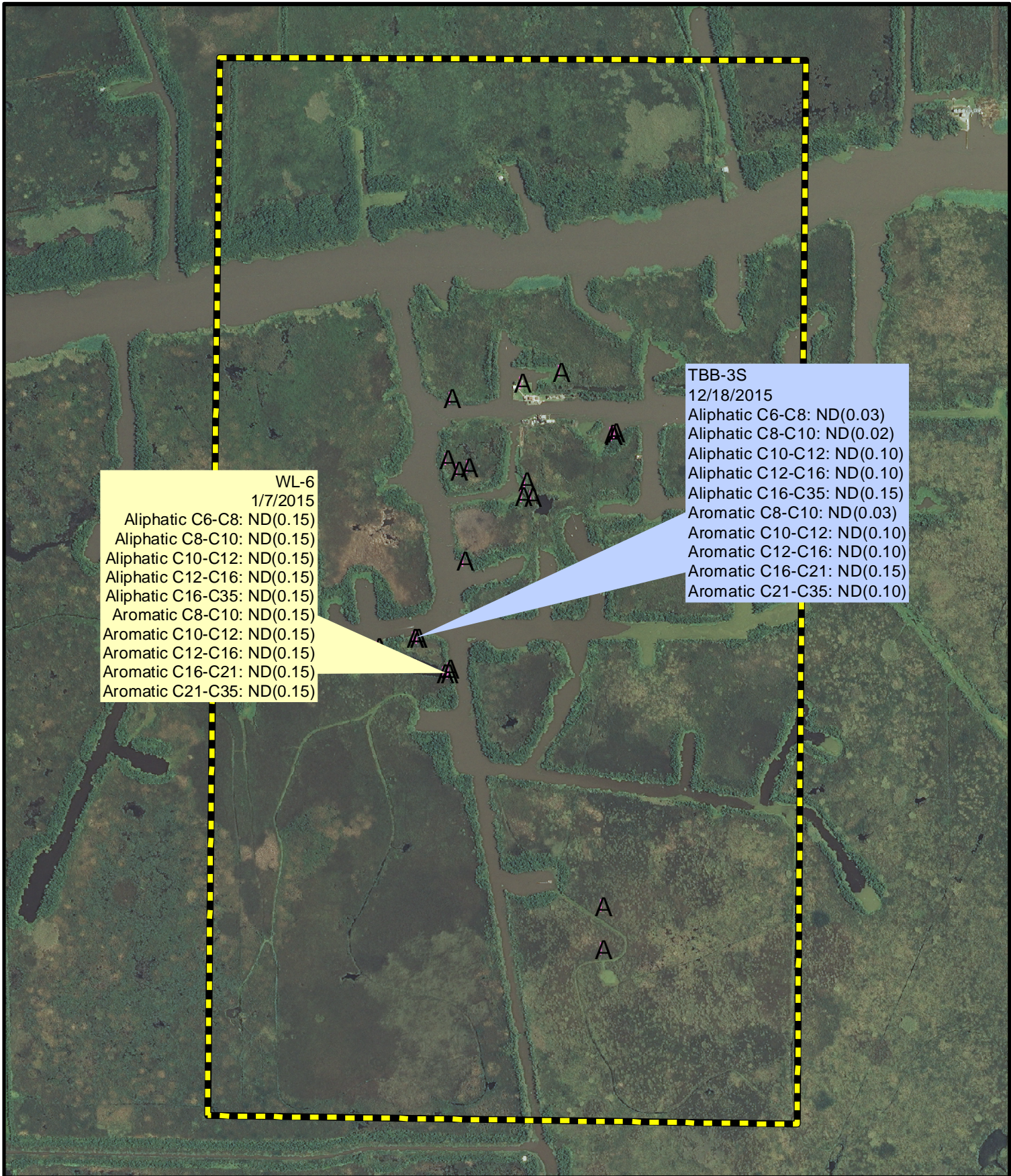
3

Figure 14
Groundwater Chloride Concentrations -
Peat Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

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Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



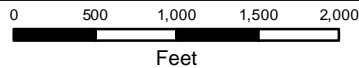
WL-6
 1/7/2015
 Aliphatic C6-C8: ND(0.15)
 Aliphatic C8-C10: ND(0.15)
 Aliphatic C10-C12: ND(0.15)
 Aliphatic C12-C16: ND(0.15)
 Aliphatic C16-C35: ND(0.15)
 Aromatic C8-C10: ND(0.15)
 Aromatic C10-C12: ND(0.15)
 Aromatic C12-C16: ND(0.15)
 Aromatic C16-C21: ND(0.15)
 Aromatic C21-C35: ND(0.15)

TBB-3S
 12/18/2015
 Aliphatic C6-C8: ND(0.03)
 Aliphatic C8-C10: ND(0.02)
 Aliphatic C10-C12: ND(0.10)
 Aliphatic C12-C16: ND(0.10)
 Aliphatic C16-C35: ND(0.15)
 Aromatic C8-C10: ND(0.03)
 Aromatic C10-C12: ND(0.10)
 Aromatic C12-C16: ND(0.10)
 Aromatic C16-C21: ND(0.15)
 Aromatic C21-C35: ND(0.10)

Legend

Section 16 Township 15 S Range 01 E

ICON Sample Location



Notes:
 Labels show MP&A result (mg/L)
 NA - Not analyzed
 ND - Not detected (detection limit)
 Blue callout indicates supplemental well (11/15-2/16)
 Source: 2013 Aerial from USDA

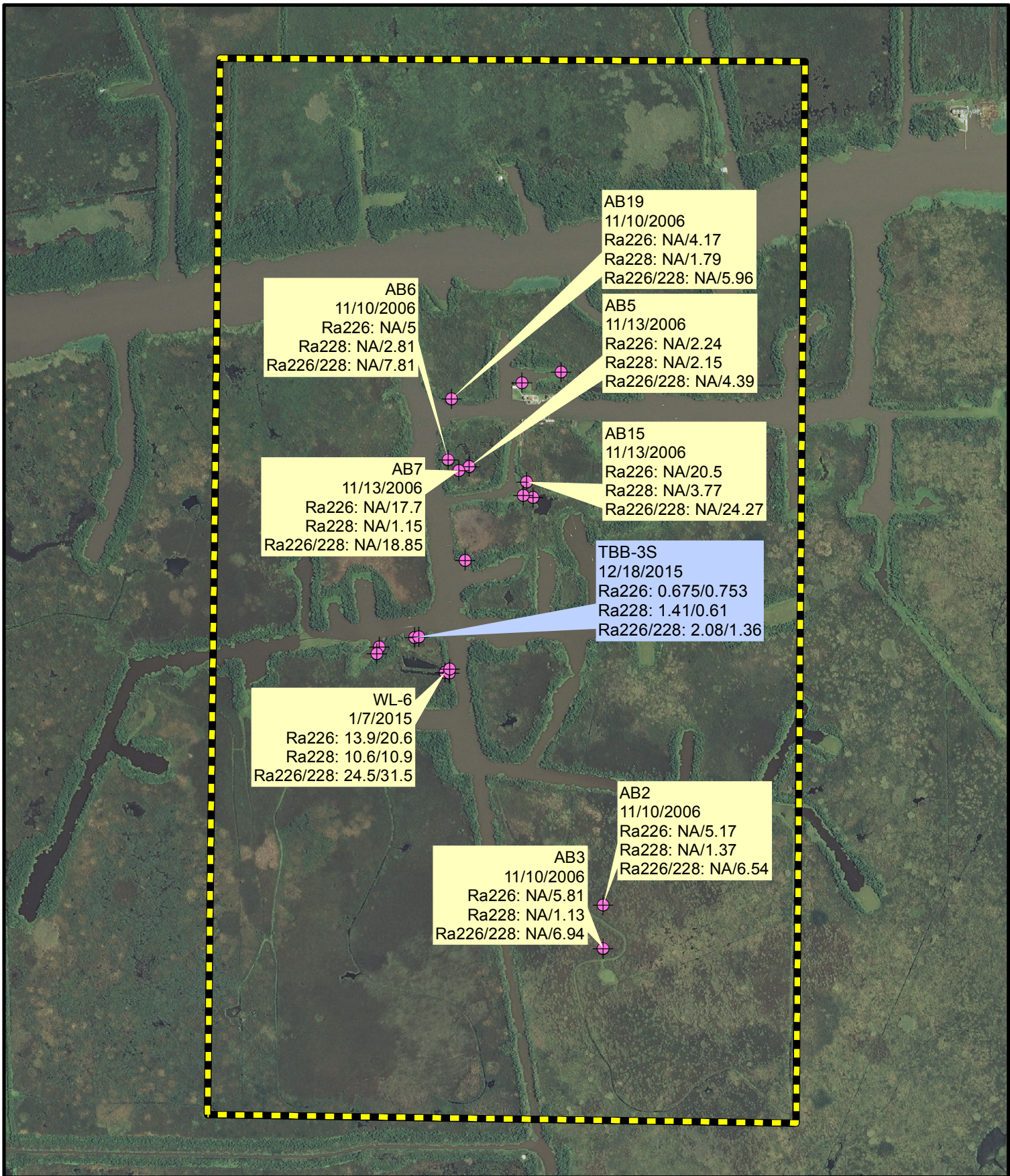
3

Figure 15
Groundwater TPH Concentrations - Peat Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

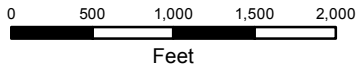
Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX



Legend

Section 16 Township 15 S Range 01 E

ICON Sample Location



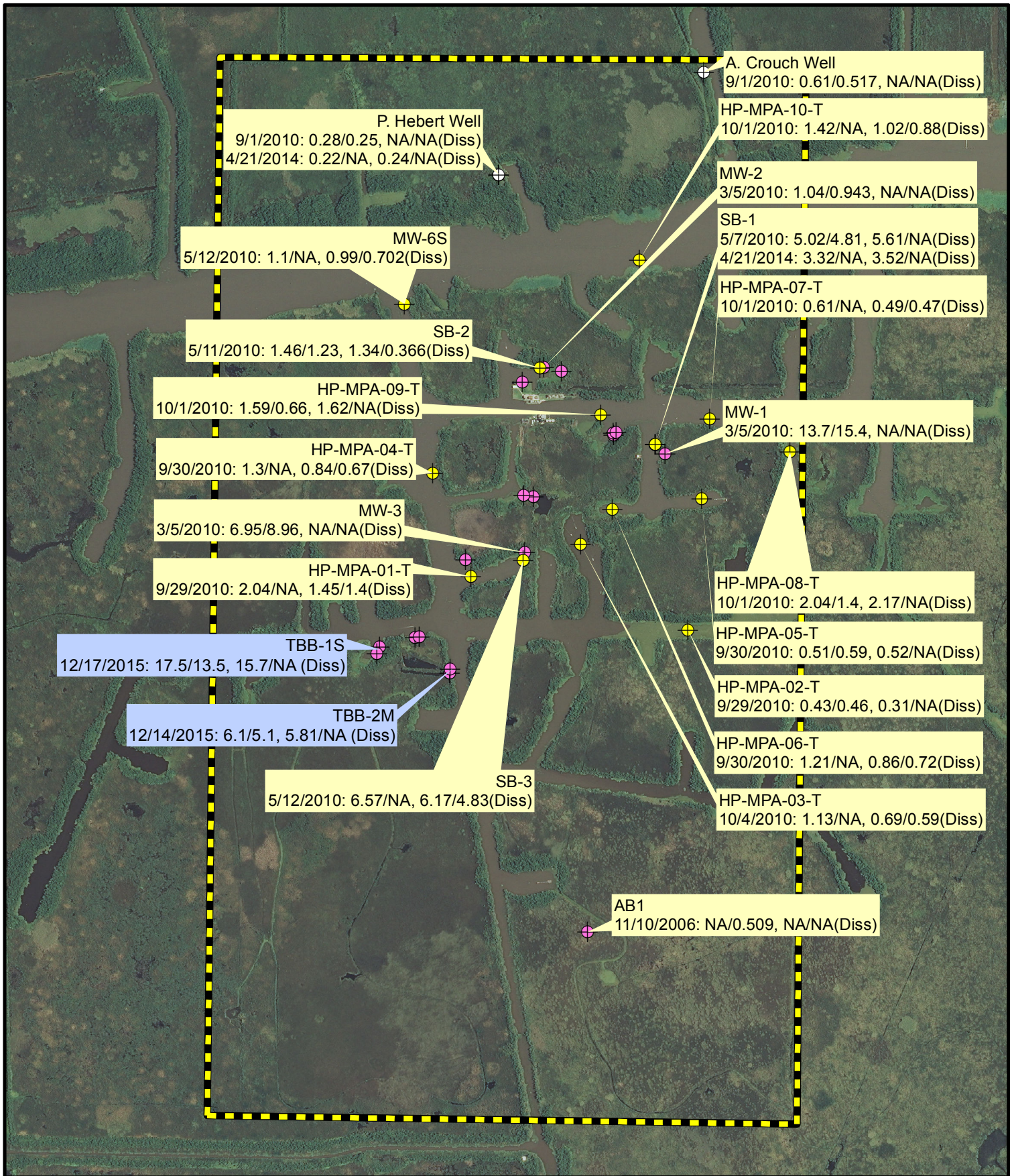
Notes:
 Labels show MP&A result (pCi/L) / ICON result (pCi/L)
 NA- Not analyzed
 Blue callout indicates supplemental well (11/15-2/16)
 Source: 2013 Aerial from USDA

Figure 16
Groundwater Radium-226/-228 Concentrations - Peat Zone

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



P. Hebert Well
 9/1/2010: 0.28/0.25, NA/NA(Diss)
 4/21/2014: 0.22/NA, 0.24/NA(Diss)

A. Crouch Well
 9/1/2010: 0.61/0.517, NA/NA(Diss)

MW-6S
 5/12/2010: 1.1/NA, 0.99/0.702(Diss)

MW-2
 3/5/2010: 1.04/0.943, NA/NA(Diss)

SB-1
 5/7/2010: 5.02/4.81, 5.61/NA(Diss)
 4/21/2014: 3.32/NA, 3.52/NA(Diss)

HP-MPA-07-T
 10/1/2010: 0.61/NA, 0.49/0.47(Diss)

SB-2
 5/11/2010: 1.46/1.23, 1.34/0.366(Diss)

HP-MPA-09-T
 10/1/2010: 1.59/0.66, 1.62/NA(Diss)

MW-1
 3/5/2010: 13.7/15.4, NA/NA(Diss)

HP-MPA-04-T
 9/30/2010: 1.3/NA, 0.84/0.67(Diss)

MW-3
 3/5/2010: 6.95/8.96, NA/NA(Diss)

HP-MPA-01-T
 9/29/2010: 2.04/NA, 1.45/1.4(Diss)

HP-MPA-08-T
 10/1/2010: 2.04/1.4, 2.17/NA(Diss)

TBB-1S
 12/17/2015: 17.5/13.5, 15.7/NA (Diss)

HP-MPA-05-T
 9/30/2010: 0.51/0.59, 0.52/NA(Diss)

TBB-2M
 12/14/2015: 6.1/5.1, 5.81/NA (Diss)

HP-MPA-02-T
 9/29/2010: 0.43/0.46, 0.31/NA(Diss)

HP-MPA-06-T
 9/30/2010: 1.21/NA, 0.86/0.72(Diss)

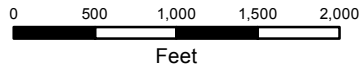
SB-3
 5/12/2010: 6.57/NA, 6.17/4.83(Diss)

HP-MPA-03-T
 10/4/2010: 1.13/NA, 0.69/0.59(Diss)

AB1
 11/10/2006: NA/0.509, NA/NA(Diss)

Legend

- Section 16 Township 15 S Range 01 E
- ICON Sample Location
- MP&A Sample Location
- Existing Water Well



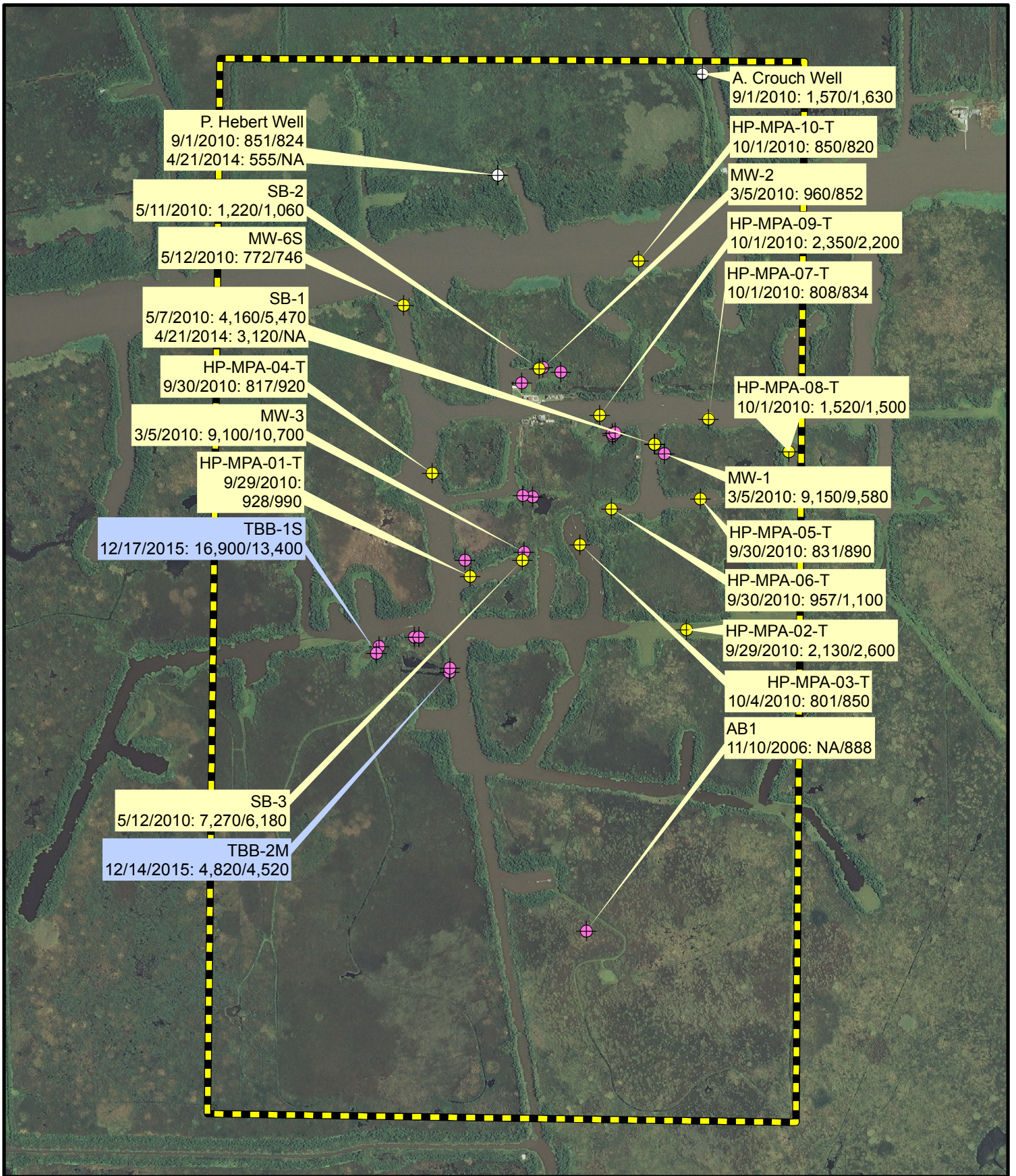
Notes:
 Labels show MP&A result (mg/L)/ICON result (mg/L)
 (Diss) Refers to dissolved results
 NA - Not analyzed
 Blue callouts indicate supplemental wells (11/15-2/16)
 Source: 2013 Aerial from USDA

Figure 17
Groundwater Barium Concentrations -
40 to 60 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



P. Hebert Well
9/1/2010: 851/824
4/21/2014: 555/NA

SB-2
5/11/2010: 1,220/1,060

MW-6S
5/12/2010: 772/746

SB-1
5/7/2010: 4,160/5,470
4/21/2014: 3,120/NA

HP-MPA-04-T
9/30/2010: 817/920

MW-3
3/5/2010: 9,100/10,700

HP-MPA-01-T
9/29/2010:
928/990

TBB-1S
12/17/2015: 16,900/13,400

SB-3
5/12/2010: 7,270/6,180

TBB-2M
12/14/2015: 4,820/4,520

A. Crouch Well
9/1/2010: 1,570/1,630

HP-MPA-10-T
10/1/2010: 850/820

MW-2
3/5/2010: 960/852

HP-MPA-09-T
10/1/2010: 2,350/2,200

HP-MPA-07-T
10/1/2010: 808/834

HP-MPA-08-T
10/1/2010: 1,520/1,500

MW-1
3/5/2010: 9,150/9,580

HP-MPA-05-T
9/30/2010: 831/890

HP-MPA-06-T
9/30/2010: 957/1,100

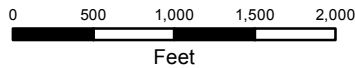
HP-MPA-02-T
9/29/2010: 2,130/2,600

HP-MPA-03-T
10/4/2010: 801/850

AB1
11/10/2006: NA/888

Legend

- Section 16 Township 15 S Range 01 E
- ICON Sample Location
- MP&A Sample Location
- Existing Water Well



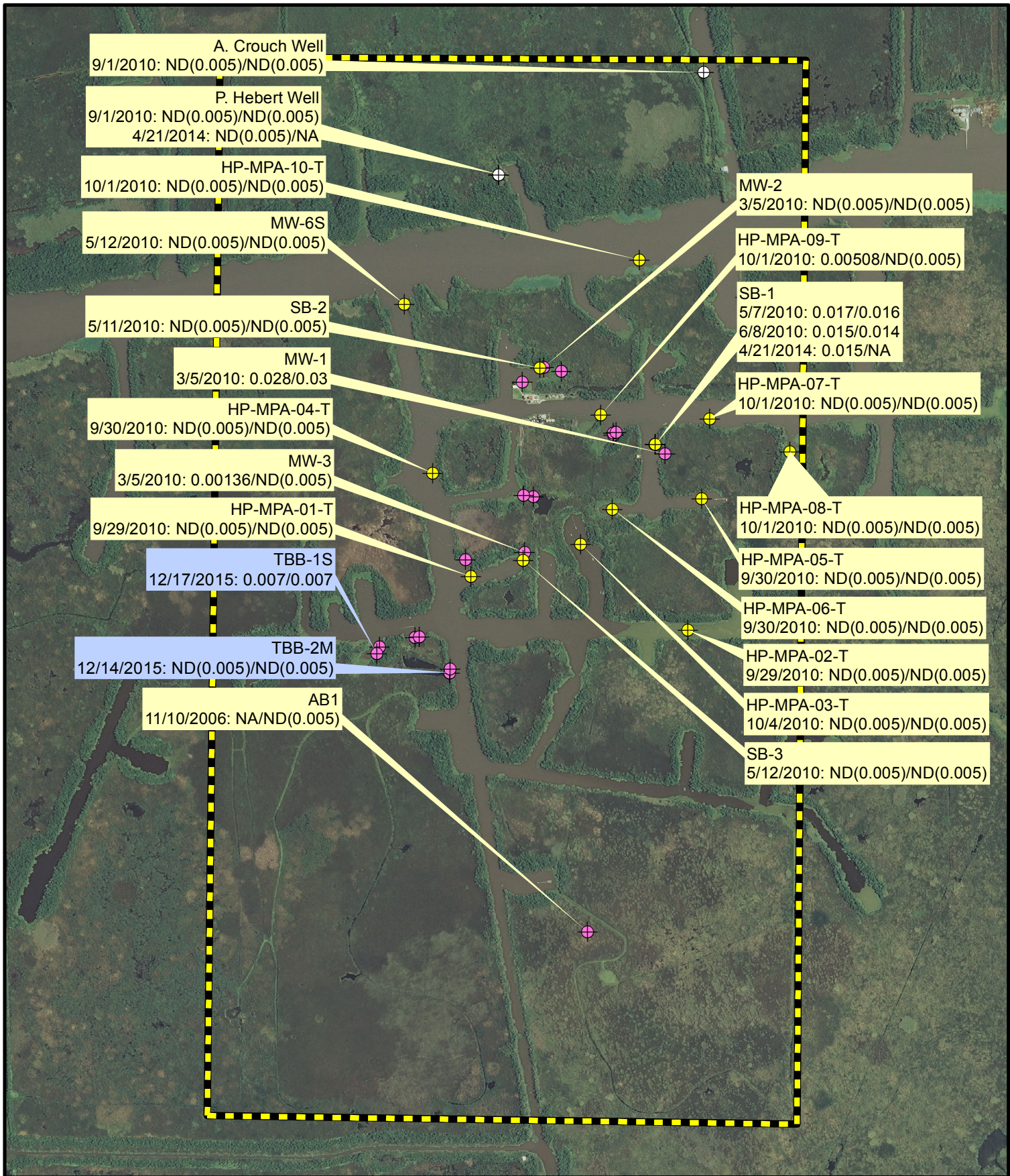
Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
NA- Not analyzed
Blue callouts indicate supplemental wells (11/15-2/16)
Source: 2013 Aerial from USDA

Figure 18
Groundwater Chloride Concentrations -
40 to 60 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX



A. Crouch Well
9/1/2010: ND(0.005)/ND(0.005)

P. Hebert Well
9/1/2010: ND(0.005)/ND(0.005)
4/21/2014: ND(0.005)/NA

HP-MPA-10-T
10/1/2010: ND(0.005)/ND(0.005)

MW-6S
5/12/2010: ND(0.005)/ND(0.005)

SB-2
5/11/2010: ND(0.005)/ND(0.005)

MW-1
3/5/2010: 0.028/0.03

HP-MPA-04-T
9/30/2010: ND(0.005)/ND(0.005)

MW-3
3/5/2010: 0.00136/ND(0.005)

HP-MPA-01-T
9/29/2010: ND(0.005)/ND(0.005)

TBB-1S
12/17/2015: 0.007/0.007

TBB-2M
12/14/2015: ND(0.005)/ND(0.005)

AB1
11/10/2006: NA/ND(0.005)

MW-2
3/5/2010: ND(0.005)/ND(0.005)

HP-MPA-09-T
10/1/2010: 0.00508/ND(0.005)

SB-1
5/7/2010: 0.017/0.016
6/8/2010: 0.015/0.014
4/21/2014: 0.015/NA

HP-MPA-07-T
10/1/2010: ND(0.005)/ND(0.005)

HP-MPA-08-T
10/1/2010: ND(0.005)/ND(0.005)

HP-MPA-05-T
9/30/2010: ND(0.005)/ND(0.005)

HP-MPA-06-T
9/30/2010: ND(0.005)/ND(0.005)

HP-MPA-02-T
9/29/2010: ND(0.005)/ND(0.005)

HP-MPA-03-T
10/4/2010: ND(0.005)/ND(0.005)

SB-3
5/12/2010: ND(0.005)/ND(0.005)

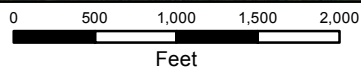
Legend

Section 16 Township 15 S Range 01 E

ICON Sample Location

MP&A Sample Location

Existing Water Well



Notes:
Labels show MP&A result (mg/L)/ICON result (mg/L)
NA - Not analyzed
ND - Not detected (Detection limit in parentheses)
Blue callouts indicate supplemental wells (11/15-2/16)
Source: 2013 Aerial from USDA

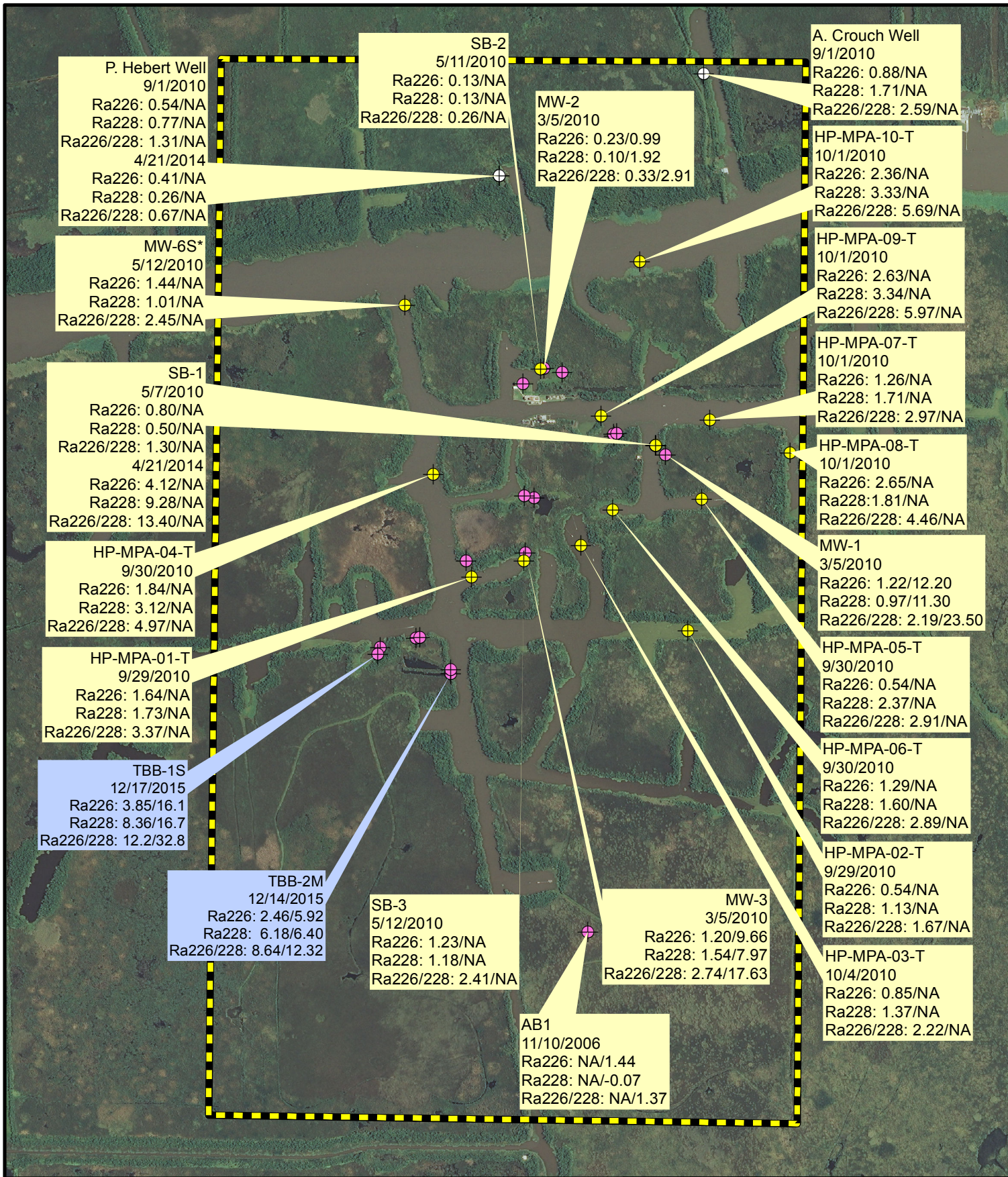


Figure 19
Groundwater Benzene Concentrations -
40 to 60 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX



P. Hebert Well
9/1/2010
Ra226: 0.54/NA
Ra228: 0.77/NA
Ra226/228: 1.31/NA
4/21/2014
Ra226: 0.41/NA
Ra228: 0.26/NA
Ra226/228: 0.67/NA

SB-2
5/11/2010
Ra226: 0.13/NA
Ra228: 0.13/NA
Ra226/228: 0.26/NA

MW-2
3/5/2010
Ra226: 0.23/0.99
Ra228: 0.10/1.92
Ra226/228: 0.33/2.91

A. Crouch Well
9/1/2010
Ra226: 0.88/NA
Ra228: 1.71/NA
Ra226/228: 2.59/NA

MW-6S*
5/12/2010
Ra226: 1.44/NA
Ra228: 1.01/NA
Ra226/228: 2.45/NA

HP-MPA-10-T
10/1/2010
Ra226: 2.36/NA
Ra228: 3.33/NA
Ra226/228: 5.69/NA

HP-MPA-09-T
10/1/2010
Ra226: 2.63/NA
Ra228: 3.34/NA
Ra226/228: 5.97/NA

SB-1
5/7/2010
Ra226: 0.80/NA
Ra228: 0.50/NA
Ra226/228: 1.30/NA
4/21/2014
Ra226: 4.12/NA
Ra228: 9.28/NA
Ra226/228: 13.40/NA

HP-MPA-07-T
10/1/2010
Ra226: 1.26/NA
Ra228: 1.71/NA
Ra226/228: 2.97/NA

HP-MPA-08-T
10/1/2010
Ra226: 2.65/NA
Ra228: 1.81/NA
Ra226/228: 4.46/NA

HP-MPA-04-T
9/30/2010
Ra226: 1.84/NA
Ra228: 3.12/NA
Ra226/228: 4.97/NA

MW-1
3/5/2010
Ra226: 1.22/12.20
Ra228: 0.97/11.30
Ra226/228: 2.19/23.50

HP-MPA-01-T
9/29/2010
Ra226: 1.64/NA
Ra228: 1.73/NA
Ra226/228: 3.37/NA

HP-MPA-05-T
9/30/2010
Ra226: 0.54/NA
Ra228: 2.37/NA
Ra226/228: 2.91/NA

TBB-1S
12/17/2015
Ra226: 3.85/16.1
Ra228: 8.36/16.7
Ra226/228: 12.2/32.8

HP-MPA-06-T
9/30/2010
Ra226: 1.29/NA
Ra228: 1.60/NA
Ra226/228: 2.89/NA

TBB-2M
12/14/2015
Ra226: 2.46/5.92
Ra228: 6.18/6.40
Ra226/228: 8.64/12.32

SB-3
5/12/2010
Ra226: 1.23/NA
Ra228: 1.18/NA
Ra226/228: 2.41/NA

MW-3
3/5/2010
Ra226: 1.20/9.66
Ra228: 1.54/7.97
Ra226/228: 2.74/17.63

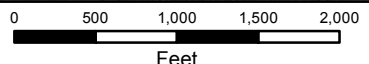
HP-MPA-02-T
9/29/2010
Ra226: 0.54/NA
Ra228: 1.13/NA
Ra226/228: 1.67/NA

HP-MPA-03-T
10/4/2010
Ra226: 0.85/NA
Ra228: 1.37/NA
Ra226/228: 2.22/NA

AB1
11/10/2006
Ra226: NA/1.44
Ra228: NA/-0.07
Ra226/228: NA/1.37

Legend

- Section 16 Township 15 S Range 01 E
- ICON Sample Location
- MP&A Sample Location
- Existing Water Well



Notes:
Labels show combined total Ra226/Ra228
MP&A results (pCi/L)/ICON results (pCi/L)
* Indicates dissolved radionuclide analyses
(where total results unavailable)
NA - Not analyzed
Blue callouts indicate supplemental wells (11/15-2/16)
Source: 2013 Aerial from USDA



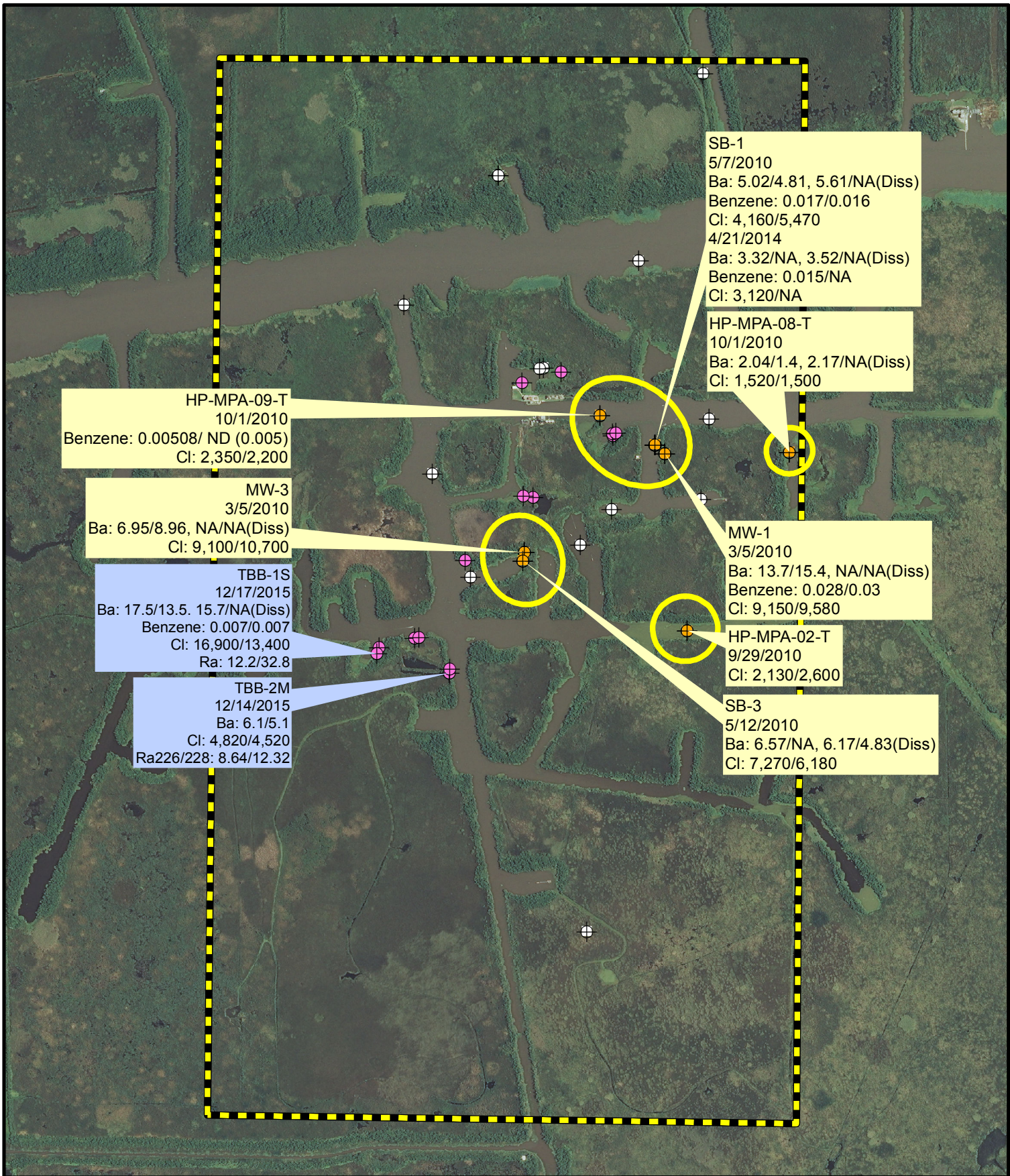
Figure 20
Groundwater Radium-226/228 Concentrations -
40 to 60 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

Drawn: DAM	Checked: DGA	Date: 2/15/2016	Project: 07-47
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SB-1
5/7/2010
Ba: 5.02/4.81, 5.61/NA(Diss)
Benzene: 0.017/0.016
CI: 4,160/5,470
4/21/2014
Ba: 3.32/NA, 3.52/NA(Diss)
Benzene: 0.015/NA
CI: 3,120/NA

HP-MPA-08-T
10/1/2010
Ba: 2.04/1.4, 2.17/NA(Diss)
CI: 1,520/1,500

HP-MPA-09-T
10/1/2010
Benzene: 0.00508/ ND (0.005)
CI: 2,350/2,200

MW-3
3/5/2010
Ba: 6.95/8.96, NA/NA(Diss)
CI: 9,100/10,700

TBB-1S
12/17/2015
Ba: 17.5/13.5, 15.7/NA(Diss)
Benzene: 0.007/0.007
CI: 16,900/13,400
Ra: 12.2/32.8

TBB-2M
12/14/2015
Ba: 6.1/5.1
CI: 4,820/4,520
Ra226/228: 8.64/12.32

MW-1
3/5/2010
Ba: 13.7/15.4, NA/NA(Diss)
Benzene: 0.028/0.03
CI: 9,150/9,580

HP-MPA-02-T
9/29/2010
CI: 2,130/2,600

SB-3
5/12/2010
Ba: 6.57/NA, 6.17/4.83(Diss)
CI: 7,270/6,180

Legend

- Section 16 Township 15 S Range 01 E
- ICON 2015 Monitoring Well Location
- Groundwater Exceedance (40 foot zone)
- Groundwater Sampling Location (40 foot zone)
- RECAP Area of Investigation

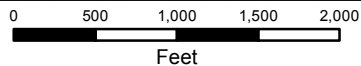


Figure 21
RECAP GW2 40 to 60 foot Zone

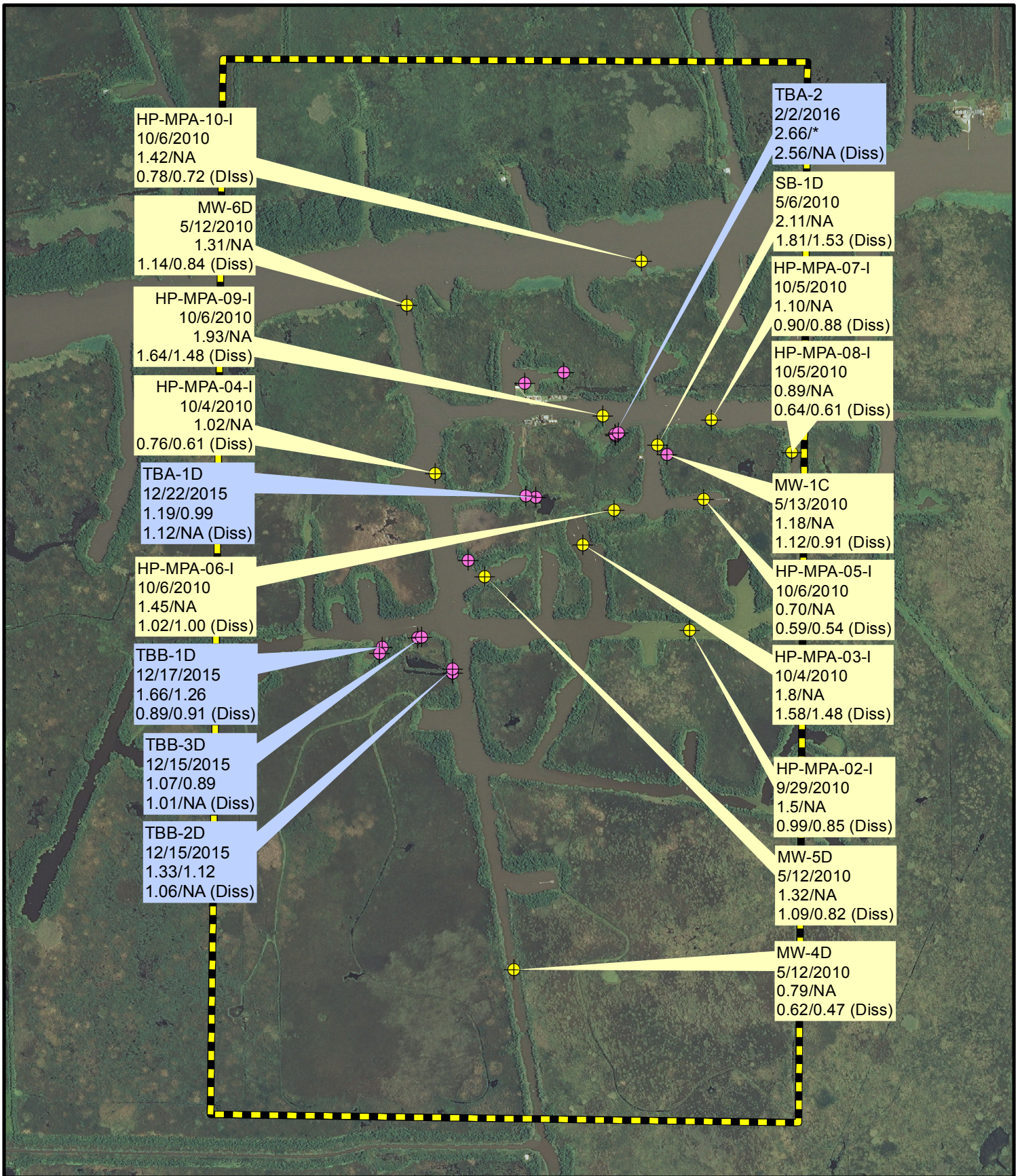
East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

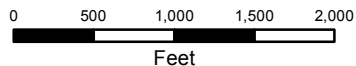
Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
Blue callouts indicate supplemental wells (11/15-2/16)
Source: 2013 Aerial from USDA

Drawn: DAM Checked: DGA Date: 2/15/2016 Project: 07-47



Legend

- Section 16 Township 15 S Range 01 E
- ICON Sample Location
- MP&A Sample Location



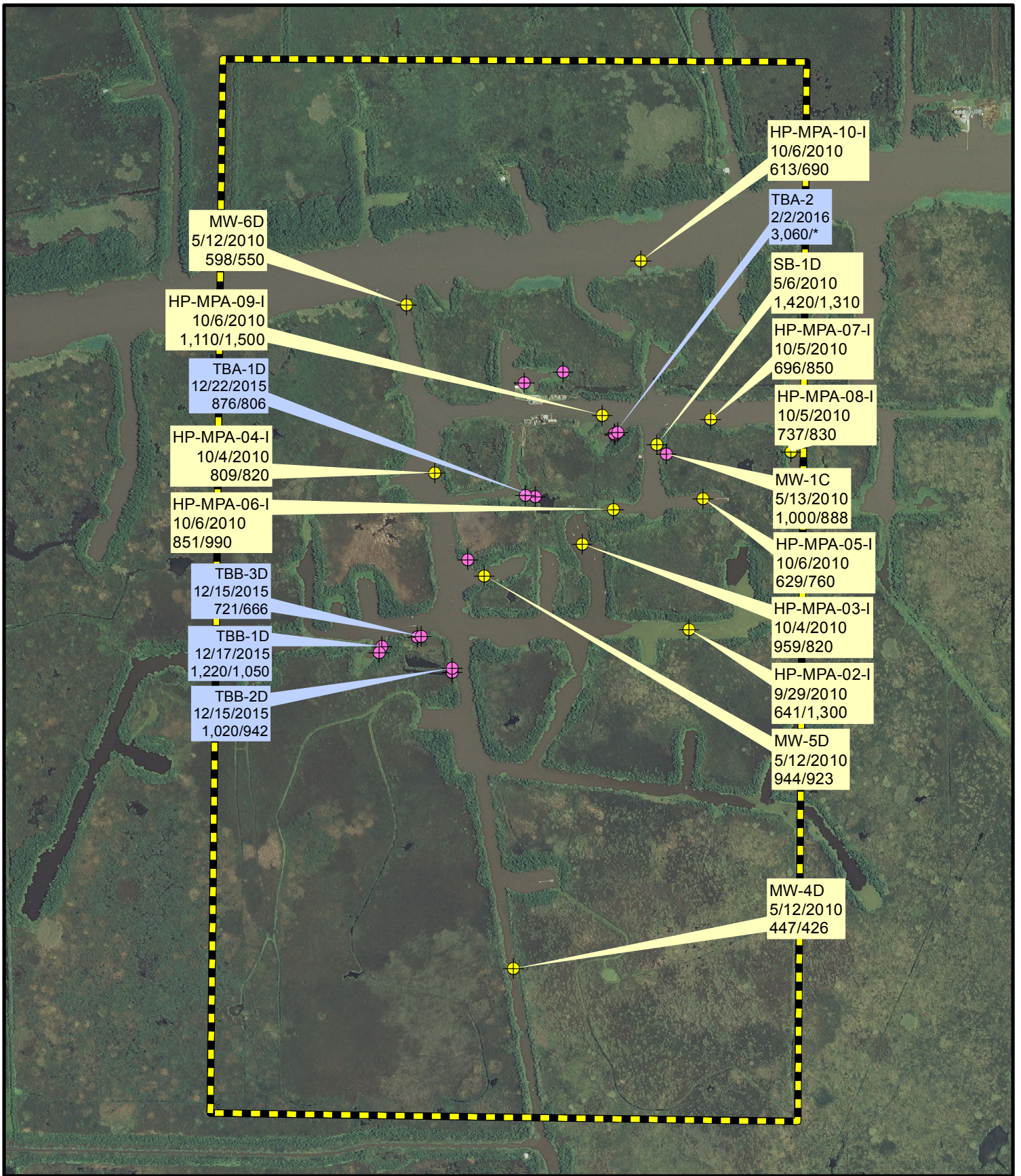
Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 Blue callouts indicate supplemental wells (11/15-2/16)
 * Samples pending analysis
 Source: 2013 Aerial from USDA

Figure 22
Groundwater Barium Concentrations -
70 to 90 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

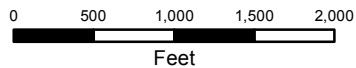
MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



Legend

- Section 16 Township 15 S Range 01 E
- ICON Sample Location
- MP&A Sample Location



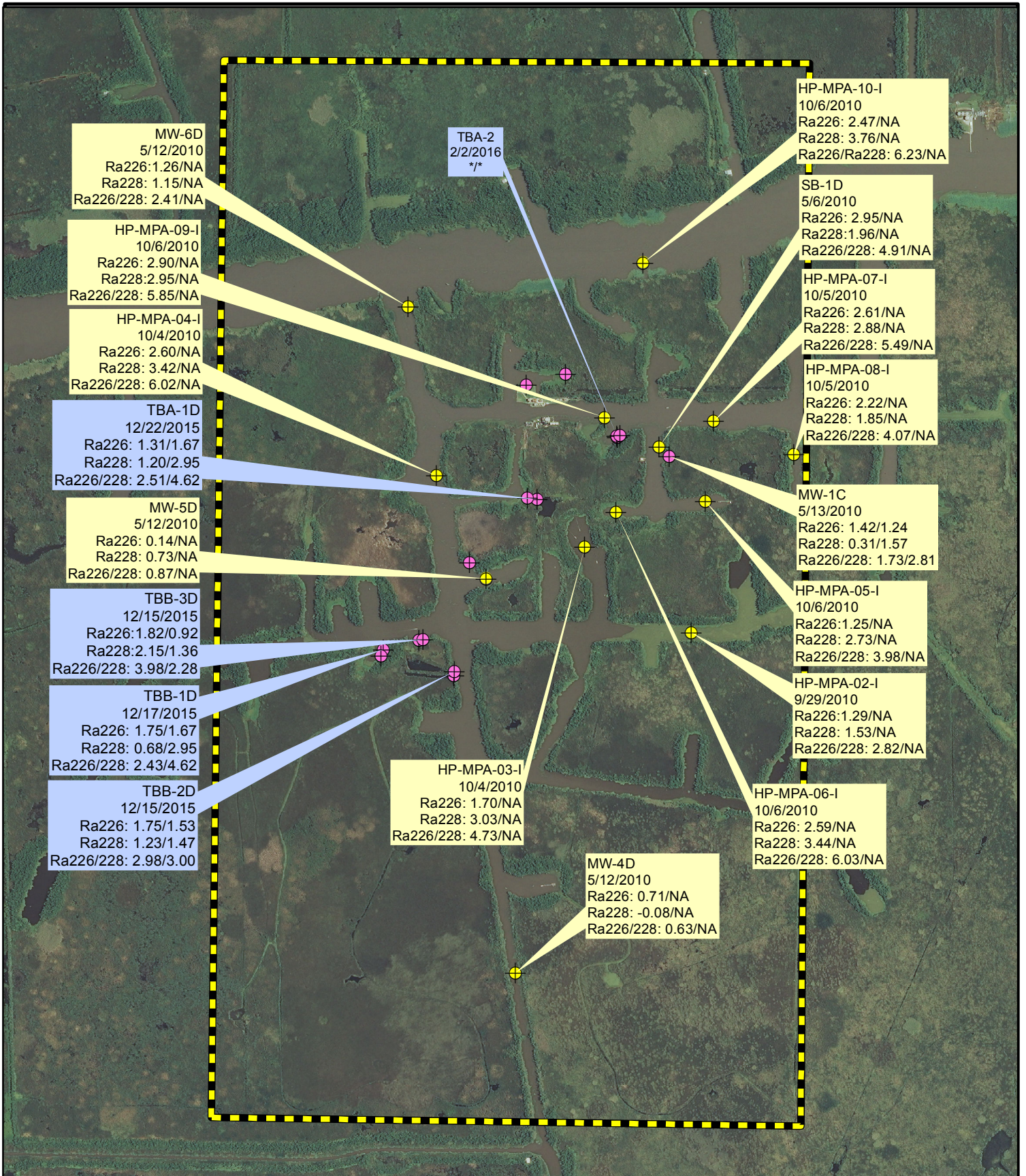
Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 Blue callouts indicate supplemental wells (11/15-2/16)
 * Samples pending analysis
 Source: 2013 Aerial from USDA

Figure 23
Groundwater Chloride Concentrations -
70 to 90 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



MW-6D
5/12/2010
Ra226: 1.26/NA
Ra228: 1.15/NA
Ra226/228: 2.41/NA

TBA-2
2/2/2016
/

HP-MPA-10-I
10/6/2010
Ra226: 2.47/NA
Ra228: 3.76/NA
Ra226/Ra228: 6.23/NA

HP-MPA-09-I
10/6/2010
Ra226: 2.90/NA
Ra228: 2.95/NA
Ra226/228: 5.85/NA

SB-1D
5/6/2010
Ra226: 2.95/NA
Ra228: 1.96/NA
Ra226/228: 4.91/NA

HP-MPA-04-I
10/4/2010
Ra226: 2.60/NA
Ra228: 3.42/NA
Ra226/228: 6.02/NA

HP-MPA-07-I
10/5/2010
Ra226: 2.61/NA
Ra228: 2.88/NA
Ra226/228: 5.49/NA

TBA-1D
12/22/2015
Ra226: 1.31/1.67
Ra228: 1.20/2.95
Ra226/228: 2.51/4.62

HP-MPA-08-I
10/5/2010
Ra226: 2.22/NA
Ra228: 1.85/NA
Ra226/228: 4.07/NA

MW-5D
5/12/2010
Ra226: 0.14/NA
Ra228: 0.73/NA
Ra226/228: 0.87/NA

MW-1C
5/13/2010
Ra226: 1.42/1.24
Ra228: 0.31/1.57
Ra226/228: 1.73/2.81

TBB-3D
12/15/2015
Ra226: 1.82/0.92
Ra228: 2.15/1.36
Ra226/228: 3.98/2.28

HP-MPA-05-I
10/6/2010
Ra226: 1.25/NA
Ra228: 2.73/NA
Ra226/228: 3.98/NA

TBB-1D
12/17/2015
Ra226: 1.75/1.67
Ra228: 0.68/2.95
Ra226/228: 2.43/4.62

HP-MPA-02-I
9/29/2010
Ra226: 1.29/NA
Ra228: 1.53/NA
Ra226/228: 2.82/NA

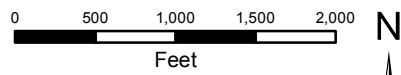
TBB-2D
12/15/2015
Ra226: 1.75/1.53
Ra228: 1.23/1.47
Ra226/228: 2.98/3.00

HP-MPA-03-I
10/4/2010
Ra226: 1.70/NA
Ra228: 3.03/NA
Ra226/228: 4.73/NA

HP-MPA-06-I
10/6/2010
Ra226: 2.59/NA
Ra228: 3.44/NA
Ra226/228: 6.03/NA

MW-4D
5/12/2010
Ra226: 0.71/NA
Ra228: -0.08/NA
Ra226/228: 0.63/NA

Legend
 Section 16 Township 15 S Range 01 E
 ICON Sample Location
 MP&A Sample Location

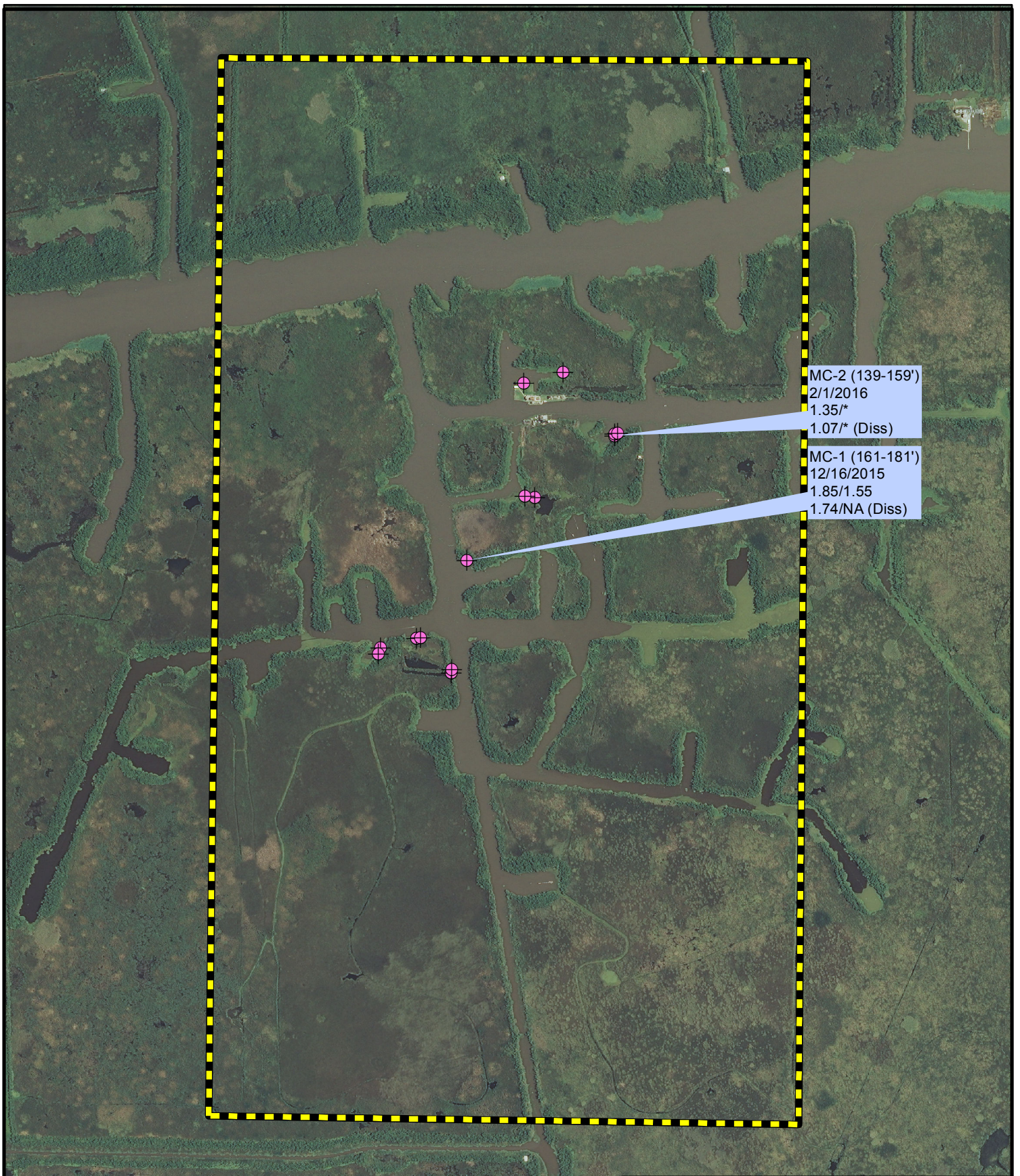


Notes: Labels show MP&A result (pCi/L)/ICON result (pCi/L)
 NA- Not analyzed
 Blue callouts indicate supplemental wells (11/15-2/16)
 * Samples pending analysis
 Source: 2013 Aerial from USDA

Figure 24
Groundwater Radium-226/228 Concentrations -
70 to 90 foot Zone
 East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.
 Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



Drawn: DAM | Checked: DGA | Date: 2/15/2016 | Project: 07-47

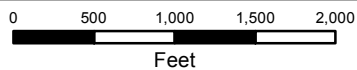


MC-2 (139-159')
 2/1/2016
 1.35/*
 1.07/* (Diss)

MC-1 (161-181')
 12/16/2015
 1.85/1.55
 1.74/NA (Diss)

Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Monitoring Well Location



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 NA - Not analyzed
 Blue callouts indicate supplemental wells (11/15-2/16)
 * Samples pending analysis
 Source: 2013 Aerial from USDA

Figure 25
Groundwater Barium Concentrations -
90 to 250 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX



Drawn: DAM	Checked: DGA	Date: 2/15/2016	Project: 07-47
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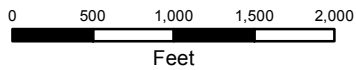


MC-2 (139-189')
2/1/2016
1,220/*

MC-1 (161-181')
12/16/2015
837/769

Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Monitoring Well Location



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
NA - Not analyzed
Blue callouts indicate supplemental wells (11/15-2/16)
* Samples pending analysis
Source: 2013 Aerial from USDA

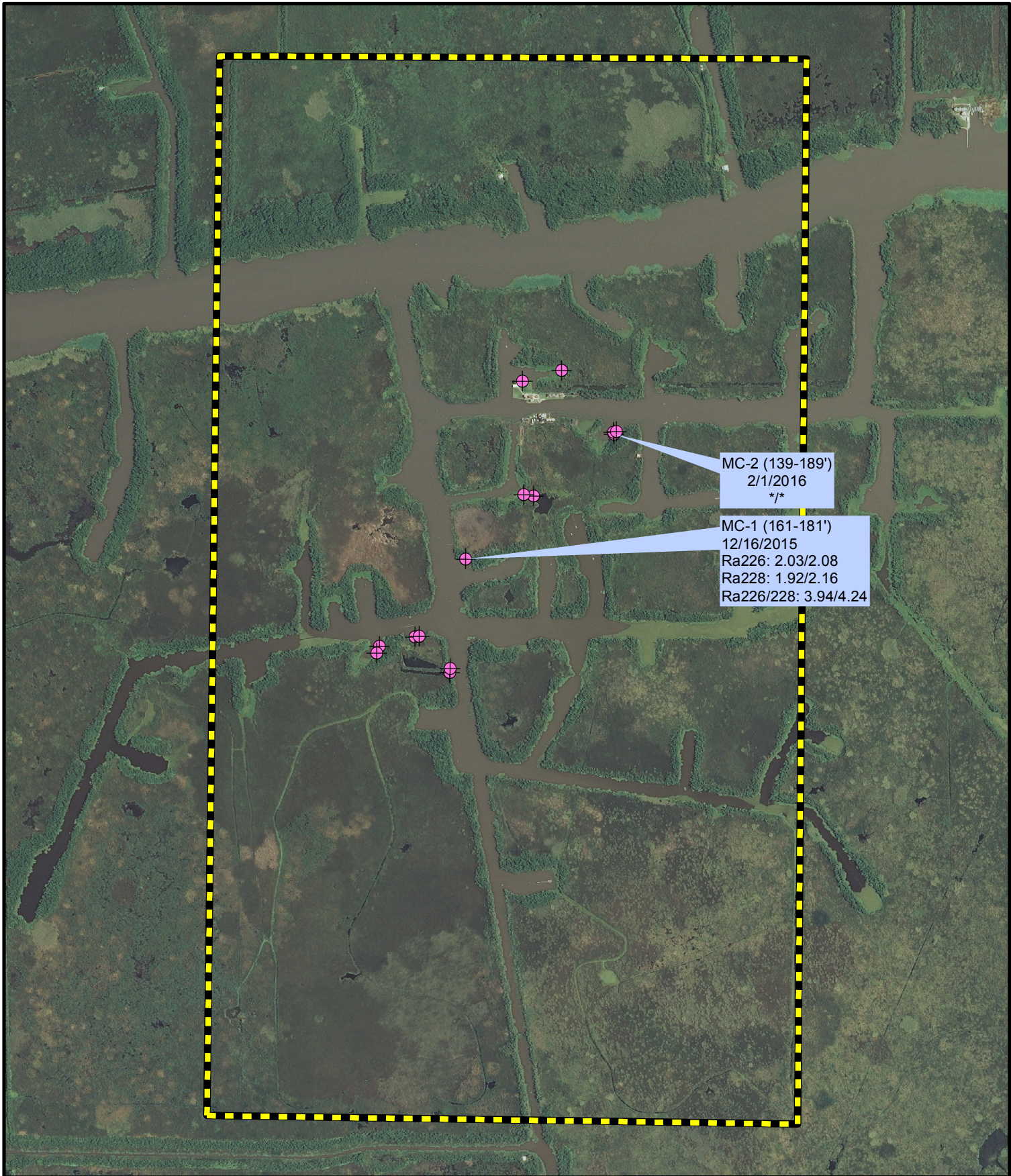
Figure 26
Groundwater Chloride Concentrations -
90 to 250 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana



MICHAEL PISANI & ASSOCIATES, INC.

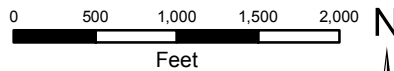
Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

Drawn: DAM	Checked: DGA	Date: 2/15/2016	Project: 07-47
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Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Monitor Well Location



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 NA - Not analyzed
 Blue callouts indicate supplemental wells (11/15-2/16)
 * Samples pending analysis
 Source: 2013 Aerial from USDA

Figure 27
Groundwater Radium-226/-228 Concentrations -
90 to 250 foot Zone
East White Lake Oil & Gas Field
Vermilion Parish, Louisiana



MICHAEL PISANI & ASSOCIATES, INC.

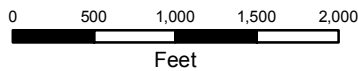
Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX

Drawn: MMH	Checked: DGA	Date: 2/15/2016	Project: 07-47
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Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Monitor Well Location



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 NA - Not analyzed
 Blue callouts indicate supplemental wells (11/15-2/16)
 * Samples pending analysis
 Source: 2013 Aerial from USDA

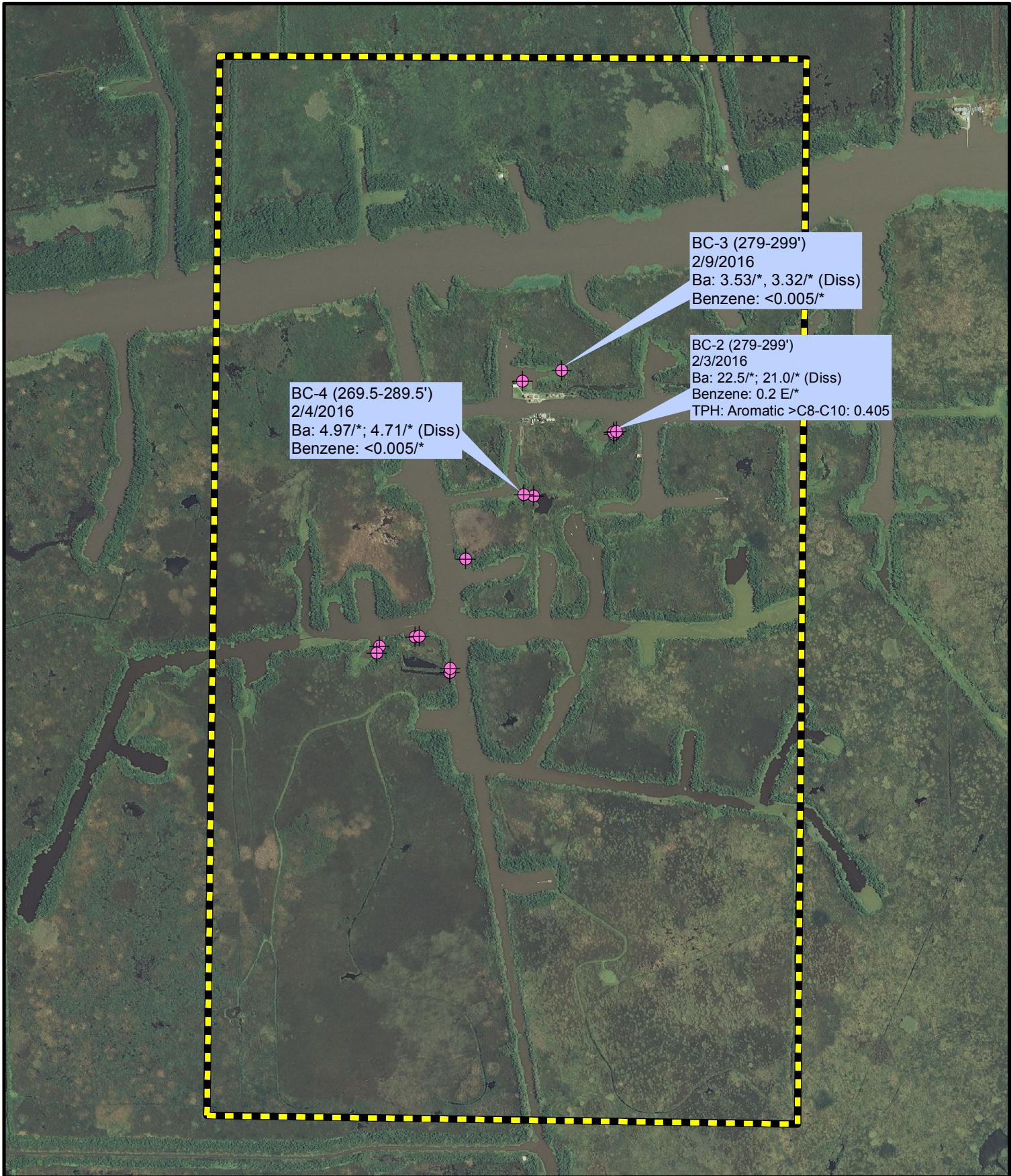
Figure 28
Groundwater Chloride Concentrations -
250 to 300 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX

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BC-3 (279-299')
2/9/2016
Ba: 3.53/*, 3.32/* (Diss)
Benzene: <0.005/*

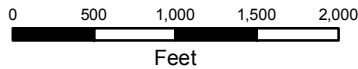
BC-2 (279-299')
2/3/2016
Ba: 22.5/*; 21.0/* (Diss)
Benzene: 0.2 E/*
TPH: Aromatic >C8-C10: 0.405

BC-4 (269.5-289.5')
2/4/2016
Ba: 4.97/*; 4.71/* (Diss)
Benzene: <0.005/*

Legend

Section 16 Township 15 S Range 01 E

ICON 2015 Monitor Well Location



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
NA - Not analyzed
Blue callouts indicate supplemental wells (11/15-2/16)
E- Estimated value
* Samples pending analysis
Source: 2013 Aerial from USDA

Figure 29
Groundwater Barium, Benzene, and TPH
Concentrations - 250 to 300 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana



MICHAEL PISANI & ASSOCIATES, INC.

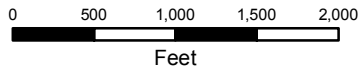
Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

Drawn: MMH	Checked: DGA	Date: 2/15/2016	Project: 07-47
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Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Monitor Well Location



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 NA - Not analyzed
 * Samples pending analysis
 Blue callouts indicate supplemental wells (11/15-2/16)
 Source: 2013 Aerial from USDA

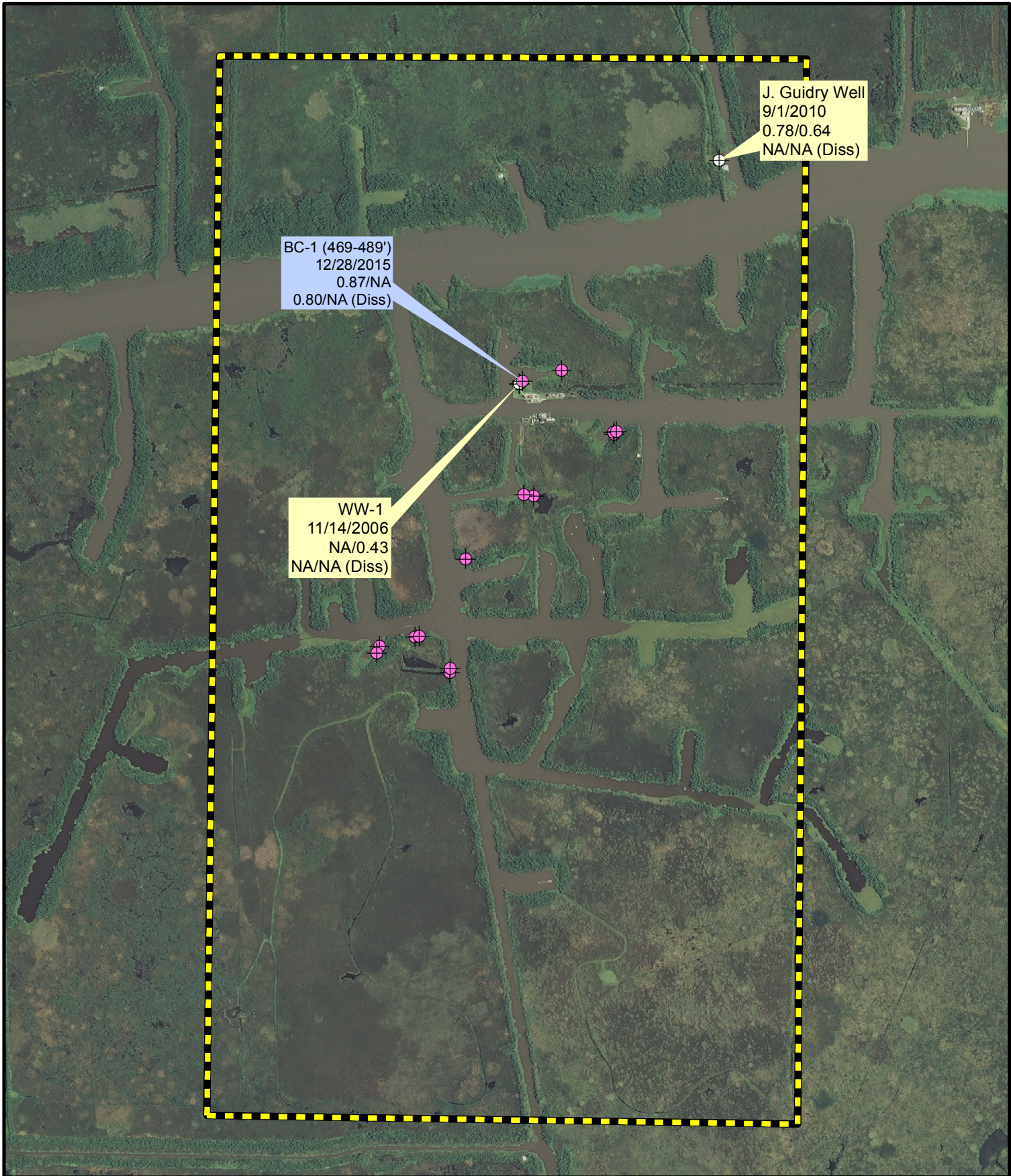
Figure 30
Groundwater Radium-226/-228 Concentrations -
250 to 300 foot Zone

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

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Drawn: MMH	Checked: DGA	Date: 2/15/2016	Project: 07-47
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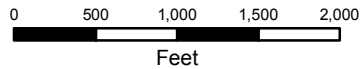
J. Guidry Well
 9/1/2010
 0.78/0.64
 NA/NA (Diss)

BC-1 (469-489')
 12/28/2015
 0.87/NA
 0.80/NA (Diss)

WW-1
 11/14/2006
 NA/0.43
 NA/NA (Diss)

Legend

- Section 16 Township 15 S Range 01 E
- ICON 2015 Monitor Well Location
- Existing Water Well



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 NA - Not analyzed
 Blue callouts indicate supplemental wells (11/15-2/16)
 Source: 2013 Aerial from USDA



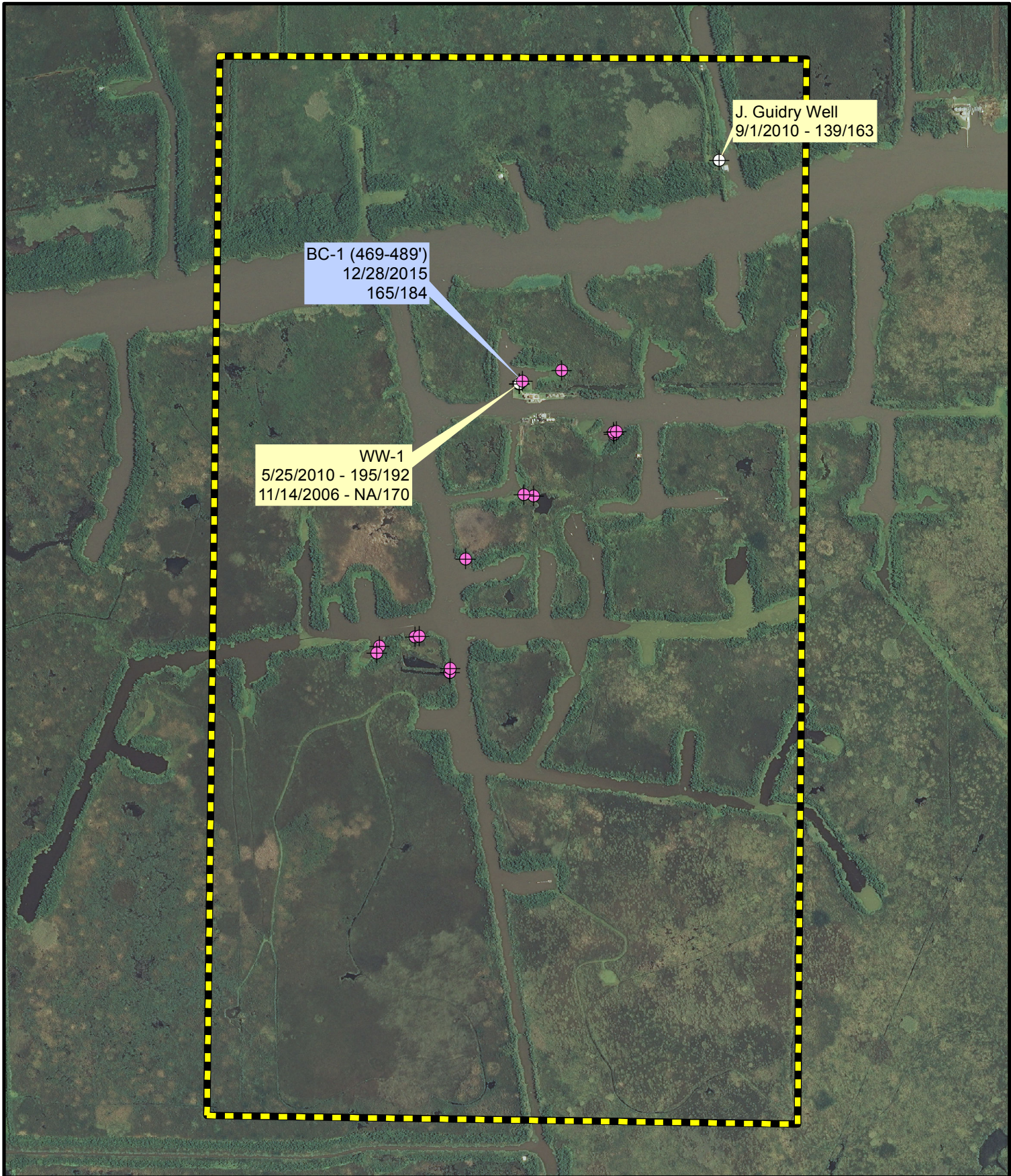
Figure 31
Groundwater Barium Concentrations -
Chicot Aquifer (>460 feet)

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana




MICHAEL PISANI & ASSOCIATES, INC.

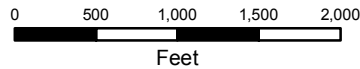
Environmental Consulting Services
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Legend

-  Section 16 Township 15 S Range 01 E
-  ICON 2015 Monitor Well Location
-  Existing Water Well



Notes: Labels show MP&A result (mg/L)/ICON result (mg/L)
 NA - Not analyzed
 Blue callout indicates supplemental well (11/15-2/16)
 Source: 2013 Aerial from USDA

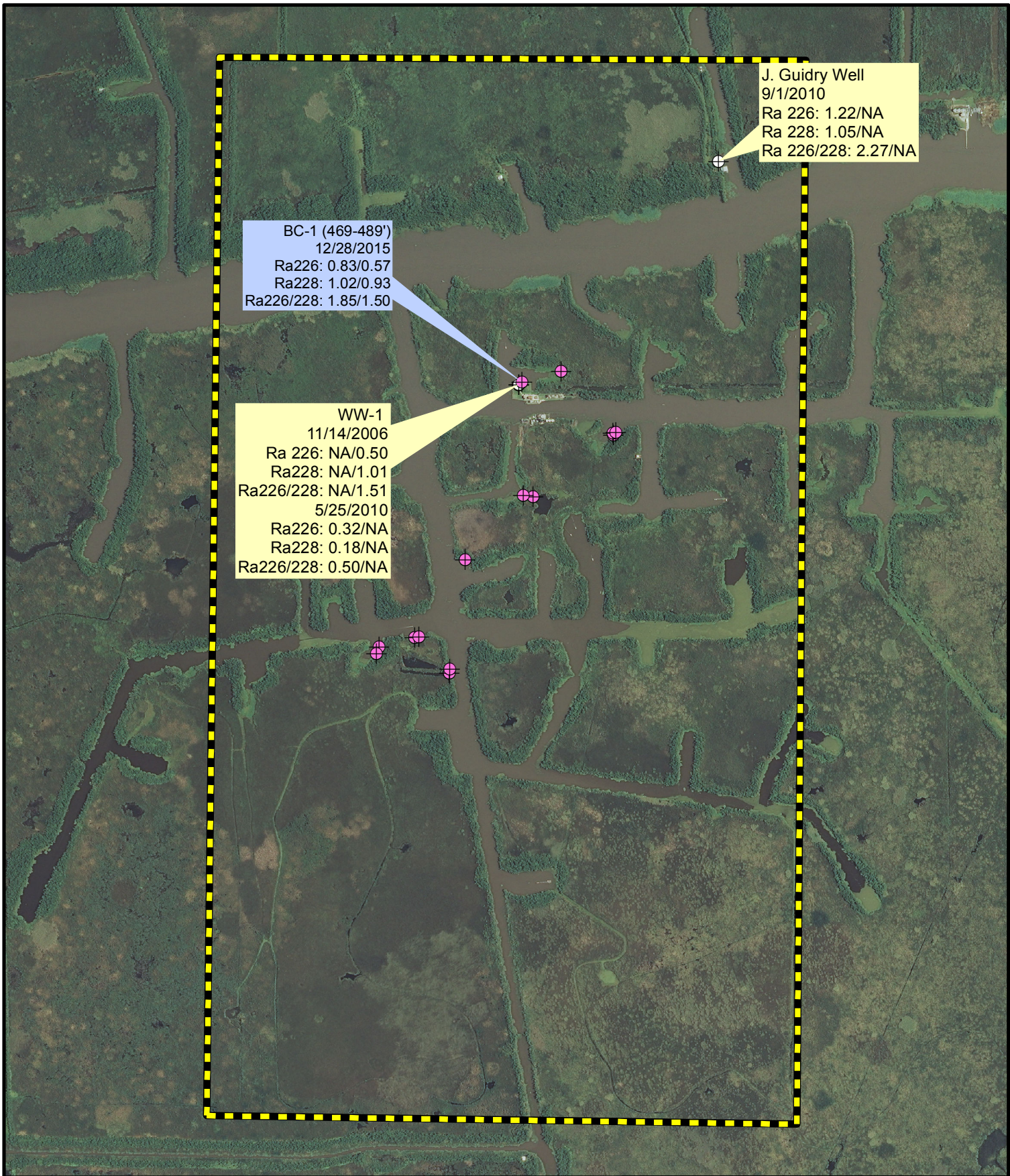
Figure 32
Groundwater Chloride Concentrations -
Chicot Aquifer (>460 feet)

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

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Drawn: MMH	Checked: DGA	Date: 2/15/2016	Project: 07-47
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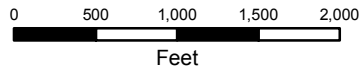
J. Guidry Well
 9/1/2010
 Ra 226: 1.22/NA
 Ra 228: 1.05/NA
 Ra 226/228: 2.27/NA

BC-1 (469-489')
 12/28/2015
 Ra226: 0.83/0.57
 Ra228: 1.02/0.93
 Ra226/228: 1.85/1.50

WW-1
 11/14/2006
 Ra 226: NA/0.50
 Ra228: NA/1.01
 Ra226/228: NA/1.51
 5/25/2010
 Ra226: 0.32/NA
 Ra228: 0.18/NA
 Ra226/228: 0.50/NA

Legend

- Section 16 Township 15 S Range 01 E
- ICON 2015 Monitor Well Location
- Existing Water Well



Notes: Labels show MP&A result (pCi/L)/ICON result (pCi/L)
 NA - Not analyzed
 Blue callouts indicate supplemental wells (11/15-2/16)
 Source: 2013 Aerial from USDA

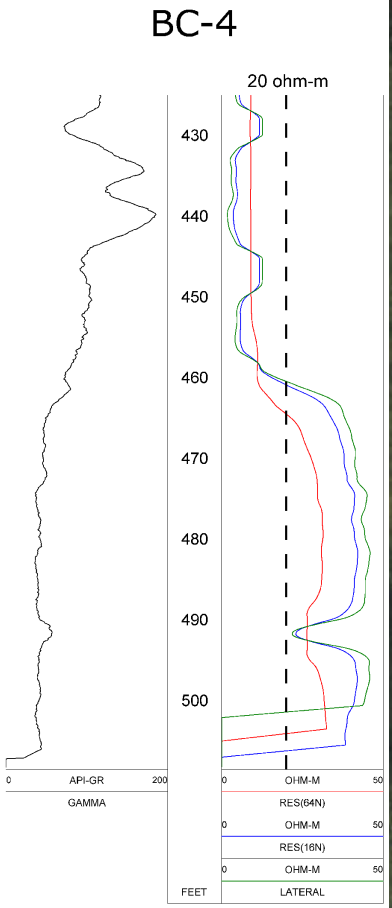
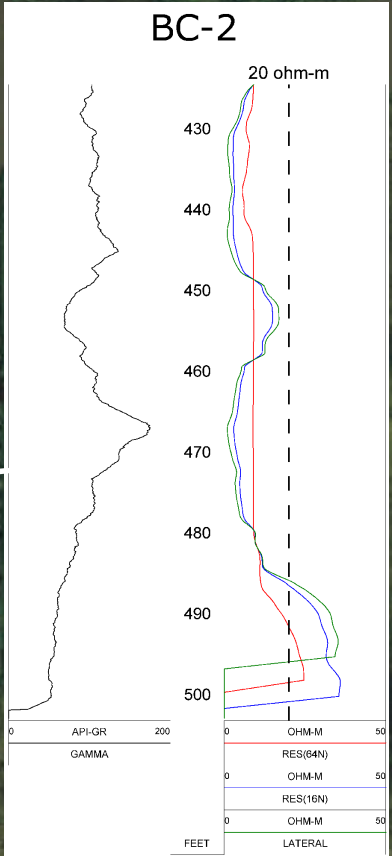
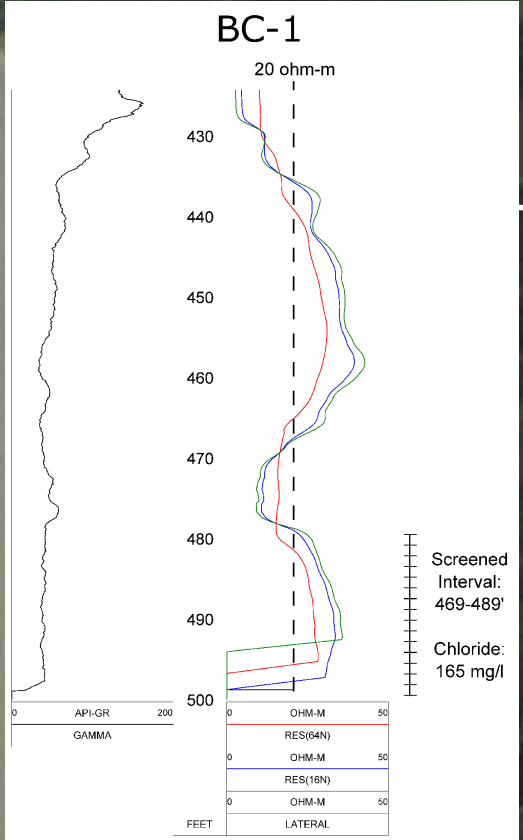
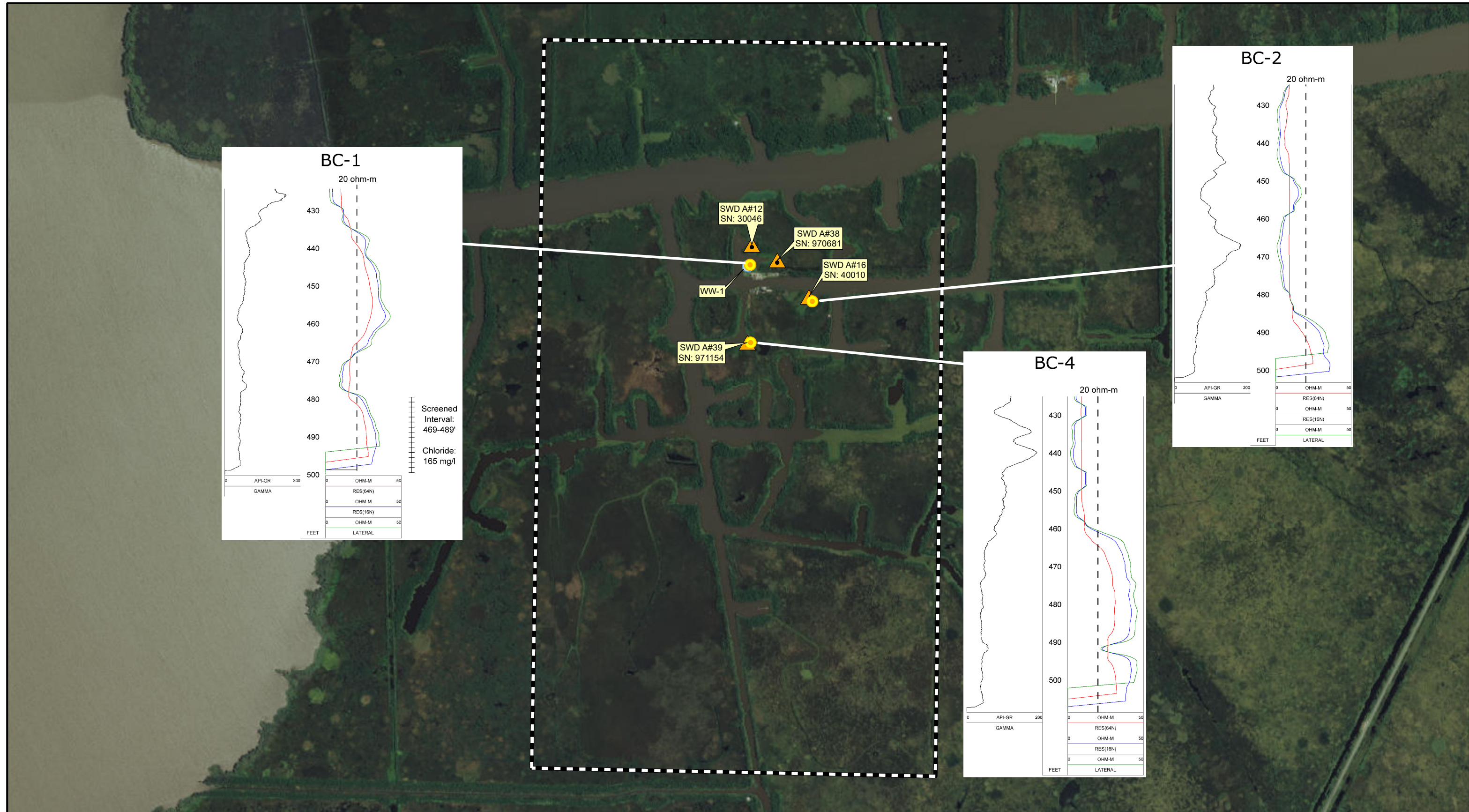
Figure 33
Groundwater Radium-226/-228 Concentrations - Chicot Aquifer (>460 feet)

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*

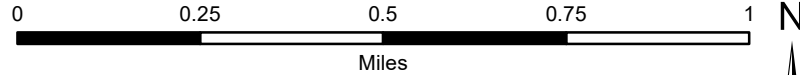
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- Legend**
- ICON Monitoring Well Location
 - Water Well Location
 - ▲ Salt Water Disposal Wells
 - Section 16

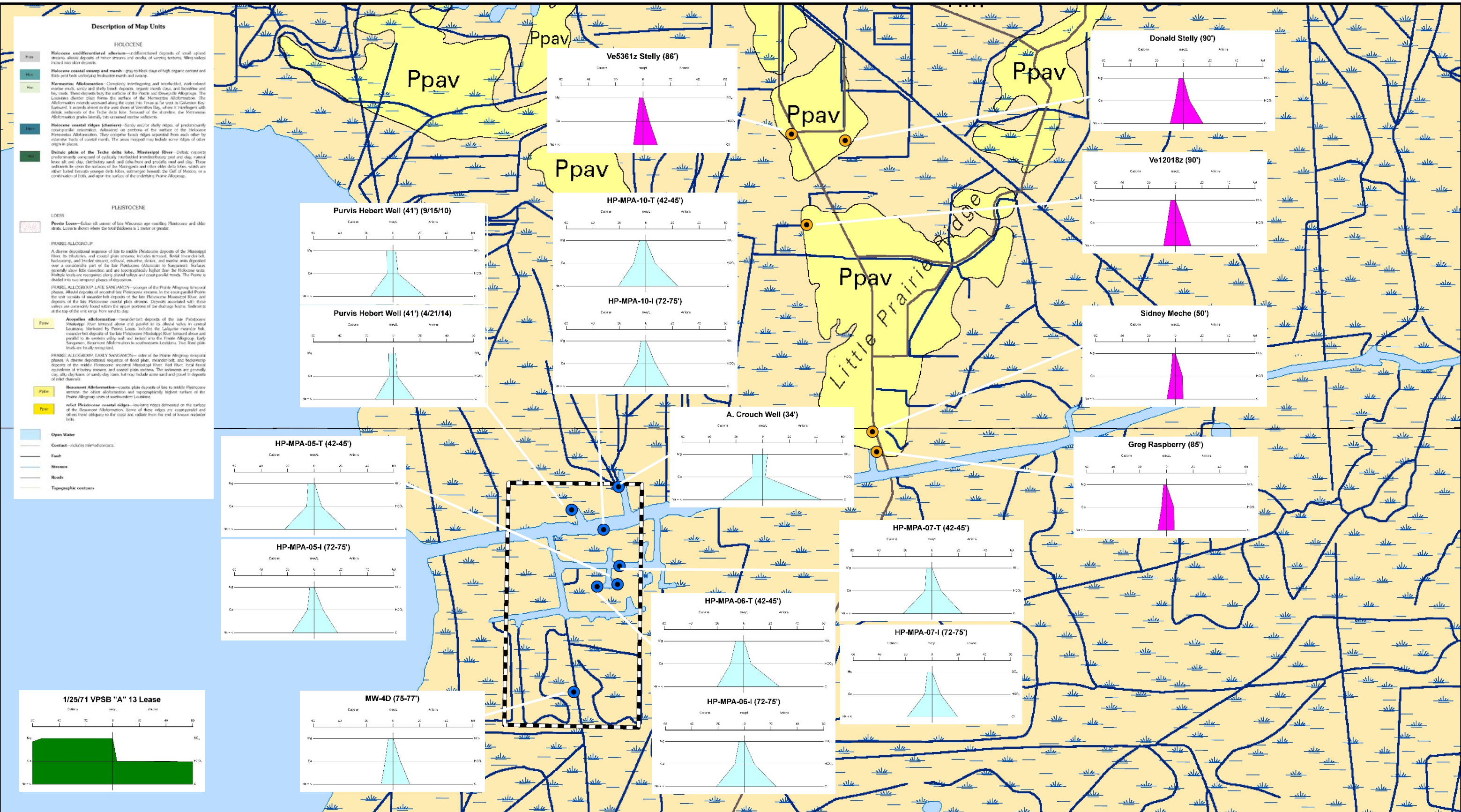


Note:
 1. Depths on electric logs are relative to the water surface and are approximately 10 feet greater than the below ground surface values
 2. Imagery basemap via ArcGIS online

Figure 34
Deep Sections of ICON Electric Logs in
Freshwater Portion of Chicot Aquifer
East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

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 Environmental Consulting Services
 Baton Rouge, LA New Orleans, LA Houston, TX

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Description of Map Units

HOLOCENE

Hu Holocene undifferentiated alluvium—undifferentiated deposits of small spind meanders, alluvial deposits of minor streams and meanders of varying widths. Shale values include thin clay deposits.

Hm Holocene coastal swamps and marshes—gray to black clay of high organic content and black peat beds underlying freshwater marsh and swamps.

Hi Holocene Alluviation—Complexly intertonguing and interfingering, dark colored marine sands, silt and shaly sand deposits, organic muds, clays, and loess and bay sands. These deposits bury the surface of the Pleistocene and Mississippi Alluvium. The Louisiana dune plain forms the surface of the Holocene Alluviation. The Alluviation records westward along the coast from Louisiana Bay, where it intertongues with deltaic sediments of the Teche delta lobe. Forward of the shoreline, the Holocene Alluviation grades laterally into unconsolidated sediments.

Hs Holocene coastal ridges (beachridges)—Steady and/or shaly ridges of predominantly coarse-grained sediment, deposited on a terrace of the surface of the Holocene Alluviation. They comprise beach ridges separated from each other by extensive tracts of coastal marsh. The areas mapped may include some ridges of other origin in place.

Hd Deltaic plain of the Teche delta lobe, Mississippi River—Deltaic deposits predominantly composed of cyclically interbedded sandstone, silt and clay, sand and silt, clay, silty clay, and silty sand and silt, and silty sand and clay. These sediments lie upon the surface of the Mississippi and other older delta lobes, which are either buried beneath younger delta lobes, submerged beneath the Gulf of Mexico, or a combination of both, and upon the surface of the underlying Pleistocene Alluvium.

PLEISTOCENE

PL Pleistocene Loess—Silt and clay cement of late Pleistocene age covering Pleistocene and older strata. Loess is shown where the total thickness is 1 meter or greater.

PRABIC ALLOGROUP

A diverse depositional sequence of late to middle Pleistocene deposits of the Mississippi River. In tributaries and coastal plain streams, it includes terraced, beaded, braided, left-bank, and right-bank channels, oxbow lakes, meanders, oxbow, and meander areas deposited over a considerable part of the late Pleistocene (Alluvium to Sangamon). Surfaces generally show little erosion and are topographically higher than the Holocene units. Multiple levels are recognized along alluvial valleys and coastal plain meanders. The Prairie is divided into two temporal phases of deposition.

PRABIC ALLOGROUP, LATE SANGAMON—younger of the Prairie Alluvium temporal phases. Alluvial deposits of unchanneled late Pleistocene streams. In the coastal plain, the late Pleistocene meander belt deposits of the late Pleistocene Mississippi River formed above and parallel to its western valley wall and extend into the Prairie Alluvium. Early Sangamon. Late Pleistocene Alluviation in southeastern Louisiana. Two flow plain facies are locally recognized.

PRABIC ALLOGROUP, EARLY SANGAMON—older of the Prairie Alluvium temporal phases. A diverse depositional sequence of flood plain, meander-belt, and braided deposits of the middle Pleistocene ancestral Mississippi River. Not their local flood cohesiveness of tributary streams, and coastal plain streams. The sediments are generally clay, silty clay, loam, or sandy clay loam, but may include some sand and gravel in deposits of river channels.

Prb Riverbank Alluviation—coarse plain deposits of late to middle Pleistocene across the entire alluviation and topographically highest surface of the Prairie Alluvium zone of southeastern Louisiana.

Prs Holocene coastal ridges—steep ridges deposited on the surface of the Riverbank Alluviation. Some of these ridges are coarsened and others their obliquity to the coast and radiate from the end of known meander belts.

Open Water

Contact—includes internal contacts.

Fault

Stream

Road

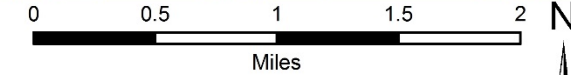
Topographic contours

Legend

Section 16

Groundwater Sampling Location Used for ICON Background Calculations

MP&A Background Groundwater Sampling Locations



Note:

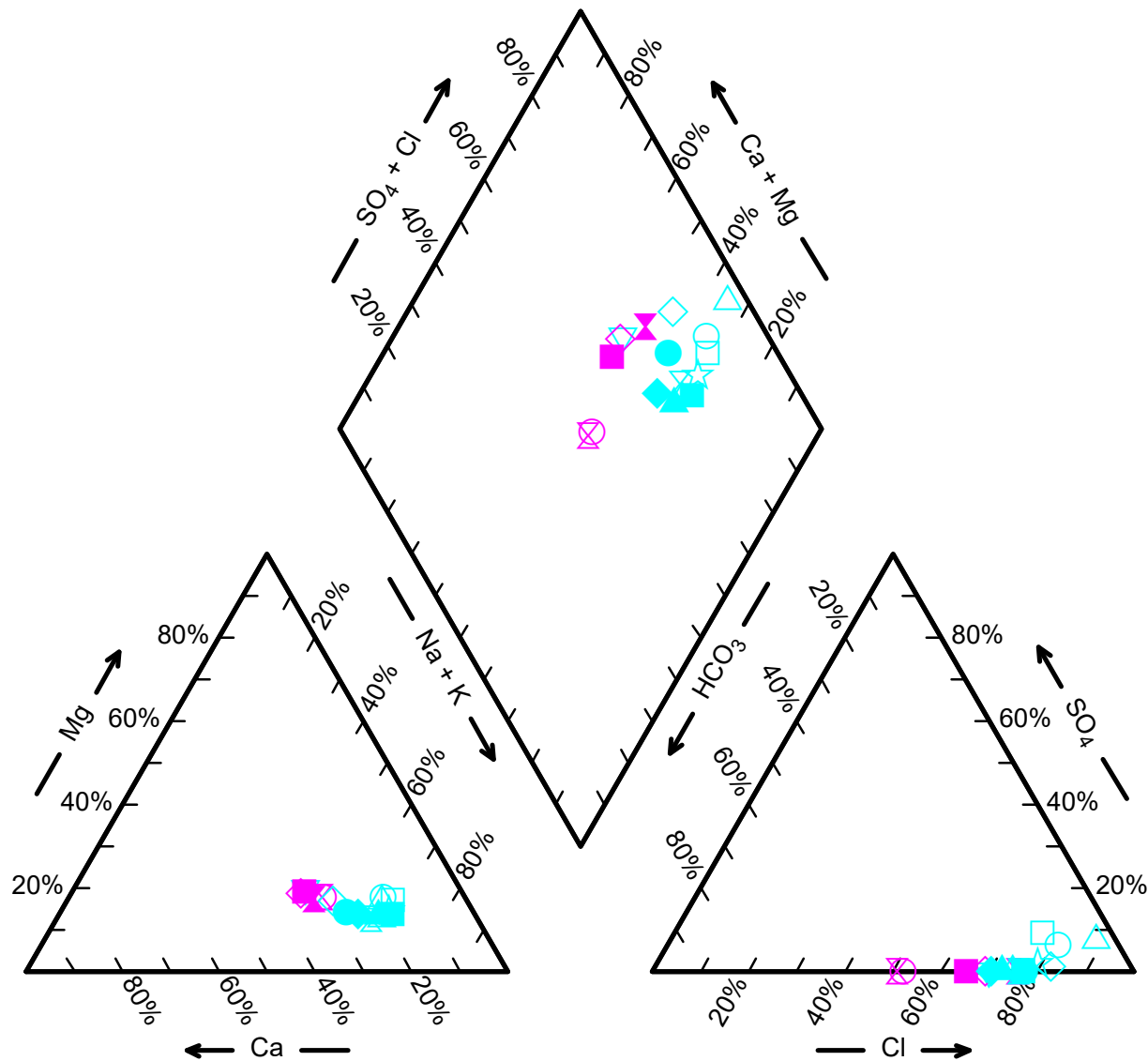
1. Stiff diagrams generated by RockWare AqQA v 1.0
2. Produced water diagram based on produced water sample collected on January 25, 1971 from VPSB "A" 13 Lease "R" MWF Zone (3/2/71 Petroleum Laboratories, Inc. lab report, Bates C1074021 0008574).
3. Surface Geology basemap from Louisiana Geological Survey (White Lake Quadrangle, 2006)

Figure 35
Stiff Diagrams - Background Wells

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.
Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

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Legend

ICON Background Samples

- ✕ G. Raspberry
- Ve12018z
- ✱ Donald Stelly
- ◇ Ve5361z Stelly
- Sidney Meche

MP&A Background Samples

- Purvis Hebert Well (9/15/10)
- Purvis Hebert Well (4/21/14)
- △ A. Crouch Well
- ▽ MW-4D
- ☆ HP-MPA-05-T
- ◇ HP-MPA-06-T
- HP-MPA-07-T
- HP-MPA-10-T
- ▲ HP-MPA-05-I
- △ HP-MPA-07-I
- ◆ HP-MPA-10-I
- ⊗ HP-MPA-06-I

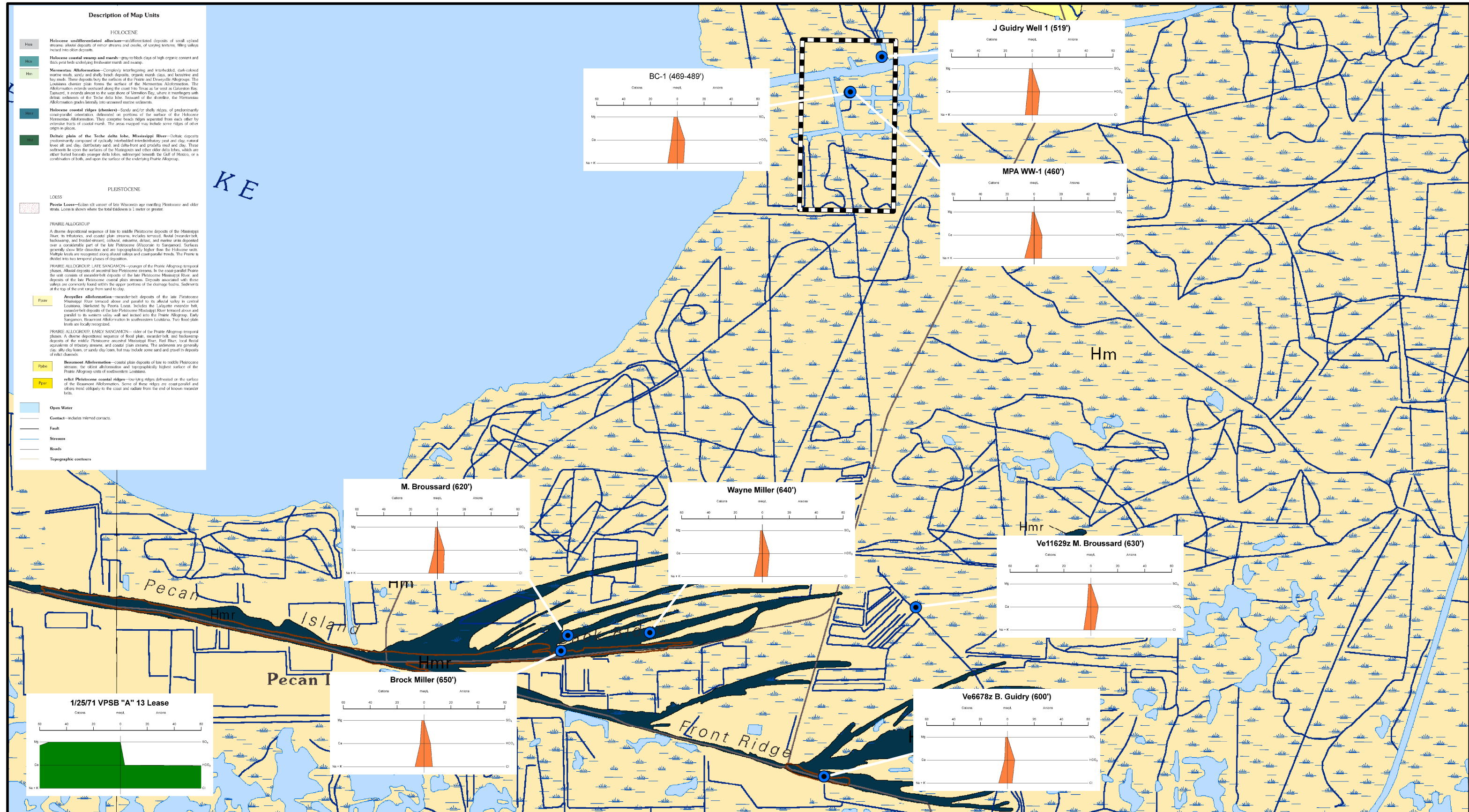
Figure 36
Piper Diagram - Background Wells

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
Houston, Texas New Orleans, Louisiana Baton Rouge, Louisiana

Designed: SAW Drawn: SAW Checked: DGA Date: 2/4/2016 Project: 07-47



Description of Map Units

HOLOCENE

Hm Holocene undifferentiated alluvium—undifferentiated deposits of small upland streams, alluvial deposits of minor streams and creeks, of varying textures, filling valleys incised into older deposits.

Hm Holocene coastal swamp and marsh—gray-to-black clays of high organic content and black peat beds underlying freshwater marsh and swamp.

Hmr Mermentau Alluviation—Complexly interfingering and interbedded, dark-colored marine sands, sandy and shaly beach deposits, organic marsh clays, and limestone and bay muds. These deposits bury the surfaces of the Prairie and Divayville Alluviums. The Louisiana channel plain forms the surface of the Mermentau Alluviation. The Alluviation extends seaward along the coast line, from as far west as Galveston Bay, Eastward, it extends almost to the west shore of Vermilion Bay, where it intertongues with deltaic sediments of the Teche delta lobe. Seaward of the Mermentau, the Mermentau Alluviation grades laterally into unconsolidated marine sediments.

Hm Holocene coastal ridges (beaches)—Sandy and/or shelly ridges, of predominantly cross-parallel orientation, delineated on portions of the surface of the Holocene Mermentau Alluviation. They comprise beach ridges separated from each other by extensive tracts of coastal marsh. The areas mapped may include some ridges of other origin in place.

Hm Deltaic plain of the Teche delta lobe, Mississippi River—Deltaic deposits predominantly composed of cyclically interbedded intertidal peat and clay, natural levee silt and clay, distributary sand and delta-front and prodelta mud and clay. These sediments lie upon the surfaces of the Mermentau and other older delta lobes, which are either buried beneath younger delta lobes, submerged beneath the Gulf of Mexico, or a combination of both, and upon the surface of the underlying Prairie Alluvium.

PLEISTOCENE

Loess

Peoria Loess—Eolian silt deposit of late Wisconsin age overlying Pleistocene and older strata. Loess is shown where the total thickness is 1 meter or greater.

PRairie ALlOGRoup

A diverse depositional sequence of late to middle Pleistocene deposits of the Mississippi River, its tributaries, and coastal plain streams, includes terraced, fluvial incision, backswamp, and (middle to early) colluvial, estuarine, deltaic, and marine units deposited over a considerable part of the late Pleistocene (Wisconsin to Sangamon). Surfaces generally show little dissection and are topographically higher than the Holocene units. Multiple levels are recognized along channel valleys and coast-parallel trends. The Prairie is divided into two temporal phases of deposition.

PRairie ALlOGRoup, LATE SANGAMON—younger of the Prairie Alluvium temporal phases. Alluvial deposits of ancient late Pleistocene streams, in the coast-parallel Prairie the unit consists of meander-belt deposits of the late Pleistocene Mississippi River, and deposits of the late Pleistocene coastal plain streams. Deposits associated with these valleys are commonly found within the upper portions of the outwash basins. Sediments at the top of the unit range from sand to clay.

PRairie ALlOGRoup, EARLY SANGAMON—older of the Prairie Alluvium temporal phases. A diverse depositional sequence of flood plain, meander-belt and backswamp deposits of the middle Pleistocene ancestral Mississippi River. Red fibers, local fluvial equivalents of tributary streams, and coastal plain streams. The sediments are generally clay, silty clay loam, or sandy clay loam, but may include some sand and gravel in deposits of relict channels.

Beaumont Alluviation—coastal plain deposits of late to middle Pleistocene streams, the oldest alluviation and topographically highest surface of the Prairie Alluvium units of southwestern Louisiana.

relict Pleistocene coastal ridges—low-lying ridges delineated on the surface of the Beaumont Alluviation. Some of these ridges are coast-parallel and others trend obliquely to the coast and radiate from the end of known meander belts.

Open Water

Contact—includes inferred contacts.

Fault

Streams

Roads

Topographic contours

Legend

● Groundwater Sampling Location

▭ Section 16

0 0.5 1 1.5 2
Miles

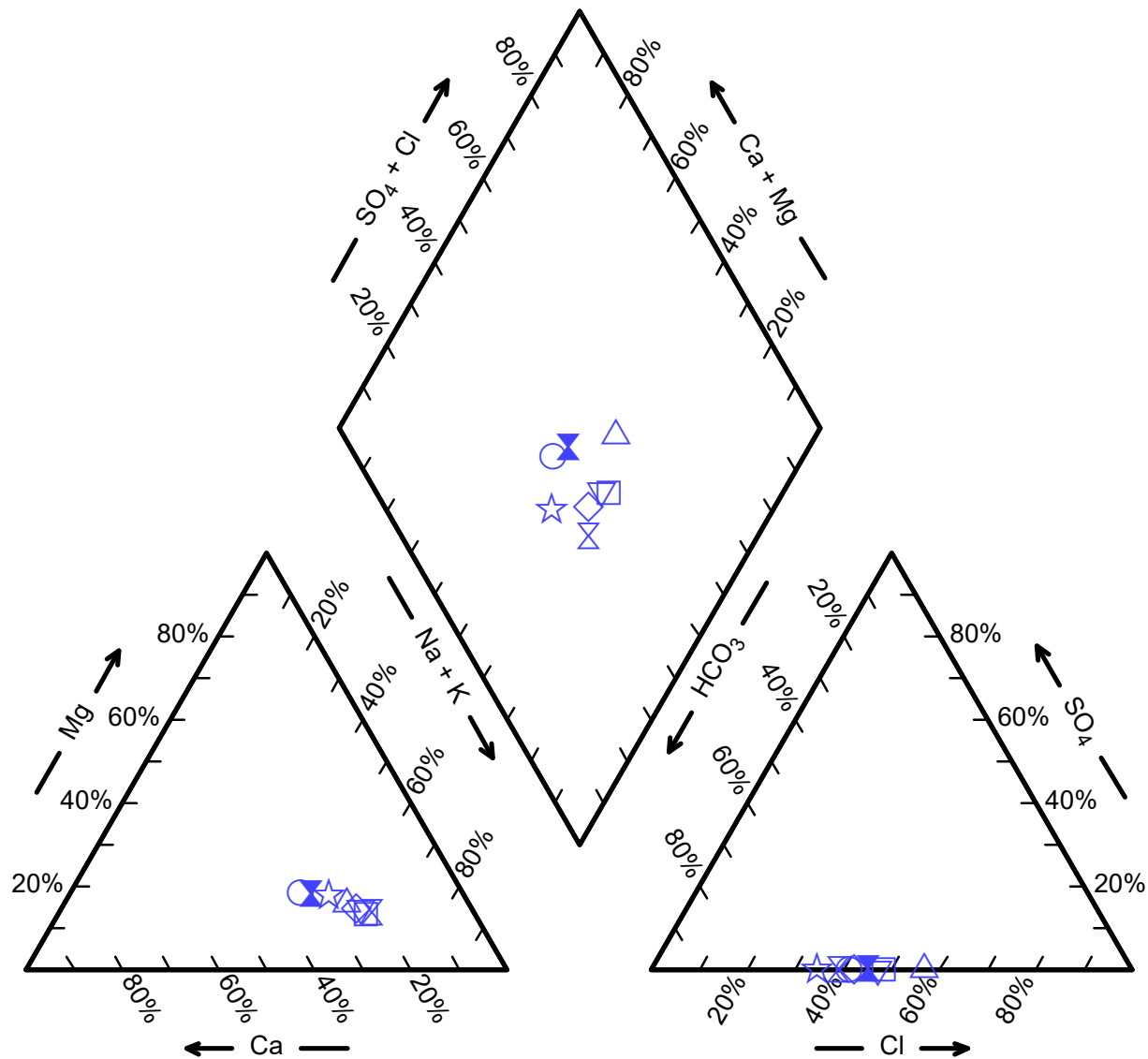
Note:
1. Stiff diagrams generated by RockWare AqQA v 1.0
2. Produced water diagram based on produced water sample collected on January 25, 1971 from VPSB "A" 13 Lease "R" MWF Zone (3/2/71 Petroleum Laboratories, Inc. lab report, Bates C1074021 0008574).
3. Surface Geology basemap from Louisiana Geological Survey (White Lake Quadrangle, 2006)

Figure 37
Stiff Diagrams - Chicot Wells (460-650')

East White Lake Oil & Gas Field
Vermilion Parish, Louisiana

MICHAEL PISANI & ASSOCIATES, INC.
Environmental Consulting Services
Baton Rouge, LA New Orleans, LA Houston, TX

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Legend

- MPA WW-1
- J Guidry Well 1
- △ Brock Miller
- ▽ M. Broussard
- ◇ Wayne Miller
- ⊗ Ve6678z B. Guidry
- ☆ Ve11629z M. Broussard
- ⊠ BC-1

Figure 38
Piper Diagram - Chicot Wells (460-650')

*East White Lake Oil & Gas Field
 Vermilion Parish, Louisiana*

MICHAEL PISANI & ASSOCIATES, INC.

Environmental Consulting Services
 Houston, Texas New Orleans, Louisiana Baton Rouge, Louisiana

Designed: SAW Drawn: SAW Checked: DGA Date: 2/3/2016 Project: 07-47

Tables

Supplement to the Most Feasible Plan for Evaluation/Remediation

Vermilion Parish School Board (VPSB) Property

Section 16 T15S, R01E

East White Lake Oilfield

Vermilion Parish, Louisiana

*State of Louisiana and the Vermilion Parish School Board v. Louisiana
Land and Exploration, et al.*

Table 1
Soil/Sediment Analytical Data
Supplemental ICON Locations (Nov/Dec 2015)
East White Lake Field
Vermilion Parish, Louisiana

Constituent	Miscellaneous						Hydrocarbons											SVOCs							
	HEM, Oil & Grease (% dry wt)		pH (S.U.)		Percent Moisture (wt%)		Aliphatic C6-C8 (mg/Kg)	Aliphatic >C8-C10 (mg/Kg)	Aliphatic >C10-C12 (mg/Kg)	Aliphatic >C12-C16 (mg/Kg)	Aliphatic >C16-C35 (mg/Kg)	Aromatic >C8-C10 (mg/Kg)	Aromatic >C10-C12 (mg/Kg)	Aromatic >C12-C16 (mg/Kg)	Aromatic >C16-C21 (mg/Kg)	Aromatic >C21-C35 (mg/Kg)	Gasoline Range Organics (mg/kg)	Diesel Range Organics (mg/kg)	Oil Range Organics (mg/kg)	2-Methylnaphthalene (mg/kg)	Acenaphthene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
	MPA	ICON	MPA	ICON	MPA	ICON	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA
29-B Standard (4)	1	NS	6-9	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RECAP Standard (5)	NS	NS	NS	NS	NS	NS	1200	120	230	370	7100	65	100	180	150	180	65	65	180						
Boring ID	Depth Interval	Date Collected																							
SS-16	0-2'	11/13/2015	-	-	-	-	68.7	65.9																	
SS-16	2-4'	11/13/2015	-	-	-	-	83.6	84.3																	
SS-16	4-6'	11/13/2015	-	-	-	-	74.4	72.3																	
SS-17	0-2'	11/12/2015	0.44	0.1	-	-	56.6	57.1																	
SS-17	2-4'	11/12/2015	0.23	0.14	-	-	56.7	56.8																	
SS-17	4-6'	11/12/2015	0.26	0.36	-	-	58	58.9																	
SS-17	6-8'	11/12/2015	0.1	0.14	-	-	52.4	51																	
SS-19	0-2'	11/12/2015	0.38	0.32	-	-	61.4	62.7																	
SS-19	2-4'	11/12/2015	0.23	0.26	-	-	55.9	63.2																	
SS-20	0-2'	11/12/2015	0.53	0.24	-	-	67.1	67.5																	
SS-20	2-4'	11/12/2015	0.34	0.26	-	-	67	68.3																	
SS-20	4-6'	11/12/2015	0.35	0.25	-	-	65	66.2																	
SS-21	0-2'	11/16/2015	1.1	1.23	5.94	-	59.2	64.6																	
SS-21	2-4'	11/16/2015	0.56	0.78	5.76	-	82.3	85.6																	
SS-22	0-2'	11/12/2015	1.42	2.91	-	-	75.6	74.5																	
SS-22	2-4'	11/12/2015	1.2	1.56	-	-	61.9	62																	
SS-22	4-6'	11/12/2015	1.34	1.02	-	-	63.1	62.9																	
SS-22	6-8'	11/12/2015	0.28	0.19	-	-	56	57.6																	
SS-23	0-2'	11/16/2015	0.11	0.13	6.31	-	52.7	54.5																	
SS-23	2-4'	11/16/2015	-	-	-	-	81.7	80.7																	
SS-24	0-2'	11/16/2015	0.41	0.4	6.4	-	63.5	63.7																	
SS-24	2-4'	11/16/2015	0.51	0.43	5.78	-	84.3	84.3																	
SS-25	0-2'	11/16/2015	0.18	0.13	6.03	-	69.3	67.3																	
SS-25	2-4'	11/16/2015	0.5	0.52	5.82	-	63.2	63.3																	
SS-25	4-6'	11/16/2015	0.3	0.44	5.6	-	60.5	61.5																	
SS-26	0-2'	11/12/2015	3.95	3.75	-	-	51.9	52.2																	
SS-26	2-4'	11/12/2015	0.92	1.78	-	-	79.4	80.2																	
TBB-1D	0-5'	11/25/2015	0.85	0.63	6.66	6.84	75.6	78.2																	
TBB-1D	5-10'	11/25/2015	0.2	0.12	7.15	7.78	53.8	47																	
TBB-1S	16-20'	12/15/2015	-	-	-	-	-	23.6																	
TBB-1S	20-21'	12/15/2015	-	-	-	-	-	19.2																	
TBB-1S	24-26'	12/15/2015	-	-	-	-	-	16.6																	
TBB-1S	34-38'	12/15/2015	-	-	-	-	-	21.9																	
TBB-1S	38-42'	12/15/2015	-	-	-	-	-	23.1																	
TBB-2D	Grab	12/1/2015	0.27	0.45	5.7	5.8	65.7	65.1																	
TBB-2M	0-7'	12/2/2015	0.23	0.22	6.11	6.16	52.4	45.8																	
TBB-2M	7-15'	12/2/2015	0.34	-	6.21	6.28	68.2	72.4																	
TBB-2M	15-17'	12/2/2015	-	-	-	-	-	27.6																	
TBB-2M	17-09'	12/2/2015	-	-	-	-	-	23.9																	
TBB-2M	19-21'	12/2/2015	-	-	-	-	-	20.4																	
TBB-2M	23-25'	12/2/2015	-	-	-	-	-	24																	
TBB-2M	29-31'	12/2/2015	-	-	-	-	-	21.8																	
MUD PIT CONTENTS	NA	12/7/2015	-	-	-	-	-	-																	

Notes:
1. "-" Sample not analyzed for parameter listed
2. "<##" - Not detected at detection limit shown
3. NS - No Standard
4. Statewide Order 29-B Elevated Wetland Standard
5. RECAP limiting standard is the lower of RECAP Soil Screening Standard for non-industrial direct contact or groundwater protection (from Table 1 of RECAP - 2003)
6. **Bolded** text signifies an exceedance
7. ICON metals values are represented in mg/kg- dry wt
8. Only detected semivolatile organic compounds (SVOCs) shown. All others less than detection limits.

Table 2
Groundwater Analytical Data
Supplemental ICON Wells (Nov. 2015 - Feb. 2016)

East White Lake Field
Vermilion Parish, Louisiana

Constituent			Total Metals (mg/L)																											
			Arsenic		Barium		Cadmium		Calcium		Chromium		Iron ¹		Lead		Magnesium		Manganese ¹		Mercury		Potassium		Sodium		Strontium		Zinc	
Sampler			MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON
RECAP GWss			0.01		2		0.005		NS		0.1		0.3		0.15		NS		0.05		0.002		NS		NS		NS		NS	
Sample ID	Screened Interval	Sample Date	<0.005	<0.01	1.85	1.55	<0.005	<0.005	151	118	<0.005	<0.01	1.48	1.48	<0.005	<0.01	57.9	43.9	0.67	0.468	0.001	<0.0002	6.11	6.02	514	409	1.54	1.27	<0.10	0.012
MC-1	161-181'	12/16/2015	<0.005	<0.01	1.85	1.55	<0.005	<0.005	151	118	<0.005	<0.01	1.48	1.48	<0.005	<0.01	57.9	43.9	0.67	0.468	0.001	<0.0002	6.11	6.02	514	409	1.54	1.27	<0.10	0.012
TBB-1D	65-75'	12/17/2015	0.020	0.013	1.66	1.26	<0.005	<0.005	136	95	0.051	0.052	60.5	50.5	0.082	0.047	74.1	53	1.65	1.230	<0.0002	<0.0002	11.9	11.9	765	572	1.66	1.2	0.19	0.186
TBB-1S	33-43'	12/17/2015	<0.050	<0.01	17.5	13.5	<0.050	<0.005	1,780	1,260	<0.050	<0.01	57.9	44	<0.050	<0.01	1,050	816	13.1	9.9	<0.0002	<0.0002	15.8	19.6	5,680	4,420	25.8	24.6	<1.00	0.021
TBB-2D	81-91'	12/15/2015	0.006	<0.01	1.33	1.12	<0.005	<0.005	162	121	0.012	0.018	19.9	15.7	0.012	<0.01	67.1	50.9	1.13	0.751	<0.0002	<0.0002	7.0	7.77	661	509	1.51	1.26	<0.10	0.061
TBB-2M	49-59'	12/14/2015	<0.020	<0.01	6.1	5.12	<0.020	<0.005	574	463	<0.020	<0.010	15.8	13.4	<0.020	<0.01	316	248	4.1	3.08	<0.0002	<0.0002	8.71	11.2	2,190	1,780	5.82	4.77	<0.40	0.346
TBB-3S	14-24'	12/18/2015	0.009	0.017	0.67	0.542	<0.005	<0.005	137	109	<0.005	<0.01	5.61	6.13	<0.005	<0.01	45.3	37.9	0.37	0.311	<0.0002	<0.0002	3.74	<5.0	648	503	1.03	0.77	<0.10	0.014
TBB-3D	66-76'	12/15/2015	<0.005	<0.01	1.07	0.886	<0.005	<0.005	164	122	0.0053	<0.01	1.86	1.92	<0.005	<0.01	48	37.3	0.19	0.16	<0.0002	<0.0002	5.17	5.23	404	318	1.08	0.877	<0.10	0.014
TBA-1D	75-85'	12/22/2015	<0.005	0.014	1.19	0.996	<0.005	<0.005	144	115	<0.005	<0.01	1.76	1.53	<0.005	<0.01	48.6	40.1	0.26	0.217	<0.0002	<0.0002	4.26	<5.0	505	369	1.23	0.936	<0.10	<0.01
BC-1	469-489'	12/28/2015	<0.005	-	0.87	-	<0.005	-	88.9	-	<0.005	-	0.99	-	<0.005	-	31.4	-	0.14	-	<0.0002	<0.0002	3.84	-	160	-	0.84	-	<0.10	-
BC-2	279-299'	2/3/2016	<0.013	*	22.5	*	<0.05	*	1,430	*	<0.05	*	17.3	*	<0.05	*	384	*	1.62	*	<0.0002	*	41.5	*	8,720	*	29.6	*	<1.00	*
BC-3	279-299'	2/9/2016	0.011	*	3.53	*	<0.01	*	352	*	<0.01	*	1.22	*	<0.01	*	135	*	0.3	*	<0.0002	*	8.82	*	1,650	*	4.61	*	<0.2	*
BC-4	269.5-289.5'	2/4/2016	<0.005	*	4.97	*	<0.02	*	477	*	<0.02	*	9.43	*	<0.02	*	170	*	1.08	*	<0.0002	*	7.94	*	1,650	*	4.37	*	<0.4	*
MC-2	139-159'	2/1/2016	0.01	*	1.35	*	<0.01	*	152	*	0.021	*	16.6	*	0.013	*	46.3	*	0.51	*	<0.0002	*	7.82	*	785	*	1.26	*	<0.20	*
TBA-2	69-79'	2/2/2016	<0.005	*	2.66	*	<0.02	*	270	*	<0.02	*	9.20	*	<0.02	*	84.2	*	0.56	*	<0.0002	*	10.5	*	1,560	*	3.45	*	<0.4	*

Notes:
¹ - Secondary Maximum Containment Level
 NS - No Applicable Standard
 - Not measured or not analyzed
 < ##, not detected at limit presented
 All screen intervals as reported by ICON
 * Samples pending analysis
 E - Estimated, outside calibration range

Table 2
Groundwater Analytical Data
Supplemental ICON Wells (Nov. 2015 - Feb. 2016)

East White Lake Field
Vermilion Parish, Louisiana

			Dissolved Metals - continued (mg/L)																			
Constituent			Arsenic		Barium		Cadmium		Chromium		Iron		Lead		Manganese		Mercury		Strontium		Zinc	
			MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON
Sampler																						
RECAP GWss			0.01		2		0.005		0.1		0.3		0.15		0.05		0.002		NS		1.1	
Sample ID	Screened Interval	Sample Date																				
MC-1	161-181'	12/16/2015	<0.005	-	1.74	-	<0.005	-	<0.005	-	1.08	-	<0.005	-	0.65	-	<0.0002	-	1.42	-	<0.10	-
TBB-1D	65-75'	12/17/2015	<0.005	0.012	0.89	0.908	<0.005	<0.005	<0.005	0.028	3.05	24.2	0.009	0.023	0.55	0.717	<0.0002	<0.0002	1.16	1.07	<0.10	0.078
TBB-1S	33-43'	12/17/2015	<0.050	-	15.7	-	<0.050	-	<0.050	-	52.2	-	<0.05	-	11.4	-	<0.0002	-	23.7	-	<1.00	-
TBB-2D	81-91'	12/15/2015	<0.005	-	1.06	-	<0.005	-	<0.005	-	4.37	-	<0.005	-	0.72	-	<0.0002	-	1.35	-	<0.10	-
TBB-2M	49-59'	12/14/2015	<0.020	-	5.81	-	<0.020	-	<0.020	-	13.2	-	<0.020	-	3.6	-	<0.0002	-	5.47	-	<0.40	-
TBB-3S	14-24'	12/18/2015	0.0074	-	0.62	-	<0.005	-	<0.005	-	3.22	-	<0.005	-	0.32	-	<0.0002	-	0.94	-	<0.10	-
TBB-3D	66-76'	12/15/2015	<0.005	-	1.01	-	<0.005	-	<0.005	-	<0.50	-	<0.005	-	0.16	-	<0.0002	-	1.07	-	<0.10	-
TBA-1D	75-85'	12/22/2015	<0.005	-	1.12	-	<0.005	-	<0.005	-	1.67	-	-	-	0.25	-	<0.0002	-	1.19	-	<0.10	-
BC-1	469-489'	12/28/2015	<0.005	-	0.8	-	<0.005	-	<0.005	-	0.89	-	<0.005	-	0.11	-	<0.0002	-	0.79	-	<0.10	-
BC-2	279-299'	2/3/2016	<0.013	*	21.0	*	<0.05	*	<0.05	*	13.5	*	<0.05	*	1.50	*	<0.0002	*	31.3	*	<1.0	*
BC-3	279-299'	2/9/2016	0.0097	*	3.32	*	<0.01	*	<0.01	*	<1.00	*	<0.01	*	0.27	*	<0.0002	*	3.6	*	<0.20	*
BC-4	269.5-289.5	2/4/2016	<0.005	*	4.71	*	<0.02	*	<0.02	*	8.71	*	<0.02	*	1.06	*	<0.0002	*	4.59	*	<0.4	*
MC-2	139-159'	2/1/2016	0.006	*	1.07	*	<0.01	*	<0.01	*	<1.00	*	<0.01	*	0.16	*	<0.0002	*	1.11	*	<0.20	*
TBA-2	69-79'	2/2/2016	<0.02	*	2.56	*	<0.02	*	<0.02	*	3.43	*	<0.02	*	0.47	*	<0.0002	*	3.67	*	<0.4	*

Notes:
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 < ##, not detected at limit presented
 All screen intervals as reported by ICON
 * Samples pending analysis
 E - Estimated, outside calibration range

Table 2
Groundwater Analytical Data
Supplemental ICON Wells (Nov. 2015 - Feb. 2016)

East White Lake Field
Vermilion Parish, Louisiana

Constituent			Radiological (pCi/L)								Water Quality (mg/L)										BTEX (mg/L)									
			Ra 226		Ra 228		Total Ra 226+228		Total Dissolved Solids ¹ (Eberline)		Bromide		Chloride ¹		Sulfate ¹		Bicarbonate Alkalinity		Carbonate Alkalinity		Total Dissolved Solids ¹		Benzene		Ethylbenzene		Toluene		Xylene (total)	
Sampler			MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON	MPA	ICON
RECAP GWss			NS		NS		5		250		NS		250		250		NS		NS		250		0.005		0.7		1		10	
Sample ID	Screened Interval	Sample Date																												
MC-1	161-181'	12/16/2015	2.03	2.08	1.92	2.16	3.94	4.24	1,660	-	2.18	1.48	837	769	106	61	349	332	<1.0	<10	1,750	1,640	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
TBB-1D	65-75'	12/17/2015	1.75	1.67	0.68	2.95	2.43	4.62	1,970	-	1.65	0.930	1,220	1,050	102	68	330	308	<1.0	<10	2,030	2,040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
TBB-1S	33-43'	12/17/2015	3.85	16.10	8.36	16.7	12.2	32.80	26,800	-	23.9	17.2	16,900	13,400	<10.0	7	316	298	<1.0	<10	33,100	24,700	0.007	0.007	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
TBB-2D	81-91'	12/15/2015	1.75	1.53	1.23	1.47	2.98	3.00	1,940	-	1.54	0.893	1,020	942	45.2	44	345	338	<1.0	<10	1,910	2,030	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
TBB-2M	49-59'	12/14/2015	2.46	5.92	6.18	6.40	8.64	12.32	7,820	-	<10.0	4.04	4,820	4,520	<10.0	<5	416	410	<1.0	<10	7,160	9,350	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
TBB-3S	14-24'	12/18/2015	0.675	0.753	1.41	0.61	2.08	1.36	1,910	-	3.77	2.92	1,120	969	1.63	2.7	393	388	<1.0	<10	2,010	2,080	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
TBB-3D	66-76'	12/15/2015	1.82	0.92	2.15	1.36	3.98	2.28	1,430	-	1.18	0.663	721	666	7.06	6.8	320	315	<1.0	<10	1,220	1,470	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
TBA-1D	75-85'	12/22/2015	1.31	1.67	1.20	2.95	2.51	4.62	1,350	-	<1.00	0.83	876	806	<1.00	1.18	363	355	<1.0	<10	1,600	1,560	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.015	<0.050
BC-1	469-489'	12/28/2015	0.83	0.569	1.02	0.93	1.85	1.50	584	-	0.41	0.23	165	184	1.84	2.45	343	350	<1.0	<10	643	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.015	<0.015
BC-2	279-299'	2/3/2016	*	*	*	*	*	*	*	*	20.3	*	16,600	*	5.11	*	319	*	<1.0	*	22,200	*	0.2 E	*	0.00932	*	<0.005	*	<0.015	*
BC-3	279-299'	2/9/2016	*	*	*	*	*	*	*	*	<4.00	*	2,850	*	57.6	*	251	*	<1.0	*	4,860	*	<0.005	*	<0.005	*	<0.005	*	<0.015	*
BC-4	269.5-289.5	2/4/2016	*	*	*	*	*	*	*	*	4.39	*	3,690	*	7.36	*	361	*	<1.0	*	5,920	*	<0.005	*	<0.005	*	<0.005	*	<0.015	*
MC-2	139-159'	2/1/2016	*	*	*	*	*	*	*	*	1.84	*	1,220	*	30.0	*	320	*	<1.0	*	2,270	*	<0.005	*	<0.005	*	<0.005	*	<0.015	*
TBA-2	69-79'	2/2/2016	*	*	*	*	*	*	*	*	3.87	*	3,060	*	3.42	*	429	*	<1.0	*	4,840	*	<0.005	*	<0.005	*	<0.005	*	<0.015	*

Notes:
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 - Not measured or not analyzed
 < ##, not detected at limit presented
 All screen intervals as reported by ICON
 * Samples pending analysis
 E - Estimated, outside calibration range

Table 2
Groundwater Analytical Data
Supplemental ICON Wells (Nov. 2015 - Feb. 2016)

East White Lake Field
Vermilion Parish, Louisiana

Constituent			TPH Mixtures and Fractions (mg/L)															
			Diesel Range Organics		Gasoline Range Organics		Oil Range Organics		Aliphatic >C10-C12	Aliphatic >C12-C16	Aliphatic >C16-C35	Aromatic >C10-C12	Aromatic >C12-C16	Aromatic >C16-C21	Aromatic >C21-C35	Aliphatic >C8-C10	Aliphatic C6-C8	Aromatic >C8-C10
			MPA	ICON	MPA	ICON	MPA	ICON	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA
RECAP GWss			0.15		0.15		0.15		0.15	0.15	7.3	0.15	0.15	0.15	0.15	0.15	3.2	0.15
Sample ID	Screened Interval	Sample Date	<0.125	<0.13	<0.100	<0.15	<0.125	<0.12	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
MC-1	161-181'	12/16/2015	<0.125	<0.13	<0.100	<0.15	<0.125	<0.12	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
TBB-1D	65-75'	12/17/2015	<0.125	<0.13	<0.100	<0.15	0.186	<0.12	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
TBB-1S	33-43'	12/17/2015	0.157	<0.13	<0.100	<0.15	0.214	<0.12	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	0.044	<0.030
TBB-2D	81-91'	12/15/2015	0.13	0.218	<0.100	<0.15	<0.125	<0.12	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
TBB-2M	49-59'	12/14/2015	0.236	<0.131	<0.100	<0.15	<0.125	<0.121	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
TBB-3S	14-24'	12/18/2015	0.157	<0.13	<0.100	<0.15	<0.125	<0.12	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
TBB-3D	66-76'	12/15/2015	2.13	2.28	<0.100	<0.15	<0.250	<0.12	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.200	<0.300	2.05
TBA-1D	75-85'	12/22/2015	<0.125	0.25	<0.100	<0.15	<0.125	0.58	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
BC-1	469-489'	12/28/2015	<0.125	<0.15	<0.100	<0.15	<0.125	<0.15	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
BC-2	279-299'	2/3/2016	0.340	*	0.425	*	<0.125	*	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	0.141	0.636	0.405
BC-3	279-299'	2/9/2016	-	*	<0.100	*	-	*	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
BC-4	269.5-289.5	2/4/2016	<0.125	*	<0.100	*	<0.125	*	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
MC-2	139-159'	2/1/2016	<0.125	*	<0.100	*	<0.125	*	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030
TBA-2	69-79'	2/2/2016	<0.125	*	<0.100	*	<0.125	*	<0.100	<0.100	<0.150	<0.100	<0.100	<0.150	<0.100	<0.020	<0.030	<0.030

Notes:
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 < ##, not detected at limit presented
 All screen intervals as reported by ICON
 * Samples pending analysis
 E - Estimated, outside calibration range

Table 2
Groundwater Analytical Data
Supplemental ICON Wells (Nov. 2015 - Feb. 2016)

East White Lake Field
Vermilion Parish, Louisiana

Constituent			Semivolatile Organic Constituents (mg/L)																
			1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,2Diphenylhydrazine Azobenzen	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chloronaphthalene	2-Chlorophenol	2-Methylnaphthalene	2-Nitrophenol	3,3-Dichlorobenzidine	4,6-Dinitro- 2-methylphenol
Sampler			MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	
RECAP GWss			0.007	0.6	NS	0.01	0.075	0.01	0.011	0.073	0.05	0.01	0.06	0.049	0.01	0.00062	NS	0.02	NS
Sample ID	Screened Interval	Sample Date																	
MC-1	161-181'	12/16/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-1D	65-75'	12/17/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-1S	33-43'	12/17/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-2D	81-91'	12/15/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-2M	49-59'	12/14/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-3S	14-24'	12/18/2015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
TBB-3D	66-76'	12/15/2015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.111	<0.010	<0.010	<0.010	<0.010
TBA-1D	75-85'	12/22/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BC-1	469-489'	12/28/2015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BC-2	279-299'	2/3/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BC-3	279-299'	2/9/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BC-4	269.5-289.5	2/4/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MC-2	139-159'	2/1/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBA-2	69-79'	2/2/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
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Table 2
Groundwater Analytical Data
Supplemental ICON Wells (Nov. 2015 - Feb. 2016)

East White Lake Field
Vermilion Parish, Louisiana

Constituent			Semivolatile Organic Constituents (mg/L)																						
			4-Bromophenyl phenyl ether	4-Chloro-3-methylphenol	4-Chlorophenyl phenyl ether	4-Nitrophenol	Acenaphthene	Acenaphthylene	Anthracene	Benzidine	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-Chloroethoxy) methane	Bis(2-Chloroethyl) ether	Bis(2-Chloroisopropyl) ether	Bis(2-Ethylhexyl) phthalate	Butyl benzyl phthalate	Chrysene	Di-n-butyl phthalate	Di-n-octyl phthalate	Dibenz(a,h)anthracene	
Sampler			MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	
RECAP GWss			NS		NS	0.05	0.037	0.1	0.043	NS	0.0078	0.0002	0.0048	0.0025	0.004	NS	0.0057	0.0057	0.006	0.73	0.0016	NS	NS	0.0025	
Sample ID	Screened Interval	Sample Date																							
MC-1	161-181'	12/16/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TBB-1D	65-75'	12/17/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TBB-1S	33-43'	12/17/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TBB-2D	81-91'	12/15/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TBB-2M	49-59'	12/14/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TBB-3S	14-24'	12/18/2015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		
TBB-3D	66-76'	12/15/2015	<0.010	<0.010	<0.010	<0.010	0.122	<0.010	0.018	<0.051	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		
TBA-1D	75-85'	12/22/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BC-1	469-489'	12/28/2015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		
BC-2	279-299'	2/3/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BC-3	279-299'	2/9/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BC-4	269.5-289.5	2/4/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MC-2	139-159'	2/1/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
TBA-2	69-79'	2/2/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

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Table 2
Groundwater Analytical Data
Supplemental ICON Wells (Nov. 2015 - Feb. 2016)

East White Lake Field
Vermilion Parish, Louisiana

Constituent			Semivolatile Organic Constituents (mg/L)																			
			Diethyl phthalate	Dimethyl phthalate	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno(1,2,3-cd)pyrene	Isophorone	Naphthalene	Nitrobenzene	Pentachlorophenol	Phenanthrene	Phenol	Pyrene	n-Nitrosodi-n-propylamine	n-Nitrosodimethylamine	n-Nitrosodiphenylamine	
Sampler			MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	MPA	
RECAP GWss			NS	NS	0.15	0.024	0.001	0.00073	0.05	0.01	0.0037	0.07	0.01	0.0019	0.001	0.18	0.18	0.018	0.01	NS	0.014	
Sample ID	Screened Interval	Sample Date																				
MC-1	161-181'	12/16/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-1D	65-75'	12/17/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-1S	33-43'	12/17/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-2D	81-91'	12/15/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-2M	49-59'	12/14/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB-3S	14-24'	12/18/2015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
TBB-3D	66-76'	12/15/2015	<0.010	<0.010	0.02	0.096	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.548	<0.010	<0.010	0.14	<0.010	0.01	<0.010	<0.010	<0.010	<0.010
TBA-1D	75-85'	12/22/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BC-1	469-489'	12/28/2015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BC-2	279-299'	2/3/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BC-3	279-299'	2/9/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BC-4	269.5-289.5	2/4/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MC-2	139-159'	2/1/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBA-2	69-79'	2/2/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Table 3
References

East White Lake Oil and Gas Field
Vermilion Parish, Louisiana

Published Technical Reports, Journal Articles and Other Materials Relied Upon

1. Louisiana Geological Survey. *White Lake 30 x 60 Minute Geologic Quadrangle*, 2006
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