JULY 2016

CALCASIEU PARISH SULFUR DIOXIDE STAKEHOLDERS GROUP

SULFUR DIOXIDE MODELING PROTOCOL

PROVIDENCE

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Project Number 1039-001

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1.0 PROJECT DESCRIPTION

On June 22, 2010, the Environmental Protection Agency (EPA) promulgated a new 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standard (NAAQS). On May 13, 2014, the EPA proposed a Data Requirements Rule (DRR) to direct state agencies to provide data in order to characterize current air quality in areas of large SO_2 sources. This proposed rule was promulgated on August 21, 2015. The data developed by the state agencies with this rule will be used by the EPA in area attainment designations for the 1-hour SO_2 NAAQS.

When a NAAQS is revised, state agencies and the EPA must make area designations based on section 107 of the Clean Air Act (CAA). The area designations process typically relies on air quality concentrations characterized by ambient monitoring data to identify areas that are either meeting or violating the NAAQS. The EPA recognizes that peak concentrations of SO_2 are commonly caused by a few major sources in an area.

As part of the NAAQS review process, the EPA conducted an analysis of SO_2 monitors across the country and determined that only up to one-third of the monitors in operation are sited to characterize peak 1-hour ambient concentrations. The EPA has determined that the monitoring network as a whole is not appropriately positioned or of adequate size for the purpose of NAAQS attainment designations.

In the now final DRR, the EPA has promulgated multiple modeling and monitoring approaches for use in the attainment designation of areas with large SO_2 sources. The purpose of this protocol is to describe how the Louisiana Department of Environmental Quality (LDEQ) will perform dispersion modeling.

In the final DRR published in August 2015, sources that have emissions greater than 2,000 tons per year of SO_2 were characterized as priority areas. All modeling performed, will determine if an area is currently meeting the SO_2 NAAQS, and establishing a designation for the area. Therefore, the focus will be on the state of the current air quality, rather than steps necessary to be in attainment.

2.0 POLLUTANT TO BE MODELED

The 2010 1-hour SO_2 NAAQS was established to protect public health by reducing the public's exposure to high short-term concentrations. The form of the standard is the 99th percentile of 1-hour daily maximum concentrations, averaged over three years. **Table 2-1** presents the NAAQS for SO_2.

Table 2-1
National Ambient Air Quality Standard

Pollutant	Primary/ Secondary	Averaging Time	NAAQS ($\mu g/m^3$)	NAAQS (ppb)	Form
SO_2	Primary	1-Hour	196	75	99^{th} percentile of 1-hour daily maximum concentrations, averaged over three years

3.0 AIR DISPERSION MODEL

The most recent version of the American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD) model will be used for the analysis. AERMOD is an EPA-approved steady-state Gaussian plume model capable of modeling multiple sources in complex terrain. The model is currently used for most industrial sources and is the appropriate model for this analysis. The Providence/ORIS BEEST Software will be used to run AERMOD. Modeling will be conducted following, as closely as possible, the modeling guidelines outlined by EPA's draft *SO_2 NAAQS Designations Modeling Technical Assistance Document* updated in February 2016.

The analysis will use the regulatory default options. The list below identifies these default options:

- Use of elevated terrain algorithms requiring input of terrain height data
- Use of stack-tip downwash (except for building downwash cases)
- Use of calms processing routines
- Use of missing data processing routines
- Use of a 4-hour half-life for exponential decay of sulfur dioxide for urban sources

The AERMOD modeling system requires several components:

- AERMAP – terrain processor
- AERMET – meteorological data processor
- BPIPPRIME- building input processor
- AERMINUTE – 1 minute ASOS winds processor for AERMET
- AERSURFACE – surface characteristics processor for AERMET

The most recent versions of the aforementioned components will be used in this modeling analysis.

The site location map, **Figure 1**, includes the topography of the surrounding area. Based on a cursory review of aerial photography, it is clear that the land use surrounding the facility is predominantly rural. Therefore, the rural dispersion mode in AERMOD will be selected.

4.0 BUILDING WAKE EFFECTS (DOWNWASH)

Source proximities will be evaluated with respect to nearby structures to determine whether or not the stack emissions might be affected by the turbulent wake of structures and leading to downwash of the plume. Although it is expected that the building wake will have no effect on dispersion from tall stacks, building wake effect is expected for the other sources at the facilities. Therefore, building downwash will be included in this analysis where data is available.

The purpose of this evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures. Wind blowing around a building creates zones of turbulence that are greater than if the building was absent.

EPA's Building Profile Input Processor for PRIME (BPIPPRIM) program will be used to evaluate building downwash parameters and the dominant downwash structure associated with each emission source. A site layout has been provided for each facility (**Figures 2 – 7**). Site layouts are based on data provided by the facilities.

EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

HGEP = H + 1.5L, where:

HGEP = minimum GEP stack height,

H = structure height, and

L = lesser dimension of the structure (height or projected width).

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis will be determined using BPIP-PRIME. In general, the lowest GEP stack height for any source is 65 meters by default. Should any stacks exceed 65 meters, an analysis of the stacks using BPIP-PRIME will be conducted to ensure that the release height used is within the calculated EPA formula height. Please note that flares are exempt from GEP stack height requirements.

Direction-specific building dimensions and the dominant downwash structure parameters used as inputs to the dispersion models will be determined using BPIP-PRIME. BPIP-PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents.

The output from the BPIP-PRIME downwash analysis lists the names and dimensions of the structures, and the emission unit locations and heights. In addition, the output contains a summary of the dominant structure for each emission unit (considering all wind directions) and the actual building height and projected widths for all wind directions. This information will then be incorporated into the data input files for the AERMOD air dispersion model.

For those sources below GEP stack height, the actual stack height will be modeled.

5.0 EMISSION SOURCE TYPES

Modeled emission sources will include facilities located within Calcasieu Parish with potential facility-wide SO_2 emissions greater than 80 tons per year. In accordance with EPA's *Final Rule for 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)*, actual emissions will be used.

> *"The EPA proposed that modeling analyses be based on either actual 1-hour SO_2 emissions from the most recent 3 years or federally enforceable allowable emissions. […] While actual emissions would be the preferred choice to use for emissions inputs, air agencies have the option of using a more conservative approach by inputting a source's most recent 3 years of allowable, or "potential to emit," emissions."*

Actual emissions will be obtained from LDEQ's Emissions Reporting and Inventory Center (ERIC) and the modeling and emissions files submitted to the LDEQ as part of the DRR Modeling Information Request that was due on March 4, 2015. The emissions data used will be based on the years 2012 - 2014. Intermittent emissions sources, such as temporary, non-routine, and emergency sources of SO_2, will be removed from the list of emissions sources[1]. A list of the sources that will be modeled along with the associated stack parameters is included as **Appendix A**. Emissions data is discussed in more detail in **Section 8.0**.

6.0 RECEPTOR GRID

The receptors will be set on a Cartesian grid at 100 meter spacing from 0 to 20 kilometers from each fenceline. Receptors will be excluded from the model when they would fall on open water, public roads, or within the boundaries of existing industrial property. These receptors will be excluded since these locations will be prohibitive to establishing fixed monitor sites or would not be representative of ambient air accessible to the public. All other receptors within the grid will be included in the model. Flag pole receptors will not be used in this analysis.

[1] In accordance with EPA's draft *SO_2 NAAQS Designations Modeling Technical Assistance Document* updated in February 2016, Section 5.5 – Intermittent Emissions.

7.0 METEOROLOGICAL DATA

Lake Charles, Louisiana is located within Calcasieu Parish. The Lake Charles surface and upper air (Station Number 3937) National Weather Service Station meteorological data for the years 2012 through 2014 will be used for this analysis. The profile base elevation of the Lake Charles surface air station is 16 feet.

8.0 MODELING ANALYSIS

Where available, actual 2012 – 2014 hourly emission rates and concurrent hourly stack gas temperatures and hourly stack gas velocities will be modeled using the AERMOD model for each emissions source within the established modeling domain For any short- duration data gaps that exist within the hourly data, the larger of the two values that immediately precede and immediately follow the data gap will be used in place of the missing data. This will provide a conservative result that is expected to be representative of actual emissions data on either side of the data gap. For data that is typically collected using a continuous monitor, short duration data gaps are expected to be for a time span ranging from a few hours to a few days and are expected to result from unexpected monitor downtime. Due to the expected short duration of any data gaps, it is assumed that the emissions source would not be capable of increasing production rates within the span of the data gap such that the proposed procedure for filling missing data would produce results lower than the value that the monitor would have recorded.

When no hourly emissions data is available for a given source, the stack gas temperature and stack gas velocity provided in the source's annual emissions inventory report submitted via the LDEQ's ERIC system will be used. Emission rates for each hour will be modeled at two times the average hourly actual emission rate for the year in question. The average hourly actual emission rate will be taken from the source's annual emissions inventory report submitted via the LDEQ's ERIC system.

Hourly varying emissions data will be input into AERMOD using the HOURMIS keyword. All sources with hourly varying emissions data will be represented in one file for each AERMOD run. Sources that do not have emissions for a given hour will have an emission rate of zero to represent that hour. Emissions occurring in a particular hour will be represented at the ending hour.

9.0 BACKGROUND

Modeled ambient air concentrations only reflect the impacts from industrial emission sources. Therefore, to truly assess compliance with the NAAQS, natural "background" concentrations are typically added to the modeled ground-level concentrations. These natural background concentrations include emissions from non-industrial emission sources (*e.g.,* vehicles, recreational watercraft, *etc*.), which are not included in the model. These background concentrations are conservative representations of emissions from natural sources, nearby emission sources other than the emission sources under consideration, and unidentified emission sources. However, the background concentrations may also include industrial emission sources already accounted for in the state inventory. Therefore, adding the background concentrations to the modeled ground-level concentrations should be conservative since impacts from the inventory sources are included in both the maximum modeled ground-level concentration and the background concentration.

EPA has agreed to accept the Shreveport Seasonal Hour of Day Background Matrix from 2012-2014 as background for the SO_2 modeling. These background values will be used in this analysis.

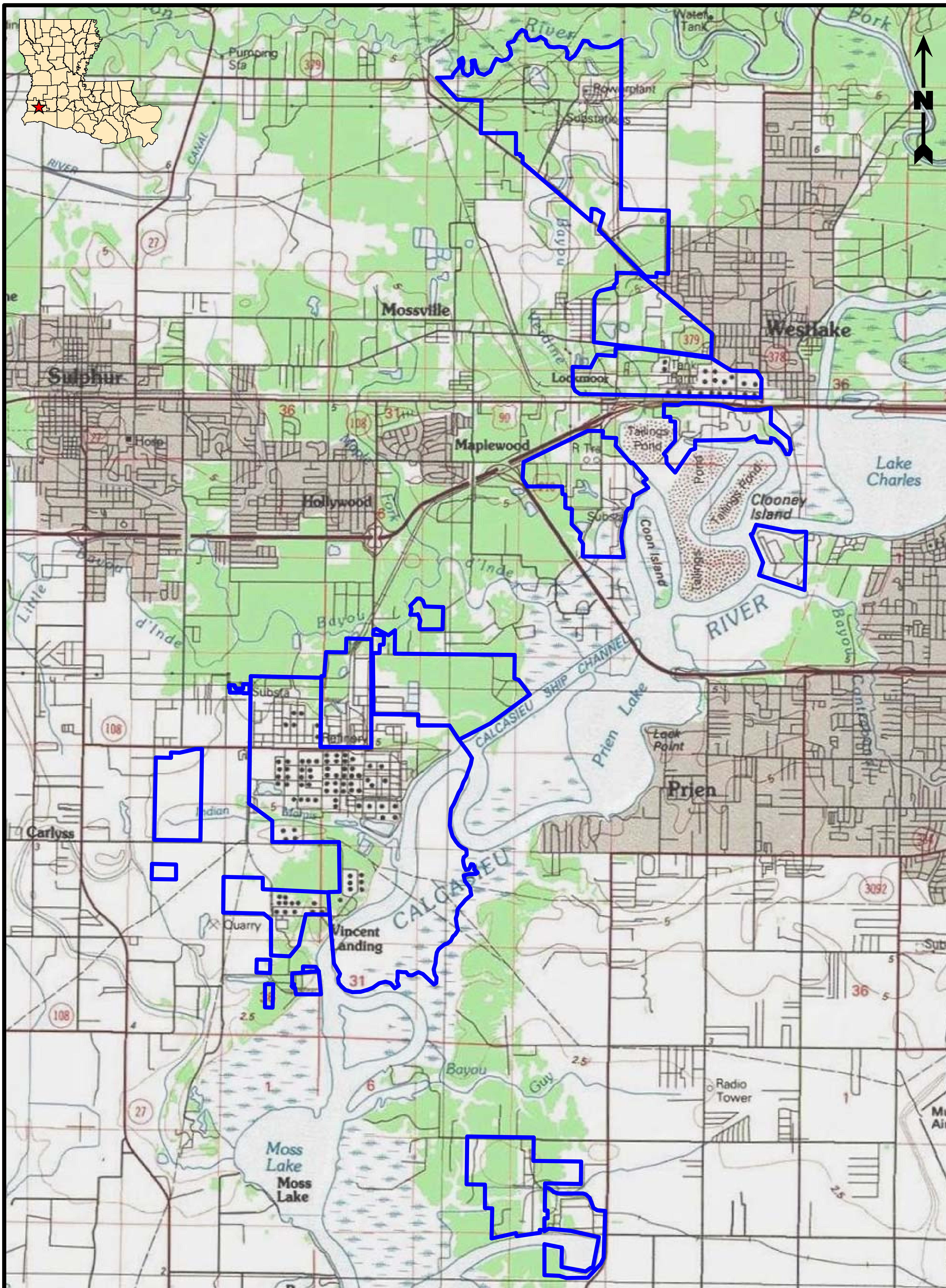
10.0 MODELING RESULTS

A modeling report will be prepared to summarize the modeling approach and results. The report will include:

- The results from the analysis discussed in **Section 8.0**.
- Modeling computer files (input files, output files, and meteorological files) will be copied to compact disc(s) or other similar electronic file transfer medium and attached to the modeling report.
- Discussion of the use of AERSURFACE in determining surface characteristics (Albedo, Bowen ratio, surface roughness)

FIGURE 1

SITE LOCATION MAP



Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 100K topographic map, "Lake Charles, LA".

1 0.5 0 1 Miles

Site Location Map

SO_2 Siting Modeling Protocol
Calcasieu Parish, Louisiana

Calcasieu Parish SO_2 Stakeholders Group

PROVIDENCE

Drawn By	LMM	06/20/16
Checked By	LMH	06/20/16
Approved By	DD	06/20/16

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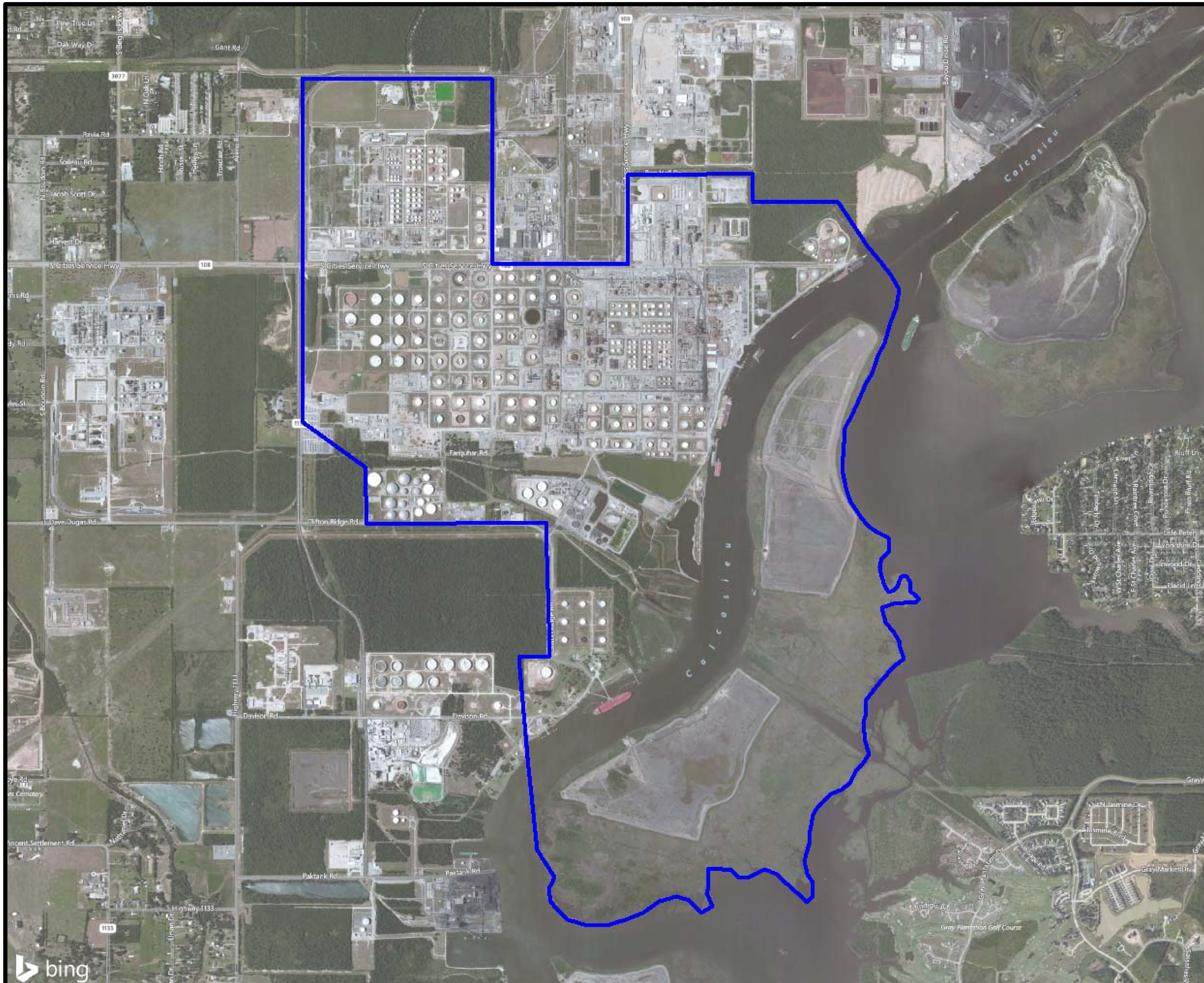
1
Figure

FIGURES 2 - 7

SITE LAYOUTS



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Legend

Property

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2016 Microsoft Corporation and its data suppliers.

2,000 1,000 0 2,000
Feet

Site Location Map
Citgo Petroleum Corporation - Lake Charles Manufacturing Complex

SO_2 Siting Modeling Protocol

Calcasieu Parish, Louisiana

Calcasieu Parish SO_2 Stakeholders Group

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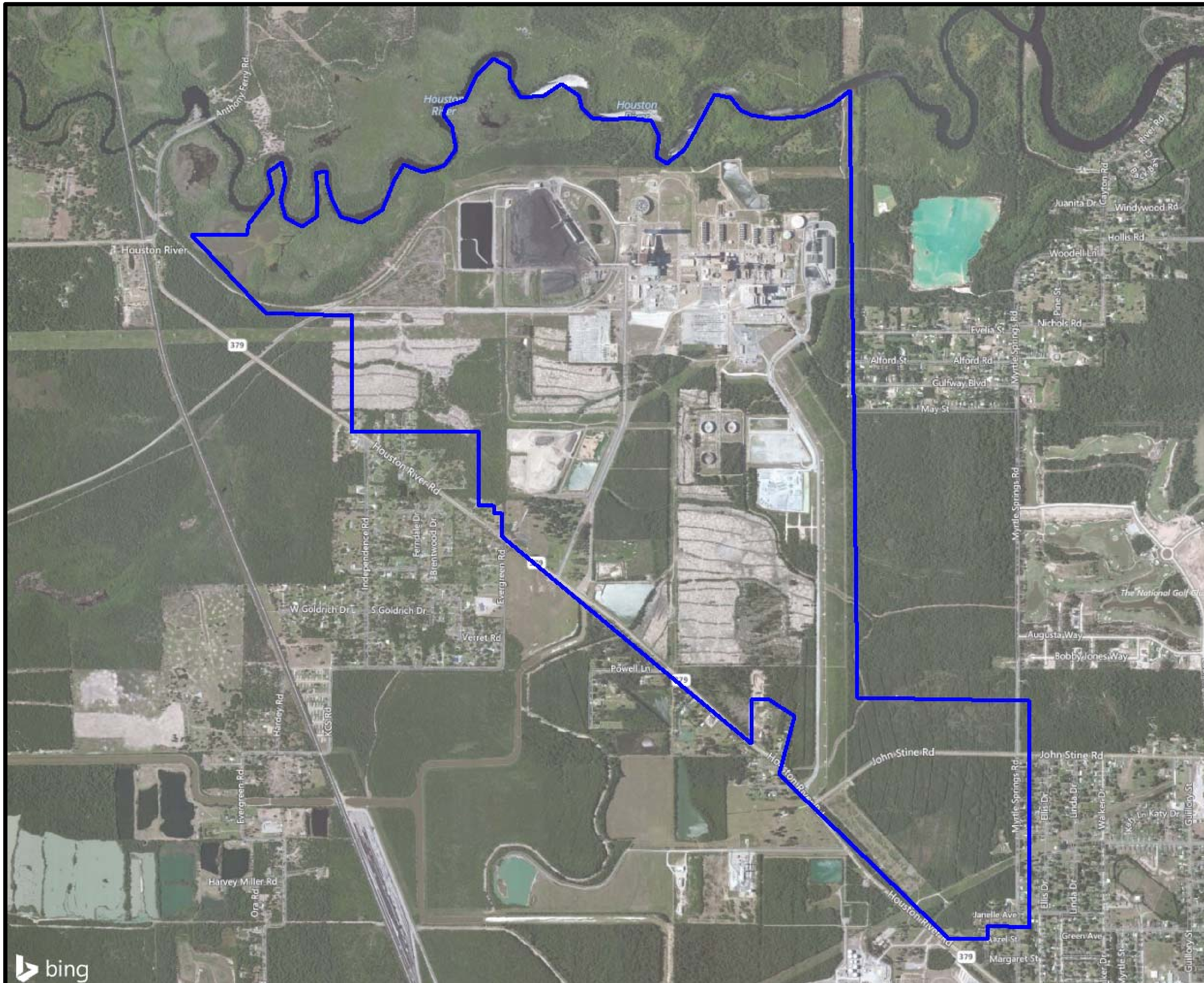
1039-001-B005

2
Figure



Legend

Property

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2016 Microsoft Corporation and its data suppliers.

1,500 750 0 1,500 Feet

Entergy Gulf States Louisiana LLC - Nelson Industrial Steam Co. & Entergy Gulf States Louisiana LLC- Roy S Nelson Plant

SO_2 Siting Modeling Protocol

Calcasieu Parish, Louisiana

Calcasieu Parish SO_2 Stakeholders Group

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Figure 3

Legend

Property

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2016 Microsoft Corporation and its data suppliers.

200 100 0 200 Feet

N

Site Location Map
Rain CII Carbon LLC - Lake Charles Calcining Plant

SO_2 Siting Modeling Protocol

Calcasieu Parish, Louisiana

Calcasieu Parish SO_2 Stakeholders Group

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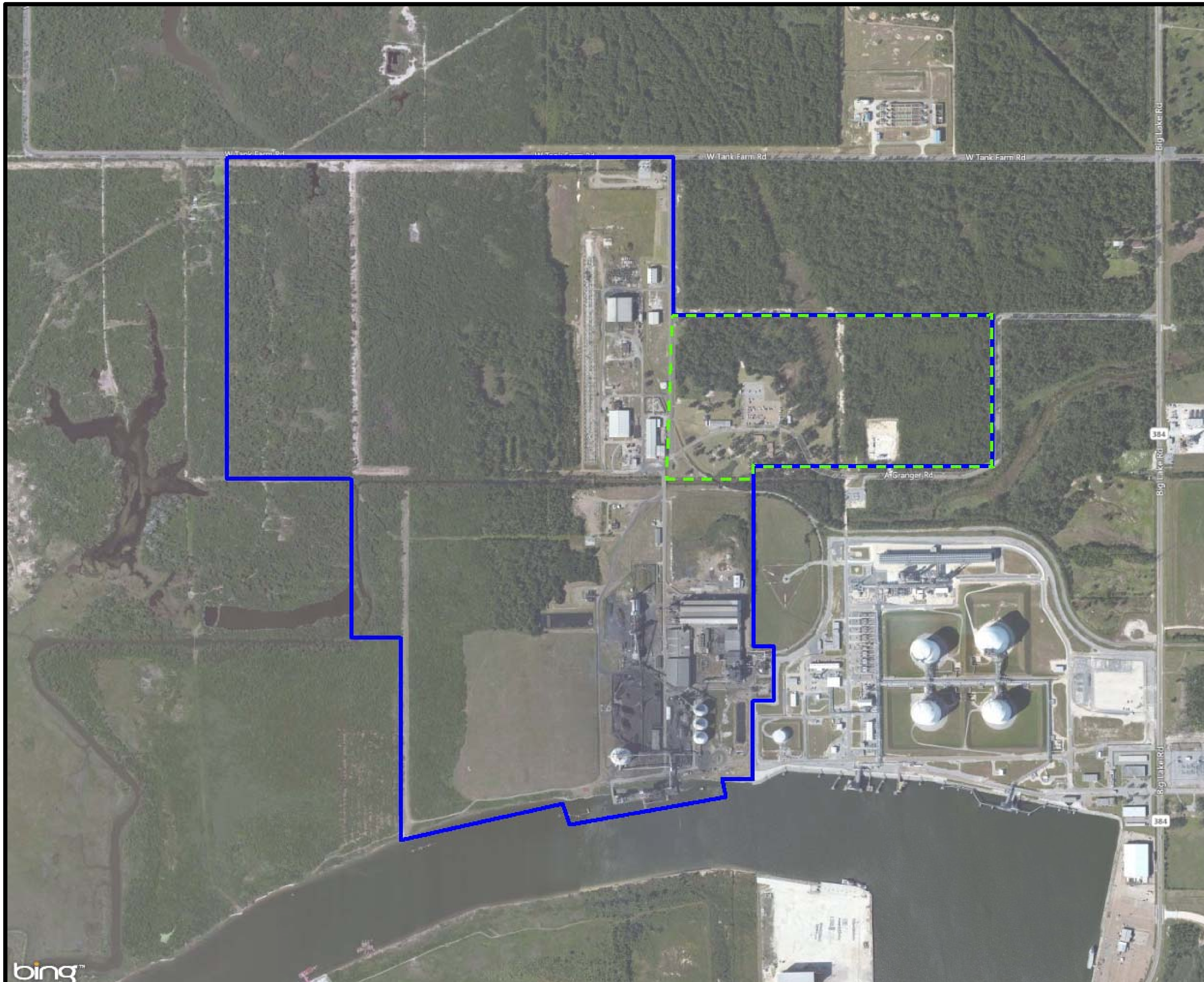
Drawing Number 1039-001-B007	Figure



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Legend

- Property Boundary
- Property Transferred to Separate Industrial Entity in June 2015

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2016 Microsoft Corporation and its data suppliers.

800 400 0 800 Feet

Site Location Map
Reynolds Metals Company - Lake Charles Carbon Company

SO_2 Siting Modeling Protocol

Calcasieu Parish, Louisiana

Calcasieu Parish SO_2 Stakeholders Group

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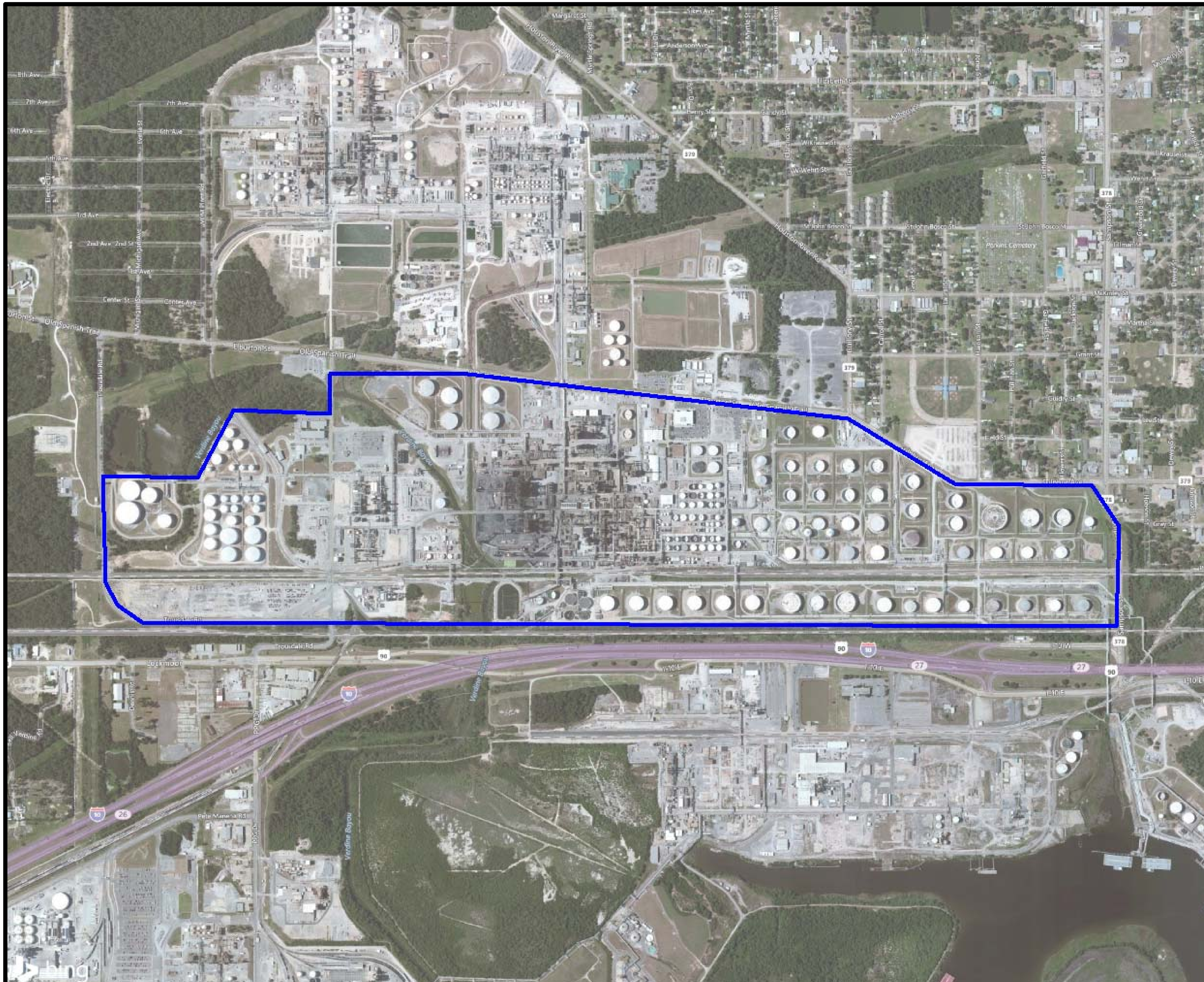
5 Figure



N

Legend

Property

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2016 Microsoft Corporation and its data suppliers.

1,000 500 0 1,000 Feet

Site Location Map
Phillips 66 – Lake Charles Refinery

SO_2 Siting Modeling Protocol

Calcasieu Parish, Louisiana

Calcasieu Parish SO_2 Stakeholders Group

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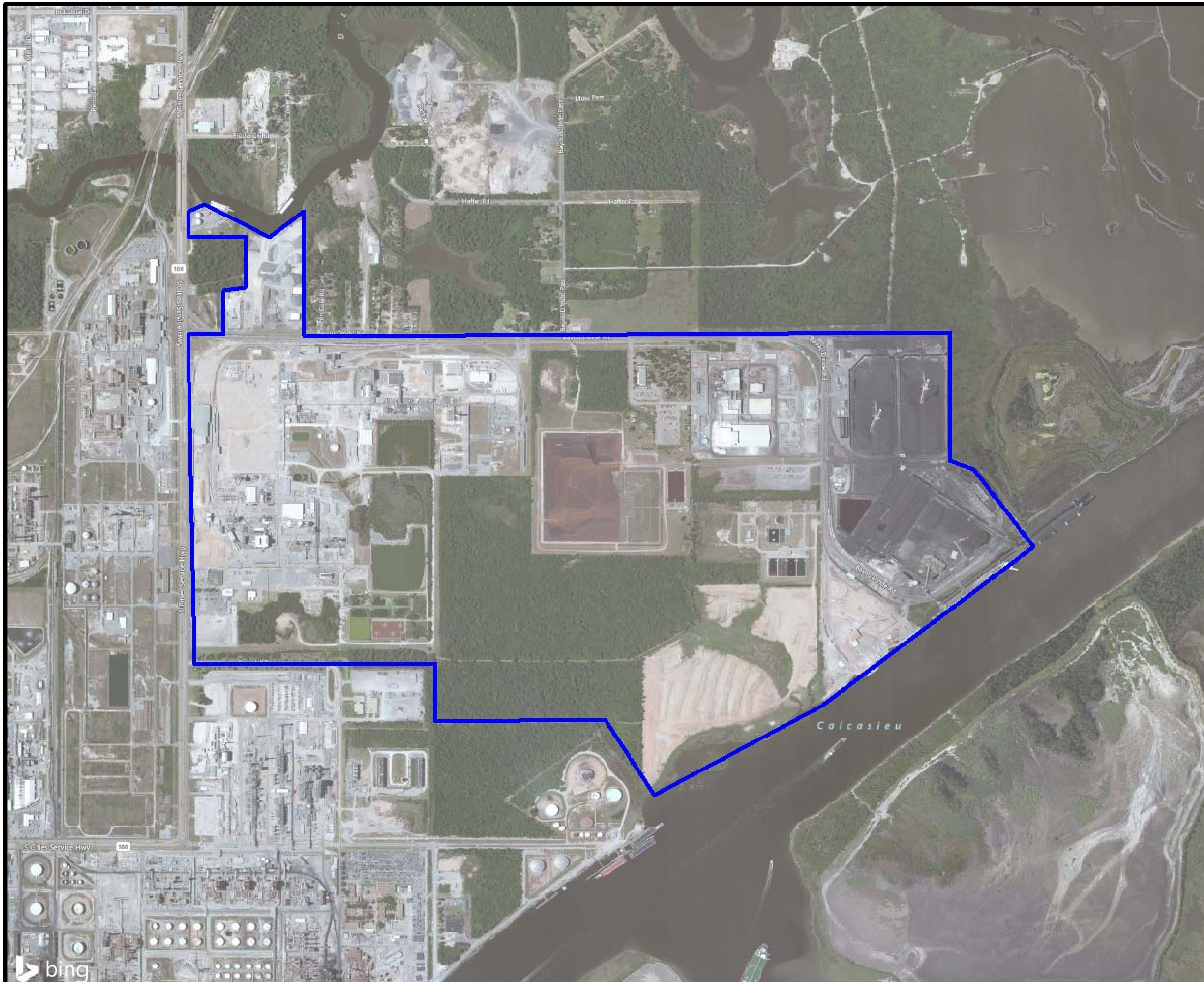
Drawing Number 1039-001-B009

6 Figure



N

Legend

Property Boundary

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2016 Microsoft Corporation and its data suppliers.

1,000 500 0 1,000 Feet

Site Location Map
Louisiana Pigment Co LP – Titanium Dioxide Plant

SO_2 Siting Modeling Protocol

Calcasieu Parish, Louisiana

Calcasieu Parish SO_2 Stakeholders Group

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Figure 7

APPENDIX A

EMISSION SOURCE PARAMETERS

APPENDIX A
LIST OF MODELED SOURCES

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)
Reynolds Metals Company- Lake Charles Carbon Co. All permitted sources of SO_2, as provided by the facility,will be included in the model. No sources will be excluded.			
1	Calciner Kiln and Cooler - Normal Operating Scenario	471433	3331505
3	Butts and Scrap- Drying w/ Dust Collection	471566	3331250
4	Drying with Dust Collection	471693	3331305
5	Thermal Fluid Heater	471646	3331349
6	Anode Baking Furnace - Normal Operating Scenario	471527	3331485
10	Bake Furnace and Storage Operation (Fugitives) -Summary	471581	3331476
11	Bake Furnace and Storage Operation (Fugitives) -Summary	471630	3331476
12	Bake Furnace and Storage Operation (Fugitives) -Summary	471679	3331476
190	THERMAL FLUID HEATER - WEST	471746	3331349
191	THERMAL FLUID HEATER - EAST	471746	3331349
Citgo Petroleum Corporation- Lake Charles Manufacturing Complex The following sources will not be incorporated into the model: GEN559 - intermittent emergency source INC510 - not a permitted source			
16	Power House Boiler B1C	469263	3338797
17	Power House Boiler B1B	469236	3338788
18	Power House Boiler B1, B1A	469211	3338791
19	Power House Boiler B2	469247	3338773
20	Power House Boiler B2A	469247	3338742
21	Power House Boiler B3, B3B	469232	3338774
22	Power House Boiler B3A, B3C	469232	3338737
23	Power House Boiler B5A	469267	3338768
24	Power House Boiler B5	469267	3338747
25	Coker Blowdown Stack B102 (BD)	469115	3338774
26	3(VIII-A)1 - DC/DA Stack B-602 (Acid Plant, AAT Area)	468366	3338158
28	3(IV)1 - B-1 Flare	469145	3338587
29	3(IV-F)3 - B-4 Flare	469142	3338359
30	3(IX)41 - B-5 Flare	468725	3338785
31	3(IX)42 - B-6 Flare	468725	3338789
32	3(IX)33 - B-7 Flare	468725	3338793
33	3(VI)6 - B-8 Flare	468461	3339018
34	3(IV)2 - B-9 Flare	468461	3339009
35	3(XXII)4 - B-11 Flare	468409	3338432
36	3(XXIII)2 - B-12 Flare	468164	3338047
37	2(202)25 - CB-701	468175	3340710
38	A-Topper Furnace B-4	469130	3339009
39	Topper Furnace B-104	469130	3339034
40	A Cat Steam Superheater Furnace, B-2	468744	3339083
41	B Cat Steam Superheater Furnace, B-2	468836	3339085
42	C Cat Steam Superheater Furnace, B-2	468922	3339082
43	A Cat Feed Preheat Furnace, B-6	468737	3339080
44	B Cat Feed Preheat Furnace, B-6	468824	3339080

APPENDIX A

LIST OF MODELED SOURCES

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)
45	C Cat Feed Preheat Furnace, B-6	468915	3339080
46	3(X)1 A-Reformer B-101 Furnace	468527	3338902
47	3(X)4 Sulfolane B-201 Furnace	468523	3338854
48	3(X)5 Sulfolane B-202 Furnace	468523	3338831
49	Vacuum Furnace B-201	469067	3338914
50	Vacuum Furnace B-2A	469086	3338913
51	Vacuum Furnace B-1	469086	3338890
52	3(I-D)3 Vacuum Furnace B-1 #2	469076	3338890
53	Coker 1 Furnace B-101	469115	3338774
54	Coker 1 Furnace B-201	469084	3338753
55	BLCOH Stabilizer Reboiler, B-101	468596	3339076
56	Feed Prep Furnace B-101 Stack 1	469086	3338875
57	FEED PRED B-101 HEATER, STACK #2	469075	3338875
58	SRF Furnace B-5	469082	3338774
59	3(XVIII-A)1 B-Reformer B-401 Furnace	468524	3338731
60	3(XVIII-A)2 B-Reformer B-406 Furnace	468524	3338723
61	3(XVIII-A)3 B-Reformer B-402 Furnace	468524	3338715
62	3(XVIII-A)4 B-Reformer B-403, 404, 405 Furnaces	468524	3338707
63	3(XXVII-A)1 ISOM B-801 Furnace	468425	3338781
64	3(XVIII)1 ALCOH B-101 Furnace	468528	3338764
65	3(XVIII)2 ALCOH B-102 Furnace	468515	3338745
66	3(X-A)1 BOH B-601 Furnace	468446	3338834
67	3(X-A)2 BOH B-602 Furnace	468446	3338827
68	C Topper Furnace B-1C	469087	3338812
69	C Topper Furnace B-2C	469085	3338802
70	BLCOH Reactor Charge Heater, B-3	468595	3339082
71	3(X)6 A-Reformer B-102, 103, 104, 105, 106 Furnaces	468528	3338862
72	3(XVIII)3 ALCOH B-103 Furnace	468528	3338775
73	Coker II B-201 Furnace	468187	3338768
74	Coker II B-202 Furnace	468187	3338790
75	3(XXVIII)1 Unicracker B-1,2,3,4,5 Furnaces	468239	3338424
76	3(XXII)1 C-Reformer B-501,502,506 Furnaces	468515	3338604
77	3(XXII)2 C-Reformer B-503,504,505 Furnaces	468505	3338643
78	Cat Feed Hydrotreater Recycle Hydrogen Furnace, B-101	468933	3339455
79	Cat Feed Hydrotreater Fractionator Feed Heater, B-102	468918	3339455
80	Furnace B-101	468958	3339248
81	Furnace B-102	468958	3339234
82	Reboiler B-103	468958	3339222
83	Furnace B-201	468958	3339410
84	Furnace B-202	468958	3339397
85	Reboiler B-203	468958	3339385
86	3(XXX)2 Mixed Xylenes B-1001 Furnace	468044	3338448
87	CV-1 B101A	469055	3339429
88	CV-1 B101B	469063	3339429

APPENDIX A
LIST OF MODELED SOURCES

Source ID	Source Description	Easting (X)	Northing (Y)
		(m)	(m)
89	CV-1 B102A	469079	3339431
90	CV-1 B102B	469098	3339431
91	3(MISC)5 - AAT Area Fugitives	469060	3338565
92	3(MISC)GEN - Miscellaneous Power Sources	468333	3338640
95	3(IX)12 - Marine Loading Uncontrolled	469373	3338553
99	3(XX-B)1 - Thermal Oxidizer B-407 (AAT Area)	468356	3338155
101	3(XX-K)2-1 - T-803 Sulfur Tank	468226	3338168
102	3(XX-K)2-2 - T-805 Sulfur Tank	468209	3338168
103	3(IX)34 - B-13 Flare ("A"Dock)	469141	3337856
104	3(IX)35 - B-14 Flare ("B/C"Dock)	469216	3338344
105	3(IX)38 - B-700 Wastewater Treatment Plant Flare	468512	3337852
106	3(XXX)1 - Vapor Combustor System - Marine Dock	469953	3339145
107	3(XXII)3 C-Reformer CCR Regenerator Vent	468486	3338663
108	3(X)7 A-Reformer F-102 Regen Vent	468486	3338891
109	3(XVIII-A)5 B-Reformer F-409 Regen Vent	468466	3338713
110	3(XX-K)1-1 - Sulfur Pit - A SRU (AAT Area)	468383	3338057
111	3(XX-K)1-2 - Sulfur Pit - C SRU (AAT Area)	468288	3338187
112	A Cat - Wet Gas Scrubber	468738	3339109
113	B Cat - Wet Gas Scrubber	468824	3339109
114	C Cat - Wet Gas Scrubber	468918	3339109
192	3(XXIX)3 - B-16 Flare	468912	3339527
193	3(XXXIV)10 - B-104 Flare	468982	3339563
194	3(XX-K)1-3 - Sulfur Pit - D SRU (AAT Area)	468288	3338167
195	3(XX-K)1-4 - Sulfur Pit - E SRU (AAT Area)	468296	3338137
Entergy Gulf States Louisiana LLC- Nelson Industrial Steam Co. All permitted sources of SO_2, as provided by the facility,will be included in the model. No sources will be excluded.			
115	Unit 1 Boiler Stack A	472310	3350210
116	Unit 2 Boiler Stack A	472306	3350210
Rain CII Carbon LLC- Lake Charles Calcining Plant All permitted sources of SO_2, as provided by the facility,will be included in the model. No sources will be excluded.			
117	Kiln Stack	467700.5	3335260.3
118	WHB/Baghouse Stack	467764.7	3335329.4
Entergy Gulf States Louisiana LLC- Roy S Nelson Plant All permitted sources of SO_2, as provided by the facility,will be included in the model. No sources will be excluded.			
119	C3A - Unit 3 Boiler Stack A	472265	3350420
122	C3B - Unit 3 Boiler Stack B	472247	3350420
125	C4 - Unit 4 Boiler	472080	3350446
128	C6 - Unit 6 Boiler	471844	3350564
129	C7 - Unit 4 Auxiliary Boiler	472194	3350407

APPENDIX A
LIST OF MODELED SOURCES

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)
Phillips 66 – Lake Charles Refinery All permitted sources of SO_2, as provided by the facility,will be included in the model. No sources will be excluded.			
131	EP022 HIGH PRESSURE BOILER (B-5)	473686.3	3345619
132	EP023 HIGH PRESSURE BOILER (B-6)	473672.1	3345619
133	EP109 HIGH PRESSURE BOILER (B-76001)	472994.3	3345714.8
134	EP065 NO. 2 CALCINER STACK	473302.3	3345438
135	EP092 BENZENE WASTE FLARE (API)	473524.6	3345389.4
136	EP041 FCC REGENERATOR	473530.2	3345507
137	EP-251 - Flare for MVRU 2	475596.2	3344594.7
138	EP064 NORTH FLARE	472864.2	3345934
139	EP031 SOUTH FLARE	473339.1	3345301.8
140	EP110 WEST FLARE	473101.2	3345292.9
141	EP006 FCC HEATER (H-6)	473608.3	3345517.9
142	EP008 HEATING OIL BELT HEATER (H-9)	473503.1	3345561.8
143	EP061 THERMAL CRACKER HEATER (H-14)	473632.3	3345501.8
144	EP085 LVT HEATER (H-15)	473492.1	3345561.9
145	EP013 COKER HEATER (H-18)	473383.1	3345564
146	EP017 NO. 2 HDS HEATER (H-24)	473465.1	3345453
147	EP045 PREMIUM COKER HEATER (H-26)	473388.3	3345514.7
148	EP086 PREMIUM COKER HEATER (H-27)	473376.2	3345582.8
149	EP037 NO.3 CRUDE UNIT HEATERS (H-1101)	473535.1	3345645.8
150	EP071 NO 3 VACUUM UNIT HEATER (H-1103)	473589.3	3345638.9
151	EP063 NO 4 HDS HEATER (H-1201)	473480.3	3345635.8
152	EP072 NO 4 HDS HEATER (H-1202)	473476.2	3345728.7
153	EP040 NO. 5 HDS (HYDRODESULFURIZER) (H-1301)	473480.3	3345641.9
154	EP047 SULFURIC ACID AIR HEATER (H-2801)	473697.2	3345845.8
155	EP057 NO 2 COKER HEATER (H-3001)	473360.2	3345630.8
156	EP058 NO 2 COKER HEATER (H-3002)	473360.3	3345655.8
157	EP054 NO 6 HDS HEATER (H-3101)	473416.2	3345764.9
158	EP055 NO 7 HDS HEATER (H-3201)	473414.2	3345744.9
159	EP073 NO 7 HDS HEATER (H-3232)	473421.2	3345744.9
160	EP059 NO 3 REFORMER/HDS HEATERS (H-3801)	473688.1	3345701.8
161	EP067 NO 8 HDS HEATER (H-3951)	473424.2	3345764.9
162	EP143 H-4050 NO. 4 CTU HEATER (H-4050)	473611.2	3345722.9
163	EP221 SZORB PROCESS HEATER (NH-2)	473647.3	3345751.7
164	EP101 HDC H2 HEATER (H-11001)	472872.3	3345550.8
165	EP118 ATMOSPHERIC TOWER HEATER (H-11002)	472886.2	3345550.7
166	EP119 VACUUM TOWER HEATER (H-11003)	472896.1	3345551
167	EP102 HDW/HDF REACTOR CHARGE HEATER (H-12001)	472823.1	3345552.7
168	EP144 HDW/HDF REACTOR CHARGE HEATER (H-12002)	472811.1	3345551.8
169	EP103 HDW/HDF VACUUM CHARGE HEATER (H-12003)	472800.1	3345551.9
170	EP105 HDS CHARGE HEATER (H-16001)	473579.3	3345808.8
171	EP106 1-5 CCR HEATER COMMON STACK (H-16101)	473492.2	3345820.7
172	EP104 CVU FEED HEATER (H-20002)	473484.3	3345758.9

APPENDIX A
LIST OF MODELED SOURCES

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)
173	NO. 2 CTU HEATER (H-30001)	473534.2	3345636.9
174	EP042 SULFURIC ACID UNIT	473726.2	3345428.9
175	EP117 NO 10 CCR REGENERATOR VENT	473507.1	3345813.9
176	EP060 NO 3 REFORMER REGEN VENT	473677.1	3345699.9
177	EP056 SULFUR PLANT	473570.3	3345406.8
178	EP111 LOHC SULFUR PLANT	472845.3	3345424
179	EP232 SZORB CAUSTIC SCRUB REGEN VENT	473591.3	3345779.9
Louisiana Pigment Co LP – Titanium Dioxide Plant All permitted sources of SO_2, as provided by the facility,will be included in the model. No sources will be excluded.			
180	OXYGEN SUPERHEATER W340-AX	470403.5	3340682.5
181	OXYGEN SUPERHEATER W340-BX	470421.7	3340682.8
182	TITANIUM TETRACHLORIDE SUPERHEATER W321-AX	470403.5	3340691.7
183	TITANIUM TETRACHLORIDE SUPERHEATER W321-BX	470421.7	3340672.9
184	CALCINER OFF-GAS SCRUBBER F476	470407.4	3340564.9
185	SPRAY DRYER DUST COLLECTOR F603-A	470374.7	3340513.3
186	SPRAY DRYER DUST COLLECTOR F603-B	470377.6	3340513.3
187	UTILITY BOILER D841-1X (ROUTINE EMISSIONS)	470312.4	3340529.7
188	PROCESS OFF-GAS INCINERATOR STACK	470365.6	3340686.9
189	UTILITY BOILER D841-2X (ROUTINE EMISSIONS)	470312.4	3340524