The August J. Levert, Jr., Family, LLC, et al v. BP America Production Company
18th Judicial District Court, Parish of Iberville
DNR Legacy Case No. 018-028-001
DAL Docket No. 2022-8332-DNR-OOC

Site Investigation Report and Proposed Remediation Plan

in support of bp's Limited Admission

January 09, 2023

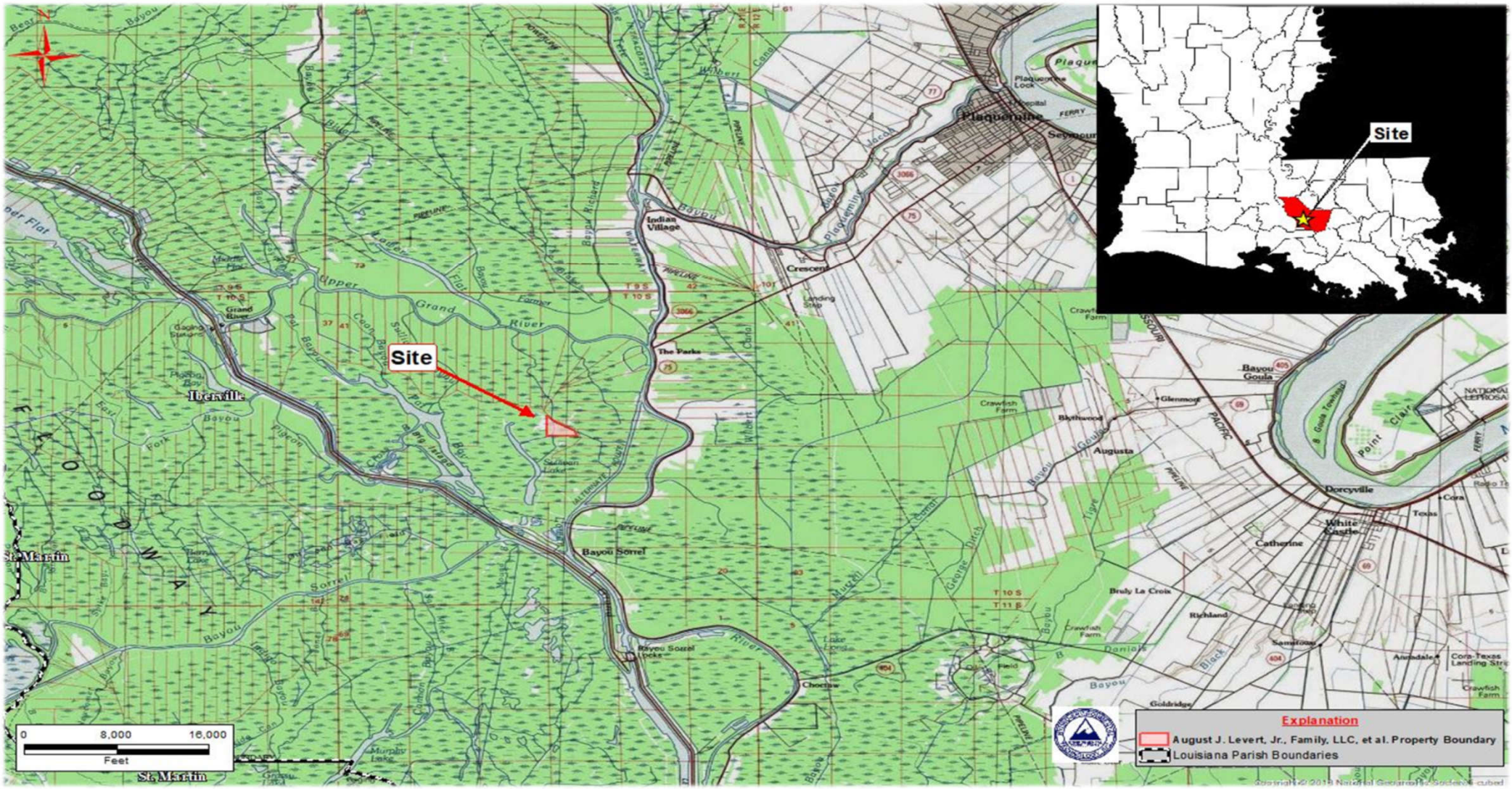
HYDRO-ENVIRONMENTAL TECHNOLOGY, INC.

INTRODUCTION

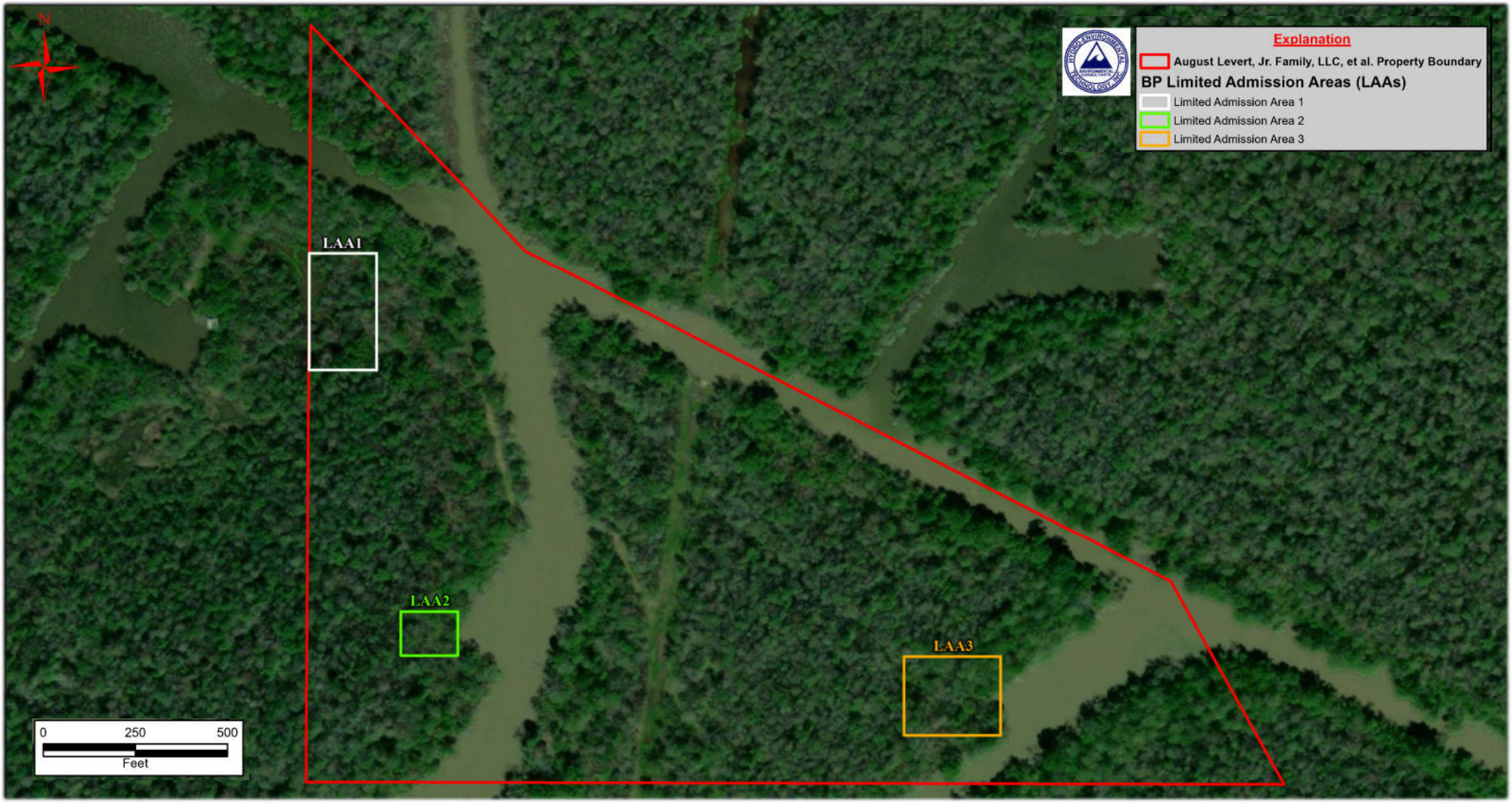
BP worked with the team below to conduct a thorough investigation of the August Levert, Jr., Family, LLC, et al. property to determine the regulatory status, current environmental conditions, and overall depositional environment to determine whether site restoration was warranted. The team also reviewed and incorporated data, as appropriate, from the adjacent Iberville Parish School Board (IPSB) property given the proximity to the site and the same overall geological setting.

Experts List

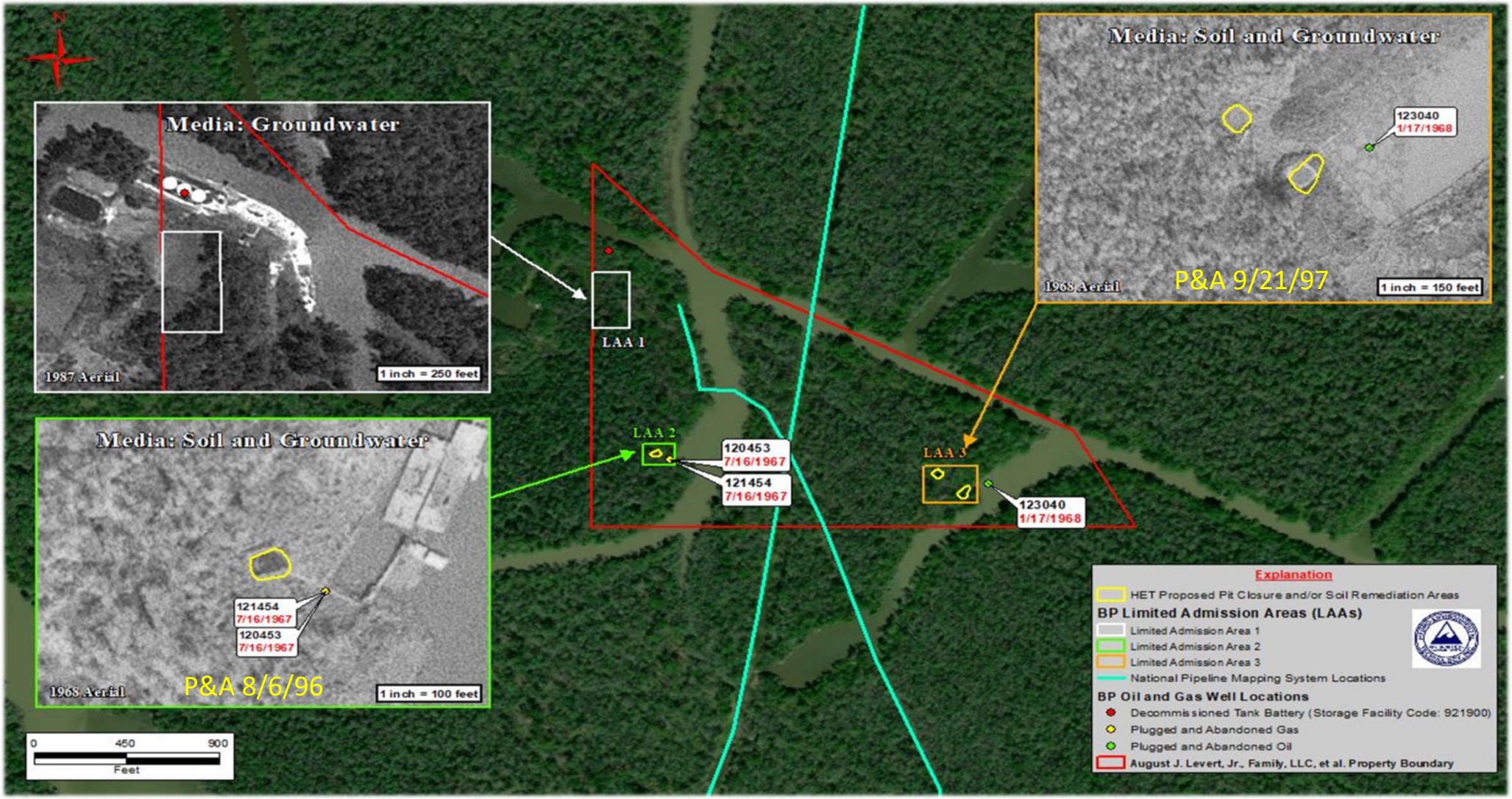
- Brent T. Pooler (HET) – Site Investigation and RECAP Assessment (Human Health)
- Matthew L. Greene (HET) – Root Zone Evaluation
- Wade Bryant (CK) – Wetland Delineation
- Dr. Helen Connelly (ERM) – Ecological Risk Assessment
- Dr. Bernie Kueper – Hydrogeologic Evaluation in Support of MNA
- Dr. John Frazier – Radiological Evaluation



Site Location Map



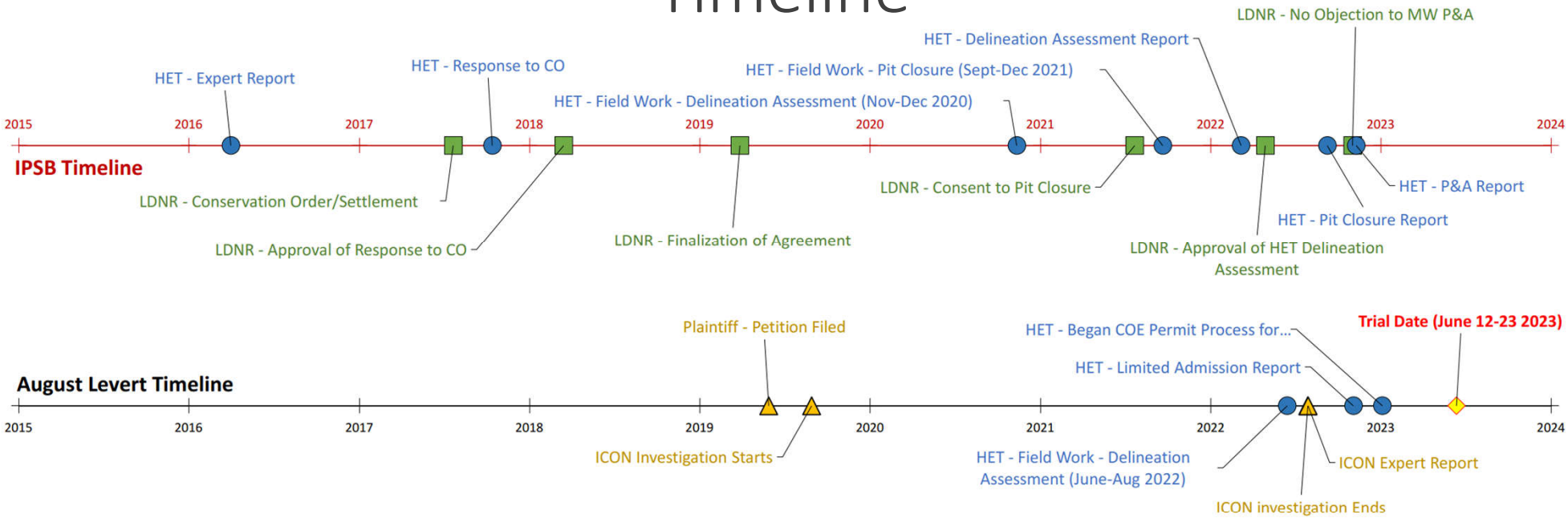
Limited Admission Areas



HET Pit Closure, Soil Remedial Areas, and Existing Pipeline Right of Ways

Iberville Parish School Board and August Levert Property Boundaries

Timeline



IPSB TIMELINE

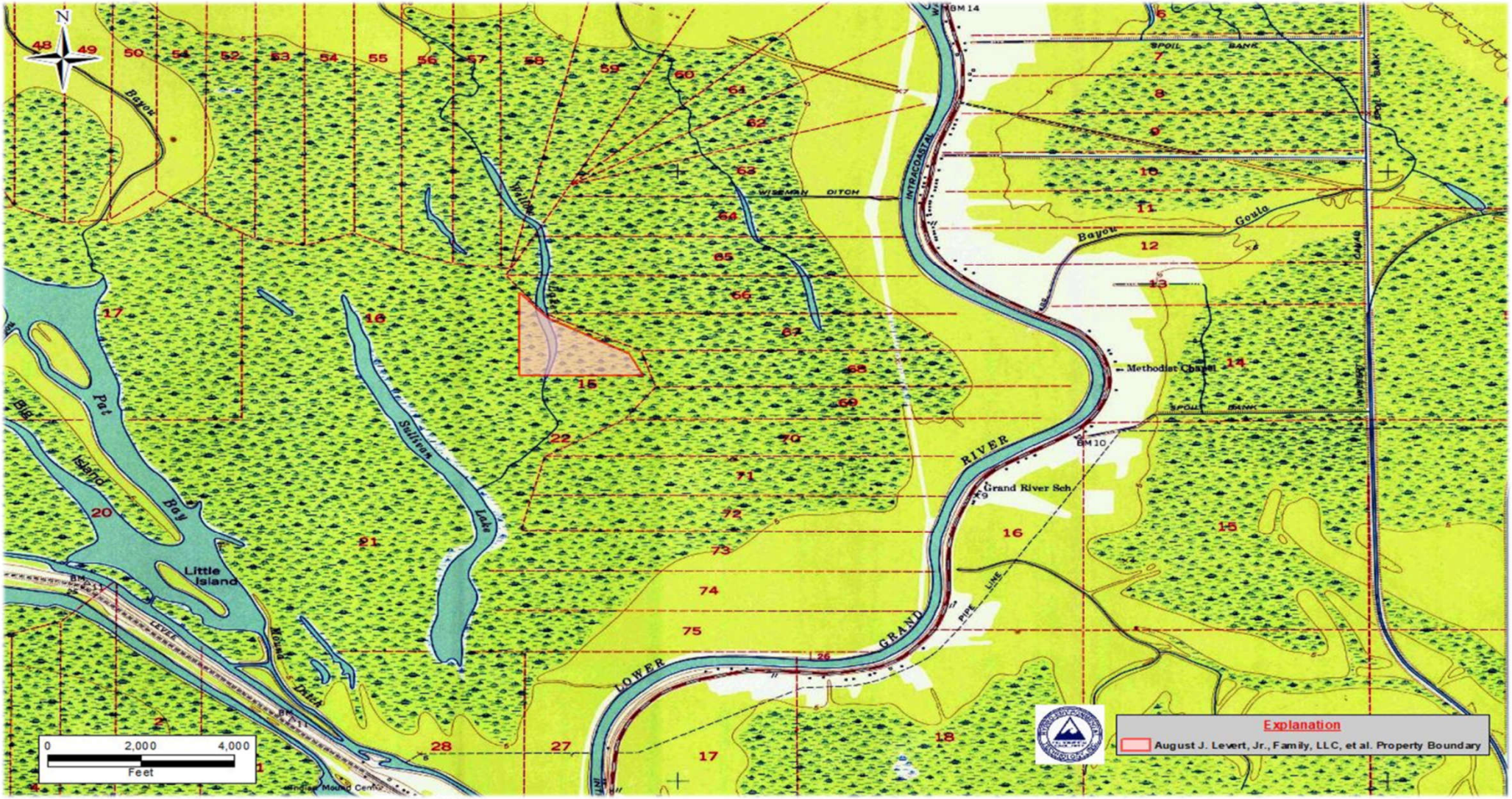
AUGUST LEVERT TIMELINE

LDNR Response

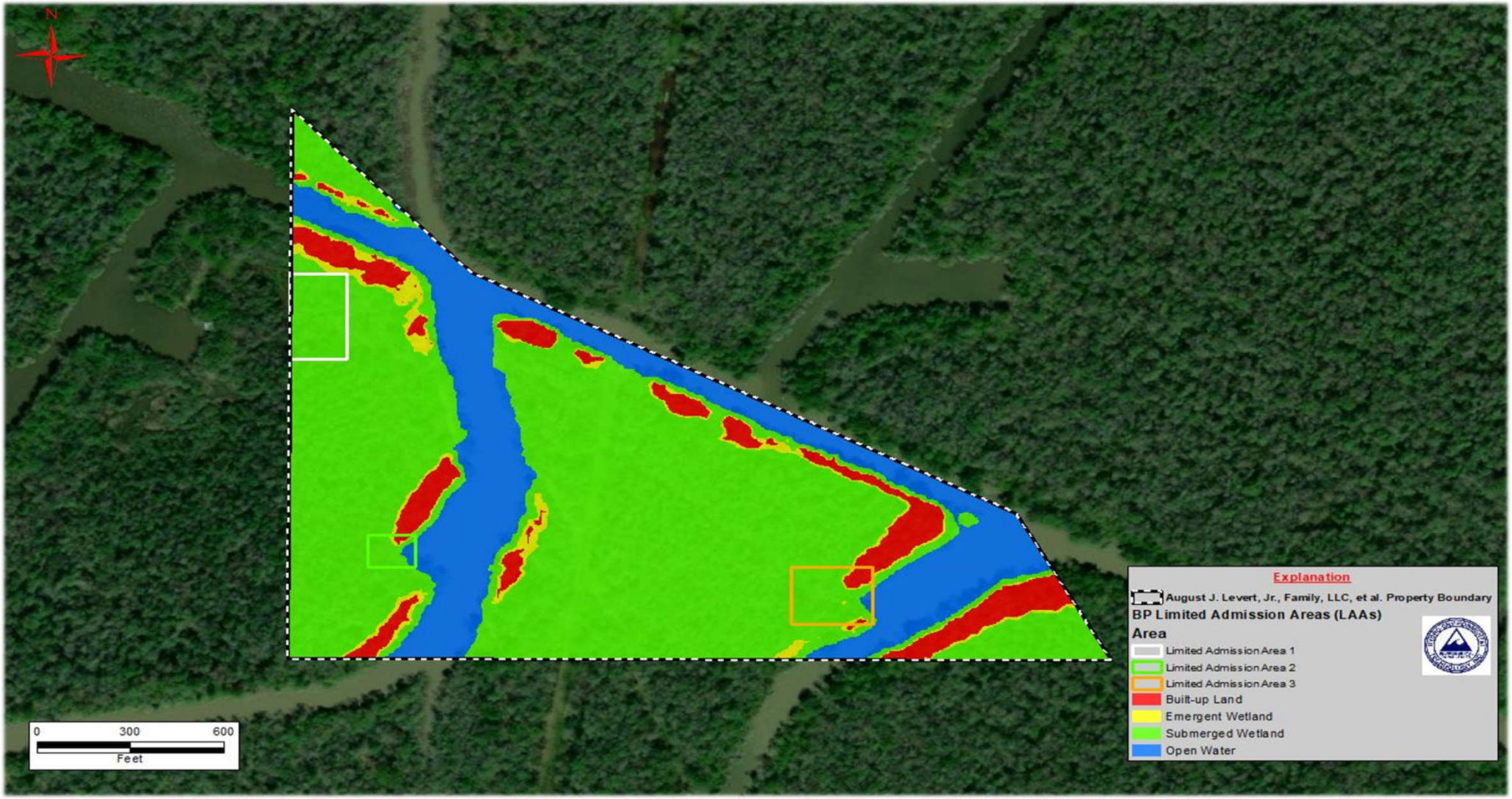
HET Reports/Response/Events

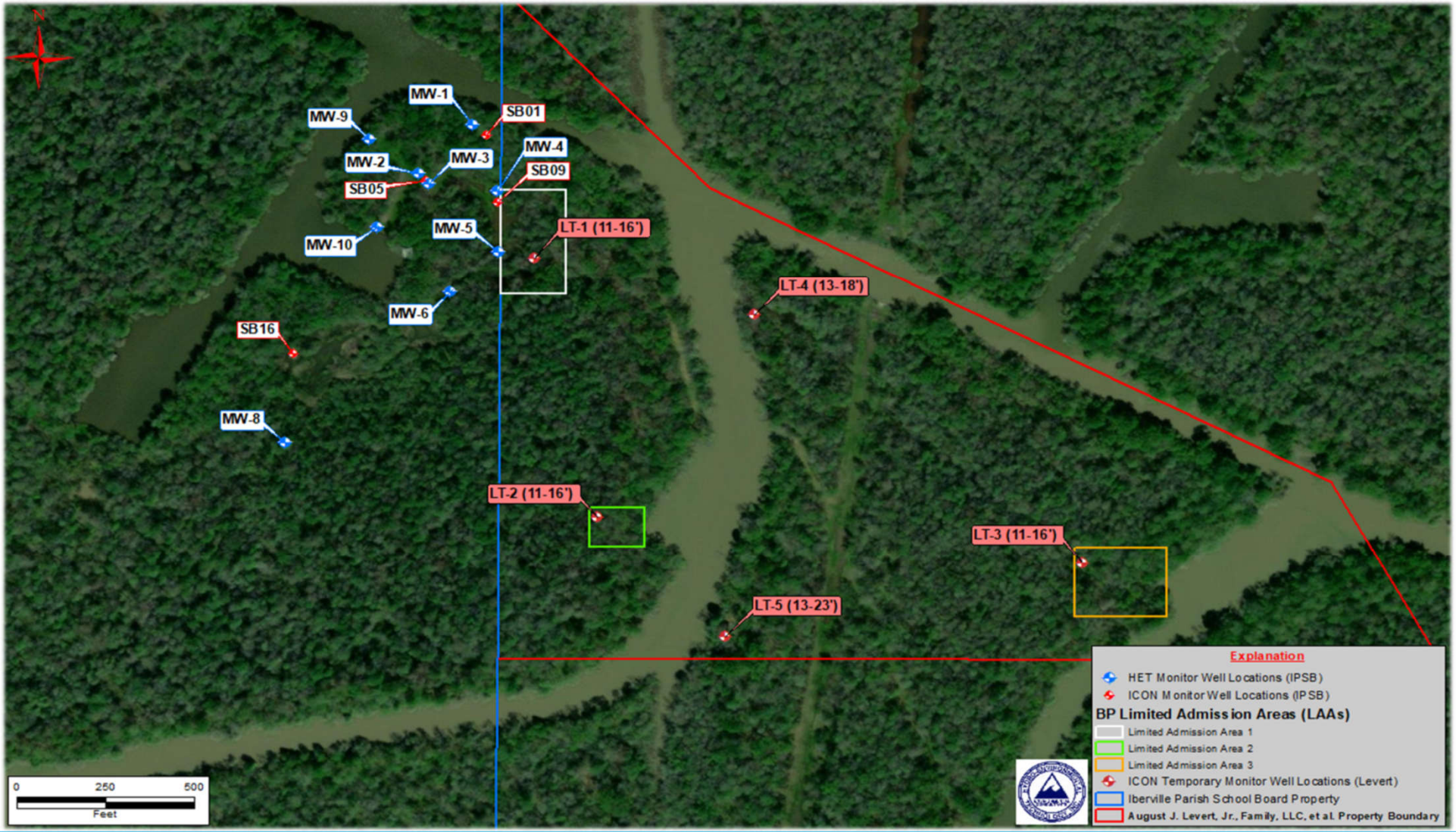
ICON Reports/Response/Events

Court Response/Events

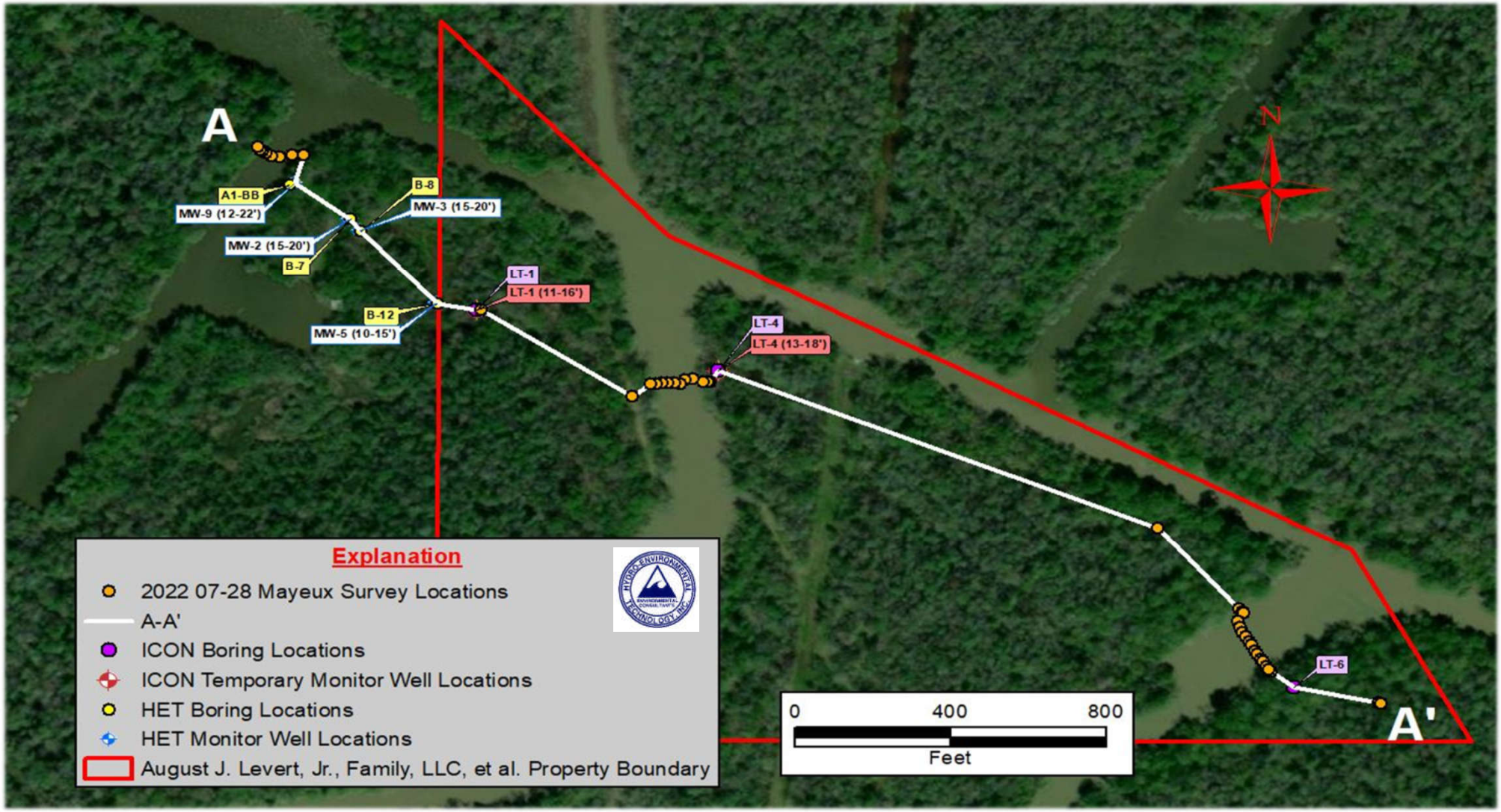


Site Location 1959 Topographic Map

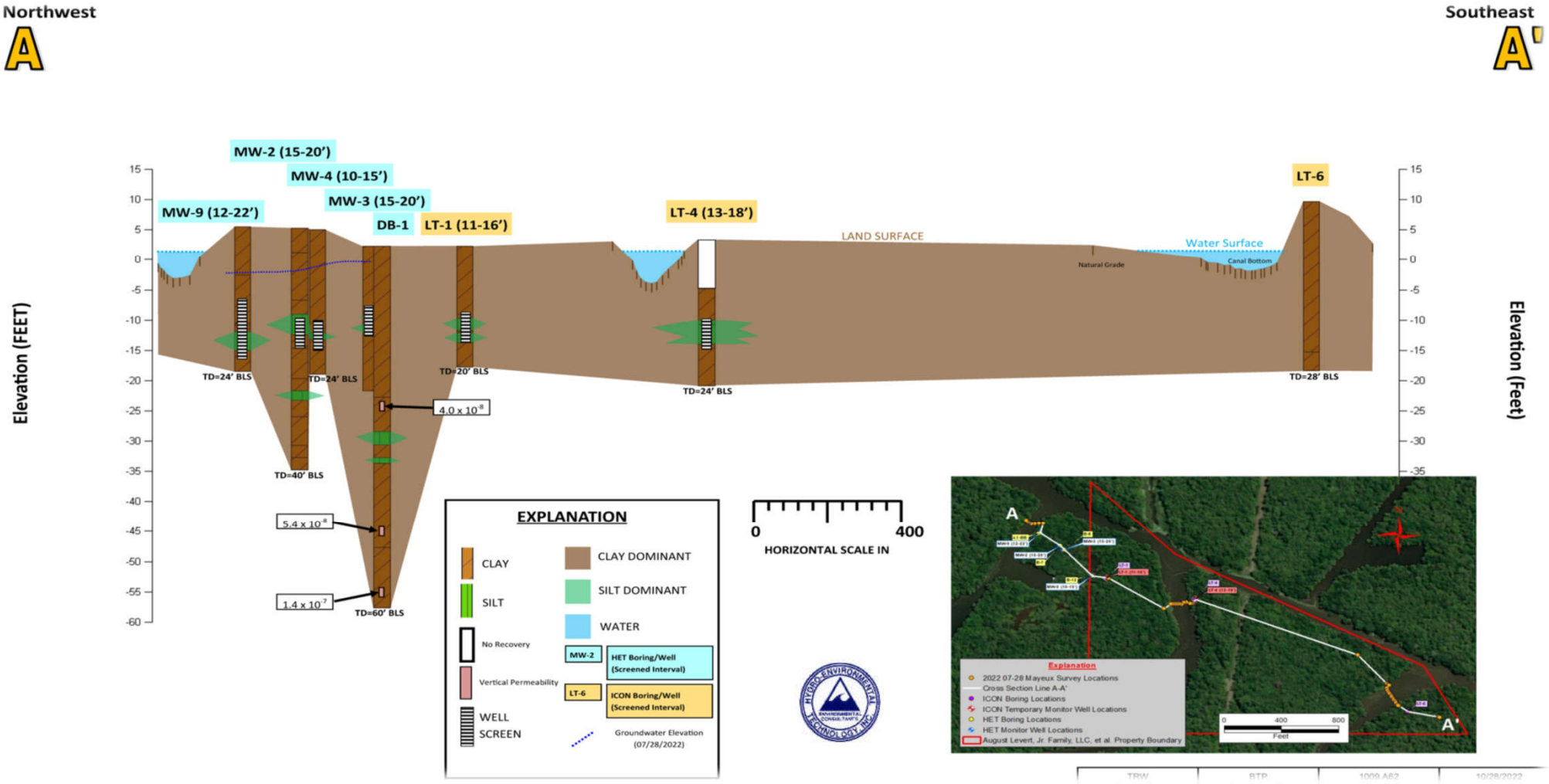

N
0
300
600
Feet
Explanation
August J. Levert, Jr., Family, LLC, et al. Property Boundary
BP Limited Admission Areas (LAAs)
Area
Limited Admission Area 1
Limited Admission Area 2
Limited Admission Area 3
Built-up Land
Emergent Wetland
Submerged Wetland
Open Water

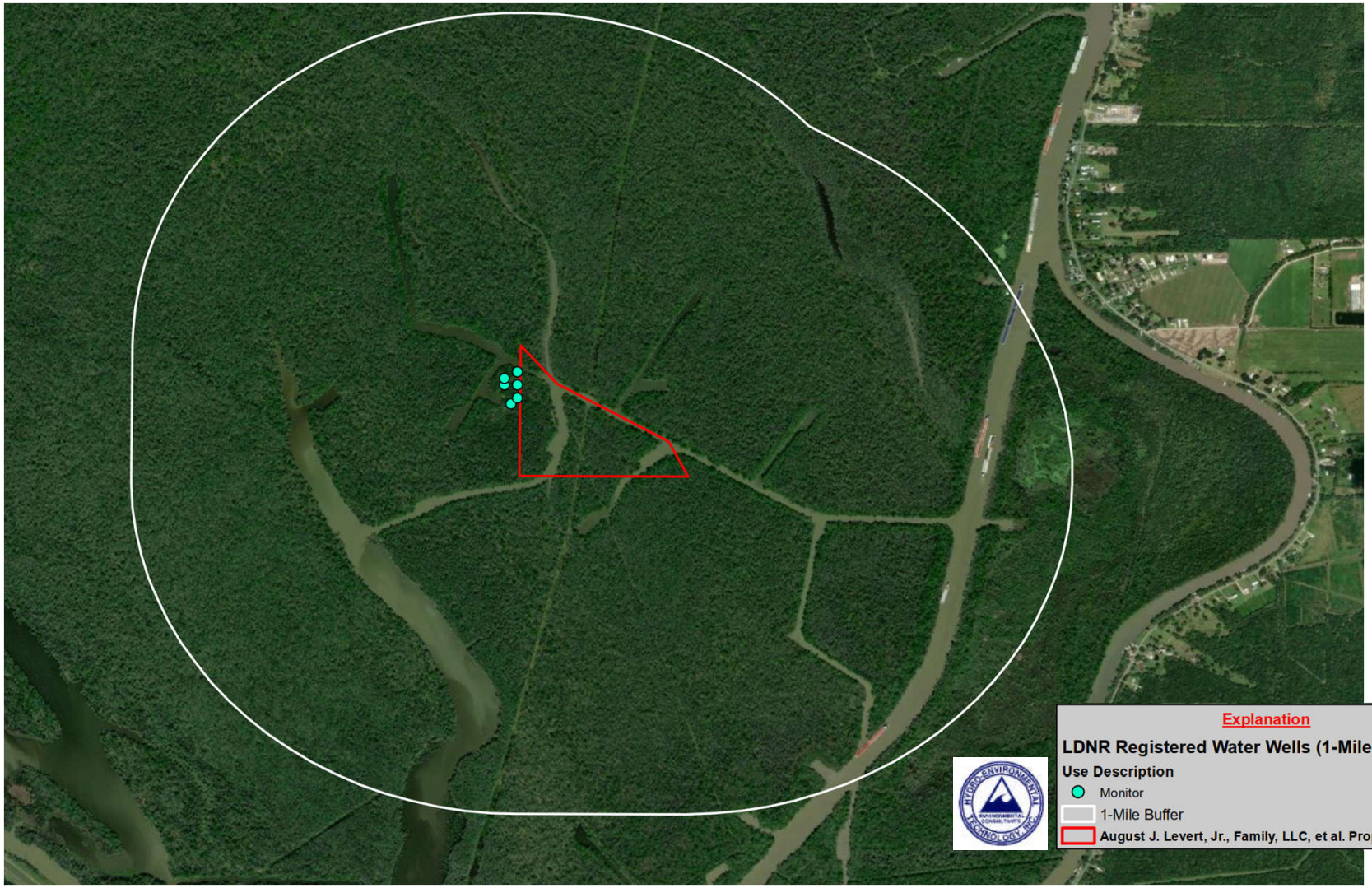


HET and ICON Monitor Well Locations on or in the vicinity of Levert Property

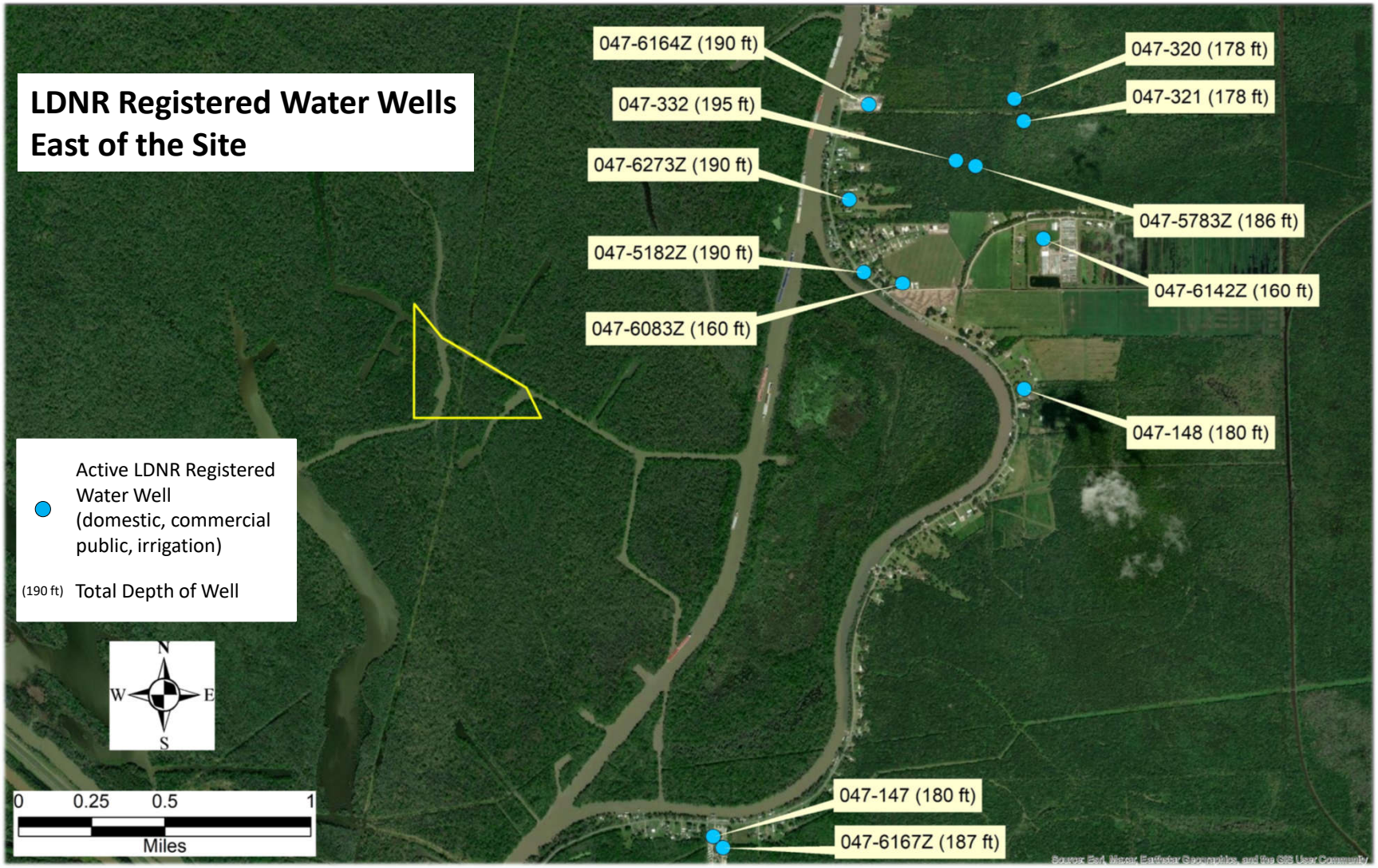


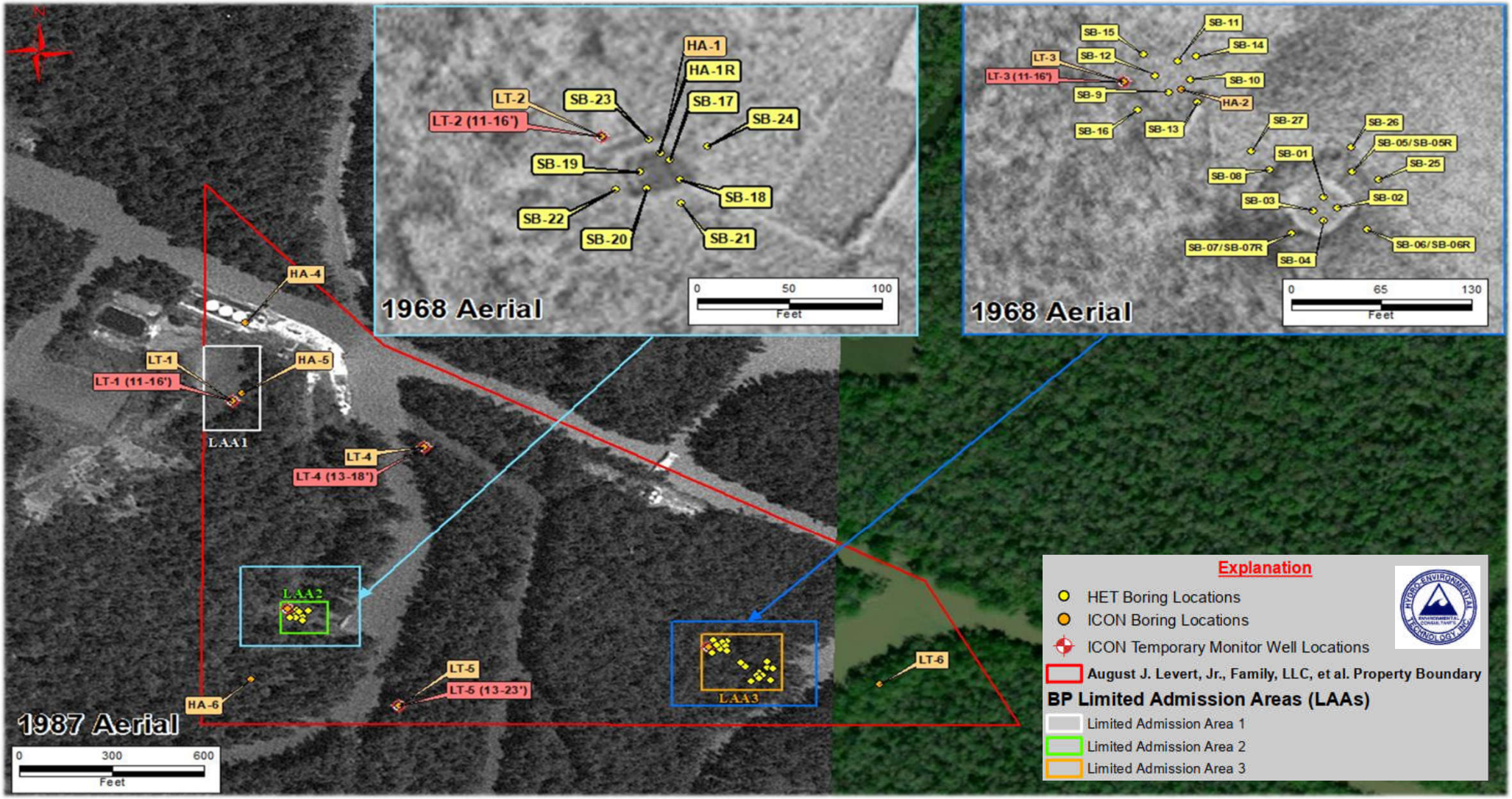
HET Line of Section


Northwest
A
Southeast
A'
MW-2 (15-20')
MW-4 (10-15')
MW-3 (15-20')
MW-9 (12-22')
DB-1
LT-1 (11-16')
LT-4 (13-18')
LT-6
LAND SURFACE
Water Surface
Natural Grade
Canal Bottom
Elevation (FEET)
Elevation (Feet)
TD=24' BLS
TD=24' BLS
TD=20' BLS
TD=24' BLS
TD=28' BLS
TD=40' BLS
TD=60' BLS
4.0 x 10-8
5.4 x 10-8
1.4 x 10-7
EXPLANATION
CLAY
SILT
No Recovery
Vertical Permeability
WELL SCREEN
CLAY DOMINANT
SILT DOMINANT
WATER
MW-2
HET Boring/Well (Screened Interval)
LT-6
ICON Boring/Well (Screened Interval)
Groundwater Elevation (07/28/2022)
0
400
HORIZONTAL SCALE IN
Explanation
2022 07-28 Mayeux Survey Locations
Cross Section Line A-A'
ICON Boring Locations
ICON Temporary Monitor Well Locations
HET Boring Locations
HET Monitor Well Locations
August Levert, Jr. Family, LLC, et al. Property Boundary
Feet



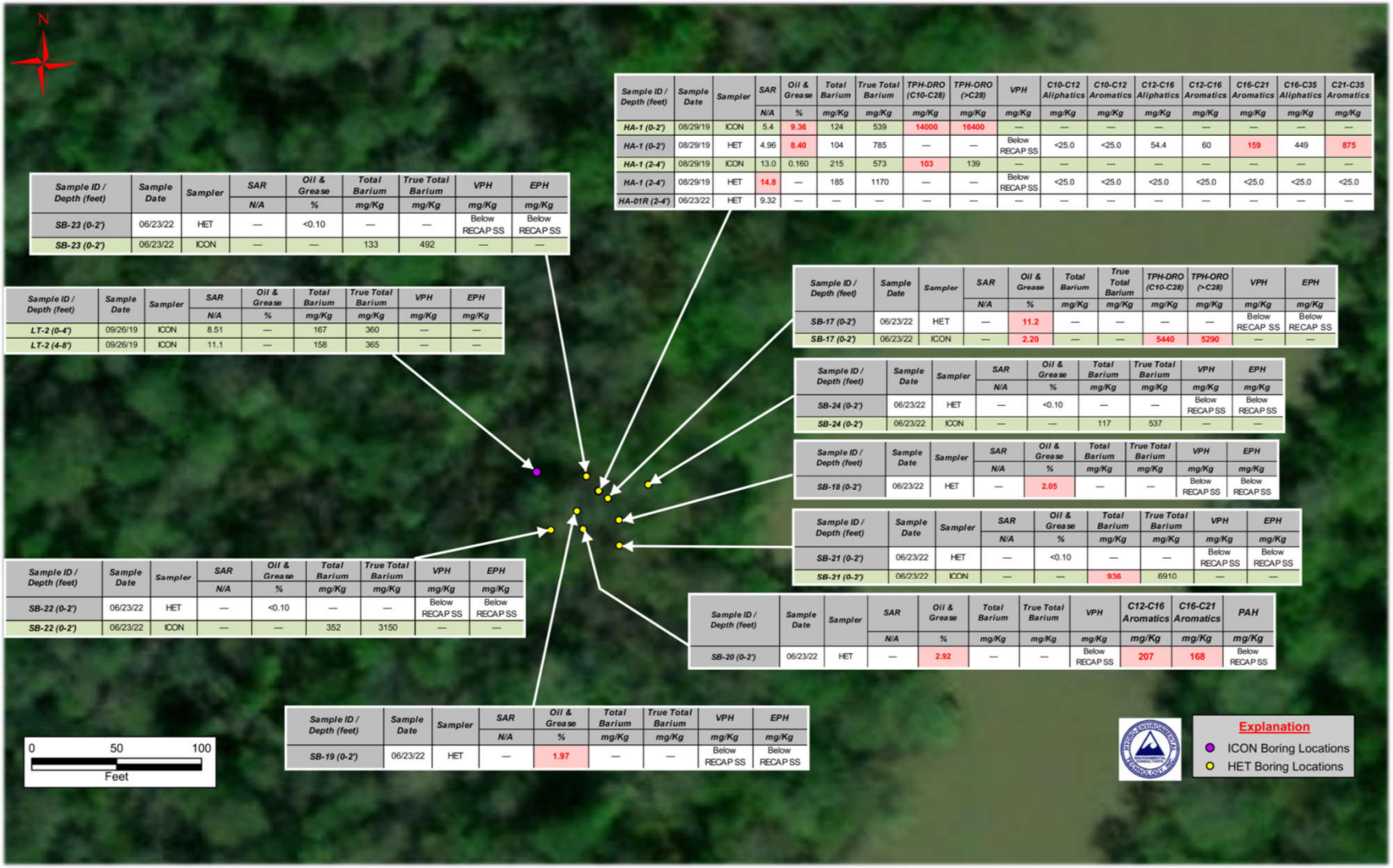
Sensitive Receptor Map


LDNR Registered Water Wells East of the Site
047-6164Z (190 ft)
047-320 (178 ft)
047-321 (178 ft)
047-332 (195 ft)
047-6273Z (190 ft)
047-5783Z (186 ft)
047-5182Z (190 ft)
047-6142Z (160 ft)
047-6083Z (160 ft)
047-148 (180 ft)
Active LDNR Registered Water Well (domestic, commercial public, irrigation)
(190 ft) Total Depth of Well
N
W
E
S
0 0.25 0.5 1
Miles
047-147 (180 ft)
047-6167Z (187 ft)



HET and ICON Sample Locations

Site Photograph of Pit in Area 2 – LAA2



Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH	C10-C12 Aliphatics	C10-C12 Aromatics	C12-C16 Aliphatics	C12-C16 Aromatics	C16-C21 Aromatics	C16-C35 Aliphatics	C21-C35 Aromatics
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
HA-1 (0-2')	08/29/19	ICON	5.4	9.36	124	539	14000	16400	—	—	—	—	—	—	—	—
HA-1 (0-2')	08/29/19	HET	4.96	8.40	104	785	—	—	Below RECAP SS	<25.0	<25.0	54.4	60	159	449	875
HA-1 (2-4')	08/29/19	ICON	13.0	0.160	215	573	103	139	—	—	—	—	—	—	—	—
HA-1 (2-4')	08/29/19	HET	14.8	—	185	1170	—	—	Below RECAP SS	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
HA-01R (2-4')	06/23/22	HET	9.32	—	—	—	—	—	—	—	—	—	—	—	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-23 (0-2')	06/23/22	HET	—	<0.10	—	—	Below RECAP SS	Below RECAP SS
SB-23 (0-2')	06/23/22	ICON	—	—	133	492	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
LT-2 (0-4')	09/26/19	ICON	8.51	—	167	360	—	—
LT-2 (4-8')	09/26/19	ICON	11.1	—	158	365	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-17 (0-2')	06/23/22	HET	—	11.2	—	—	—	—	Below RECAP SS	Below RECAP SS
SB-17 (0-2')	06/23/22	ICON	—	2.20	—	—	5440	5290	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-24 (0-2')	06/23/22	HET	—	<0.10	—	—	Below RECAP SS	Below RECAP SS
SB-24 (0-2')	06/23/22	ICON	—	—	117	537	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-18 (0-2')	06/23/22	HET	—	2.05	—	—	Below RECAP SS	Below RECAP SS

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-21 (0-2')	06/23/22	HET	—	<0.10	—	—	Below RECAP SS	Below RECAP SS
SB-21 (0-2')	06/23/22	ICON	—	—	936	6910	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-22 (0-2')	06/23/22	HET	—	<0.10	—	—	Below RECAP SS	Below RECAP SS
SB-22 (0-2')	06/23/22	ICON	—	—	352	3150	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	C12-C16 Aromatics	C16-C21 Aromatics	PAH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-20 (0-2')	06/23/22	HET	—	2.92	—	—	Below RECAP SS	207	168	Below RECAP SS

Sample ID / Depth (feet)	Sample Date	Sampler	SAR	Oil & Grease	Total Barium	True Total Barium	VPH	EPH
			N/A	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-19 (0-2')	06/23/22	HET	—	1.97	—	—	Below RECAP SS	Below RECAP SS

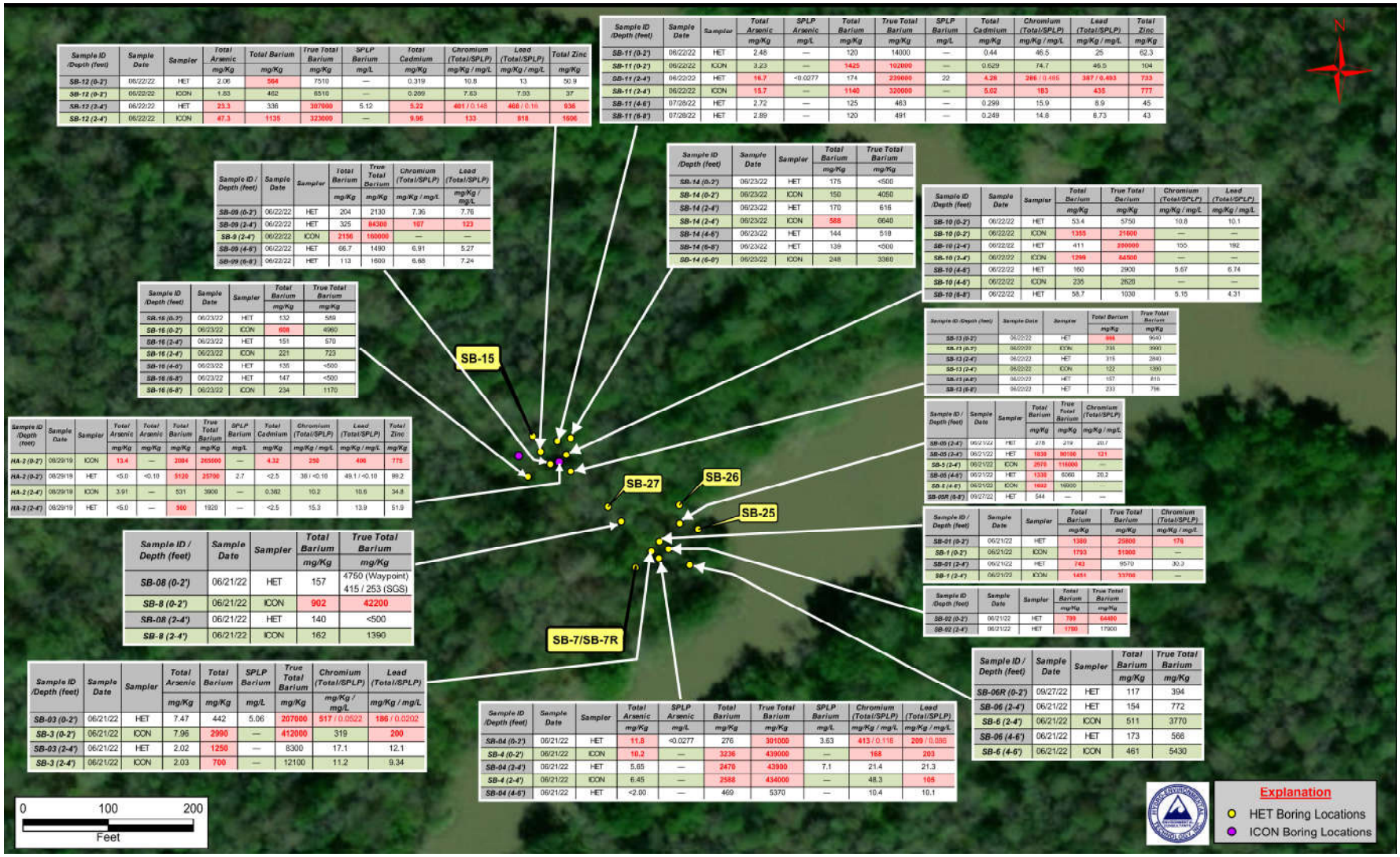
Soil Concentration Map (LAA2)

Soil and Pit Closure in LAA 3

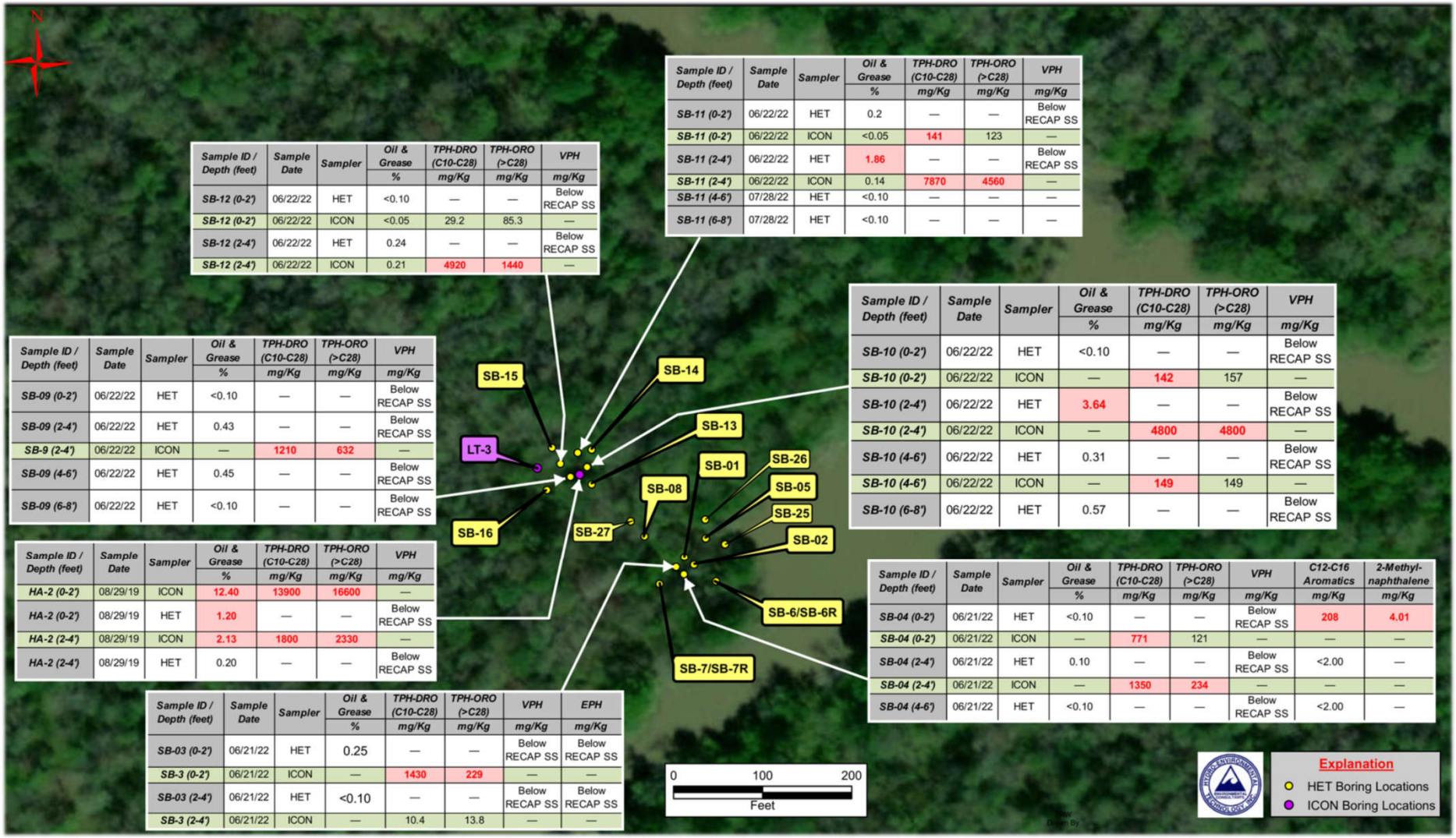
Drone Photograph of the Western and Eastern Pits in Area 3 – LAA3

Site Photograph of Eastern Pit in Area 3 – LAA3

Site Photograph of Western Pit in Area 3 – LAA3



Soil Concentration Map (Metals - LAA3)



Sample ID / Depth (feet)	Sample Date	Sampler	Oil & Grease	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH
			%	mg/Kg	mg/Kg	mg/Kg
SB-12 (0-2')	06/22/22	HET	<0.10	—	—	Below RECAP SS
SB-12 (0-2')	06/22/22	ICON	<0.05	29.2	85.3	—
SB-12 (2-4')	06/22/22	HET	0.24	—	—	Below RECAP SS
SB-12 (2-4')	06/22/22	ICON	0.21	4920	1440	—

Sample ID / Depth (feet)	Sample Date	Sampler	Oil & Grease	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH
			%	mg/Kg	mg/Kg	mg/Kg
SB-11 (0-2')	06/22/22	HET	0.2	—	—	Below RECAP SS
SB-11 (0-2')	06/22/22	ICON	<0.05	141	123	—
SB-11 (2-4')	06/22/22	HET	1.86	—	—	Below RECAP SS
SB-11 (2-4')	06/22/22	ICON	0.14	7870	4560	—
SB-11 (4-6')	07/28/22	HET	<0.10	—	—	—
SB-11 (6-8')	07/28/22	HET	<0.10	—	—	—

Sample ID / Depth (feet)	Sample Date	Sampler	Oil & Grease	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH
			%	mg/Kg	mg/Kg	mg/Kg
SB-09 (0-2')	06/22/22	HET	<0.10	—	—	Below RECAP SS
SB-09 (2-4')	06/22/22	HET	0.43	—	—	Below RECAP SS
SB-9 (2-4')	06/22/22	ICON	—	1210	632	—
SB-09 (4-6')	06/22/22	HET	0.45	—	—	Below RECAP SS
SB-09 (6-8')	06/22/22	HET	<0.10	—	—	Below RECAP SS

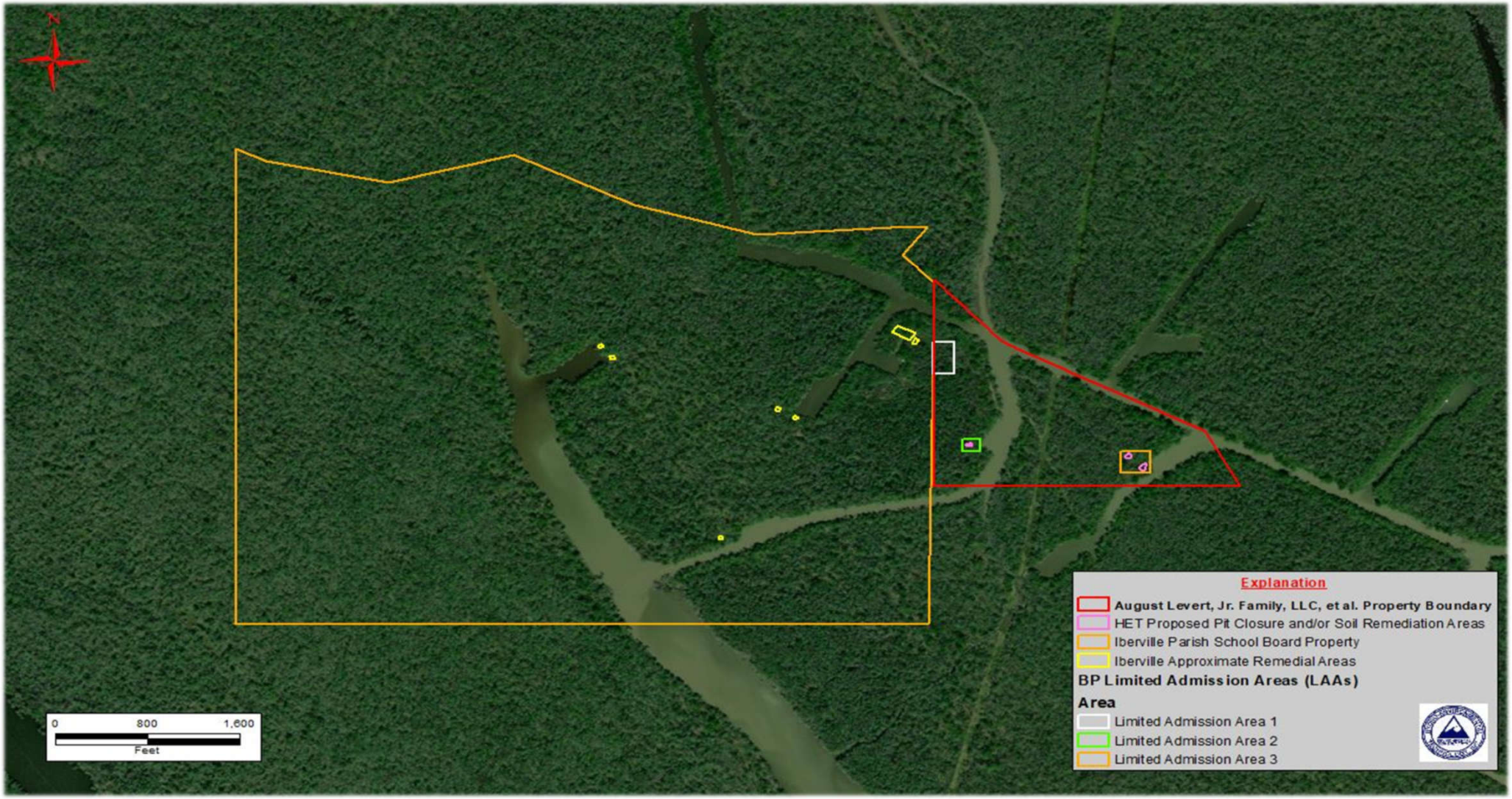
Sample ID / Depth (feet)	Sample Date	Sampler	Oil & Grease	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH
			%	mg/Kg	mg/Kg	mg/Kg
SB-10 (0-2')	06/22/22	HET	<0.10	—	—	Below RECAP SS
SB-10 (0-2')	06/22/22	ICON	—	142	157	—
SB-10 (2-4')	06/22/22	HET	3.64	—	—	Below RECAP SS
SB-10 (2-4')	06/22/22	ICON	—	4800	4800	—
SB-10 (4-6')	06/22/22	HET	0.31	—	—	Below RECAP SS
SB-10 (4-6')	06/22/22	ICON	—	149	149	—
SB-10 (6-8')	06/22/22	HET	0.57	—	—	Below RECAP SS

Sample ID / Depth (feet)	Sample Date	Sampler	Oil & Grease	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH
			%	mg/Kg	mg/Kg	mg/Kg
HA-2 (0-2')	08/29/19	ICON	12.40	13900	16600	—
HA-2 (0-2')	08/29/19	HET	1.20	—	—	Below RECAP SS
HA-2 (2-4')	08/29/19	ICON	2.13	1800	2330	—
HA-2 (2-4')	08/29/19	HET	0.20	—	—	Below RECAP SS

Sample ID / Depth (feet)	Sample Date	Sampler	Oil & Grease	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH	C12-C16 Aromatics	2-Methyl-naphthalene
			%	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-04 (0-2')	06/21/22	HET	<0.10	—	—	Below RECAP SS	208	4.01
SB-04 (0-2')	06/21/22	ICON	—	771	121	—	—	—
SB-04 (2-4')	06/21/22	HET	0.10	—	—	Below RECAP SS	<2.00	—
SB-04 (2-4')	06/21/22	ICON	—	1350	234	—	—	—
SB-04 (4-6')	06/21/22	HET	<0.10	—	—	Below RECAP SS	<2.00	—

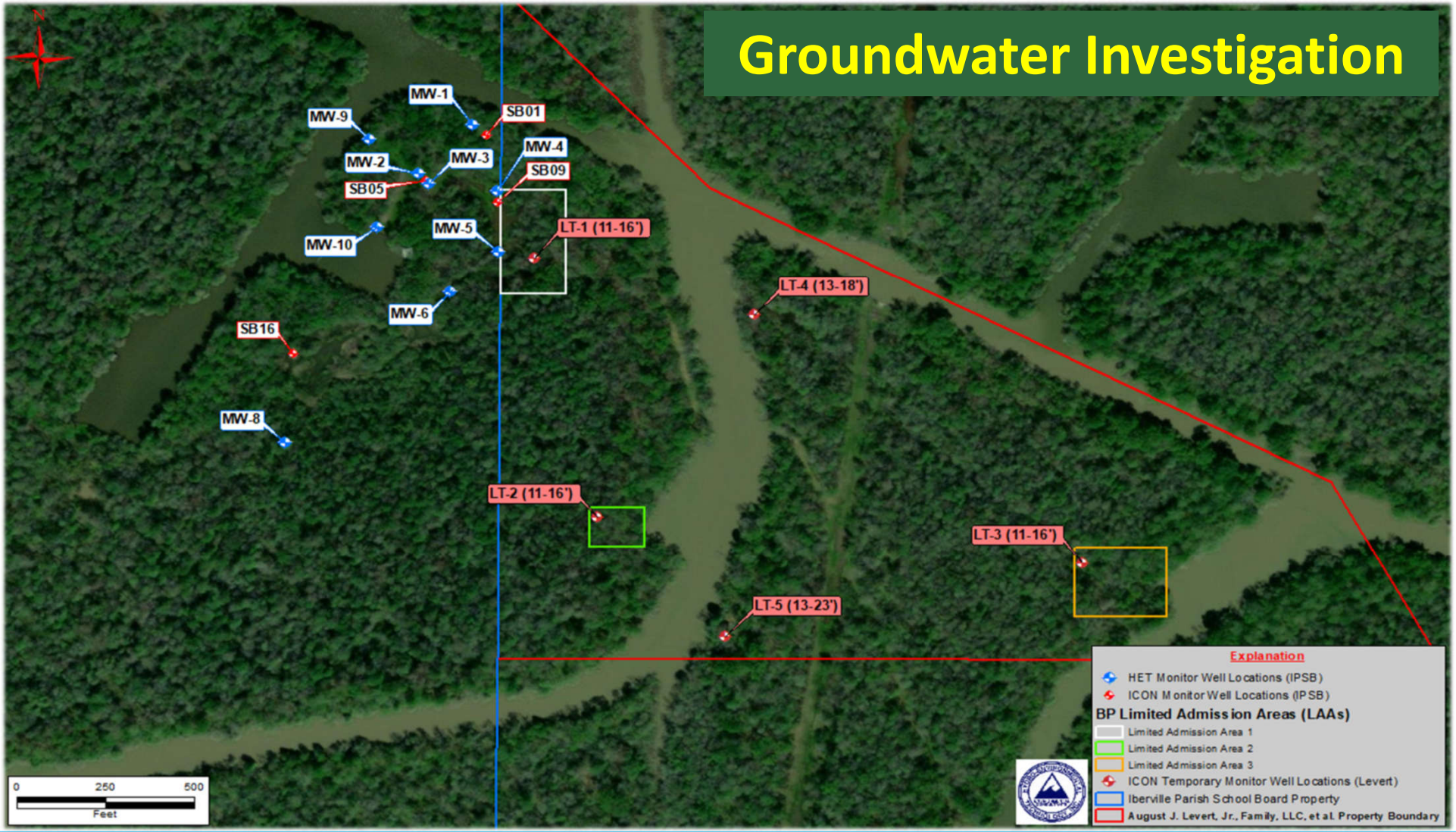
Sample ID / Depth (feet)	Sample Date	Sampler	Oil & Grease	TPH-DRO (C10-C28)	TPH-ORO (>C28)	VPH	EPH
			%	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SB-03 (0-2')	06/21/22	HET	0.25	—	—	Below RECAP SS	Below RECAP SS
SB-3 (0-2')	06/21/22	ICON	—	1430	229	—	—
SB-03 (2-4')	06/21/22	HET	<0.10	—	—	Below RECAP SS	Below RECAP SS
SB-3 (2-4')	06/21/22	ICON	—	10.4	13.8	—	—

Soil Concentration Map (Hydrocarbons - LAA3)



IPSB and Levert Proposed Remediation Areas

Groundwater Investigation



HET and ICON Monitor Well Locations on or in the vicinity of Levert Property

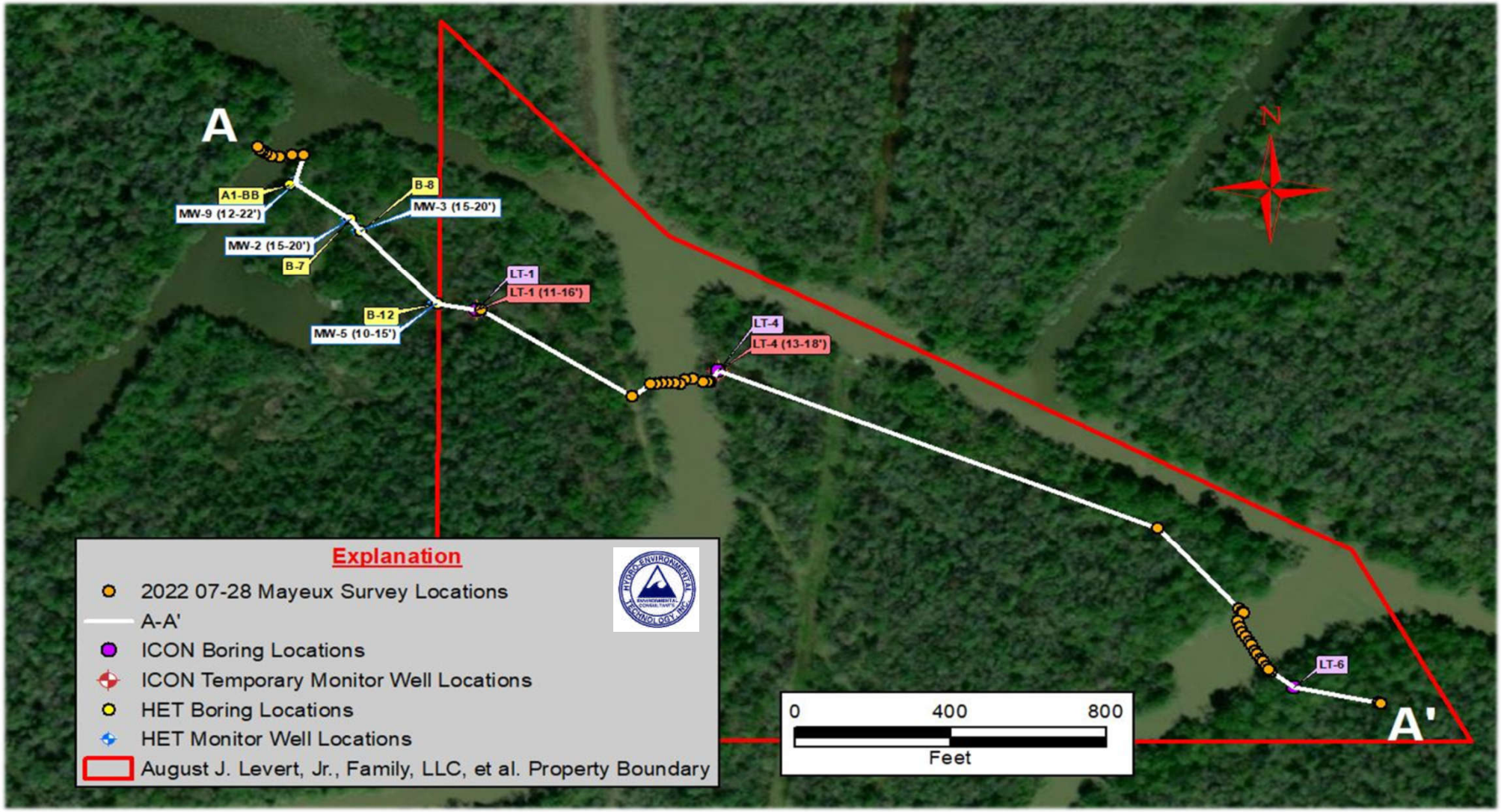
HYDRO-ENVIRONMENTAL TECHNOLOGY, INC.
Environmental Consultants
820 Apollo Road
Scott, Louisiana 70583
(337) 261-1963
Fax (337) 261-1953

BORING No. LT-2

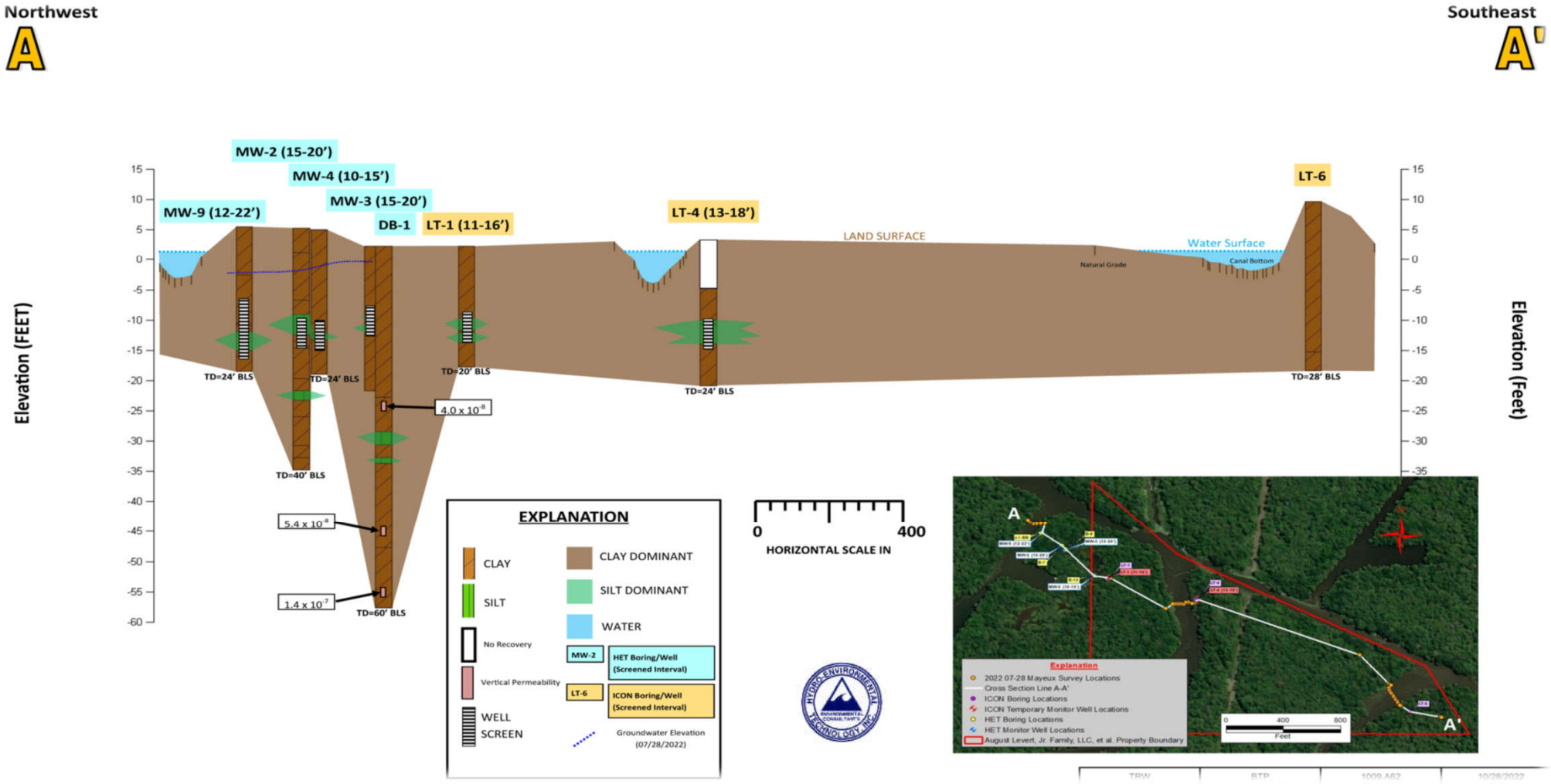
PROJECT NAME	August J. Levert, Jr., Family, LLC, et al. vs. BP America Production Company	DATE STARTED	09-26-2019
PROJECT NUMBER	1009.A62	DATE COMPLETED	09-26-2019
LOCATION	Plaquemine, La	CASING TYPE/DIAMETER	PVC / 0.75"
DRILLING METHOD	Marsh Master	SCREEN TYPE/SLOT	PVC with Filter Sock / 0.010"
SAMPLING METHOD	2.25" x 4' Dual Tube	SAND PACK/TYPE	N/A
GROUND ELEVATION	N/A	GROUT TYPE/QUANTITY	4% Bentonite Slurry
TOP OF CASING	N/A	DRILLED DEPTH TO WATER	N/A
LOGGED BY	Ryan Leonards	TOTAL DEPTH	16 Feet BLS
REMARKS	Field Coordinates: 30.19556, -91.34185 +/- 18'		

PID (ppm)	SCREENED INTERVAL	SAMPLE TIME	SAMPLE ID.	EXTENT	DEPTH (FT BLS)	U.S.C.S	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONDUCTIVITY (mS/cm)
0.6		0825	0-4		0-2, 2-4, 4-6, 6-8	CL		Clay, gray, low moisture, low density, iron	1.73, 2.94
0.9		0835	4-8					Clay, gray, low moisture, low density, moderate moisture at 7.7-8.0', iron	3.16, 3.61
					8-10	N/A		No Recovery	
1.5		0855	12-16		12-14, 14-16	ML		Silt, high clay content, gray, high moisture, low density	3.11
					16-18, 18-20, 20-22, 22-24				

Soil core picture of LT-2 (12-16’ BLS)



HET Line of Section


Northwest
A
Southeast
A'
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Elevation (Feet)
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0
400
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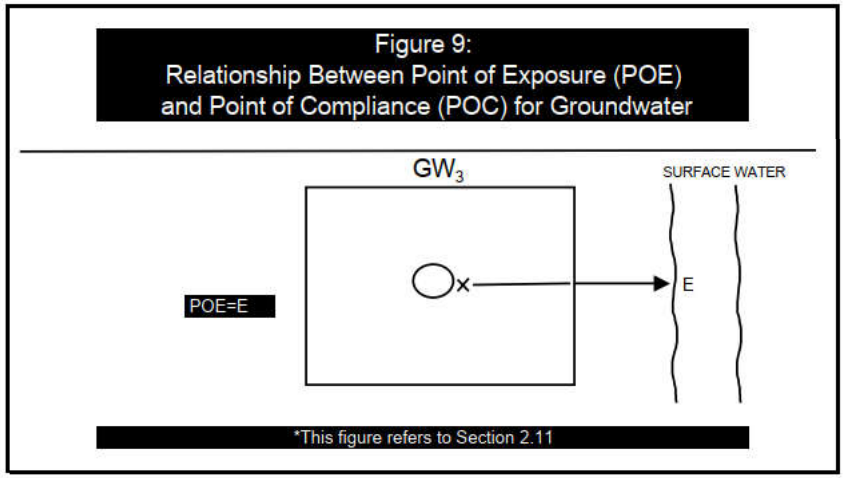
HET Boring Locations
HET Monitor Well Locations
August Levert, Jr. Family, LLC, et al. Property Boundary
0
400
800
Feet



Point of compliance (POC) - the point in groundwater where the RECAP standard must be met (refer to Section 2.11).

Point of exposure (POE) - a location of actual or potential contact between an organism and a chemical agent.

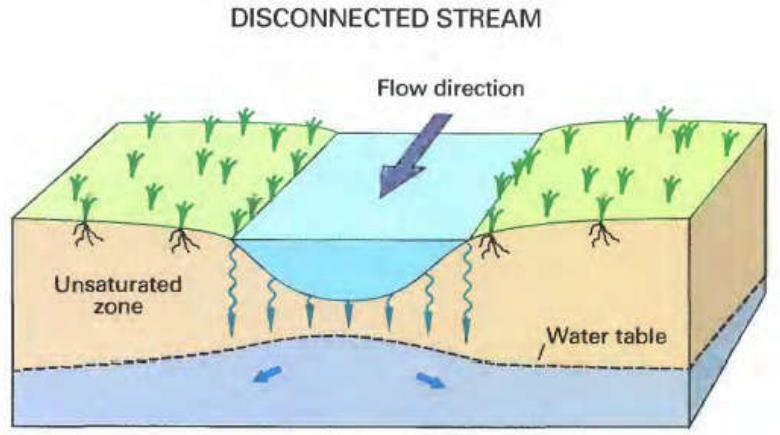
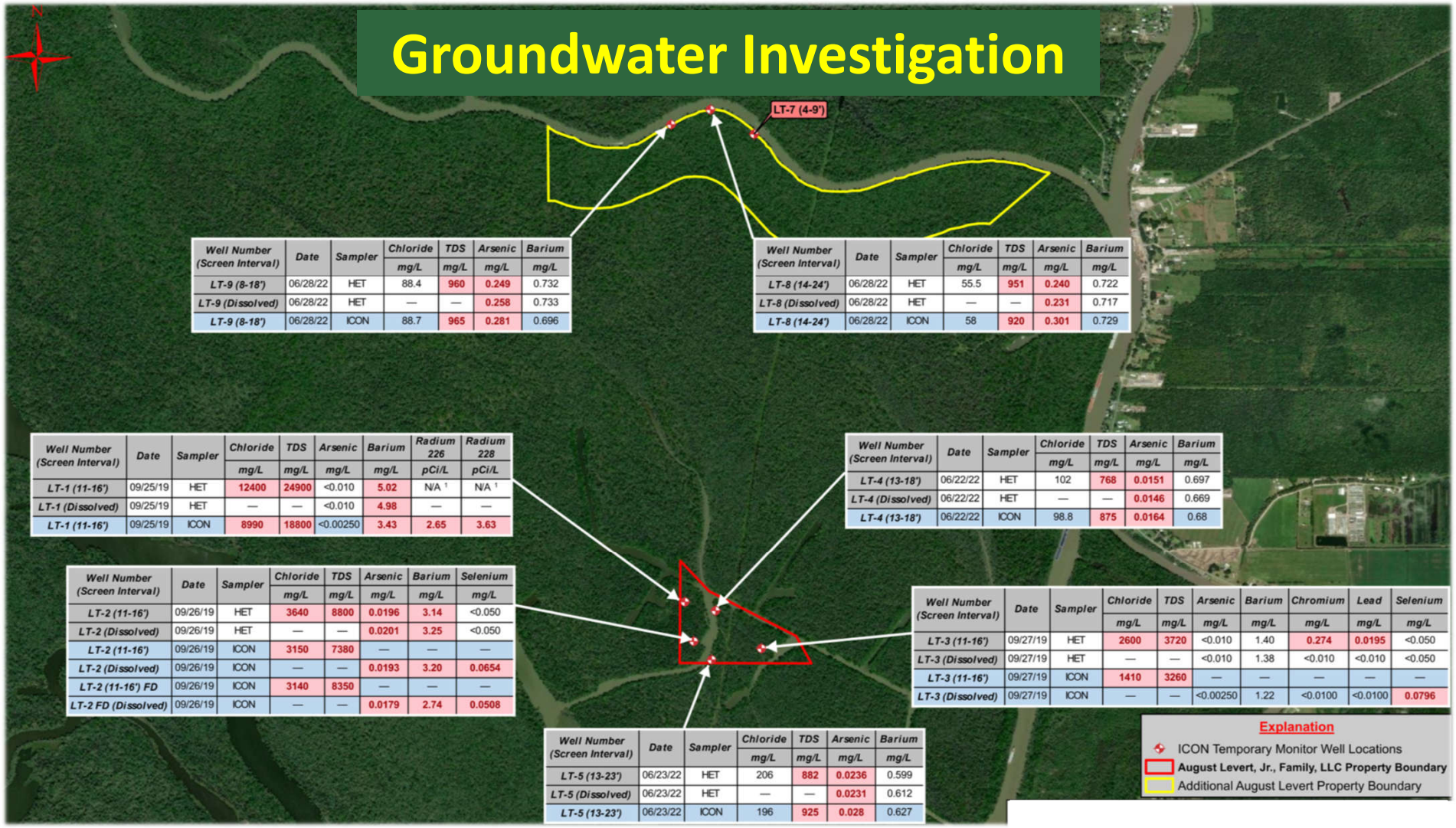


Figure 10. *Disconnected streams are separated from the ground-water system by an unsaturated zone.*

Groundwater Investigation



Well Number (Screen Interval)	Date	Sampler	Chloride	TDS	Arsenic	Barium
			mg/L	mg/L	mg/L	mg/L
LT-9 (8-18')	06/28/22	HET	88.4	960	0.249	0.732
LT-9 (Dissolved)	06/28/22	HET	—	—	0.258	0.733
LT-9 (8-18')	06/28/22	ICON	88.7	965	0.281	0.696

Well Number (Screen Interval)	Date	Sampler	Chloride	TDS	Arsenic	Barium
			mg/L	mg/L	mg/L	mg/L
LT-8 (14-24')	06/28/22	HET	55.5	951	0.240	0.722
LT-8 (Dissolved)	06/28/22	HET	—	—	0.231	0.717
LT-8 (14-24')	06/28/22	ICON	58	920	0.301	0.729

Well Number (Screen Interval)	Date	Sampler	Chloride	TDS	Arsenic	Barium	Radium 226	Radium 228
			mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L
LT-1 (11-16')	09/25/19	HET	12400	24900	<0.010	5.02	N/A [1]	N/A [1]
LT-1 (Dissolved)	09/25/19	HET	—	—	<0.010	4.98	—	—
LT-1 (11-16')	09/25/19	ICON	8990	18800	<0.00250	3.43	2.65	3.63

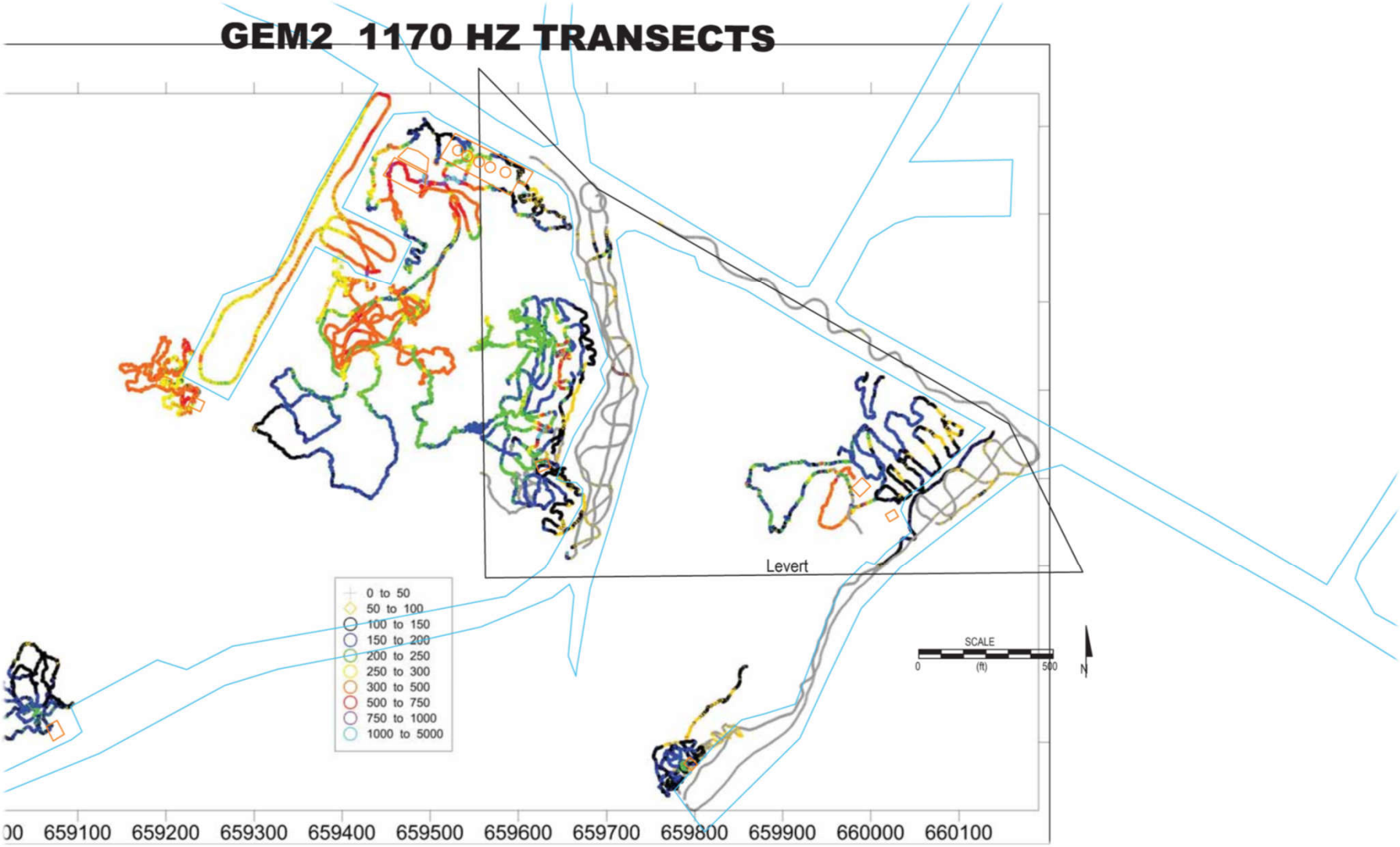
Well Number (Screen Interval)	Date	Sampler	Chloride	TDS	Arsenic	Barium
			mg/L	mg/L	mg/L	mg/L
LT-4 (13-18')	06/22/22	HET	102	768	0.0151	0.697
LT-4 (Dissolved)	06/22/22	HET	—	—	0.0146	0.669
LT-4 (13-18')	06/22/22	ICON	98.8	875	0.0164	0.68

Well Number (Screen Interval)	Date	Sampler	Chloride	TDS	Arsenic	Barium	Selenium
			mg/L	mg/L	mg/L	mg/L	mg/L
LT-2 (11-16')	09/26/19	HET	3640	8800	0.0196	3.14	<0.050
LT-2 (Dissolved)	09/26/19	HET	—	—	0.0201	3.25	<0.050
LT-2 (11-16')	09/26/19	ICON	3150	7380	—	—	—
LT-2 (Dissolved)	09/26/19	ICON	—	—	0.0193	3.20	0.0654
LT-2 (11-16') FD	09/26/19	ICON	3140	8350	—	—	—
LT-2 FD (Dissolved)	09/26/19	ICON	—	—	0.0179	2.74	0.0508

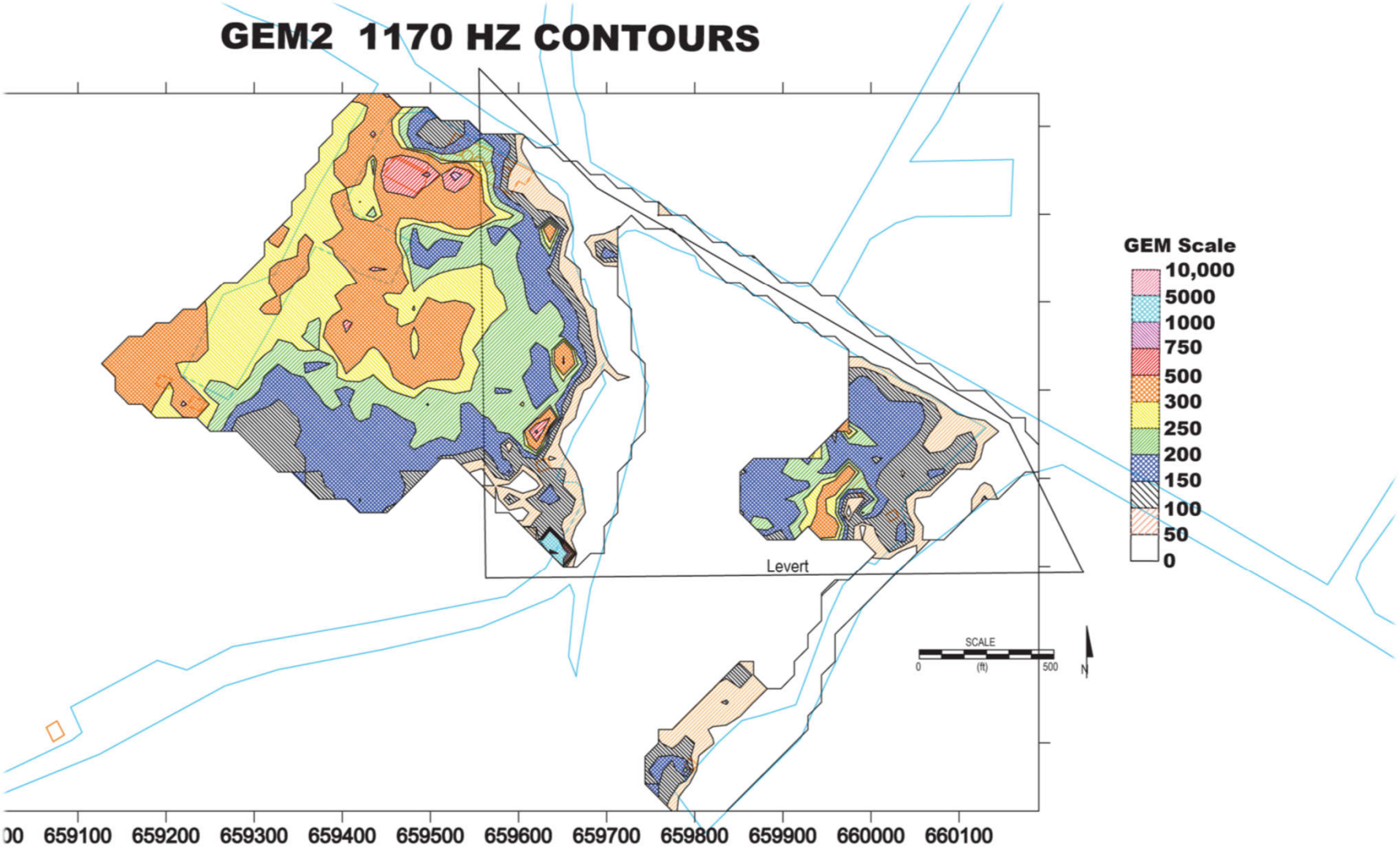
Well Number (Screen Interval)	Date	Sampler	Chloride	TDS	Arsenic	Barium	Chromium	Lead	Selenium
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LT-3 (11-16')	09/27/19	HET	2600	3720	<0.010	1.40	0.274	0.0195	<0.050
LT-3 (Dissolved)	09/27/19	HET	—	—	<0.010	1.38	<0.010	<0.010	<0.050
LT-3 (11-16')	09/27/19	ICON	1410	3260	—	—	—	—	—
LT-3 (Dissolved)	09/27/19	ICON	—	—	<0.00250	1.22	<0.0100	<0.0100	0.0796

Well Number (Screen Interval)	Date	Sampler	Chloride	TDS	Arsenic	Barium
			mg/L	mg/L	mg/L	mg/L
LT-5 (13-23')	06/23/22	HET	206	882	0.0236	0.599
LT-5 (Dissolved)	06/23/22	HET	—	—	0.0231	0.612
LT-5 (13-23')	06/23/22	ICON	196	925	0.028	0.627

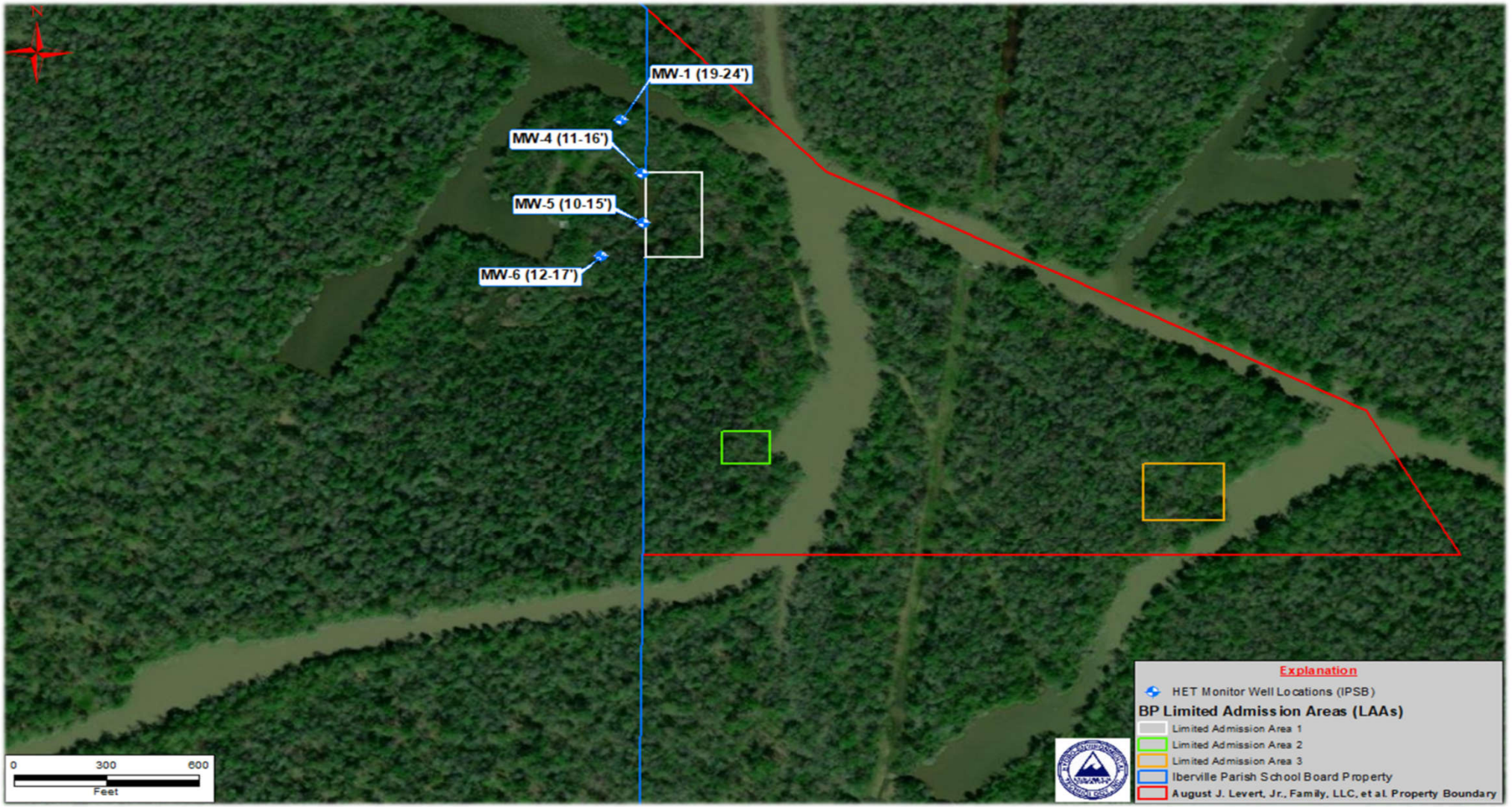
Groundwater Concentration Map



ICON GEM Transects (Figure 18 from ICON Expert Report)



ICON GEM Transects (Figure 19 from ICON Expert Report)



HET Slug Tested Monitor Well Locations

ESTIMATED WELL YIELD

HET INSTALLED WELLS

IPSB

PLAQUEMINE, IBERVILLE PARISH, LA

SHALLOW WATER BEARING UNIT

$$Q = \frac{60\ h_c\ K\ b}{9.3 + \log (K\ b)}$$

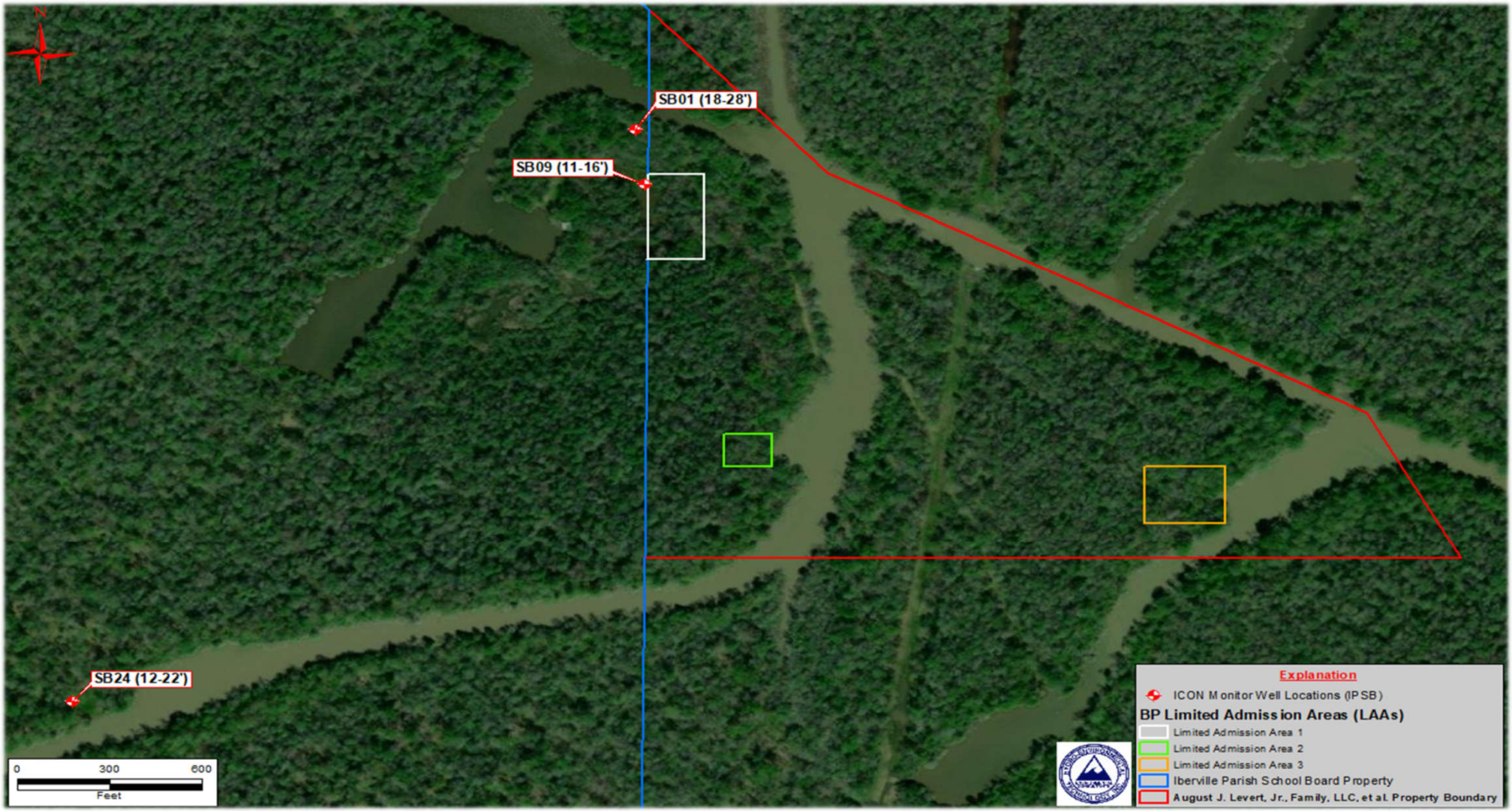
Value	
Q	well yield (gpm)
h_c	confining head above the upper stratigraphic boundary of water bearing unit (feet)
K	hydraulic conductivity of water bearing unit (cm/sec)
b	saturated thickness of water bearing unit (feet)

K Values:	K (ft/day)	K (cm/sec)	h_c (ft) [1]	b (ft) [2]	Estimated Yield (gpm)	Estimated Yield (gpd)	Test Date	Screen Interval (ft)
B2/MW1	0.140	0.0000494	14.70	2.00	0.016	24	10/13/2015	20-25'
B2/MW1 (Recovery)	0.014	0.0000049	14.70	2.00	0.002	3		
B11/MW4	0.029	0.0000102	10.51	1.20	0.002	3	10/13/2015	10-15'
B11/MW4 (Recovery	0.013	0.0000046	10.51	1.20	0.001	1		
B12/MW5	0.420	0.0001483	8.13	2.50	0.031	44	10/13/2015	10-15'
B12/MW5 (Recovery)	0.180	0.0000635	8.13	2.50	0.014	20		
B13/MW6	0.890	0.0003142	10.66	2.50	0.081	117	10/13/2015	10-15'
B13/MW6 (Recovery)	0.270	0.0000953	10.66	2.50	0.027	39		
AVG:	0.245	0.0000863	11.00	2.05	0.022	31		
GEOMEAN:	0.104	0.0000366	10.76	1.97	0.009	13		

1ft/day = 3.53e-4 cm/sec
gpd (gallons per day) = 60 minutes multiplied by 24 hours

From: LDEQ RECAP 2003, Appendix F, Figure 3, Confined Aquifer
(K from Bouwer and Rice method)

[1] Based on water levels recorded by HET on 10/13/2015
[2] Thickness determined from HET boring logs with base at total depth of well



ICON Slug Tested Monitor Well Locations

ESTIMATED WELL YIELD

ICON INSTALLED WELLS
IPSB
PLAQUEMINE, IBERVILLE PARISH, LA

SHALLOW WATER BEARING UNIT

$$Q = \frac{60\ h_c\ K\ b}{9.3 + \log (K\ b)}$$

Value	
Q	well yield (gpm)
h_c	confining head above the upper stratigraphic boundary of water bearing unit (feet)
K	hydraulic conductivity of water bearing unit (cm/sec)
b	saturated thickness of water bearing unit (feet)

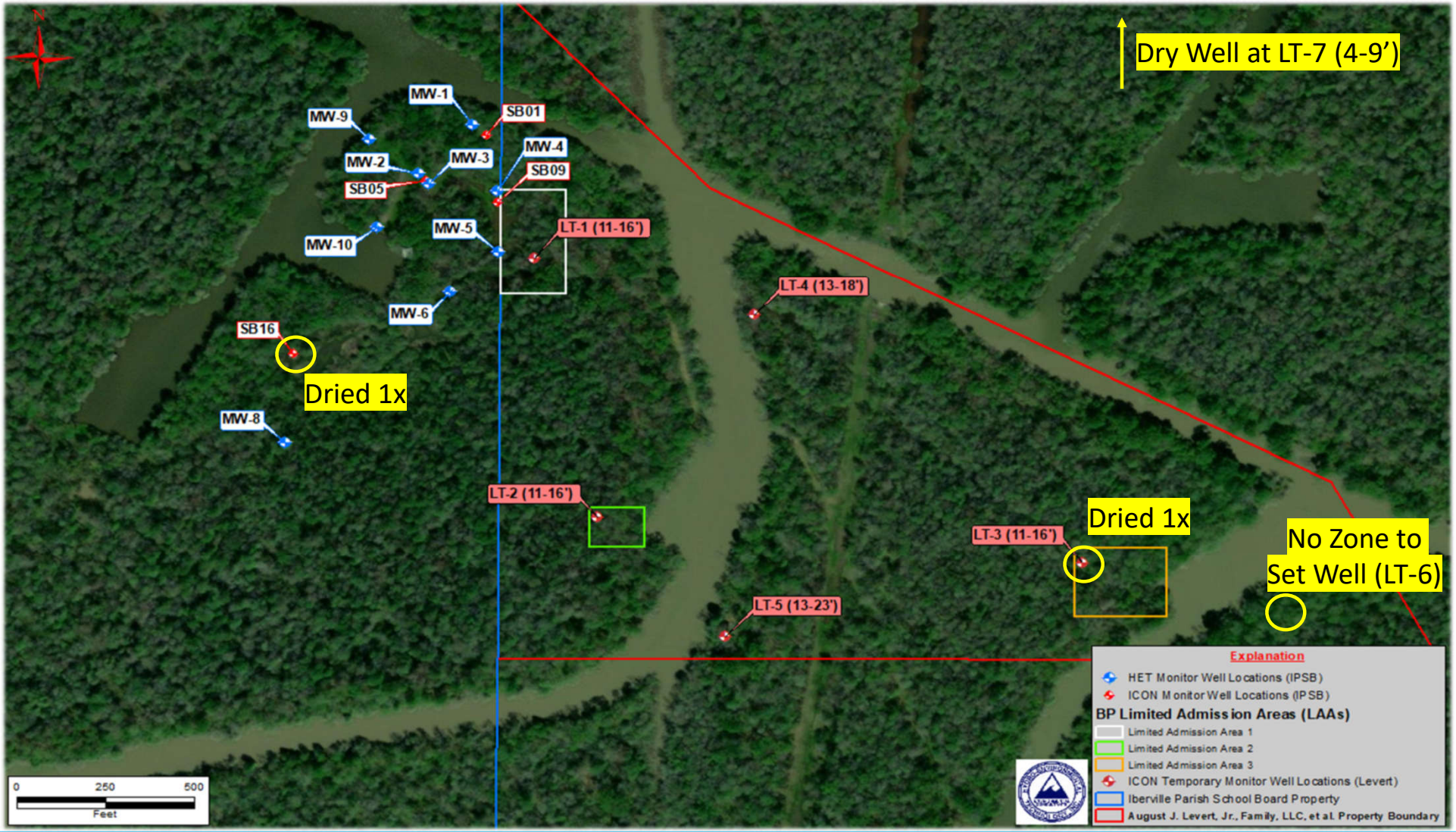
Bouwer & Rice

K Values:	K (ft/day)	K (cm/sec)	h_c (ft) [1]	b (ft) [2]	Estimated Yield (gpm)	Estimated Yield (gpd)	Test Date	Screen Interval (ft)
SB-1 Falling Head #1 - BR	0.1846	0.0000652	14.50	7.00	0.067	96	6/9/2015	18-28'
SB-1 Falling Head #2 - BR	0.1793	0.0000633	14.50	7.00	0.065	93		
SB-1 Falling Head #3 - BR	0.1836	0.0000648	14.50	7.00	0.066	95		
SB-9 Falling Head #1 - BR	0.7842	0.0002768	13.70	2.30	0.086	123	6/12/2015	11-16'
SB-9 Falling Head #2 - BR	0.7185	0.0002536	13.70	2.30	0.079	114		
SB-9 Falling Head #3 - BR	0.7046	0.0002487	13.70	2.30	0.078	112		
SB-24 Falling Head #1 - BR	0.1906	0.0000673	14.40	6.20	0.061	88	6/24/2015	12-22'
SB-24 Falling Head #2 - BR	0.1762	0.0000622	14.40	6.20	0.057	82		
SB-24 Falling Head #3 - BR	0.1765	0.0000623	14.40	6.20	0.057	82		
AVG:	0.366	0.0001294	14.20	5.17	0.068	98		
GEOMEAN:	0.290	0.0001022	14.20	4.64	0.068	97		

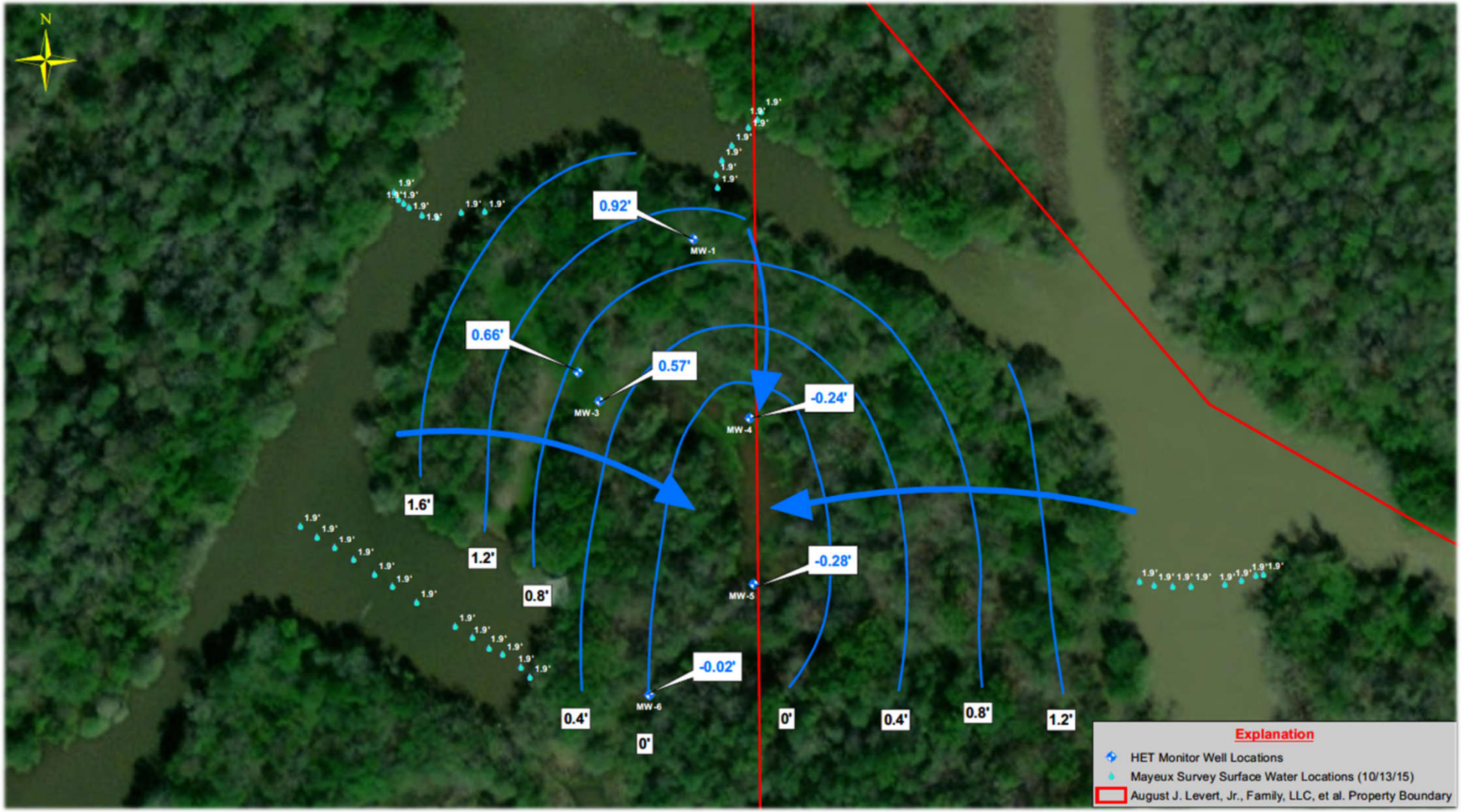
1ft/day = 3.53e-4 cm/sec
gpd (gallons per day) = 60 minutes multiplied by 24 hours

From: LDEQ RECAP 2003, Appendix F, Figure 3, Confined Aquifer
(K from Bouwer and Rice method)

[1] Based on Appendix D of ICON's Expert Report
[2] Thickness based on HET boring logs



ICON Dry Well Locations



Potentiometric Surface Map (10/13/2015)

Text Table 3
Groundwater RECAP Standards

Compound	GW_{3NDW} [1]	DAF	Solubility	LRS	Maximum Concentration [2]
Salinity Parameters					
chlorides	250 [3]	440	N/A	110,000	12,400
TDS	500 [3]	440	N/A	220,000	24,900
Metal Parameters					
arsenic	0.010	440	N/A	4.4	0.301
barium	45	440	N/A	19,800	5.02
chromium	960	440	N/A	422,400	0.274
lead	0.05	440	N/A	22	0.0195
selenium	0.05	440	N/A	22	0.0796

1 - RECAP, Table 3 MO-1 Standard
2 - Maximum groundwater concentration between ICON and HET data
3 - Surface Water Criteria (LDEQ Subsegment 120107)
N/A - Not Applicable
LRS - Limiting RECAP Standard (lowest value)
Concentrations reported in mg/L

Groundwater Summary

- Low levels of constituents
- Very low yielding, discontinuous zone (less than 123 gpd in every monitor well)
- Shallow water bearing zone has been determined by all parties as non-drinking (i.e., GW_3)
- Not usable groundwater (i.e., not USDW)
- Not in hydraulic communication with adjacent oilfield canals or surface water bodies
- Meets RECAP standards
- Safe for human health and environment

Other Site Considerations

Root Zone Investigation

Prepared by: Matthew L. Greene

SITE INVESTIGATION REPORT AND PROPOSED REMEDIATION PLAN

August Levert, Jr., Family, LLC, et al. v. BP America Production Company
18th Judicial District Court, Division "A", Docket No. 078953
North Half of Fractional Section 15, Township 10 South, Range 11 East
Grand River Oil and Gas Field
Iberville Parish, Louisiana
LDNR OC Legacy Project No. 018-028
November 03, 2022

Prepared for

BP America Production Company c/o
Mr. George Arceneaux III
Liskow & Lewis
822 Harding Street
Lafayette, Louisiana 70505
(337) 232-7424

Matthew L. Greene (CPSS #495789)
Environmental Scientist

CPSS
Certified Professional Soil Scientist
MATTHEW L. GREENE
495789

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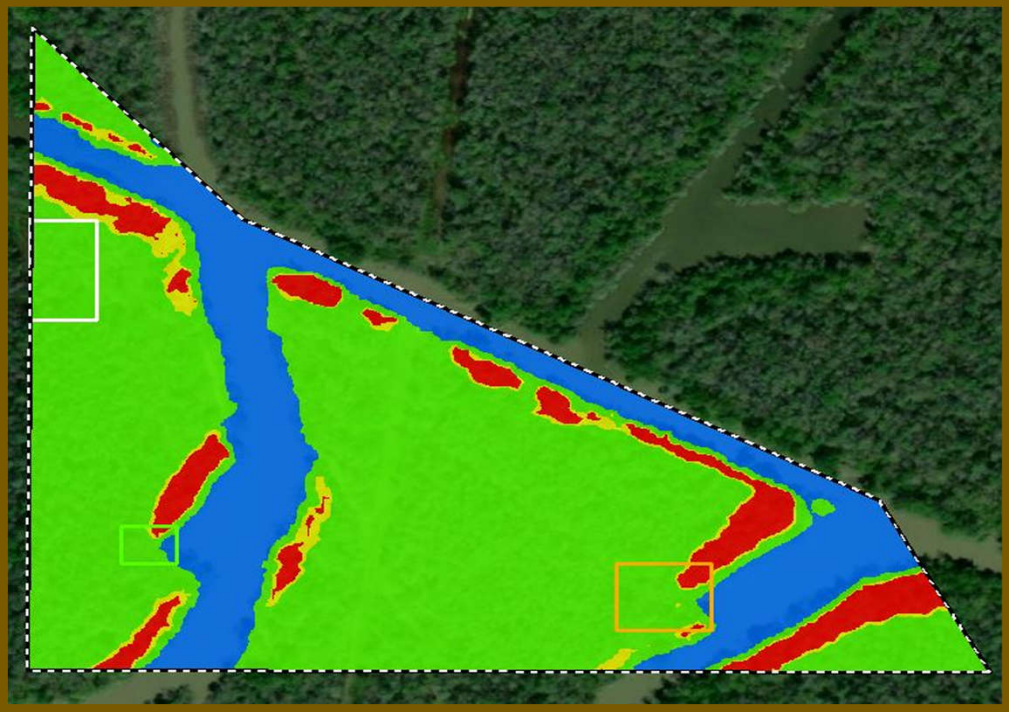
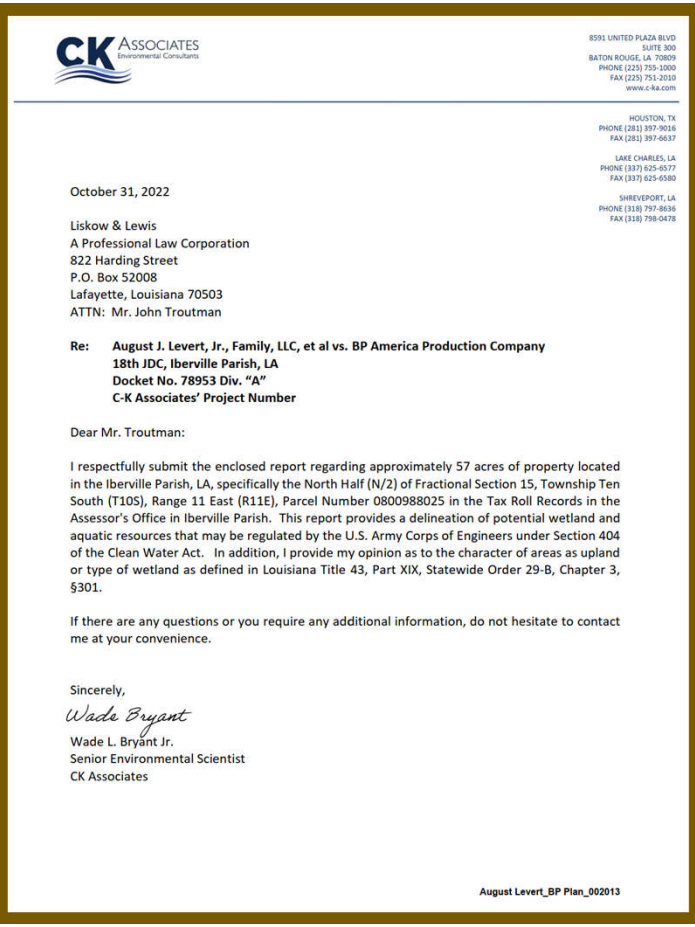
1990 30 Years 2020

August Levert_BP Plan_000001

Wetland Delineation



Prepared by: Wade Bryant



CK Associates
Environmental Consultants

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October 31, 2022

Liskow & Lewis
A Professional Law Corporation
822 Harding Street
P.O. Box 52008
Lafayette, Louisiana 70503
ATTN: Mr. John Troutman

Re: August J. Levert, Jr., Family, LLC, et al vs. BP America Production Company
18th JDC, Iberville Parish, LA
Docket No. 78953 Div. "A"
C-K Associates' Project Number

Dear Mr. Troutman:

I respectfully submit the enclosed report regarding approximately 57 acres of property located in the Iberville Parish, LA, specifically the North Half (N/2) of Fractional Section 15, Township Ten South (T10S), Range 11 East (R11E), Parcel Number 0800988025 in the Tax Roll Records in the Assessor's Office in Iberville Parish. This report provides a delineation of potential wetland and aquatic resources that may be regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. In addition, I provide my opinion as to the character of areas as upland or type of wetland as defined in Louisiana Title 43, Part XIX, Statewide Order 29-B, Chapter 3, §301.

If there are any questions or you require any additional information, do not hesitate to contact me at your convenience.

Sincerely,

Wade Bryant

Wade L. Bryant Jr.
Senior Environmental Scientist
CK Associates

August Levert_BP Plan_002013

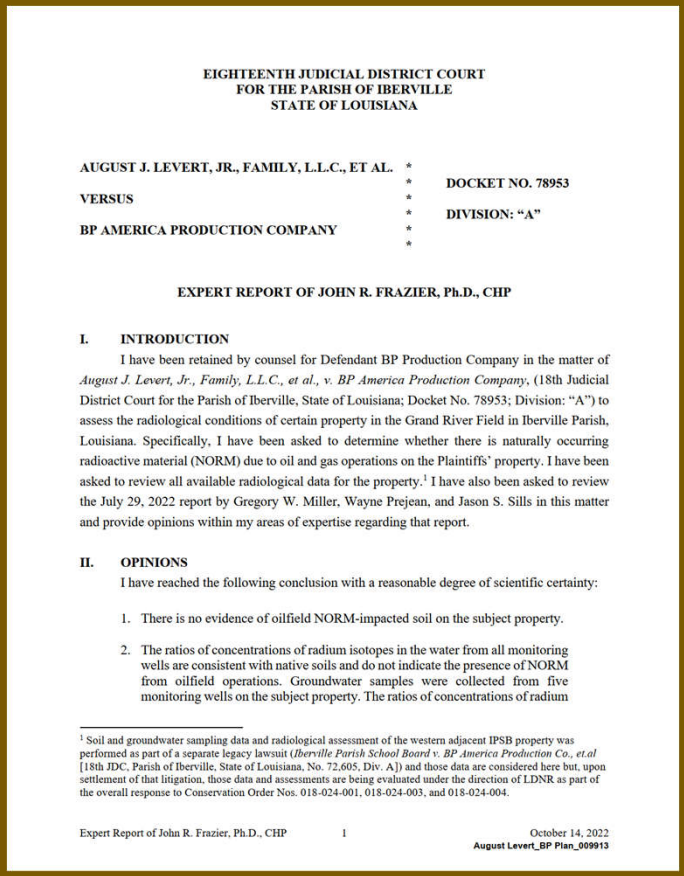
Radiological Evaluation

Table 1. Summary of Laboratory Measurements of Groundwater Samples

	Eberline Lab					Pace Lab				
	Ra-226		Ra-228			Ra-226		Ra-228		
Sample	Result	CSU*	Result	CSU	TDS**	Result	CSU	Result	CSU	TDS***
ID	(pCi/L)	(pCi/L)	(pCi/L)	(pCi/L)	(mg/L)	(pCi/L)	(pCi/L)	(pCi/L)	(pCi/L)	(mg/L)
LT-1	NA	-	NA	-	NA	2.65	1.00	3.63	0.954	18,800
LT-2	2.43	0.783	2.07	0.653	6,320	3.20	1.03	1.57	0.602	7,380
Lab. Dup.	2.62	0.870	2.88	0.834	6,320	-	-	-	-	-
Blind Dup.	-	-	-	-	-	3.26	1.10	1.58	0.660	8,350
LT-3	0.769	0.280	1.51	0.631	3,340	1.06	0.613	1.07	0.634	3,260
LT-4	0.528	0.342	1.46	0.627	647	0.0498	0.352	0.563	0.510	875
Lab. Dup.	0.810	0.417	0.887	0.569	647	-	-	-	-	-
LT-5	0.852	0.460	1.16	0.539	885	0.310	0.407	0.662	0.505	925
LT-8	0.522	0.354	1.20	0.575	1,300	0.825	0.574	0.591	0.476	920
Lab. Dop	1.29	0.594	0.913	0.523	1,300	-	-	-	-	-
LT-9	0.833	0.494	0.829	1.02	1,060	0.810	0.476	0.458	0.498	965

NA – Not Analyzed (Elemental Interference)
*CSU = Calculated Standard Uncertainty (2 sigma)
**TDS = Total Dissolved Solids
***TDS values for ICON samples taken from Table 4 of the July 29, 2022 ICON report (Miller 2022)

[2] "Elemental interference" is a term assigned by Eberline to indicate the presence of non-radiological element(s) that prevented performance of the specified analysis. This is of no consequence here as there was analysis of the split sample at Pace laboratory.



EIGHTEENTH JUDICIAL DISTRICT COURT
FOR THE PARISH OF IBERVILLE
STATE OF LOUISIANA

AUGUST J. LEVERT, JR., FAMILY, L.L.C., ET AL. *
VERSUS *
BP AMERICA PRODUCTION COMPANY *
DOCKET NO. 78953
DIVISION: "A"

EXPERT REPORT OF JOHN R. FRAZIER, Ph.D., CHP

I. INTRODUCTION

I have been retained by counsel for Defendant BP Production Company in the matter of *August J. Levert, Jr., Family, L.L.C., et al., v. BP America Production Company*, (18th Judicial District Court for the Parish of Iberville, State of Louisiana; Docket No. 78953; Division: "A") to assess the radiological conditions of certain property in the Grand River Field in Iberville Parish, Louisiana. Specifically, I have been asked to determine whether there is naturally occurring radioactive material (NORM) due to oil and gas operations on the Plaintiffs' property. I have been asked to review all available radiological data for the property.[1] I have also been asked to review the July 29, 2022 report by Gregory W. Miller, Wayne Prejean, and Jason S. Sills in this matter and provide opinions within my areas of expertise regarding that report.

II. OPINIONS

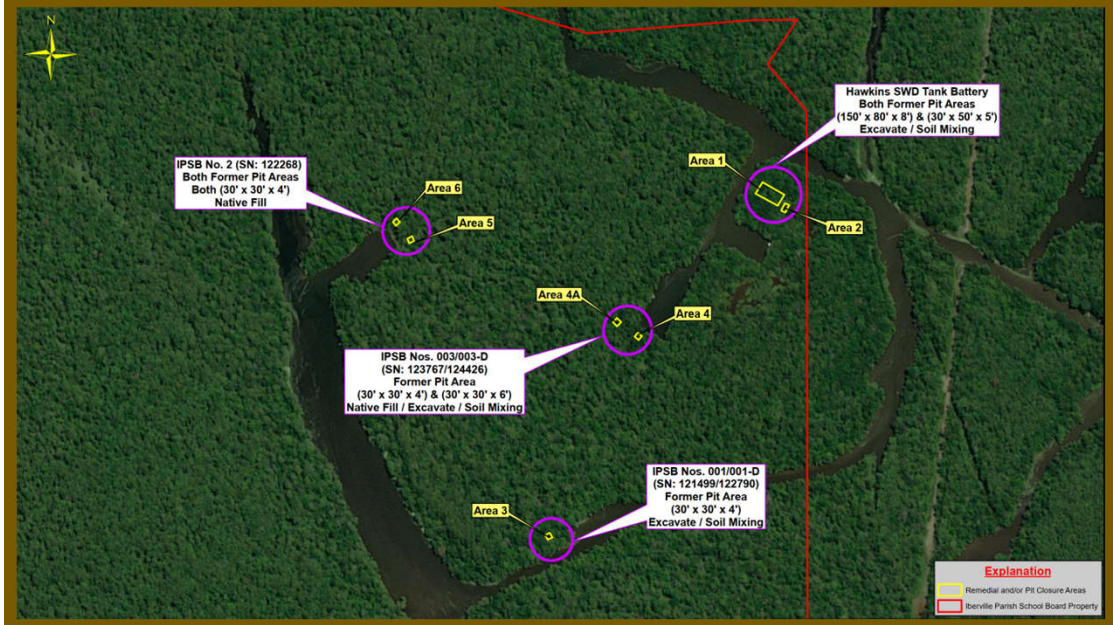
I have reached the following conclusion with a reasonable degree of scientific certainty:

1. There is no evidence of oilfield NORM-impacted soil on the subject property.
2. The ratios of concentrations of radium isotopes in the water from all monitoring wells are consistent with native soils and do not indicate the presence of NORM from oilfield operations. Groundwater samples were collected from five monitoring wells on the subject property. The ratios of concentrations of radium

[1] Soil and groundwater sampling data and radiological assessment of the western adjacent IPSB property was performed as part of a separate legacy lawsuit (*Iberville Parish School Board v. BP America Production Co., et.al* [18th JDC, Parish of Iberville, State of Louisiana, No. 72,605, Div. A]) and those data are considered here but, upon settlement of that litigation, those data and assessments are being evaluated under the direction of LDNR as part of the overall response to Conservation Order Nos. 018-024-001, 018-024-003, and 018-024-004.

Prepared by: Dr. John Frazier

IPSB Property Data



Assessment and Pit Closure Reports

PIT CLOSURE REPORT
State of Louisiana and the Iberville Parish School Board
v. BP America Production Company, et al.
18th Judicial Court, Division "A", Docket No. 72605
Grand River and Sullivan Lake Oil and Gas Fields
Section 16, Township 10 South, Range 11 East
LDNR OC Legacy Project Nos.
18-024-001, 18-024-002, 18-024-003, and 18-024-004
Plaquemine, Iberville Parish, Louisiana
September 08, 2022

Prepared for

Mr. Gary W. Snellgrove
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Source: Pit Closure Report dated September 08, 2022, prepared by HET.

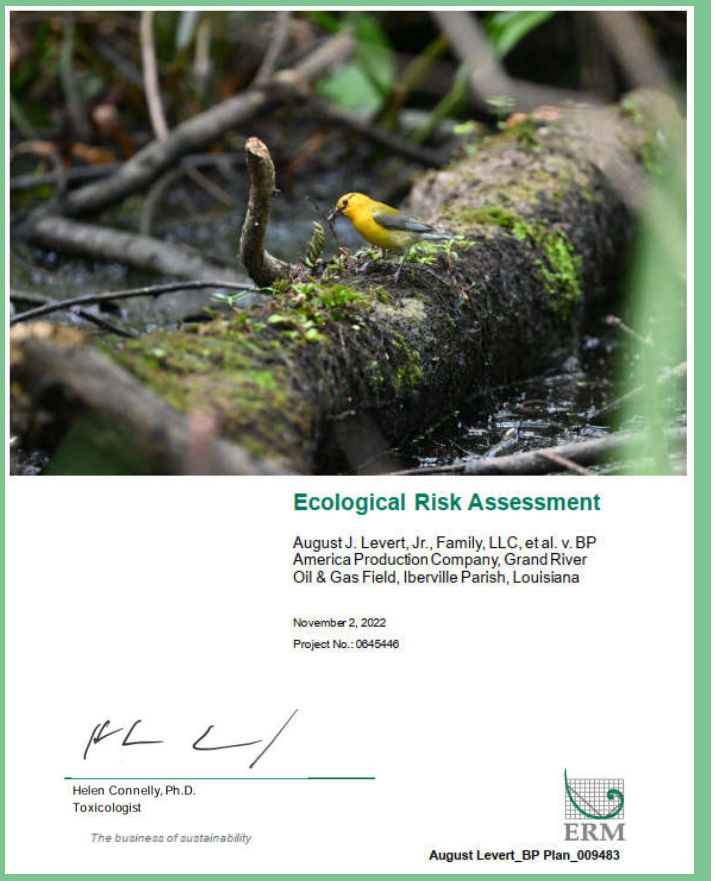
Ecological Risk Assessment

August Levert, Jr., Family, LLC, et al. v.

BP America Production Company

Docket No. 2022-8332-DNR-OCC

Prepared by: Helen Connelly, Ph.D.



Ecological Risk Assessment

August J. Levert, Jr., Family, LLC, et al. v. BP America Production Company, Grand River Oil & Gas Field, Iberville Parish, Louisiana

November 2, 2022

Project No.: 0645446

Helen Connelly, Ph.D.
Toxicologist

The business of sustainability

ERM

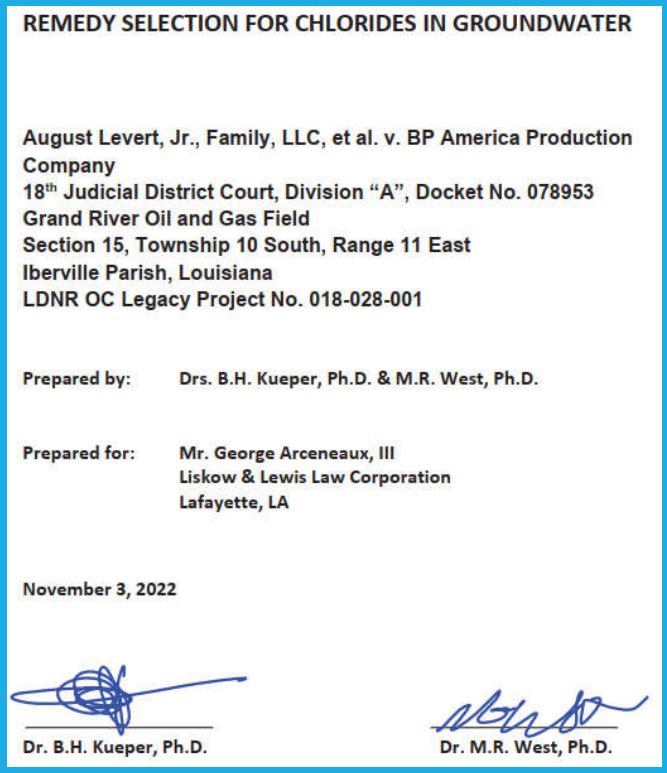
August Levert_BP Plan_009483

Remedy Selection for Chlorides in Groundwater

August Levert, Jr., Family, LLC, et al. v.

BP America Production Company

Docket No. 2022-8332-DNR-OCC



REMEDY SELECTION FOR CHLORIDES IN GROUNDWATER

August Levert, Jr., Family, LLC, et al. v. BP America Production Company
18th Judicial District Court, Division "A", Docket No. 078953
Grand River Oil and Gas Field
Section 15, Township 10 South, Range 11 East
Iberville Parish, Louisiana
LDNR OC Legacy Project No. 018-028-001

Prepared by: **Drs. B.H. Kueper, Ph.D. & M.R. West, Ph.D.**

Prepared for: **Mr. George Arceneaux, III**
Liskow & Lewis Law Corporation
Lafayette, LA

November 3, 2022

Dr. B.H. Kueper, Ph.D. **Dr. M.R. West, Ph.D.**

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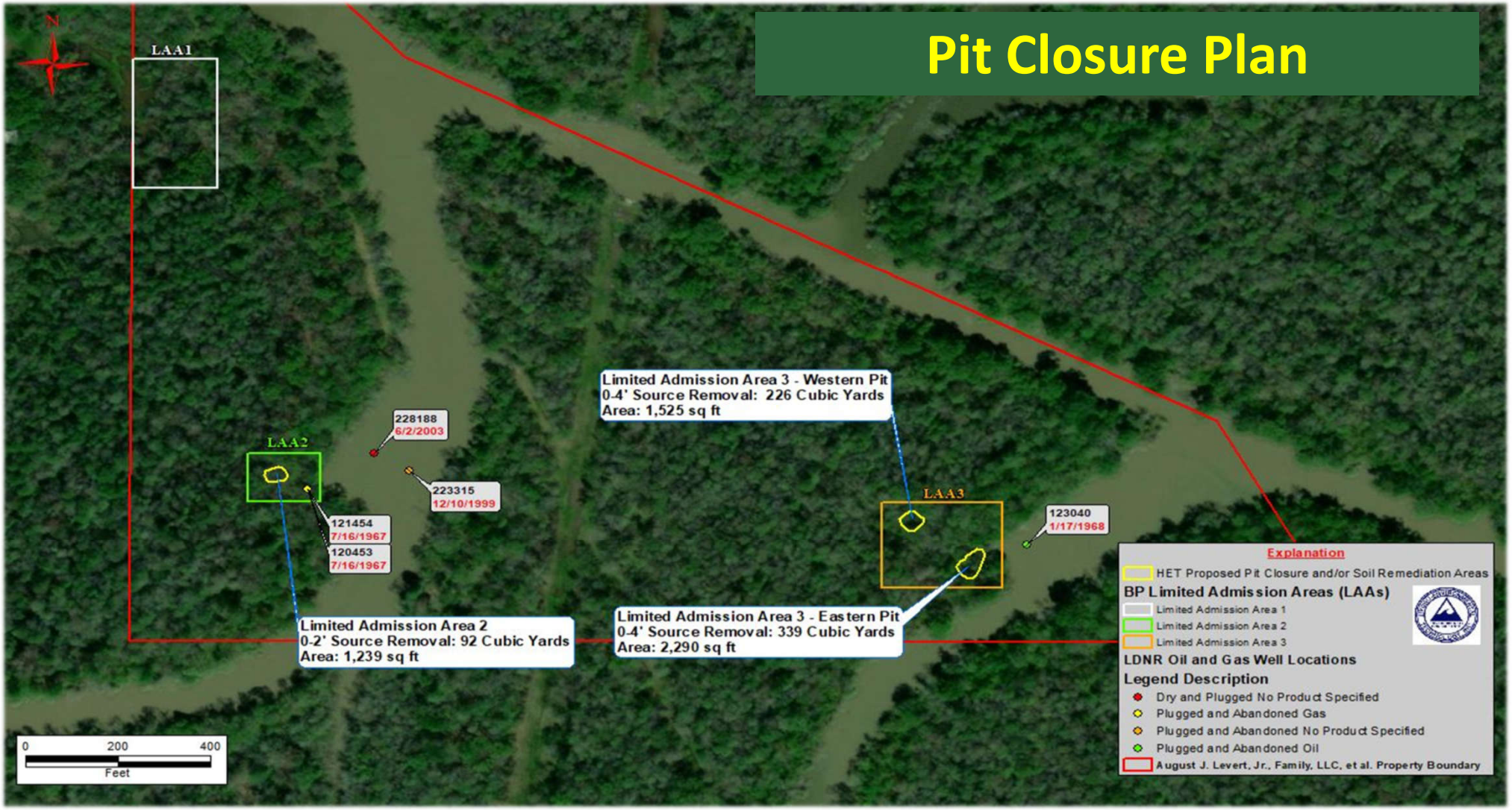
BP Most Feasible Plan

- Pit Closure utilizing excavation and off-site disposal that meets Statewide Order 29-B Section 313 standards.
- Groundwater monitoring after pit closure to confirm constituent concentration meet RECAP and is in declining conditions as defined in RECAP.

Pit Closure Plan



Site Photographs from IPSB Soil Remedial Activities

Site Photographs from IPSB Soil Remedial Activities

Groundwater Remedy Evaluation and Selection in Support of MFP

Groundwater Evaluation and Remediation Options

- Closure under current conditions based on RECAP standards
- Pump and Treat (P&T) remediation
- Monitored Natural Attenuation (MNA)

Groundwater Remedy Selection

- Overall protectiveness (human health and environment)
- Regulatory compliance
- Effectiveness (short-term and long-term)
- Reduction of toxicity, mobility or volume
- Implementability
- Cost

USEPA (1990, 1993, 1997)

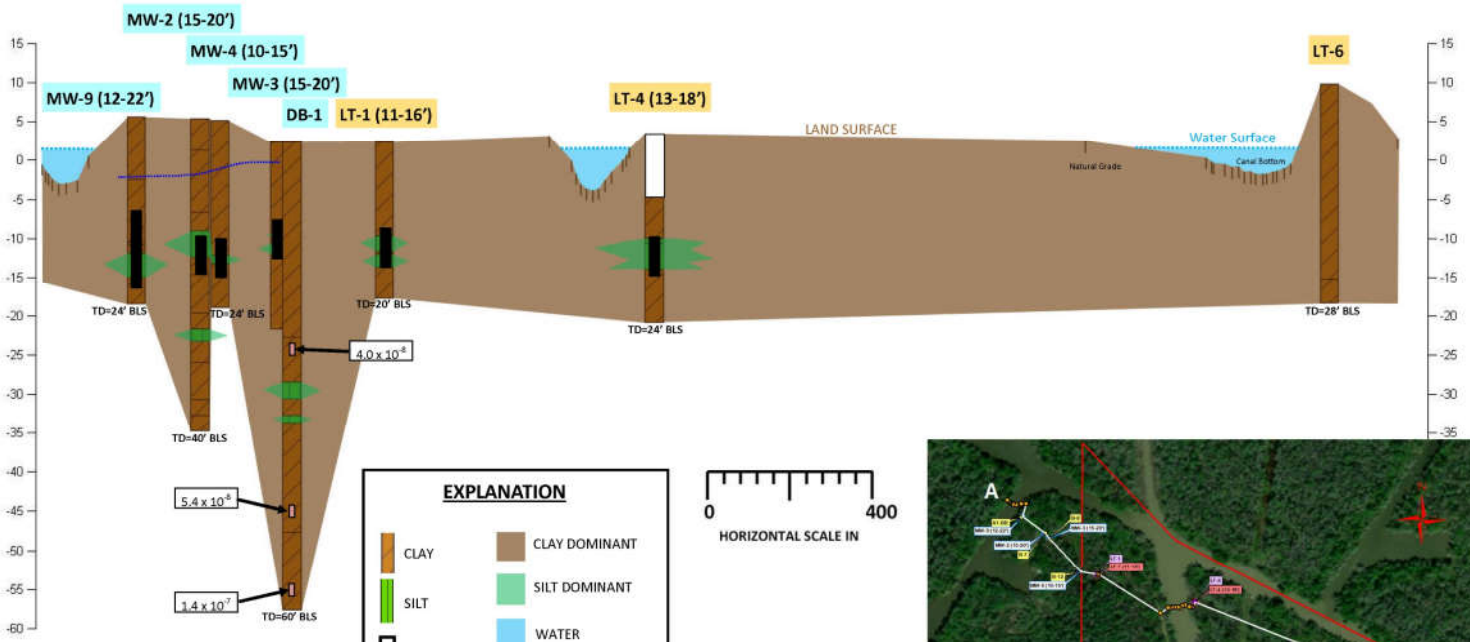
Key Considerations for Levert Groundwater

- The potential uses of the property are principally recreational.
- The geological setting consists of an overall dominant clay lithology as part of a backswamp environment.
- Useable groundwater is encountered well below the shallow water bearing zone within the Atchafalaya aquifer at depths greater than 100 feet below land surface.
- Shallow water bearing silts exist at depths between 11-16 feet below land surface that have been classified as unusable (GW3).
- Discontinuous silts with low transmissivity in a diffusion dominated environment.
- Residual constituent concentrations meet RECAP standards. No risk to or impairment of human health or the environment exists.
- There are no exposure pathways to the shallow water bearing zone.

Pump and Treat Remedy Evaluation

- Requires a large number of recovery wells
- Requires long term operation and maintenance, including infrastructure

P&T Remedy – Unreliable Future Performance



- Discontinuous shallow water bearing zone
- Poor implementability due to back-diffusion from clay.

Long-Term Effectiveness of Potential P&T Plan

Remediate to Background Chlorides (124 mg/L)

PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND
AUGUST J. LEVERT, ET AL V BP AMERICA PRODUCTION CO.; 18TH JDC; DOCKET #78953
GRAND RIVER FIELD, IBERVILLE PARISH, LOUISIANA
PREPARED FOR JONES, SWANSON, HUDDELL, & DASCHBACH LLC

Governing Equations:

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

PORE VOLUME FLUSHING AND REMEDIATION TIME

PARAMETER	UNIT	CHLORIDE
Impacted Thickness	ft	7
Porosity	unitless	0.3
Area of Plume	ft^2	2,087,817
Pore Volume	gal	32,795,429
Retardation Factor (Rf)	unitless	1
Target Concentration (Cf)	unitless	124
Initial Concentration (Co)	unitless	10,931
NPV		4.5
Recovery volume to achieve remediation target	gal	146,893,237
Aquifer pumping rate (single well)	gpm	0.135
Number of recovery wells	ea	40
Depth of recovery wells	ft	20
GW Recovery Rate	gpd	7,776
Time to reach remedial target	years	51.8

From ICON (2022), Appendix F, August Levert_BP Plan_002947

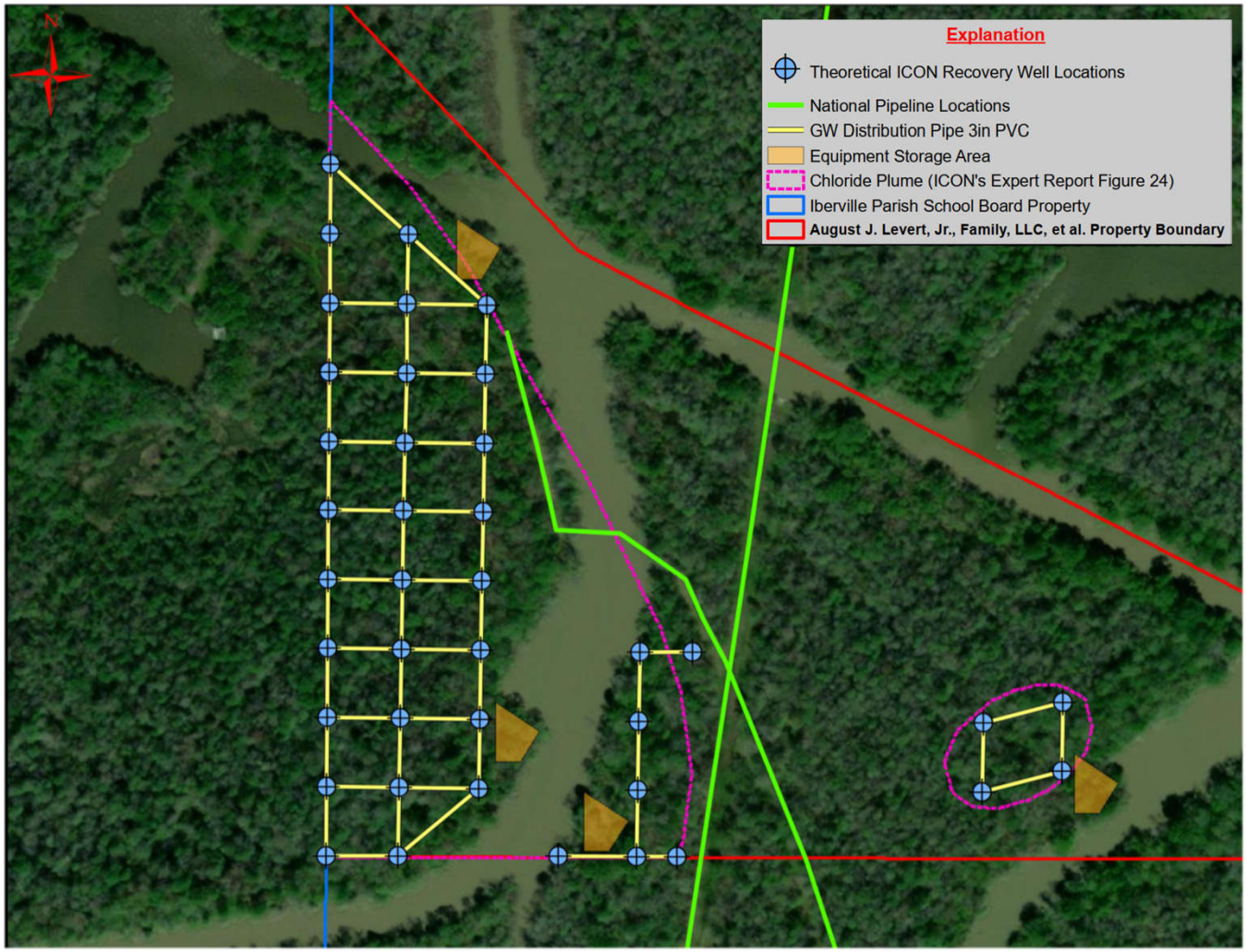
Estimated Time to Reach Background Chloride Concentration in Groundwater (124 mg/L)

Dataset	Groundwater Pumping Rate per Well (gpd)[1]	RECAP Well Yield (gpd)	Number of Pumping Wells[1]	Total Groundwater Recovery Rate (gpd)	Groundwater Recovery Volume to Achieve Remediation Target (gal) [1]	Time to Reach Remedial Target (yrs)
ICON (2022) P&T Remedy Calculations	194.4		40	7776	146,893,237	51.8
ICON (2015) RECAP Well Yield (ICON Slug Testing in ICON Wells)		156	40	6240	146,893,237	64
HET (2022) RECAP Well Yield (ICON Slug Testing in ICON Wells)		97	40	3880	146,893,237	104
HET (2016) RECAP Well Yield (HET Slug Testing in HET Wells)		13	40	520	146,893,237	774

Average = 248 years

[1] From ICON (2022) Pore Volume Flushing Analysis – Remediation to Background, Appendix F, August Levert_BP Plan_002947

- Recovery System
  - 40 Recovery Wells
  - Storage Tanks
  - Generator/Fuel Tank (750,000 gallons for recovery wells)
  - 8,800 feet of piping
- RO System
  - Pre-Treatment Unit
  - RO Unit
  - Storage Tanks for Retentate
  - Generator/Fuel Tank (869,000 gallons for RO System)
- Dock/Barge Facility (Disposal Option)
- 2 SWD Wells (Injection Option)
  - SWD Pumps
  - Generator/Fuel



Theoretical Groundwater Remediation System based on ICON, Appendix F, Groundwater Remediation Outline

HIGH COST OF P&T REMEDY (Background)

$27.5M – $33.1M

REMEDIATION OF SOIL AND GROUNDWATER TO BACKGROUND STANDARDS

	Volume Reduction w/offsite disposal of water	Volume Reduction w/onsite disposal of water
Soil Remediation (to 8' bls)	$4,009,842	$4,009,842
Groundwater Remediation	$28,068,409	$10,604,436
RO Unit Capital and O&M costs	$5,003,106	$5,003,106
SWD Capital and O&M costs	----	$11,910,924
TOTAL	**$37,081,357**	**$31,528,308**

Theoretical From Exhibit 1: August_Levert_BP_Plan_002078

OVERVIEW OF P&T CHALLENGES

- Poor implementability
  - Low hydraulic conductivity
  - Discontinuous shallow water bearing zones
- High and variable (i.e., unknown) costs
- Invasive and disruptive impact on the property
- Unreliable future performance
- Unnecessary due to concentrations lacking impact to human health and the environment.

Monitored Natural Attenuation

- MNA relies upon the Natural Assimilative Capacity of the subsurface to reduce concentrations in groundwater over time (USEPA, 1999).
- MNA may be applied as a stand-alone remedial process (RECAP, 2003).
- MNA will meet the objective of reducing concentrations in groundwater within a timeframe that is reasonable compared to P&T.
- MNA has good implementability.

2.16: Monitored Natural Attenuation

Monitored natural attenuation is defined as the biodegradation, dispersion, dilution, sorption, volatilization, and/or chemical and biochemical transformation/stabilization of constituents to effectively reduce constituent concentration, toxicity, mobility, mass, or volume to levels that are protective of human health and the ecosystem (USEPA ORD, OSWER). Monitored natural attenuation may be applied as a stand alone remedial process or included as a unit operation of a remedial process. It should be evaluated and compared to other remedial processes to determine which is the most appropriate process for a site. As with any remedial process, monitored natural attenuation should be selected only where it can meet all of the remedial goals for the site and where it can obtain those goals in an appropriate timeframe. An appropriate timeframe is one that is reasonable compared to that offered by other remedial methods.

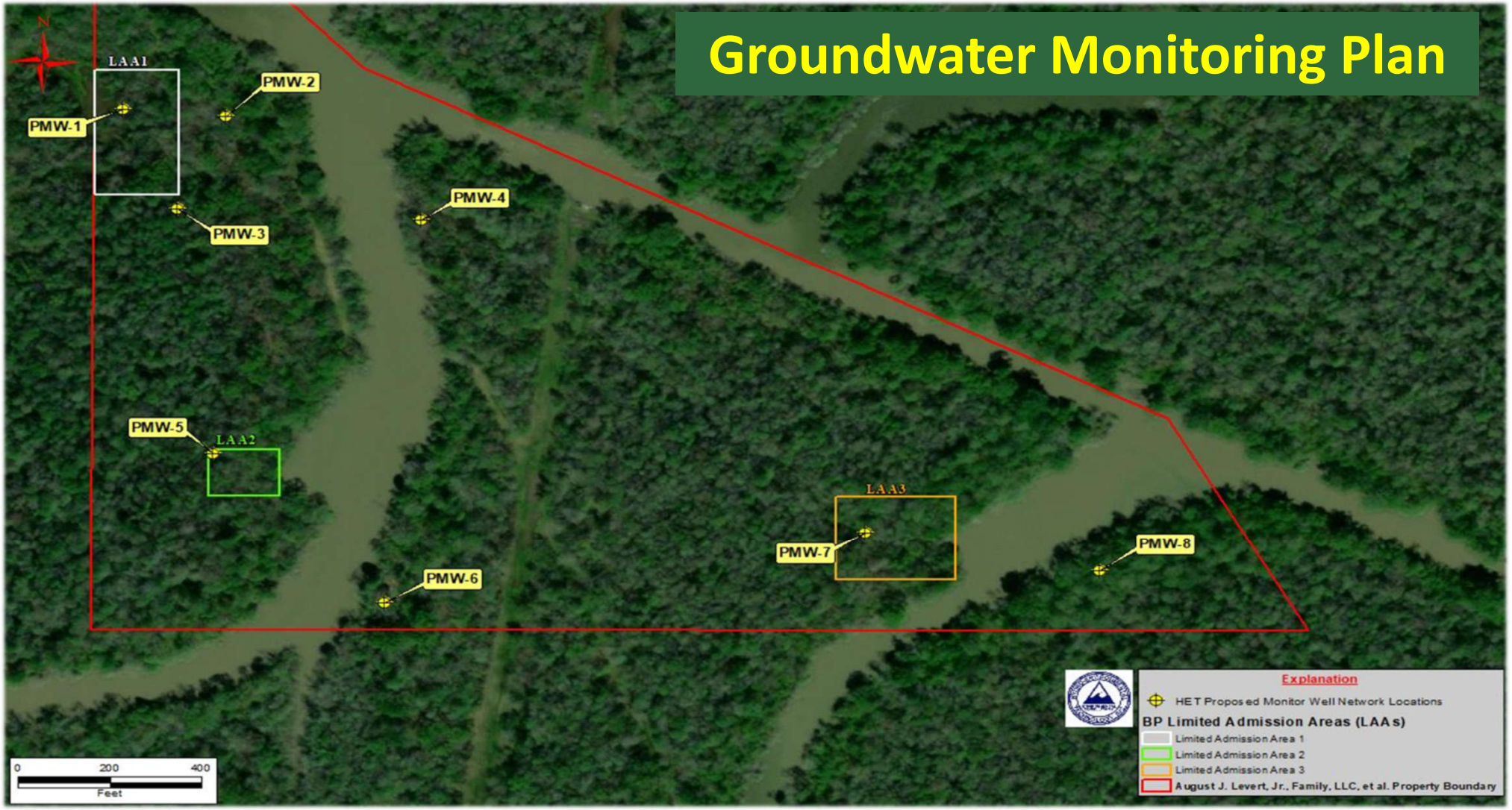
RECAP

- All sources of COC have been controlled ☐
- Plume has reached declining conditions and the area of constituent concentrations above SS is not expanding ☐
- Constituents are susceptible to natural degradation processes ☐
- Constituent concentrations reaching human or ecological receptors do not result in unacceptable risks ☐
- Conditions are favorable for degradation and/or natural attenuation of the COC ☐

Summary & Conclusions on Groundwater

- Shallow discontinuous water bearing zone is not a usable resource (i.e., GW3)
- Implementing a P&T remedy will be damaging to the property
- MNA timeframe is comparable to P&T
- Groundwater constituent concentrations meet RECAP standards.
- MNA is the appropriate groundwater remedy
- Sources are being mitigated and constituent concentrations are in a declining (beneficial) condition

Groundwater Monitoring Plan



HET Proposed Monitor Well Network Locations

BP Most Feasible Plan Conclusion

- Pit Closure utilizing excavation and off-site disposal that meets Statewide Order 29-B Section 313 standards.
- Groundwater monitoring after pit closure to confirm constituent concentration meet RECAP and is in declining conditions as defined in RECAP.

Text Table 4
Itemized Costs for Soil Remediation, Pit Closure Activities, and Groundwater Monitoring
August Levert Property
Grand River Oil and Gas Field Oil and Gas Field

Proposed Remediation Option	Proposed Cost Estimates
Excavation and off-site disposal of all pits associated with LAAs 2 and 3	$891,059.80
Mitigation Banking	$20,000.00
Installation of Permanent Monitor Wells as part of the Groundwater Monitoring Network	$66,680.00
Groundwater Monitoring on a quarterly basis for a period of one (1) year	$144,300.00
HET Safety Management, Project Management, and Reporting Requirements	$49,360.00
Total Estimated Cost	$1,171,399.80