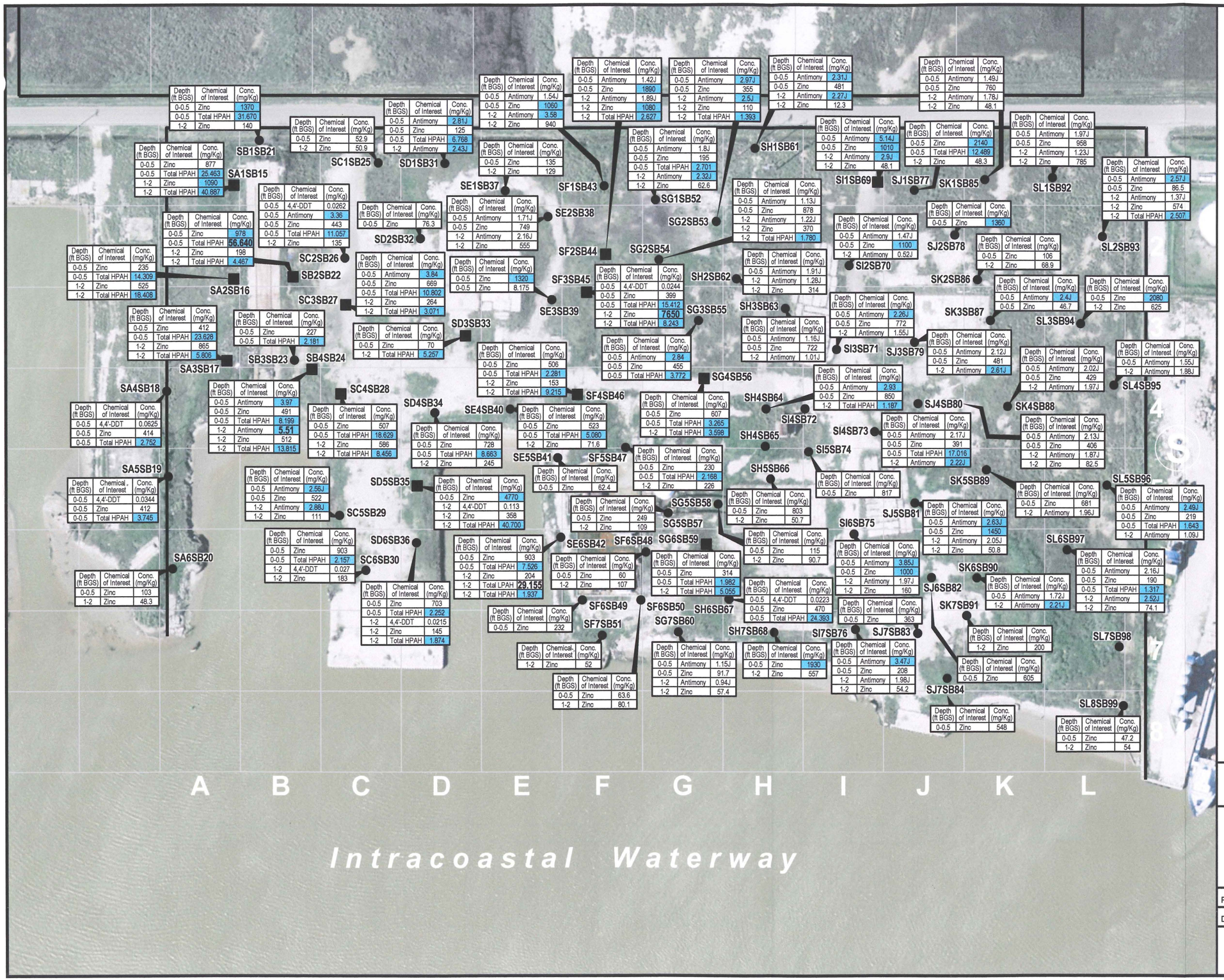

EXPLANATION

- Gulfco Marine Maintenance Site Boundary (approximate)
- ● Shallow Soil Sample (0-2 ft)
- ■ Shallow (0-2 ft) and Deep (4-5 ft) Soil Sample

Notes:
1. Data Qualifier: J = Estimated value.
2. BGS = below ground surface.
3. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for background soil data).
4. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Tables 1 & 2).
The screening levels are:
Antimony - 0.27 mg/kg
4,4'-DDT - 0.021 mg/kg
Zinc - 46 mg/kg
Total LPAH - 29 mg/Kg
Total HPAH - 1.1 mg/Kg

N

Approx. Scale in Feet
0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 6A
DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - SOUTH AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

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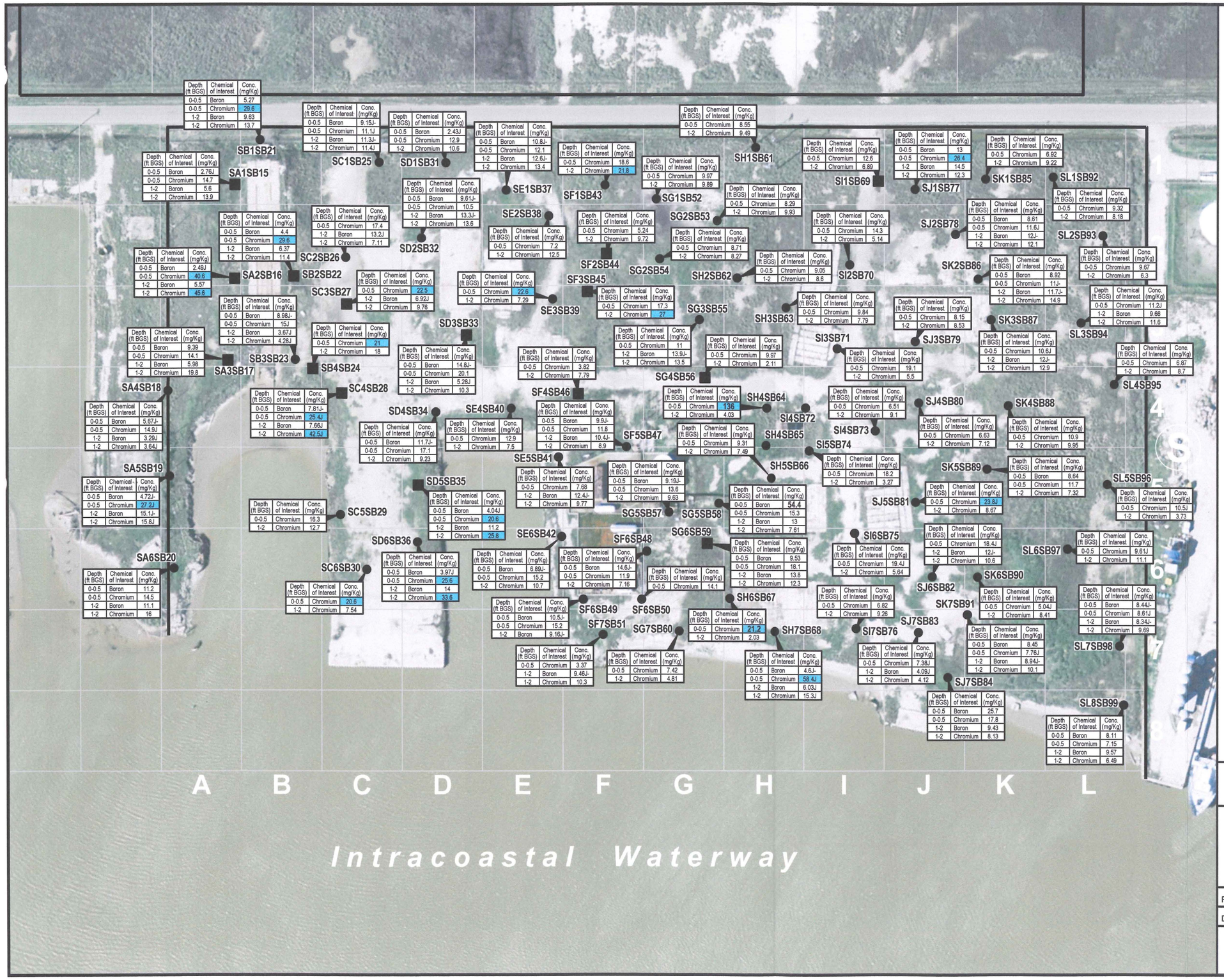


EXPLANATION

- Gulfco Marine Maintenance Site Boundary (approximate)
- ● Shallow Soil Sample (0-2 ft)
- ■ Shallow (0-2 ft) and Deep (4-5 ft) Soil Sample

Notes:
1. Data Qualifiers: J = Estimated value.
   J- = Estimated value, biased low.
2. BGS = below ground surface.
3. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for background soil data).
4. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Tables 1 & 2).
The screening levels are:
Boron - 0.5 mg/Kg
Chromium - 0.4 mg/Kg

N

Approx. Scale in Feet

0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

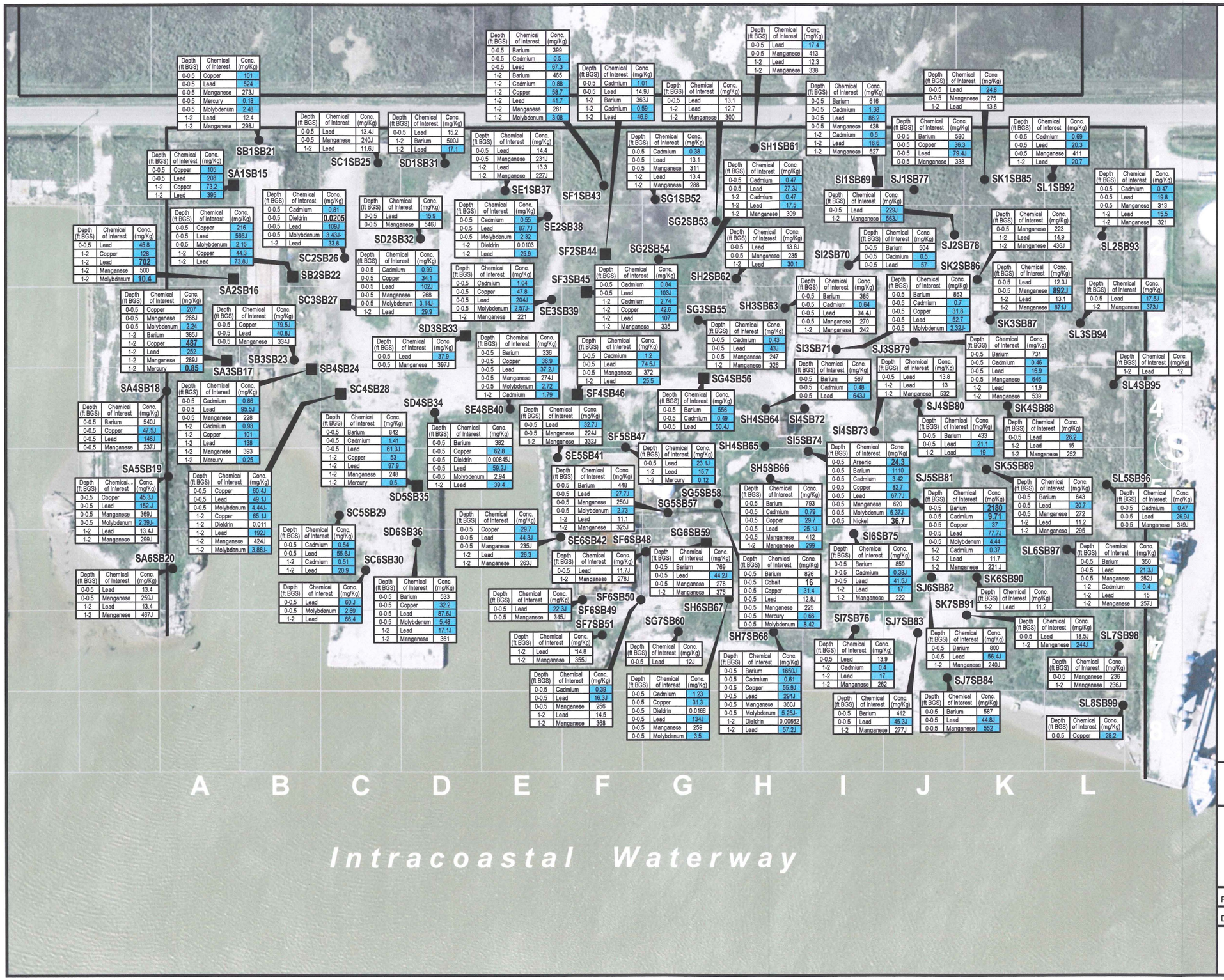
GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 6B

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - SOUTH AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Gulfco Marine Maintenance Site Boundary (approximate)
- ● Shallow Soil Sample (0-2 ft)
- ■ Shallow (0-2 ft) and Deep (4-5 ft) Soil Sample

Notes:

1. Data Qualifiers: J = Estimated value.
   J- = Estimated value, biased low.
2. BGS = below ground surface.
3. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for background soil data).
4. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Tables 1 & 2).
The screening levels are:
Arsenic - 18 mg/Kg
Barium - 330 mg/Kg
Cadmium - 0.36 mg/Kg
Copper - 28 mg/Kg
Dieldrin - 0.0049 mg/Kg
Lead - 11 mg/Kg
Manganese - 220 mg/Kg
Mercury - 0.1 mg/Kg
Molybdenum - 2 mg/Kg
Nickel - 30 mg/Kg

N

Approx. Scale in Feet

0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 6C

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - SOUTH AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
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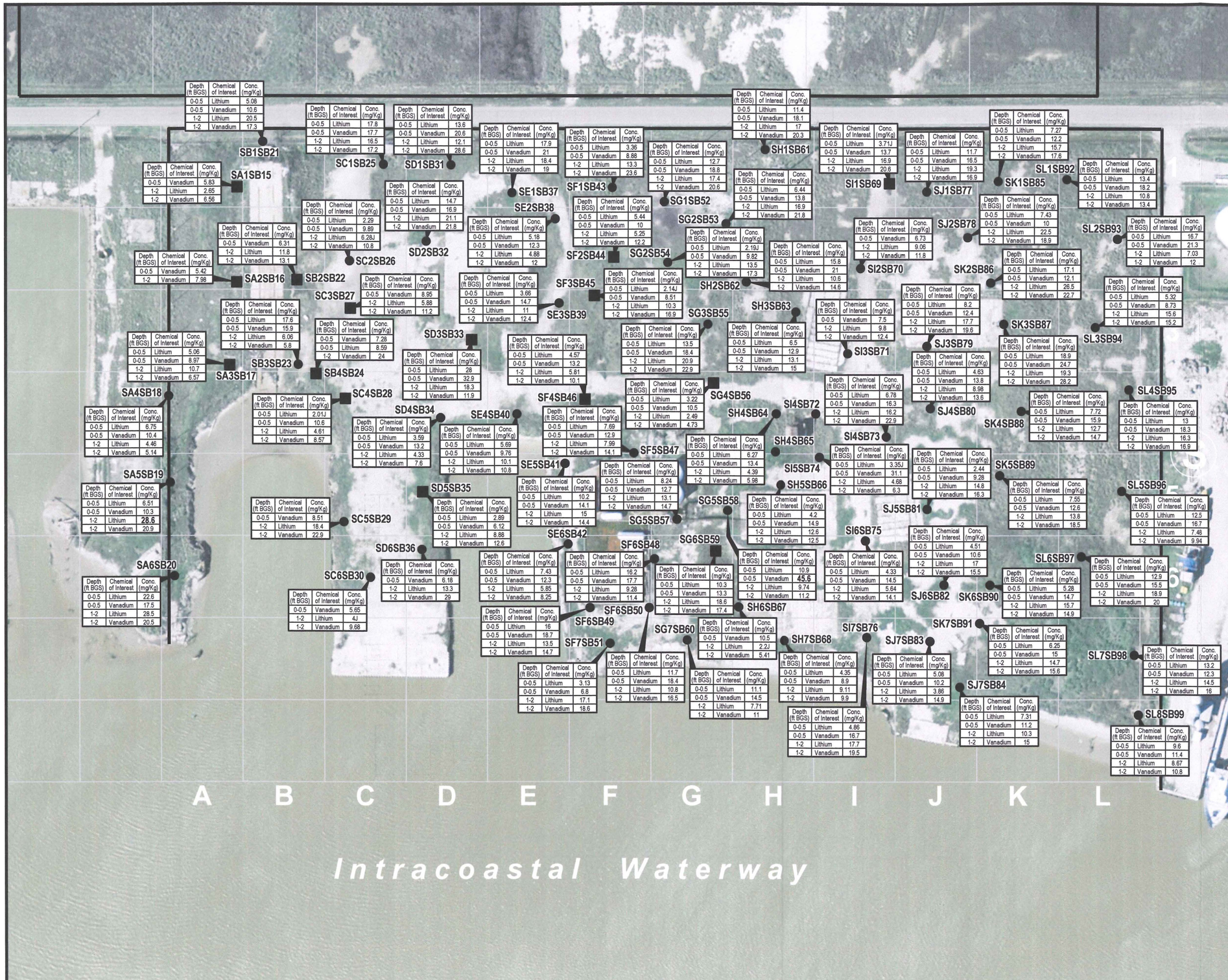

EXPLANATION

Gulfco Marine Maintenance Site Boundary (approximate)

● Shallow Soil Sample (0-2 ft)

■ Shallow (0-2 ft) and Deep (4-5 ft) Soil Sample

Notes:
1. Data Qualifiers: J = Estimated value. J- = Estimated value, biased low.
2. BGS = below ground surface.
3. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Tables 1 & 2).
The screening levels are:
Lithium - 2 mg/Kg
Vanadium - 2 mg/Kg

Approx. Scale in Feet

0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 6D

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - SOUTH AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Gulfco Marine Maintenance Site Boundary (approximate)
- ● Shallow (0-2 ft) Soil Sample
- ▲ Shallow (0-2 ft) and Deep (4+ ft) Soil Sample
- ⊠ Geotechnical Soil Boring

Notes:
1. Data Qualifiers: J = Estimated value. J- = Estimated value, biased low.
2. BGS = below ground surface.
3. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for background soil data).
4. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Tables 3 & 4).
The screening levels are:
Antimony - 0.27 mg/Kg
Barium - 330 mg/Kg
Copper - 28 mg/Kg
Dieldrin - 0.0049 mg/Kg
Nickel - 30 mg/Kg
Total HPAH - 1.1 mg/Kg
Zinc - 46 mg/Kg

Approx. Scale in Feet
0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 7A
DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - NORTH AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
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Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	5.17J-
0-0.5	Chromium	11.7
0-0.5	Lithium	20
0-0.5	Vanadium	13.6
1-2	Boron	314J
1-2	Chromium	16.5
1-2	Lithium	**32.2**
1-2	Vanadium	18.5

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	5.07J
0-0.5	Chromium	10.7
0-0.5	Lithium	16.1
0-0.5	Vanadium	7.85
1-2	Boron	4.33
1-2	Chromium	11.1
1-2	Lithium	17.3
1-2	Vanadium	12.2

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	9.21J-
0-0.5	Chromium	12.9
0-0.5	Lithium	16.2
0-0.5	Vanadium	22.6

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	4.22J
0-0.5	Chromium	12.7
0-0.5	Lithium	18.3
0-0.5	Vanadium	25.5
1-2	Chromium	11.2
1-2	Lithium	17.3
1-2	Vanadium	24.2

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	11.2
0-0.5	Lithium	15.7
0-0.5	Vanadium	25.7
1-2	Boron	6.79J-
1-2	Chromium	12
1-2	Lithium	15.8
1-2	Vanadium	16.2

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	**39.2**
0-0.5	Chromium	128
0-0.5	Lithium	18.8
0-0.5	Vanadium	**45.8**
1-2	Boron	16.1
1-2	Chromium	17.9
1-2	Lithium	26.8
1-2	Vanadium	26.6

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	5.25J
0-0.5	Chromium	8.75
0-0.5	Lithium	14.3
0-0.5	Vanadium	9.5
1-2	Boron	5.37J-
1-2	Chromium	10.9
1-2	Lithium	17.2
1-2	Vanadium	8.34

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
1-1.5	Boron	14.7J-
1-1.5	Chromium	18.1
1-1.5	Lithium	16.9
1-1.5	Vanadium	34.4
1.5-2	Boron	15.6J-
1.5-2	Chromium	22.8
1.5-2	Lithium	20.2
1.5-2	Vanadium	21.9

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	9.84J-
0-0.5	Chromium	12.4
0-0.5	Lithium	19
0-0.5	Vanadium	20.2
1-2	Boron	6.04J-
1-2	Chromium	13.2
1-2	Lithium	19.1
1-2	Vanadium	24.8

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	17.6
0-0.5	Chromium	24
0-0.5	Lithium	26.6
0-0.5	Vanadium	26.8
1.5-2	Boron	13.8
1.5-2	Chromium	14.8
1.5-2	Lithium	21.5
1.5-2	Vanadium	24.2

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	3.15J
0-0.5	Chromium	10.2
0-0.5	Lithium	19.1
0-0.5	Vanadium	10.5
1-2	Boron	3.84J
1-2	Chromium	7.76
1-2	Lithium	13.1
1-2	Vanadium	8.46

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.8	Boron	10.8J-
0-0.8	Chromium	23.1
0-0.8	Lithium	11.7
0-0.8	Vanadium	17.1

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
1-2	Boron	15.1J-
1-2	Chromium	20.1
1-2	Lithium	28.8
1-2	Vanadium	27

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	18
0-0.5	Chromium	19.6
0-0.5	Lithium	23.9
0-0.5	Vanadium	30.1
1.5-2	Boron	15.4
1.5-2	Chromium	16.5
1.5-2	Lithium	21.7
1.5-2	Vanadium	22.1

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	9J-
0-0.5	Chromium	11.4
0-0.5	Lithium	19.6
0-0.5	Vanadium	16.9
1-2	Boron	6.89J-
1-2	Chromium	10.2
1-2	Lithium	14
1-2	Vanadium	13.3

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	8.98
0-0.5	Lithium	15.4
0-0.5	Vanadium	19.5
1-2	Chromium	13.1
1-2	Lithium	23.8
1-2	Vanadium	27.1

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Boron	6.11J-
0-0.5	Chromium	9.59
0-0.5	Lithium	14.4
0-0.5	Vanadium	14.2
1-2	Boron	13.7J-
1-2	Chromium	13.4
1-2	Lithium	19.6
1-2	Vanadium	16.9

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	30
0-0.5	Lithium	2.59
0-0.5	Vanadium	10.6
1-2	Chromium	15
1-2	Lithium	11.4
1-2	Vanadium	19.5

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	7.9
0-0.5	Lithium	13.4
0-0.5	Vanadium	17.8
1-2	Chromium	15.9
1-2	Lithium	27.6
1-2	Vanadium	29.8

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	11.5
0-0.5	Lithium	13.2
0-0.5	Vanadium	19.6
1-2	Chromium	15.8
1-2	Lithium	25.7
1-2	Vanadium	32

EXPLANATION

- Gulfco Marine Maintenance Site Boundary (approximate)
- ● Shallow (0-2 ft) Soil Sample
- ▲ Shallow (0-2 ft) and Deep (4+ ft) Soil Sample
- ⊠ Geotechnical Soil Boring

Notes:
1. Data Qualifiers: J = Estimated value. J- = Estimated value, biased low.
2. BGS = below ground surface.
3. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for background soil data).
4. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Tables 3 & 4).
The screening levels are:
Boron - 0.5 mg/Kg
Chromium - 0.4 mg/Kg
Lithium - 2 mg/Kg
Vanadium - 2 mg/Kg

Approx. Scale in Feet
0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

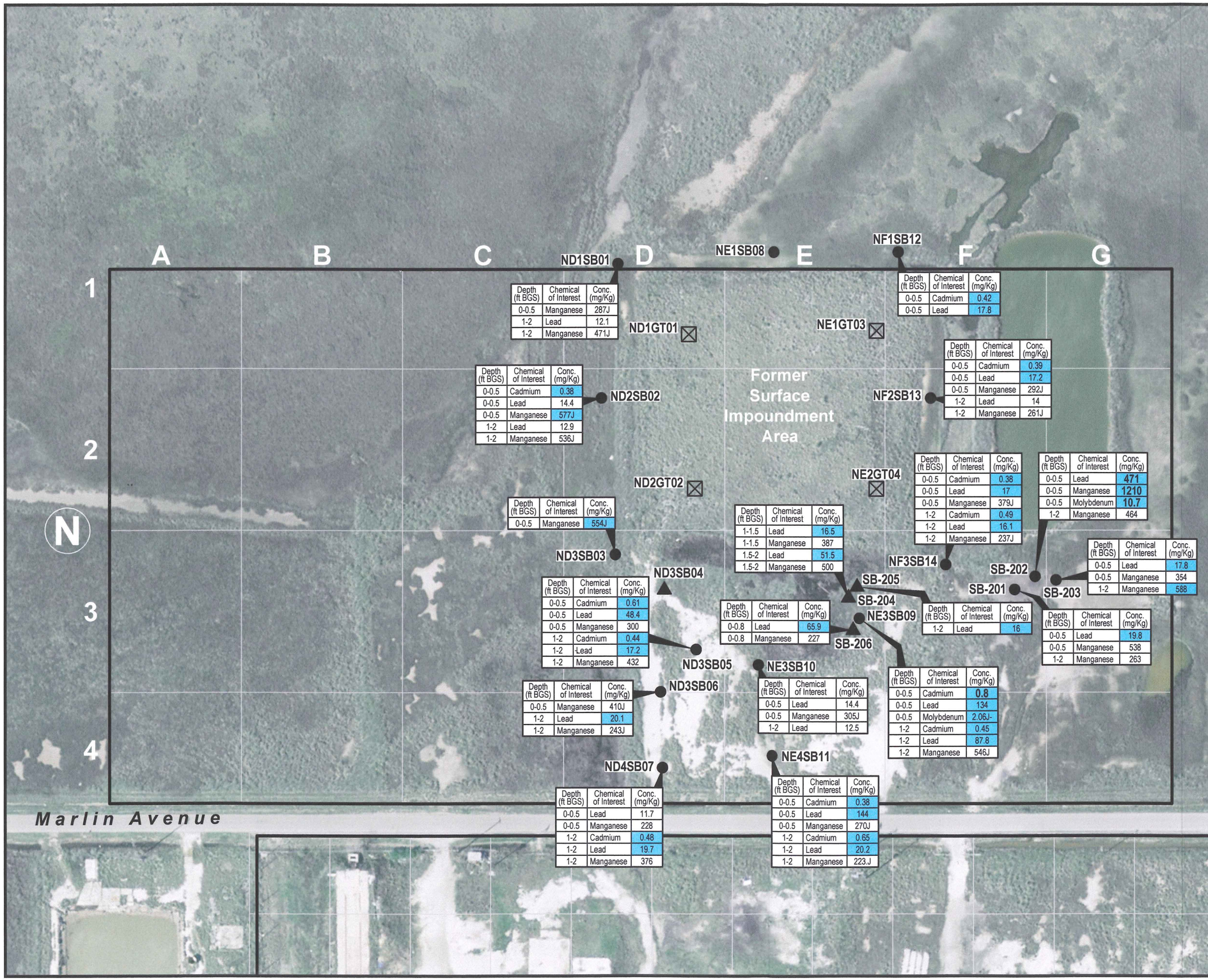
GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 7B

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - NORTH AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Manganese	287J
1-2	Lead	12.1
1-2	Manganese	471J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Cadmium	0.42
0-0.5	Lead	17.8

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Cadmium	0.38
0-0.5	Lead	14.4
0-0.5	Manganese	577J
1-2	Lead	12.9
1-2	Manganese	536J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Cadmium	0.39
0-0.5	Lead	17.2
0-0.5	Manganese	292J
1-2	Lead	14
1-2	Manganese	261J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Manganese	554J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
1-1.5	Lead	16.5
1-1.5	Manganese	387
1.5-2	Lead	51.5
1.5-2	Manganese	500

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Cadmium	0.38
0-0.5	Lead	17
0-0.5	Manganese	379J
1-2	Cadmium	0.49
1-2	Lead	16.1
1-2	Manganese	237J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Lead	471
0-0.5	Manganese	1210
0-0.5	Molybdenum	10.7
1-2	Manganese	464

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Lead	17.8
0-0.5	Manganese	354
1-2	Manganese	588

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Cadmium	0.61
0-0.5	Lead	48.4
0-0.5	Manganese	300
1-2	Cadmium	0.44
1-2	Lead	17.2
1-2	Manganese	432

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.8	Lead	65.9
0-0.8	Manganese	227

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
1-2	Lead	16

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Lead	19.8
0-0.5	Manganese	538
1-2	Manganese	263

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Manganese	410J
1-2	Lead	20.1
1-2	Manganese	243J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Lead	14.4
0-0.5	Manganese	305J
1-2	Lead	12.5

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Cadmium	0.8
0-0.5	Lead	134
0-0.5	Molybdenum	2.06J-
1-2	Cadmium	0.45
1-2	Lead	87.8
1-2	Manganese	546J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Lead	11.7
0-0.5	Manganese	228
1-2	Cadmium	0.48
1-2	Lead	19.7
1-2	Manganese	376

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Cadmium	0.38
0-0.5	Lead	144
0-0.5	Manganese	270J
1-2	Cadmium	0.65
1-2	Lead	20.2
1-2	Manganese	223.J

EXPLANATION

- Gulfco Marine Maintenance Site Boundary (approximate)
- ● Shallow (0-2 ft) Soil Sample
- ▲ Shallow (0-2 ft) and Deep (4+ ft) Soil Sample
- ⊠ Geotechnical Soil Boring

Notes:
1. Data Qualifiers: J = Estimated value. J- = Estimated value, biased low.
2. BGS = below ground surface.
3. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for background soil data).
4. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Tables 3 & 4).
The screening levels are:
Cadmium - 0.36 mg/Kg
Lead - 11 mg/Kg
Manganese - 220 mg/Kg
Molybdenum - 2 mg/Kg

N

Approx. Scale in Feet

0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

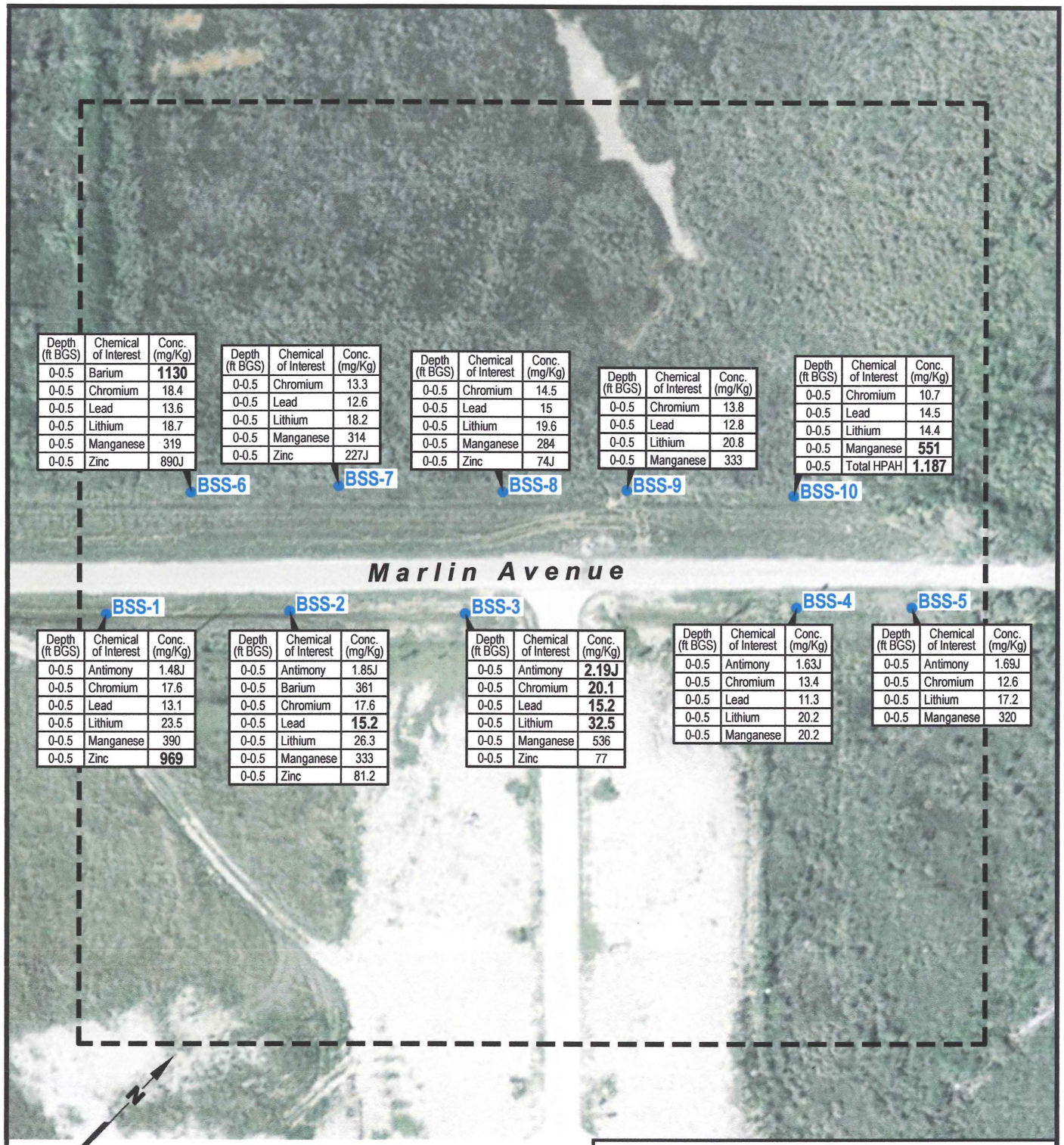
GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 7C

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - NORTH AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Barium	**1130**
0-0.5	Chromium	18.4
0-0.5	Lead	13.6
0-0.5	Lithium	18.7
0-0.5	Manganese	319
0-0.5	Zinc	890J

BSS-6

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	13.3
0-0.5	Lead	12.6
0-0.5	Lithium	18.2
0-0.5	Manganese	314
0-0.5	Zinc	227J

BSS-7

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	14.5
0-0.5	Lead	15
0-0.5	Lithium	19.6
0-0.5	Manganese	284
0-0.5	Zinc	74J

BSS-8

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	13.8
0-0.5	Lead	12.8
0-0.5	Lithium	20.8
0-0.5	Manganese	333

BSS-9

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chromium	10.7
0-0.5	Lead	14.5
0-0.5	Lithium	14.4
0-0.5	Manganese	**551**
0-0.5	Total HPAH	**1.187**

BSS-10

BSS-1

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Antimony	1.48J
0-0.5	Chromium	17.6
0-0.5	Lead	13.1
0-0.5	Lithium	23.5
0-0.5	Manganese	390
0-0.5	Zinc	**969**

BSS-2

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Antimony	1.85J
0-0.5	Barium	361
0-0.5	Chromium	17.6
0-0.5	Lead	**15.2**
0-0.5	Lithium	26.3
0-0.5	Manganese	333
0-0.5	Zinc	81.2

BSS-3

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Antimony	**2.19J**
0-0.5	Chromium	**20.1**
0-0.5	Lead	**15.2**
0-0.5	Lithium	**32.5**
0-0.5	Manganese	536
0-0.5	Zinc	77

BSS-4

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Antimony	1.63J
0-0.5	Chromium	13.4
0-0.5	Lead	11.3
0-0.5	Lithium	20.2
0-0.5	Manganese	20.2

BSS-5

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Antimony	1.69J
0-0.5	Chromium	12.6
0-0.5	Lithium	17.2
0-0.5	Manganese	320

Approx. Scale in Feet

0 40 80

EXPLANATION

Background Soil Area Boundary (per Figure 8 of Field Sampling Plan)

BSS-1 ● Approximate Background Soil Sample Location

Source of photo:
H-GAC, Texas aerial photograph, 2006.

Notes:
1. Background Area located approximately 2,000 feet east of Gulfco site.
2. J = Estimated value.
3. BGS = Below ground surface.
4. Bold values are the maximum measured concentration for that compound.

* The compounds shown in the figure are the compounds that were detected at a concentration greater than the screening level (See Table 5).
The screening levels are:
Antimony - 0.27 mg/Kg
Chromium - 0.4 mg/Kg
Lead - 11 mg/Kg
Lithium - 2 mg/Kg
Manganese - 220 mg/Kg
Total HPAH - 1.1 mg/Kg
Zinc - 46 mg/Kg

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 8

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR SOIL INVERTEBRATES* - BACKGROUND AREA SOIL

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
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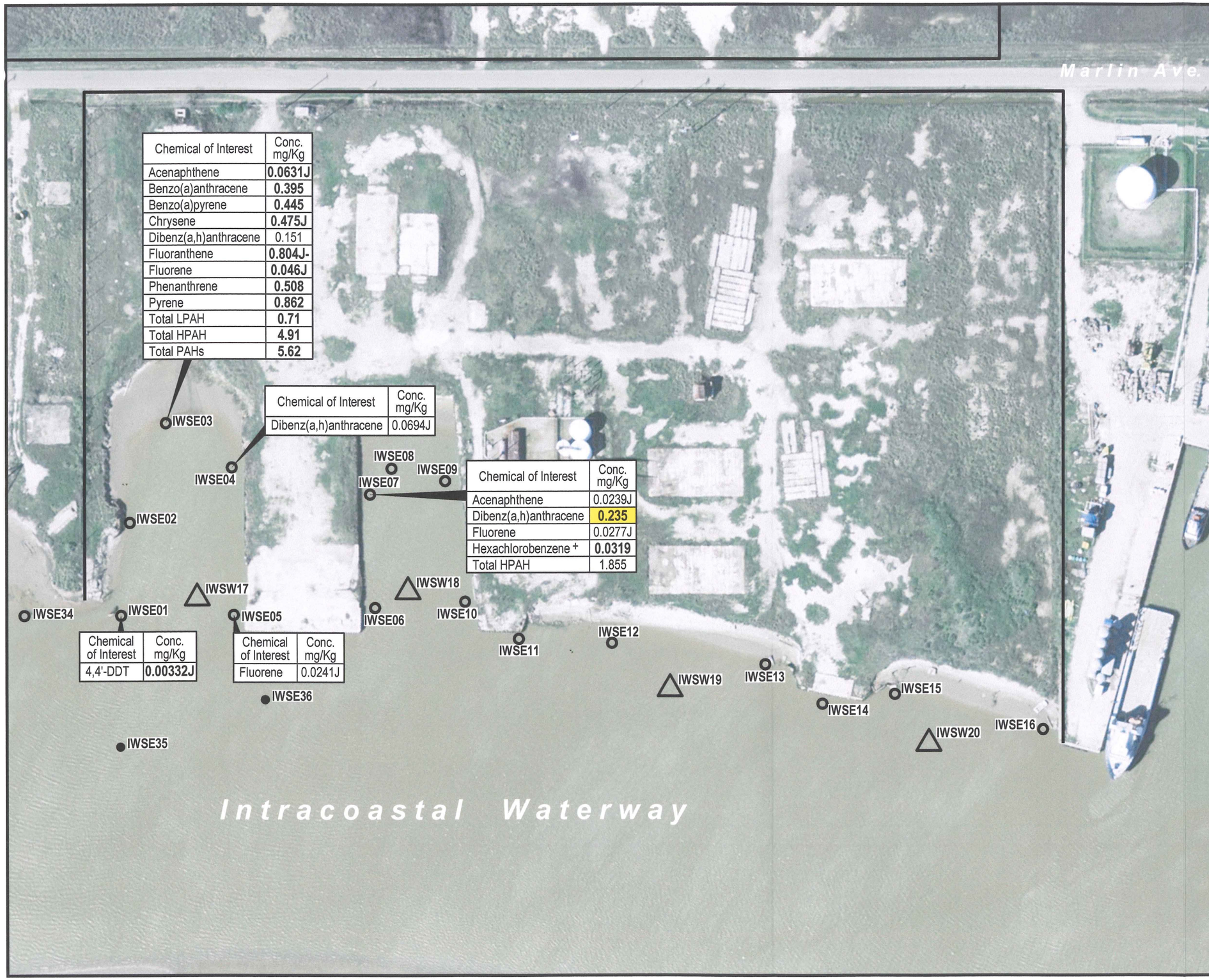

Chemical of Interest	Conc. mg/Kg
Acenaphthene	**0.0631J**
Benzo(a)anthracene	**0.395**
Benzo(a)pyrene	**0.445**
Chrysene	**0.475J**
Dibenz(a,h)anthracene	0.151
Fluoranthene	**0.804J-**
Fluorene	**0.046J**
Phenanthrene	**0.508**
Pyrene	**0.862**
Total LPAH	**0.71**
Total HPAH	**4.91**
Total PAHs	**5.62**

Chemical of Interest	Conc. mg/Kg
Dibenz(a,h)anthracene	0.0694J

Chemical of Interest	Conc. mg/Kg
Acenaphthene	0.0239J
Dibenz(a,h)anthracene	**0.235**
Fluorene	0.0277J
Hexachlorobenzene +	**0.0319**
Total HPAH	1.855

Chemical of Interest	Conc. mg/Kg
4,4'-DDT	**0.00332J**

Chemical of Interest	Conc. mg/Kg
Fluorene	0.0241J

EXPLANATION

- Gulfco Marine Maintenance Site Boundary (approximate)
- Intracoastal Waterway Sediment Sample
- Intracoastal Waterway Surface Water Sample
- Attempted Intracoastal Waterway Sediment Sample (not enough sediment present to allow for sampling)

Notes:
1. Data Qualifiers: J = Estimated value.
   J- = Estimated value, biased low.
2. Total PAH concentrations were calculated using ½ of the sample detection limit as a proxy value for undetected PAHs.
3. Bold values are the maximum measured concentration for that compound.

* Values shown in the figure exceed the Effects Range Low (ERL) (See Table 6). Yellow highlighted values exceed the midpoint of the ERL and Effects Range Medium (ERM).

\+ Value exceeds the Apparent Effects Threshold (AET).

The ERLS are:
4,4'-DDT - 0.0012 mg/Kg
Acenaphthene - 0.016 mg/Kg
Benzo(a)anthracene - 0.261 mg/Kg
Benzo(a)pyrene - 0.430 mg/Kg
Chrysene - 0.384 mg/Kg
Dibenz(a,h)anthracene - 0.0634 mg/Kg
Fluoranthene - 0.6 mg/Kg
Fluorene - 0.019 mg/Kg
Hexachlorobenzene (AET) - 0.006 mg/Kg
Phenanthrene - 0.24 mg/Kg
Pyrene - 0.665 mg/Kg
Total LPAH - 0.552 mg/Kg
Total HPAH - 1.7 mg/Kg
Total PAH - 4.02 mg/Kg

N

Approx. Scale in Feet
0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 9

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR BENTHIC INVERTEBRATES* -INTRACOASTAL WATERWAY SEDIMENT

PROJECT: 1352	BY: ZGK	REVISIONS
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Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Arsenic	9.62
0-0.5	Nickel	24.8

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Arsenic	9.58
0-0.5	Nickel	**27.3**

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Arsenic	**9.59**
0-0.5	Nickel	21.8

EXPLANATION

IWSE29 ● Sediment Station

IWSW30 △ Surface Water Station

Notes:
1. Fish tissue samples collected from throughout background area.
2. BGS = below ground surface.
3. Bold values are the maximum measured concentration for that compound.

* Values shown in the figure exceed the Effects Range Low (ERL) (See Table 7). The ERLs are:
Arsenic - 8.2 mg/Kg
Nickel - 20.9 mg/Kg

N

Approx. Scale in Feet

0 125 250

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 10

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR BENTHIC INVERTEBRATES* - INTRACOASTAL WATERWAY BACKGROUND SEDIMENT

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

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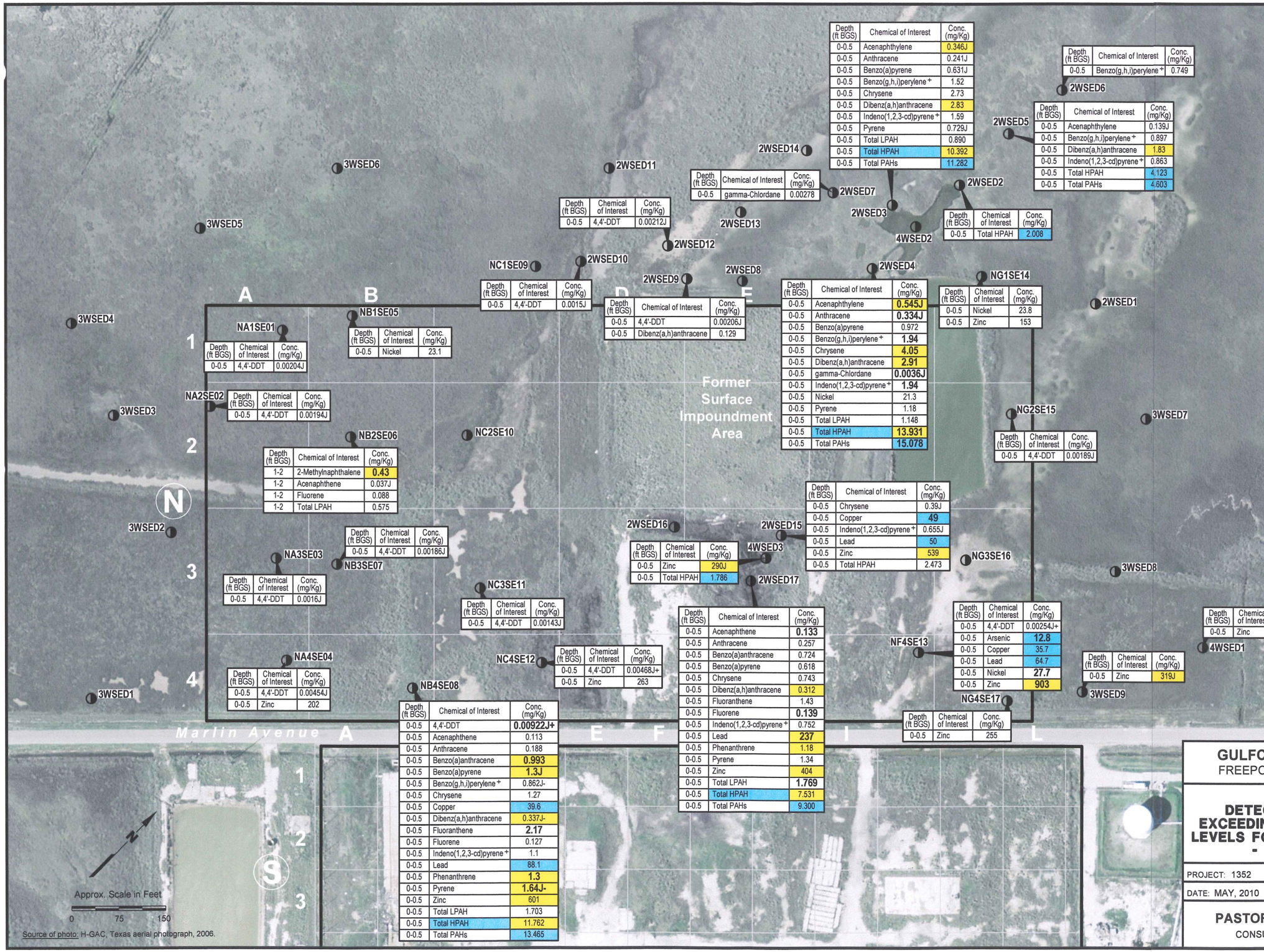

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00204J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Nickel	23.1

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00194J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
1-2	2-Methylnaphthalene	0.43
1-2	Acenaphthene	0.037J
1-2	Fluorene	0.088
1-2	Total LPAH	0.575

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00186J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.0016J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00143J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00454J
0-0.5	Zinc	202

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00468J+
0-0.5	Zinc	263

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00922J+
0-0.5	Acenaphthene	0.113
0-0.5	Anthracene	0.188
0-0.5	Benzo(a)anthracene	0.993
0-0.5	Benzo(a)pyrene	1.3J
0-0.5	Benzo(g,h,i)perylene +	0.862J-
0-0.5	Chrysene	1.27
0-0.5	Copper	39.6
0-0.5	Dibenz(a,h)anthracene	0.337J-
0-0.5	Fluoranthene	2.17
0-0.5	Fluorene	0.127
0-0.5	Indeno(1,2,3-cd)pyrene +	1.1
0-0.5	Lead	88.1
0-0.5	Phenanthrene	1.3
0-0.5	Pyrene	1.64J-
0-0.5	Zinc	601
0-0.5	Total LPAH	1.703
0-0.5	Total HPAH	11.762
0-0.5	Total PAHs	13.465

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00212J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00206J
0-0.5	Dibenz(a,h)anthracene	0.129

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	gamma-Chlordane	0.00278

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Acenaphthene	0.346J
0-0.5	Anthracene	0.241J
0-0.5	Benzo(a)pyrene	0.631J
0-0.5	Benzo(g,h,i)perylene +	1.52
0-0.5	Chrysene	2.73
0-0.5	Dibenz(a,h)anthracene	2.83
0-0.5	Indeno(1,2,3-cd)pyrene +	1.59
0-0.5	Pyrene	0.729J
0-0.5	Total LPAH	0.890
0-0.5	Total HPAH	10.392
0-0.5	Total PAHs	11.282

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Total HPAH	2.008

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Benzo(g,h,i)perylene +	0.749

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Acenaphthylene	0.139J
0-0.5	Benzo(g,h,i)perylene +	0.897
0-0.5	Dibenz(a,h)anthracene	1.83
0-0.5	Indeno(1,2,3-cd)pyrene +	0.863
0-0.5	Total HPAH	4.123
0-0.5	Total PAHs	4.603

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Acenaphthylene	0.545J
0-0.5	Anthracene	0.334J
0-0.5	Benzo(a)pyrene	0.972
0-0.5	Benzo(g,h,i)perylene +	1.94
0-0.5	Chrysene	4.05
0-0.5	Dibenz(a,h)anthracene	2.91
0-0.5	gamma-Chlordane	0.0036J
0-0.5	Indeno(1,2,3-cd)pyrene +	1.94
0-0.5	Nickel	21.3
0-0.5	Pyrene	1.18
0-0.5	Total LPAH	1.148
0-0.5	Total HPAH	13.931
0-0.5	Total PAHs	15.078

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Nickel	23.8
0-0.5	Zinc	153

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00189J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Chrysene	0.39J
0-0.5	Copper	49
0-0.5	Indeno(1,2,3-cd)pyrene +	0.655J
0-0.5	Lead	50
0-0.5	Zinc	539
0-0.5	Total HPAH	2.473

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Zinc	290J
0-0.5	Total HPAH	1.786

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Acenaphthene	0.133
0-0.5	Anthracene	0.257
0-0.5	Benzo(a)anthracene	0.724
0-0.5	Benzo(a)pyrene	0.618
0-0.5	Chrysene	0.743
0-0.5	Dibenz(a,h)anthracene	0.312
0-0.5	Fluoranthene	1.43
0-0.5	Fluorene	0.139
0-0.5	Indeno(1,2,3-cd)pyrene +	0.752
0-0.5	Lead	237
0-0.5	Phenanthrene	1.18
0-0.5	Pyrene	1.34
0-0.5	Zinc	404
0-0.5	Total LPAH	1.769
0-0.5	Total HPAH	7.531
0-0.5	Total PAHs	9.300

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	4,4'-DDT	0.00254J+
0-0.5	Arsenic	12.8
0-0.5	Copper	35.7
0-0.5	Lead	64.7
0-0.5	Nickel	27.7
0-0.5	Zinc	903

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Zinc	255

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Zinc	319J

Depth (ft BGS)	Chemical of Interest	Conc. (mg/Kg)
0-0.5	Zinc	269J

EXPLANATION

Gulfco Marine Maintenance Site Boundary (approximate)

Sediment Sample Location

Notes:
1. Data Qualifiers: J = Estimated value.
   J- = Estimated value, biased low.
   J+ = Estimated value, biased high.
2. BGS = below ground surface.
3. Total PAH concentrations were calculated using ½ of the sample detection limit as a proxy value for undetected PAHs.
4. Bold values are the maximum measured concentration for that compound.
5. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for background soil data).

* Values shown in the figure exceed the Effects Range Low (ERL) (See Table 8). Yellow highlighted values exceed the midpoint of the ERL and Effects Range Medium (ERM).

\+ Value exceeds the Apparent Effects Threshold (AET).
The ERLS are:
2-Methylnaphthalene - 0.07 mg/Kg
4,4'-DDT - 0.0012 mg/Kg
Acenaphthene - 0.016 mg/Kg
Acenaphthylene - 0.044 mg/Kg
Anthracene - 0.0853 mg/Kg
Arsenic - 8.2 mg/Kg
Benzo(a)anthracene - 0.261 mg/Kg
Benzo(a)pyrene - 0.430 mg/Kg
Benzo(g,h,i)perylene (AET) - 0.67 mg/Kg
Chrysene - 0.384 mg/Kg
Copper - 34 mg/Kg
Dibenz(a,h)anthracene - 0.0634 mg/Kg
Fluoranthene - 0.6 mg/Kg
Fluorene - 0.019 mg/Kg
gamma-Chlordane - 0.00226 mg/Kg
Indeno(1,2,3-cd)pyrene (AET) - 0.6 mg/Kg
Lead - 46.7 mg/Kg
Nickel - 20.0 mg/Kg
Phenanthrene - 0.24 mg/Kg
Pyrene - 0.665 mg/Kg
Zinc - 150 mg/Kg
Total LPAH - 0.552 mg/Kg
Total HPAH - 1.7 mg/Kg
Total PAH - 4.02 mg/Kg

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 11

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR BENTHIC INVERTEBRATES* - WETLAND SEDIMENT

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

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CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

Gulfco Marine Maintenance Site Boundary (approximate)

Pond Sediment Sample Location

Notes:
1. All samples from 0-0.5 ft depth interval.
2. Data Qualifiers: J = Estimated value.
3. Bolded values are the maximum measured concentration for that compound.
4. Light blue highlighted values are higher than maximum background concentrations (See Figure 8 for soil background data).

* Values shown in the figure exceed the Effects Range Low (ERL) (See Table 9). Yellow highlighted values exceed the midpoint of the ERL and Effects Range Medium (ERM).
The ERLS are:
4,4'-DDT - 0.0012 mg/kg
Zinc - 150 mg/kg

N

Approx. Scale in Feet

0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 12

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR BENTHIC INVERTEBRATES* - PONDS SEDIMENT

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
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EXPLANATION

IWSE29 ● Sediment Station

IWSW30 △ Surface Water Station

Notes:
1. Fish tissue samples collected from throughout background area.
2. Data Qualifier: J = Estimated value.
* Values shown in the figure exceed the TCEQ Ecological Benchmark for Water (See Tables 11 & 15). Bolded values are the maximum measured concentration for that compound.

N

Approx. Scale in Feet

0 125 250

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 13
DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR AQUATIC RECEPTORS* - INTRACOASTAL WATERWAY BACKGROUND SURFACE WATER

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

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EXPLANATION

Gulfco Marine Maintenance Site Boundary (approximate)

Wetland Surface Water Sample Location

Notes:
1. Data Qualifier: J = Estimated value.
2. Light blue highlighted values exceed concentrations measured in background surface water (See Figure 13 for background surface water concentrations).
3. Bolded values are the maximum measured concentration for that compound.

* Values shown in the figure exceed the TCEQ Ecological Benchmark for Water (See Tables 12 & 16).

N

Approx. Scale in Feet

0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 14

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR AQUATIC RECEPTORS* - WETLAND SURFACE WATER

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

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EXPLANATION

Gulfco Marine Maintenance Site Boundary (approximate)

Pond Surface Water Sample Location

Notes:
1. Data Qualifier: J = Estimated value.
2. Bolded values are the maximum measured concentration for that compound.
3. No compounds were measured above background concentrations (See Figure 13 for background surface water concentrations).

* Values shown in the figure exceed the TCEQ Ecological Benchmark for Water (See Tables 13 & 17).

N

Approx. Scale in Feet

0 60 120

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 15

DETECTED CONCENTRATIONS EXCEEDING ECOLOGICAL SCREENING LEVELS FOR AQUATIC RECEPTORS* - PONDS SURFACE WATER

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: MAY, 2010	CHECKED: KHT	

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