Whitenton Group, Inc.
ENVIRONMENTAL CONSULTANTS

Biological Assessment

Houston Central Gas Plant Expansion Project
Colorado County, Texas

Prepared for

Copano Processing, L.P.

Prepared by

Whitenton Group, Inc.

June 2012
Revised January 2013

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Houston Central Gas Plant Expansion Project
Colorado County, Texas

Prepared for

Copano Processing, L.P.
Sheridan, Texas

Prepared by

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WGI Project No. 1213

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ACRONYMS AND ABBREVIATIONS

AHPS	Advanced Hydrologic Prediction Service
AOI	Area of Impact
BGEPA	Bald and Golden Eagle Protection Act
BACT	Best Available Control Technology
BSCFD	Billion Standard Cubic Feet per Day
BA	Biological Assessment
CO_2	Carbon Dioxide
CO	Carbon Monoxide
ESL	Effects Screening Levels
EO	Element of Occurrence
ESA	Endangered Species Act
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GPM	Gallons per Minute
H_2S	Hydrogen Sulfide
Pb	Lead
LDAR	Leak Detection and Repair
MMPA	Marine Mammal Protection Act
MAOI	Maximum Area of Impact
MBTA	Migratory Bird Treaty Act
MMSCFD	Million Standard Cubic Feet per Day
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
NWI	National Wetland Inventory
NGL	Natural Gas Liquids
NRCS	Natural Resources Conservation Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
O_3	Ozone
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
RTO	Regenerative Thermal Oxidizer
SIL	Significant Impact Level
SWPPP	Stormwater Pollution Prevention Plan
SO_2	Sulfur Dioxide
TCEQ	Texas Commission on Environmental Quality
TNDD	Texas Natural Diversity Database
TPWD	Texas Parks and Wildlife Department
TPDES	Texas Pollutant Discharge Elimination System
US	United States

USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VOC	Volatile Organic Compound
WGI	Whitenton Group, Inc.

1.0 EXECUTIVE SUMMARY

Copano Processing, L.P. (Copano) owns and operates the Houston Central Gas Plant, which is a natural gas processing, treatment, and fractionation facility near Sheridan in Colorado County, Texas. The Houston Central Gas Plant has a current nameplate capacity of 1,100 million standard cubic feet per day (MMSCFD). Copano is proposing to add an additional 400 MMSCFD cryogenic processing train, bringing the total plant capacity up 1.5 billion standard cubic feet per day (BCFD)[1]. The proposed project is located approximately 3.0 miles southeast of the intersection of Farm to Market Road 2437 and US Highway 90. The project is subject to Prevention of Significant Deterioration (PSD) review for greenhouse gases (GHG) by the United States (US) Environmental Protection Agency (EPA) and meets the requirements of the Texas Commission on Environmental Quality (TCEQ)'s Oil and Gas Standard Permit. A Standard Permit is a general permit developed by the TCEQ for a specific facility or source type that can be used to authorize new facilities if they meet the pre-determined requirements of the permit. The requirements include emissions controls and standards that meet the TCEQ Best Available Control Technology (BACT) guidelines. The proposed facilities will utilize emissions controls that satisfy all requirements of the Standard Permit as described in this section.

This Biological Assessment (BA) is a complete evaluation of the potential environmental effects the proposed project may have on federally protected species and/or their potential habitat. Protected species evaluated in this document include threatened, endangered, and candidate species, migratory birds, bald and golden eagles, and marine mammals. This BA includes a field survey and an evaluation of potential environmental impacts based on air quality modeling results, construction information, and Texas Pollutant Discharge Elimination System (TPDES) information provided by Copano and RPS, Copano's air quality permitting consultant for the project.

Construction of the proposed new cryogenic processing train will take place within the existing plant in an area approximately 5.9 acres in size. No additional earth disturbance will be required outside of this 5.9-acre area. The construction will take place within a disturbed industrial site. A portion of the site is currently an active flare pit that would be relocated. The remainder of the site is currently utilized for equipment storage and a roadway to adjacent sites. No vegetation was observed within the proposed construction area. No new outfall structures will be required for this project. The project will utilize existing staging areas for construction.

Federally protected species considered in this BA include the Attwater's greater prairie-chicken, Houston toad, interior least tern, Louisiana black bear, red wolf, smooth pimpleback, Sprague's pipit, Texas fawnsfoot, Texas pimpleback, whooping crane, bald and golden eagles, migratory birds, and marine mammals. Three field surveys were completed: a pedestrian protected species habitat evaluation of the proposed project area and the portions of the surrounding facility that are not restricted by stringent safety requirements; a windshield habitat evaluation of all publicly-accessible habitats within a 3-mile radius of the project area; and an aerial habitat evaluation of all areas within a 3-mile radius. Data were collected to describe resident vegetation communities and assess the potential for occurrence of protected species. Five habitat types were observed in the areas surrounding the Houston Central Gas Plant: wetland, pastureland, mixed woodland, open water, and riverine.

In support of this BA, RPS performed dispersion modeling of air pollutants that will be emitted by the proposed project. The majority of the predicted concentrations due to the project are less than the Significant Impact Levels (SIL) designated by the United States (US) Environmental Protection Agency (EPA) for each pollutant and averaging period. All predicted concentrations from the project, as well as existing concentrations in the area, are demonstrated to comply with the applicable National Ambient Air Quality Standards (NAAQS). For pollutants and averaging periods for which the dispersion modeling predicted concentrations above the SIL [annual nitrogen dioxide (NO_2), 1-hour NO_2, and 24-hour Particulate Matter $(PM)_{2.5}$], the significant areas of impact (AOI)s located the farthest distance from the source in all directions were plotted to create an action area.

The action area has a maximum radius of approximately 0.5 miles, and the project has the potential to impact portions of the four observed habitat types: riverine, open water, mixed woodland, and pastureland. All four of these habitats may be utilized by migratory birds. Bald or golden eagles have the potential to utilize any of the four habitats. The Houston toad has the potential to utilize portions of the woodland and open water habitats. No additional federally protected species are likely to utilize these areas.

The maximum predicted concentrations of all modeled pollutants is well below the respective TCEQ Effects Screening Levels (ESL)s and also well below the first screening level of 10% of the ESLs. Accordingly, no adverse welfare impacts are expected to occur within the action area as the result of the project's emissions of these pollutants.

The construction of the proposed project will have no direct or indirect impact on federally protected species habitat. Copano will utilize BACT to control emissions and thus minimize impacts to the surrounding environment to the maximum extent practicable. The controls proposed for each pollutant are consistent with the TCEQ BACT guidance.

Based on the information gathered for this BA, Whitenton Group, Inc. (WGI) biologists recommend that a finding of "no effect" be accepted for the following federally protected species: Attwater's greater prairie-chicken, Houston toad, interior least tern, Louisiana black bear, red wolf, smooth pimpleback, Sprague's pipit, Texas fawnsfoot, Texas pimpleback, and whooping crane. The take of migratory birds, bald or golden eagles, or marine mammals is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Marine Mammal Protection Act described below in Sections 3.3 - 3.5, respectively.

2.0 INTRODUCTION

Copano owns and operates the Houston Central Gas Plant, which is a natural gas processing, treatment, and fractionation facility near Sheridan in Colorado County, Texas. The Houston Central Gas Plant has a current nameplate capacity of 1,100 MMSCFD. Copano is proposing to add an additional 400 MMSCFD cryogenic process train, bringing the total plant capacity up 1.5 BCFD[1].

The project is subject to Prevention of Significant Deterioration (PSD) review for greenhouse gases (GHG) by the United States (US) Environmental Protection Agency (EPA) and meets the requirements of the TCEQ's Oil and Gas Standard Permit. A Standard Permit is a general permit developed by the TCEQ for a specific facility or source type that can be used to authorize new facilities if they meet the pre-determined requirements of the permit. The requirements include emissions controls and standards that meet the TCEQ BACT guidelines. The proposed facilities will utilize emissions controls that satisfy all requirements of the Standard Permit as described in this section.

This BA is a complete evaluation of the potential environmental impacts the proposed project may have on federally protected species and/or their potential habitat. Protected species evaluated in this document include threatened, endangered, and candidate species, migratory birds, bald and golden eagles, and marine mammals. Federal agency regulations for protected species evaluated in this BA are described in Section 3.0.

The purpose of this BA is to research, evaluate, analyze, and document the potential for direct and indirect effects, interdependent and interrelated actions, and cumulative effects on federally protected species as a result of the proposed project. This BA includes a pedestrian protected species habitat evaluation of the proposed construction area, a windshield and aerial assessment of habitats in the surrounding areas, and an evaluation of potential environmental impacts based on air quality modeling results, construction information, operation information, and TPDES information provided by Copano and RPS.

The conclusion of this BA will include a recommended determination of effect on federally protected species and their habitat. Three possible determinations offered by the US Fish and Wildlife Service (USFWS) for the purpose of Biological Assessments and Evaluations are described (verbatim) below[2].

1. No effect – A "no effect" determination means that there are absolutely no effects from the proposed action, positive or negative, to listed species. A "no effect" determination does not include effects that are insignificant (small in size), discountable (extremely unlikely to occur), or beneficial. "No effect" determinations do not require written concurrence from the Service unless the National Environmental Policy Act analysis is an Environmental Impact Statement. However, the Service may request copies of no effect assessments for our files.

2. May affect, not likely to adversely affect – A "may affect, not likely to adversely affect" determination may be reached for a proposed action where all effects are beneficial, insignificant, or discountable. Beneficial effects have contemporaneous positive effects without any adverse effects to the species or habitat (i.e., there cannot be a "balancing," where the benefits of the proposed action would be expected to outweigh the adverse effects – see below). Insignificant effects relate to the size of the effects and should not reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. This conclusion is usually reached through the informal consultation process, and written concurrence from the Service exempts the proposed action from formal consultation. The federal action agency's written request for Service concurrence should accompany the biological assessment/biological evaluation.

Note: A conclusion or finding of "may affect, but is not likely to adversely affect" by an action agency and the USFWS, consultation with the USFWS is considered complete. This is known as "informal consultation".

3. May affect, likely to adversely affect - A "may affect, likely to adversely affect" determination means that all adverse effects cannot be avoided. A combination of beneficial and adverse effects is still "likely to adversely affect" even if the net effect is neutral or positive. Section 7 of the Endangered Species Act require that the federal action agency request initiation of formal consultation with the Service when a "may affect, likely to adversely affect" determination is made. A written request for formal consultation should accompany the biological assessment/biological evaluation.

   Note: A conclusion or finding of "may affect, likely to adversely affect" by an action agency and the USFWS; or if USFWS does not concur with an action agency's finding of "not likely to adversely affect" determination, then "formal consultation" is required between the action agency and the USFWS. Formal consultation results in the USFWS issuing a biological opinion as to whether or not the action, as proposed, will jeopardize the continued existence of any listed species.

3.0 AGENCY REGULATIONS

3.1 REGULATIONS AND STANDARDS

The Clean Air Act requires air quality standards be maintained to protect public health and the environment. These standards are the NAAQS and are regulated by the USEPA and the TCEQ. Ambient air is the air to which the general public has access, as opposed to air within the boundaries of an industrial facility. The NAAQS are concentration limits of pollutants in ambient air over specific averaging times. The averaging time is the time period over which the air pollutant concentrations must be met to comply with the NAAQS. The NAAQS are classified into two categories: primary and secondary standards. Primary standards are set to protect public health, including "sensitive" populations. Secondary standards are set to protect public welfare, including the environment[3].

The USEPA sets NAAQS for six principal air pollutants, also referred to as criteria air pollutants. These six criteria air pollutants are NO_2, ozone (O_3), sulfur dioxide (SO_2), PM, carbon monoxide (CO), and lead (Pb)[3]. A geographic area whose ambient air concentration for a criteria pollutant is equal to or less than the primary standard is an attainment area. A geographic area with an ambient air concentration greater than the primary standard is a nonattainment area. A geographic area will have a separate designation for each criteria pollutant[4].

To demonstrate compliance with NAAQS and other applicable air quality standards and guidelines, air quality analysis is performed using computer models to simulate the dispersion of the emitted pollutants into the atmosphere and predict ground level concentrations at specified receptor locations in the area around the source of emissions. If the modeled concentration for a given pollutant and averaging period is less than the USEPA-specified SIL, the project is determined to have no significant impact on ambient air quality, and no further analysis is required for that pollutant and averaging period. If the SIL is predicted by the model to be exceeded for a given pollutant, further analysis of the project emissions combined with existing concentrations in the area is required to estimate total ambient concentrations. The analysis must demonstrate that the total concentration, does not exceed the applicable NAAQS.

3.2 ENDANGERED SPECIES ACT

The USFWS and the National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA-NMFS) regulate the Endangered Species Act (ESA) of 1973. “The purpose of the ESA is to protect and recover imperiled species and the ecosystems on which they depend.” Imperiled species are defined specifically to include those listed by the USFWS as threatened or endangered[7]. Candidate species are those “the FWS has enough information to warrant proposing them for listing but is precluded from doing so by higher listing priorities[8].” Candidate species are not specifically protected by the ESA, but will be included for the purposes of this BA.

Section 9 of the ESA prohibits the “take” of threatened and endangered species. "Take" is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." “Harm” is defined as “an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering[9].”

3.3 MIGRATORY BIRD TREATY ACT

“A migratory bird is any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle.” According to the USFWS, there are approximately 836 bird species protected by the MBTA[10].

All migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918, which is regulated in the US by the USFWS. The MBTA prohibits the following: "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird . . . or any part, nest, or egg of any such bird[10]".

3.4 BALD AND GOLDEN EAGLE PROTECTION ACT

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA) of 1940, which is regulated by the USFWS. The BGEPA prohibits the following: ''take, possess, sell, purchase, barter, offer to sell, purchase, or barter, transport, export or import, at any time or any manner, any bald eagle (or golden eagle), alive or dead, or any part, nest, or egg thereof.'' "Take" is defined as ''pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb.'' ''Disturb'' is defined as: ''to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior[11].''

3.5 MARINE MAMMAL PROTECTION ACT

The USFWS and NOAA-NMFS regulate the Marine Mammal Protection Act (MMPA) of 1972. The MMPA prohibits the "take" of marine mammals in US waters or by US Citizens outside US waters and the importation of marine mammals or marine mammal products into the US. "Take" is defined as "hunt, harass, capture, or kill." [12]

4.0 PROJECT DESCRIPTION

4.1 PROJECT PURPOSE AND LOCATION

The purpose of the project is to construct and operate a new 400 MMSCFD cryogenic processing train at the existing Houston Central Gas Plant. Many producers, large and small, in the Eagle Ford Shale play are depending on Copano and their expansion project to bring rich gas to market. The expansion will allow these producers to bring new production online and extract the maximum value for their production. Additionally, Copano supplies natural gas liquids to the petrochemical and refining industries, which rely on Copano's supply of natural gas liquids as feedstock and blending components for their facilities[1].

The new cryogenic processing train will be used to dehydrate and separate natural gas liquids (NGL) from gas through the cryogenic process. The liquids will be treated to remove carbon dioxide (CO_2) and trace amounts of hydrogen sulfide (H_2S). The acid gas is routed to a new Regenerative Thermal Oxidizer (RTO). A process flow diagram for the proposed new equipment is provided as Figure 4-1 (Appendix A)[1].

The proposed project is located approximately 3.0 miles southeast of the intersection of Farm to Market Road 2437 and US Highway 90. (Figure 1 - Appendix B).

Project location information:

USGS Quad	Latitude/Longitude
Sheridan Sheridan NE	29.468795 -96.625591

4.2 CONSTRUCTION INFORMATION

4.2.1 CONSTRUCTION DESCRIPTION

Construction of the proposed new cryogenic processing train will take place within the existing plant in an area approximately 5.9 acres in size. No additional earth disturbance will be required outside of this 5.9-acre area. The construction will take place within a disturbed industrial site. A portion of the site is currently an active flare pit that would be relocated. The remainder of the site is currently utilized for equipment storage and a roadway to adjacent sites. No vegetation was observed within the proposed construction area. Construction activities will include site work, installation of drilled shaft foundations and spread footings, installation of pipe rack and supports, installation of major equipment, and installation of a new motor control center building. No new outfall structures will be required for this project. The project will utilize existing staging areas for construction. The construction area is shown on Figure 2 and 3 (Appendix B).

The new cryogenic processing train will include:

- Inlet gas mole sieve dehydrators with two supplemental heaters
- 400 MMSCFD cryogenic process
- Liquid amine treating unit
- RTO
- Two residue turbines
- Amine storage tank
- Associated fugitive components

The projected construction start date (pending necessary permit approvals) is 01 June 2013. The projected operation start date is 01 May 2014.

4.2.2 CONSTRUCTION ACTIVITIES AND SCHEDULE

The total time estimated to complete the construction of the project is approximately 48 weeks. The construction schedule will be 10 hours per day, five days per week until completion. The schedule may increase, as needed, to meet the project deadline. The following general construction activities are included:

- Site Dirt Work
- Installation of drilled shaft foundations and spread footings
- Installation of pipe rack and other pipe supports
- Setting of major equipment items (compressors, vessels, exchangers, skids)
- Installation of rack piping and interconnecting pipe between major equipment
- Installation of new Motor Control Center building and associated wiring to equipment motors
- Installation of instrument devices and associated wiring
- Pressure testing of various piping systems
- Installation of insulation
- Controls checkout
- Plant start-up and commissioning
- Touch-up painting

The estimated number of personnel required for construction of the cryogenic processing train is an average of 120 and a maximum of 200 for a maximum timeframe of 48 weeks. Any emissions resulting from the additional construction personnel would be insignificant and temporary.

4.2.3 CONSTRUCTION EQUIPMENT REQUIRED

Equipment required to complete the proposed facilities construction activities and their estimated schedule is listed below.

- One large crane (550 tons) for major lifts - 20 weeks
- One large crane (250 tons) for tailing of major lifts – 3 weeks
- Small cranes (80 tons) - 48 weeks for one, 30 weeks for one
- Two 4-wheel drive fork lifts – 48 weeks for one, 30 weeks for one
- Six utility vehicles – 48 weeks
- One backhoe – 48 weeks
- One mini excavator—24 weeks
- Two air compressors – 48 weeks
- Three JLG lifts – two for 40 weeks, one for 24 weeks
- One scissor lift – 24 weeks
- Two ground compactors (jumping jacks) – 24 weeks
- One dump truck – 16 weeks
- Seven welding machines and generators - 38 weeks

4.2.4 STORMWATER

Best Management Practices will be utilized in accordance with Section 401 of the Clean Water Act Chapter 279 of the Texas Water Code and as prescribed in the Storm Water Pollution Prevention Plan (SWPPP) required for construction.

The Houston Central Gas Plant currently has an Oil and Hazardous Materials Spill Prevention, Control, and Countermeasure Plan in place and the facility employees are trained to implement these plans. This plan will be updated to incorporate the new processing train as appropriate; and, will be utilized during construction, operations, and maintenance of the proposed additional furnace.

4.2.5 CONSTRUCTION NOISE LEVELS

Copano project engineers estimate that noise levels during construction should be comparable to noise levels from maintenance activities that currently take place at the plant.

The best available technology will be used to maintain noise levels during construction below 75 decibels measured at the property fenceline.

4.3 OPERATION AND MAINTENANCE INFORMATION

4.3.1 OPERATION DESCRIPTION

The new cryogenic processing train will be constructed within the existing plant, immediately adjacent to the existing cryogenic processing trains.

The new cryogenic processing train will be used to dehydrate and separate NGL from gas through the cryogenic process. The liquids will be treated to remove CO_2 and trace amounts of H_2S. The acid gas is routed to a new RTO[1].

The maximum operating schedule is 24 hours per day, 7 days per week, and 52 weeks per year.

Three new full-time personnel will be required for operation.

Required maintenance includes the following:

1. Mars Solar Turbines (3 & 4): The Manufacturer is contracted quarterly to perform preventative maintenance on each unit. No additional air emissions are anticipated.

2. RTO (2): The unit is maintained according to manufacturer's recommendations. This involves annual preventative maintenance on the unit performed by the equipment manufacturer. No additional air emissions are anticipated.

3. Supplemental Gas Heaters (1 & 2): These units are maintained according to manufacturer's recommendations. This involves annual preventative maintenance on the unit performed by the equipment manufacturer. No additional air emissions are anticipated.

4. This plant will require fugitive emissions monitoring per the TCEQ plant permit. A contractor is used to perform fugitive emissions monitoring as required per the TCEQ permit.

No additional environmental impacts are anticipated as a result of maintenance activities required for the project.

4.3.2 WATER USE

The Houston Central Gas Plant obtains water from its own ground water well. The total water consumption estimated for the cryogenic processing train is 10 gallons per minute (gpm).

4.3.3 WASTEWATER

The new cryogenic processing train will be located within the existing Houston Central Gas Plant. The Houston Central Gas Plant is exempt from a TPDES permit and does not require a SWPPP for operations. The proposed expansion project would produce a maximum of 10 gpm of wastewater.

Currently, wastewater from the existing Houston Central Gas Plant is neutralized with chlorine and sent to a permitted underground well located within the existing facility. This underground well is permitted by the Railroad Commission of Texas [Sheridan Gas Unit Lease, (042784), Well No. 66U, Sheridan (Wilcox) Field, Colorado County, RRC District 03]. The permit conditions allow up to 8000 bbl/day of RCRA, non-exempt non-hazardous, open and closed drain system water, and sanitary sewer system effluent to be injected to a subsurface depth between 2700 and 3900 feet.

Currently, the Houston Central Gas Plant injects approximately 1200 bbl/day of cooling tower basin water into the underground well. The proposed project would add approximately 343 bbl/day of Reverse Osmosis Unit effluent to the existing wastewater injection. The total injection, including the estimated addition effluent from the expansion project, would be well below the limits of the permit.

Best Management Practices will be utilized in accordance with Section 401 of the Clean Water Act Chapter 279 of the Texas Water Code.

4.3.4 OPERATION NOISE LEVELS

Project engineers estimate that noise levels during operation should be comparable to noise levels from maintenance activities that currently take place at the Houston Central Gas Plant.

4.3.5 EMISSION CONTROLS

The proposed project meets the requirements of the TCEQ's Oil and Gas Standard Permit. A Standard Permit is a general permit developed by the TCEQ for a specific facility or source type that can be used to authorize new facilities if they meet the pre-determined requirements of the permit. The requirements include emissions controls and standards that meet the TCEQ BACT guidelines. The proposed facilities will utilize emissions controls that satisfy all requirements of the Standard Permit as described in this section.

Two natural gas-fired combustion turbines used for residue gas compression will constitute 92% of the total project nitrogen oxides (NO_x) emissions increase and 90% of the CO emissions increase. The Standard Permit requires the turbines to meet a NO_x emission limit of 3.0 g/hp-hr. The proposed turbines will be equipped with state-of-the-art Solar™ low NO_x combustors that will meet a NO_x emissions level of 0.125 g/hp-hr, which is far below the level required by the Standard Permit. These combustors are also designed to maximize combustion efficiency to minimize emissions of CO, PM, and volatile organic compound (VOC). The combustor design will reduce CO emissions to 0.21 g/hp-hr. The turbines are not a significant source of VOC and PM. The turbines will fire low sulfur natural gas which results in insignificant SO_2 emissions.

Due to their small size and infrequent operation, the Regeneration Heaters will not be a significant source of emissions of any pollutant. Emissions will be controlled by a combination of limited operating hours (600 hr/yr), burning low sulfur natural gas, and efficient combustion design and operation.

The flare used to control flash gas emissions will have a minimum destruction efficiency of 98% for VOC and H_2S and will be operated in accordance with 40 CFR 60.18, including minimum flare stream heating value and maximum flare stream exit velocity requirements, as required by the Standard Permit.

The RTO used to control VOC and H_2S emissions in the Amine Unit acid gas stream will meet VOC and H_2S destruction efficiencies of at least 99% and 99.8%, respectively. The Standard Permit does not have specific control requirements for an RTO; however, a flare that achieves 98% destruction of these compounds and would result in no additional NO_x and CO emissions meets BACT requirements for similar facilities. Therefore, use of the proposed RTO would meet or exceed the TCEQ BACT requirement, if applicable.

There are no specific control requirements applicable to fugitive VOC emissions from the project because uncontrolled fugitive emissions are less than 25 tons per year of VOC. However, Copano will implement the TCEQ's 28M leak detection and repair (LDAR) program to control VOC emissions. This LDAR program will limit the VOC fugitive emissions to less than 3 tons per year.

5.0 BACKGROUND INFORMATION

5.1 GENERAL ENVIRONMENTAL INFORMATION

This section provides applicable environmental characteristics for the general region in which the project is located.

5.1.1 GENERAL REGION INFORMATION

The survey area is located within two eco-regions of Texas[13]: approximately 70% Southern Post Oak Savanna and 30% Northern Humid Gulf Coastal Prairies. The survey area is located in the Gulf Coastal Plain physiographic province of North America[14].

The Southern Post Oak Savanna making up the western majority of the survey area was historically characterized by native grasses such as little bluestem, silver bluestem, and brownseed paspalum with scattered clumps of trees. Post oaks were dominant, but other species included blackjack oak, water oak, winged elm, hackberry, and yaupon. Suppression of fire and land clearing practices by ranchers and farmers in the area resulted in thick undergrowth by species such as yaupon, as well as the removal of many of the larger hardwoods[15].

The Northern Humid Gulf Coastal Prairies making up the eastern minority of the survey area was historically characterized by grasslands with scattered oak mottes. Dominant grassland species included little bluestem, yellow Indiangrass, and brownseed paspalum. The dominant tree species is coastal live oak[15].

The Gulf Coastal Plain physiographic province borders the Gulf Coast. The majority of the river basins of Texas drain towards the Gulf of Mexico. This ecoregion also receives more rainfall than many other ecoregions in Texas. As a result, this region is ecologically diverse inland as well as immediately adjacent to the coastline. Freshwater wetlands, marshes, and swamps as well as hardwood bottomlands, prairies, and oak mottes are common throughout this region[16]. This region is a prime nesting and wintering location for migratory birds[15]. Because of the abundant water resources, the rich soils, and the proximity to the coast, this area is commonly converted to cropland, ranchland, and industrial development[17]. These land uses have reduced and fragmented the critical protected species habitat throughout the region.

5.1.2 LAND USE

The proposed expansion project is located in Colorado County approximately 70 miles from the Gulf Coast. The chief agricultural products included rice, cattle, corn, nursery plants, poultry, hay, and sorghum[16]. Other land uses throughout Colorado County include residential, urban, commercial, and industrial developments.

Based on the background review, the land use within the survey area is industrial development and ranchland.

5.1.3 CLIMATE

The growing season in Colorado County is 280 days with an annual rainfall of 41 inches. The average temperature in January is 50°F with an average daily minimum of 36.8°F, and the average temperature in July is 82.7°F with an average daily maximum of 95.6°F. Prevailing winds are from the south-southeast with an average speed of 9.4 miles per hour. Average humidity is 59% with a higher average humidity at dawn of 90%[17].

As of 1 May 2012, the US Drought Monitor indicated the survey area is in D1 Drought – Moderate[18]. According to the National Weather Service/Advanced Hydrologic Prediction Service (NWS/AHPS), the area has received approximately 0.5-1.5 inches of rain within the 30 days prior to the field survey, is approximately 1-4 inches below normal for the previous 30 days, and is approximately 1-2 inches below normal for the previous 60 days[19].

Palmer Hydrological Drought Index data obtained from the NOAA – National Climatic Data Center (NCDC)[20] for Colorado County and the State of Texas are shown in Table 1 below.

Table 1. Palmer Hydrological Drought Index Summary[20]

Year	Colorado County	East Texas
2005	mid-range	moderately moist
2006	severe drought	extreme drought
2007	very moist	moderately moist
2008	mid-range	moderate drought
2009	mid-range	extreme drought
2010	mid-range	moderately moist
2011	severe drought	severe drought

The NOAA – NCDC Hydrological Drought Index indicates that, while Colorado County has been impacted by drought only two of the past seven years, the watersheds that contribute to the project region have been impacted by significant drought conditions for four out of the past seven years. Long-term drought conditions have weakened many ecosystems across Texas[20].

5.1.4 TOPOGRAPHY

The Colorado County is level rolling land with elevations ranging from 150-425 feet above sea level[16]. The project area is flat with an elevation of approximately 253 feet above sea level[21] (Figure 4 – Appendix B).

According to the Federal Emergency Management Agency (FEMA) flood insurance rate maps, the proposed project site and portions of the surrounding areas are located within a designated 100-year floodplain[22].

5.1.5 GEOLOGY

The geologic formations within the study area are the Willis Formation, Lissie Formation, and alluvium and low terrace deposits[23].

The geologic units found within and surrounding the proposed project area are listed and described below in Table 2.

Table 2. Geologic Units Summary[23]

Map Unit	Unit Name and Description	Rock Types
Pow	Willis Formation	Clay or mud, silt, sand/ gravel
Qal	alluvium	sand, silt, clay or mud/ gravel
Ql	Lissie Formation	sand, silt, clay or mud

Deep sandy soils associated with the Willis Formation have the potential to support the Houston toad.

5.1.6 SOILS

Dominant soils found in Colorado County include: clays and loams[16].

The Natural Resource Conservation Service (NRCS) soil units mapped within and surrounding the proposed project area are listed and described below in Table 3[24].

Table 3. NRCS Soil Units Summary[24]

NRCS Map Unit Symbol	NRCS Map Unit Name	NRCS Map Unit Characteristics	USDA Classification				NRCS Hydric Soil
			Depth	Drainage	Permeability	Landform	
CmB	Cheetham loamy sand	1-3% slopes	very deep	moderately well drained	moderately slow	gently sloping	No
GoA	Garwood fine sandy loam	0-1% slopes	very deep	moderately well drained	slow	nearly level	Yes
GrA	Garwood-Cieno complex	0-1% slopes	very deep	moderately well drained	slow	nearly level	Yes
KaA	Katy fine sandy loam	0-1% slopes	very deep	moderately well drained	moderately slow	nearly level	Yes
KuB	Kuy sand	1-3% slopes	very deep	moderately well drained	moderate	N/A	No
MfB	Milby sand	1-3% slopes	very deep	moderately well drained	slow	gently sloping	No
MkB	Mockley fine sandy loam	1-3% slopes	very deep	well drained	moderately slow	very gently sloping	No
NaA	Nada-Cieno complex	0-1% slopes	very deep	moderately well drained	very slow	nearly level	Yes
NgA	Nez loamy sand	0-1% slopes	very deep	moderately well drained	very slow	N/A	Yes
NhA	Nez fine sandy loam	0-1% slopes	very deep	moderately well drained	very slow	N/A	Yes
RoB	Robco loamy fine sand	1-3% slopes	very deep	moderately well drained	slow	nearly level to moderately sloping	No
SwB	Straber loamy fine sand	1-3% slopes	very deep	moderately well drained	very slow	nearly level to moderately sloping	No
TfA	Telf-Cieno complex	0-1% slopes	very deep	moderately well drained	very slow	nearly level to gently sloping	Yes
TmA	Tremona loamy sand	0-1% slopes	very deep	somewhat poorly drained	very slow	nearly level to gently sloping	No
WyA	Wockley fine sandy loam	0-1% slopes	very deep	somewhat poorly drained	moderately slow	nearly level	Yes

5.1.7 WATER RESOURCES

Colorado County has abundant water resources. The Colorado River bisects the county and the San Bernard River bounds the county to the east. Other prominent water features in the area include Eagle Lake, Middle Bernard Creek, Little San Bernard River, Miller Creek, Sandy Creek, and Cummins Creek[25].

The watersheds or river basins that contribute water resources into the project region are the Lavaca, Colorado, and Guadalupe. The proposed project site is located within the Lavaca watershed[26].

Available digital data from the Texas Parks and Wildlife Department (TPWD) designate three Ecologically Unique River and Stream Segments: the Colorado River, approximately 10.5 miles northeast of the study area, West Mustang Creek approximately 25.5 miles southeast of the study area, and the Lavaca River, approximately 35 miles south of the study area[27].

Based on the background review, the water resources in the survey area include ponds, streams, and potential wetlands.

The USFWS National Wetland Inventory (NWI) data within, and immediately adjacent to, the proposed project area are demonstrated in Figure 5 (Appendix B)[28].

5.2 PROTECTED SPECIES

5.2.1 THREATENED OR ENDANGERED SPECIES LIST

Threatened, endangered, and candidate species listed by the USFWS and TPWD as having the potential to occur in Colorado County[29, 30] are provided in Table 4.

Table 4. USFWS/TPWD List of Threatened or Endangered Species for Colorado County, Texas[29, 30]

Common Name	Scientific Name	Species Group	USFWS List Status	TPWD List Status
Attwater's greater prairie-chicken	*Tympanuchus cupido attwateri*	birds	E	LE
Houston toad	*Anaxyrus houstonensis*	amphibians	E	LE
interior least tern	*Sterna antillarum athalassos*	birds	-	LE
Louisiana black bear	*Ursus americanus luteolus*	mammals	-	LT
red wolf	*Canis rufus*	mammals	-	LE
smooth pimpleback	*Quadrula houstonensis*	mollusks	-	C
Sprague's pipit	*Anthus spragueii*	birds	-	C
Texas fawnsfoot	*Truncilla macrodon*	mollusks	-	C
Texas pimpleback	*Quadrula petrina*	mollusks	-	C
whooping crane	*Grus americana*	birds	E	LE

Note: USFWS List Status symbols: "E" stands for Endangered. TPWD List Status Symbols: "LE" stands for Listed Endangered, "LT" stands for Listed Threatened, and "C" stands for Candidate.

5.2.2 THREATENED OR ENDANGERED SPECIES DESCRIPTIONS

A brief description of these species and their habitat requirements are included below.

Attwater's Greater Prairie-Chicken

The Attwater's greater prairie-chicken is a brownish, strongly black-barred grouse of medium size (17 inches in length) with a short, rounded, blackish tail. Booming grounds, or leks, are communal display areas named for the sound produced by displaying male prairie chickens. Booming grounds are usually found on bare ground or short grass areas where the females can easily see the males[31]. They may be naturally occurring short grass flats or artificially maintained areas such as roads, runways, oil well pads, and drainage ditches[32]. Heavily grazed areas such as those around windmills, ponds, and other cattle concentration areas are also used for booming sites[31].

Males begin to set up territories in late January-February. Hens begin to arrive at the booming grounds in late February and early March. Mating occurs in early March and booming activity gradually tapers during the last week of April and the first two weeks of May. Males have abandoned booming grounds by mid-May. Nesting begins in early March with the nest being a well-concealed, shallow depression about 8 inches in diameter lined with dry grass and feathers from the hen. The preferred nest location is in mid to tall grass cover with the grass canopy concealing the nest. Hens on average lay 12 eggs and the peak of the hatch is in late April to early May[31].

Attwater's greater prairie-chickens are found only in the coastal prairie of Texas. Grass and open space are required by the prairie chickens[32]. A mixture of native grasses of varying heights is optimum habitat. Short grass cover (less than 10 inches in height) is used for courtship, feeding, and to avoid moisture during heavy dew or after rains. Mid-grass areas (10-16 inches in height) are used for roosting and feeding. Tall grasses (16-24 inches in height) are used for nesting, loafing, and escape cover[31].

Prime habitat consists of tall grass dominated by bunchgrasses such as little bluestem, Indiangrass, switchgrass, and big bluestem along with flowering plants such as *Ruellia*, yellow falsegarlic, and ragweed. They prefer open prairies without any wood cover and avoid areas with more than 25% shrub cover. The most commonly consumed plants in their diet are *Ruellia*, yellow falsegarlic, upright prairie-coneflower, Leavenworth vetch, stargrass, bedstraw, doveweed, and ragweed[31].

Houston Toad

Houston toads are generally dorsally light brown and speckled, but individual coloration can vary from black to red. Dorsal speckles are black and enclose one or more warts. The ventral color is cream to yellow and the chest is "suffused with black pigment and occasional black spots." Houston toads typically have dark bands on their legs and extending from each eye to the mouth. The throat of males is usually black. They are stout-bodied with short legs and rough skin. Adult Houston toads are medium-sized (2-3.5 inches) with females larger and bulkier[33, 47].

Adult Houston toads can be observed from December to June. Breeding is partially triggered by rainfall events and warm night temperatures; and, typically peaks in February and March. Females typically visit a waterbody once a breeding season to lay eggs. Males can visit the same waterbody upwards of 15 times in one breeding season. Males are typically located in a waterbody by their breeding call, which is very long (7-22 seconds) and high pitched[47].

Houston toads require three habitat types for persistence: breeding, occupied, and dispersal. These habitat types occur within narrow bands of geologic formations in east-central Texas. The specific geologic formations associated with potential Houston toad habitat include the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis[34]. Underlying geology contributes to the mineral content of the surface soil, which Houston toads are dependent upon. Houston toads are highly sensitive to habitat degradation, fragmentation, and loss[47].

Breeding habitat consists of small pools and ephemeral ponds, including ditches, stock ponds, flooded pastures, prairie potholes, and streams. These non-flowing aquatic habitats must persist for at least 40-80 days, depending on limiting factors such as ambient temperature and available food resources. Permanent waterbodies have an increased potential for predators and impacts from livestock and agriculture, which can decrease survivability. Studies have shown that stock ponds with impacted margins were not utilized, but regained suitability after livestock access was restricted[47].

Occupied habitat includes the adjacent upland woods surrounding the breeding ponds. Adults occupy this habitat year round. Juveniles occupy this habitat prior to dispersal. Preferred occupied habitat characteristics include pine or oak woodlands interspersed with open bunchgrasses and coastal prairies over deep sandy soils within a mile of the preferred breeding ponds. These toads spend daylight hours in burrows that are self-constructed or constructed by other wildlife. They can also be found under tree roots, leaf litter, or debris.

Juvenile toads will disperse within days of emergence from the breeding waterbody. Juveniles require adequate dispersal habitat for species dispersion and breeding recruitment. Loosely connected terrestrial habitats are required for dispersal. Connected forested habitats allow for longer distance dispersal[47].

Tadpoles feed primarily on pollen (usually from nearby pines), the jelly envelopes of other recently hatched Houston toads, and algae on floating leaves. Adults feed primarily on ground beetles, although they have been known to eat smaller toads and ants[33].

Interior Least Tern

Least terns are small birds, measuring about 21-24 cm long with a 51 cm wingspread. Sexes appear similar, with a black-capped crown, white forehead, grayish back and dorsal wing surface, and white undersurface; legs are a variation of orange and yellow colors depending on the sex, and a black-tipped bill whose color also varies depending on sex[36].

The interior least tern is piscivorous, feeding in shallow waters of rivers, streams and lakes. Least terns also feed on crustaceans, insects, mollusks and annelids. The terns usually feed close to their nesting sites. Fishing occurs close to the riverine colony. Terns nesting at sand and gravel pits and other artificial habitats may fly up to 3.2 km to fish[36].

Breeding colonies or terneries are usually small (up to 20 nests) with nests spaced far apart. Egg-laying and incubation occur from late May to early August, depending on the geographical location and availability of habitat[36].

The interior least tern is migratory and breeds along the Mississippi, Red and Rio Grande River systems and rivers of central Texas. Distribution generally is restricted to less altered river segments. Wintering grounds are located along the Gulf Coast[36].

The riverine nesting areas of interior least terns are sparsely vegetated sand and gravel bars within a wide unobstructed river channel, or salt flats along lake shorelines. Nesting locations usually are at the higher elevations and away from the water's edge because nesting starts when the river flows are high and small amounts of sand are exposed. The size of nesting areas depends on water levels and the extent of associated sandbars[36].

<u>Louisiana Black Bear</u>

The Louisiana black bear is a large mammal with long black hair and a short tail. The facial profile is blunt, eyes small, and a broad nose pad with large nostrils. The muzzle of the Louisiana black bear is yellowish-brown. Some bears have a white patch on the lower throat and chest. Adult males are typically larger, ranging from 300-400 pounds. Adult females range in weight from 120-180 pounds. The Louisiana black bear is 4-7 feet in length[37].

Originally, Louisiana black bear were known to occur in the forests of eastern Texas, Louisiana, and Mississippi. They typically inhabit bottomland hardwood forests. Other habitat types utilized by the Louisiana black bear include brackish and freshwater marshes, salt domes, and agricultural fields. These bears require large, remote tracts of land with minimal human disturbance. The last known populations in eastern Texas were in the swamps and thickets of the Big Thicket region of southeast Texas. Today, Louisiana black bears primarily occur within the boundaries of the state of Louisiana. The largest concentration exists in the Atchafalaya River and Tensas River Basins[37].

Louisiana black bears are opportunistic feeders with a diet that may consist of acorns, berries, carrion, and insect larvae. In addition the bears may feed on agricultural products such as corn, wheat, and sugarcane[37].

The breeding period for Louisiana black bears is the summer. Females begin breeding around 3 years of age and have a gestation period of 7 or 8 months. Litter size ranges from 1-4, with cubs being born every other year in January or February[37].

Red Wolf

The red wolf is one of only two wolf species in the world. Their fur is a reddish color and they are smaller in size than the gray wolf. The average adult red wolf grows up to 4 feet in length and 50-80 pounds[38].

Originally, red wolves were found throughout the southeastern US. The USFWS declared the red wolf extinct in the wild in 1980. In 1987, captive individuals were released to the wild in North Carolina. This reintroduced population is reportedly thriving and growing[38].

Red wolves feed on rabbits, deer, raccoons, and rodents. They live in packs of 5-8, which typically consists of one breeding pair and their offspring[38]. Little information is available describing red wolf preferred habitat characteristics.

Smooth Pimpleback

The smooth pimpleback is a small, freshwater mussel that is endemic to the Brazos and Colorado River drainages in Texas. It ranges in size from 45-60 mm and is generally round and inflated. External colors range from tan to black with no rays but occasional growth-rest bands[39].

Little is known about habitat preferences for the smooth pimpleback. Characteristics of known locations include mud, sand, or fine gravel substrates in small to large riverine systems and few reservoirs. It is assumed that this mussel can tolerate impoundment at select locations and slow to moderate flow rates[40].

According to the Federal Register, current distribution of the smooth pimpleback is limited in the Colorado River Basin and more abundant in the Brazos River Basin. The only recorded observations of smooth pimplebacks found in Colorado County occurred within the Colorado River in 1999 and 2009. No smooth pimpleback populations have been observed in any tributaries of the Colorado River within Colorado County[40].

Sprague's Pipit

Sprague's pipits are small, migratory passerines with a slender shape and relatively narrow bill. Their underparts are brown with broad black streaks. Legs are yellowish to pale brown. The upper mandible is dark and contrasts with the pale lower mandible[41].

The only known population of Sprague's pipit occurs within North America. Known breeding sites are located in Canada, Montana, North and South Dakota, and Minnesota. Wintering grounds are located in Arizona, New Mexico, Texas, Oklahoma, Arkansas, Mississippi, Louisiana, and northern Mexico. Migration occurs in April to May and September to November[41].

Preferred habitat includes well-drained, open grasslands with native mid-grasses of intermediate thickness and with moderate litter depths. Preferred grasslands are undisturbed. Grazing, prescribed burning, or mowing can be tolerated after one year. Food primarily consists of arthropods, but occasionally seeds. Nests are a cup shape on the ground, made of woven dried grasses. Average clutch size is 4.5 and young are cared for by the female for approximately 25 days until fledging[41].

Texas Fawnsfoot

The Texas fawnsfoot is a small, freshwater mussel that is endemic to the Brazos and Colorado River drainages in Texas. It can reach up to 60 mm in length. This mussel is generally oval and thin. External colors range from yellow to brown with broken rays and irregular blotches[40].

Little is known about habitat preferences for the Texas fawnsfoot. Characteristics of known locations include sand substrates in moderate to large riverine systems. It is assumed that this mussel prefers moderate flow rates. It is also assumed that this mussel cannot tolerate impoundments and low flow rates[40].

According to the Federal Register, current distribution of the Texas fawnsfoot is thought to be limited to the Brazos River, San Saba River, and Colorado River. No Texas fawnsfoot populations have been observed in the Colorado River Basin in recent years except in the lower mainstem Colorado River in 2009 and the San Saba River in 2011[40].

Texas Pimpleback

The Texas pimpleback is a large, freshwater mussel that is endemic to the Brazos and Colorado River drainages in Texas. It is larger than most pimpleback species ranging from 60-90 mm. This mussel is generally round and moderately inflated. External colors range from yellow to brown with occasional mottles or dark green rays[39].

Little is known about habitat preferences for the Texas pimpleback. Characteristics of known locations include mud, sand, gravel, or cobble substrates in moderate-sized riverine systems. It is assumed that this mussel prefers shallow depths and slow to moderate flow rates. It is also assumed that this mussel cannot tolerate impoundments and scourable substrates[40].

According to the Federal Register, current distribution of the Texas pimpleback is thought to be limited to the Concho River, Guadalupe River, San Marcos River, and San Saba River. No Texas pimpleback populations have been observed in the Colorado River Basin in recent years except in Runnels and San Saba counties[40].

Whooping Crane

The whooping crane is a large bird that stands approximately 5 feet tall with a wingspan of approximately 7 feet. These birds have long necks and legs, a white body, a red crown, black primary feathers, and a long, pointed beak[42].

Whooping cranes inhabit a variety of habitats due to migration; however, they primarily inhabit large wetlands. During migration, these cranes prefer to feed and roost in wetlands, rivers, and upland grain fields with other bird species. They feed on crustaceans, mollusks, amphibians, fish, rodents, small birds, and berries[42].

Parents prefer to build their nests in marshes among taller vegetation, such as sedges, for protection. Females usually lay 2 eggs per clutch and one clutch per year in April or May. The eggs hatch approximately one month later. Parents share the rearing duties, but the female takes the primary role in raising the young[42].

The main population of whooping crane migrates across the central United States and Canada. This population breeds (May to October) in Wood Buffalo National Park in Alberta, Canada and spends the winter (November to March) on the Texas coast at the Aransas National Wildlife Refuge near Rockport, Texas. They migrate (October to November and April) through the central US (North Dakota, South Dakota, Nebraska, Oklahoma, and Texas)[42].

According to the USFWS, there is no designated critical habitat for any of the federally listed threatened and endangered species within at least 49 miles of the survey area[43].

5.2.3 TEXAS NATURAL DIVERSITY DATABASE RESULTS

A records review of the Texas Natural Diversity Database (TNDD) was completed for the proposed project area and surrounding areas by the TPWD on 24 March 2012. No elements of occurrence (EO) are located within the survey area. The EO closest to the proposed project area (EO ID 344) is approximately 49 miles to the northwest and is listed as a Houston toad last observed in 2003[44].

5.2.4 MARINE MAMMAL HABITAT

Marine mammals are ecologically restricted to marine and estuarine habitats. The closest marine or estuarine habitat to the project area (Matagorda Bay) is approximately 50 miles to the south. Marine mammals with the potential to occur in Matagorda Bay include bottlenose dolphins and West Indian manatees. Bottlenose dolphins are fairly common within the Matagorda Bay system. West Indian manatees are an occasional occurrence; the last known occurrence found was in 2004 near Rockport[45].

5.2.5 HOUSTON TOAD KNOWN POPULATIONS

According to the Houston Toad Conservation Program website, Houston toads were observed in nine counties (Austin, Bastrop, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson) in Texas in the 1980s to 1990s. In 2006, recorded observations were limited to Bastrop and Leon counties. Habitat destruction, severe long-term drought, and wildfires have had a devastating impact on the Houston toad population[35]. Currently, observations of the Houston toad have been recorded in Austin, Bastrop, Colorado, Lavaca, Lee, Leon, Milam, and Roberston counties, Texas[47].

The Houston Toad Conservation Program, a collaboration including but not limited to the Houston Zoo, state and federal agencies, Texas State University, the Environmental Defense Fund and private landowners, has collected Houston toad eggs for the purpose of species preservation and head starting. Head starting is a program where toads (eggs, larvae, and juveniles) are protected and released when they reach a certain size. Although the head start release sites have not been identified, toads are released into the same ponds from which eggs were collected. It can be inferred that release locations are limited to known population locations, at minimum[46].

Through informal email correspondence on 13 June 2012, Dr. Michael Forstner conveyed the following information regarding Houston toad known populations in the project region. Although there are few recorded occurrences of Houston toads in Colorado and Lavaca counties, no known surveys were conducted between the mid-1990s and the mid-2000s for these counties. Dr. Forstner indicated that the closest and most recent detections of Houston toads to the project area are approximately 9.3 miles to the west in Lavaca County by Dr. Forstner (2011), approximately 15.22 miles to the west in Lavaca County by Dr. Yantis (1990), approximately 24.85 miles to the northeast at the Attwater Prairie Chicken National Wildlife Refuge in Colorado County, and approximately 26.1 miles to the north in Colorado County by Dr. Forstner (2007). Detections have also been recorded in recent years in Austin and Burleson counties[47].

Note: Dr. Michael Forstner is a professor in the Department of Biology at Texas State University, the Alexander-Stone Chair of Genetics, and an expert on Houston toads. Dr. Forstner, in collaboration with university students and faculty, state and federal agencies, zoos, and landowners, has studied and monitored Houston toads since the early 1990s[48].

5.2.6 HOUSTON TOAD SUITABILITY MODEL

Dr. Forstner was contracted to conduct a Houston toad habitat evaluation of the project action area. Dr. Forstner's habitat evaluation included a desktop review and pedestrian field survey. The desktop review included a context suitability assessment for Houston toads utilizing the 2008 suitability map and records of occurrence.

As stated in Section 5.2.5, the closest known occurrence of Houston toads to the project area is approximately 9.3 miles to the west. Houston toads have been detected moving significant distances [up to 2.5 miles through suitable dispersal habitat (canopy cover) and up to 1.25 miles through unsuitable dispersal habitat], but not as far as 9.3 miles.

The 2008 suitability map was generated through a model that incorporates known habitat characteristics and statistically valid variables, such as soil depth and canopy cover. The suitability map demonstrates the potential for Houston toad habitat within and surrounding the action area.

The results of the suitability assessment show the action area at the end of a narrow band of suitable habitat. This narrow band begins just northeast of the project area and follows Middle Sandy Creek northward. A small portion of the suitable habitat band falls within the action area.

The background review indicated that it took more than five years to detect the Houston toad in this region (Austin, Colorado, and Lavaca counties). Therefore, it is reasonable to assume that Houston toads are not abundant in this region. Current Houston toad observation data indicates that the Houston toad requires large contiguous patches of suitable habitat. Middle Sandy Creek could serve as potential dispersal habitat. However, this habitat is not likely to be utilized and is a path to unsuitable breeding and occupied habitats. The background review indicated that there is no known evidence to support the potential presence of the Houston toad within or adjacent to the action area; or, of the potential use of this area by the Houston toad in the near future[47].

6.0 PROTECTED SPECIES HABITAT EVALUATION

WGI completed a protected species habitat evaluation on 19 April 2012 to determine if habitat within the project area was likely to support any of the federally protected species potentially occurring in Colorado County. The field surveys included a pedestrian survey of the proposed project area and the portions of the surrounding facility that are not restricted by stringent safety requirements. The field surveys also included a windshield survey of all terrestrially accessible habitats visible from public areas within a 3-mile radius of the project area. The majority of the lands within the 3-mile radius are privately-owned and not visible or accessible from public areas. An aerial survey was conducted of the 3-mile radius to observe the inaccessible areas and survey for the presence of bald or golden eagles or evidence of their nests. Data were collected to describe resident vegetation communities and assess the potential for occurrence of protected species. The dominant habitats observed within a 1-mile radius of the construction area are described below and demonstrated in Figure 6 (Appendix B).

Photographs of the proposed project area and accessible surrounding areas are included as Appendix C. A summary of the field survey data is provided in Appendix D.

6.1 PLANT COMMUNITIES OBSERVED

The proposed project area is previously disturbed by industrial activities. A portion of the site is currently an active flare pit that would be relocated. The remainder of the site is currently a staging area for adjacent construction activities. No vegetation was observed within the proposed construction area. Existing roads and staging areas would be utilized.

Immediately to the west of the construction area is the existing Houston Central Gas Plant. Immediately to the south is an active construction site. To the north and east is a mosaic of woodland and pastureland. The majority of the Houston Central Gas Plant is industrial infrastructure, concrete, or roadbase.

Middle Sandy Creek was a dry stream bed at the time of the survey and is approximately 0.30 miles to the north of the project area at its closest point.

The dominant habitats observed in the areas surrounding the project area include: wetland, pastureland, mixed woodland, riverine, and open water. A significant portion of these habitats have historically been manipulated or impacted by industrial and agricultural development.

Wetland – One emergent/scrub-shrub wetland was observed within the survey area. Dominant species observed within the wetland mosaic included *Sesbania drummondii* (rattlebox) and *Polygonum hydropiperoides* (swamp smartweed).

Pastureland – This habitat is primarily maintained or heavily grazed and dominated by non-native species. Dominant species observed included *Cynodon dactylon* (bermudagrass), *Croton capitatus* (wooly croton), *Paspalum notatum* (bahiagrass), *Carduus nutans* (nodding thistle), and *Rudbeckia triloba* (browneyed Susan).

Mixed woodland – This habitat includes large tracts that are often fragmented by pastureland. These woodlands are subject to disturbance from utility lines and industrial and agricultural development. Dominant species observed collectively include *Quercus virginiana* (coastal live oak), *Ilex vomitoria* (yaupon holly), *Quercus stellata* (post oak), *Vaccinium arboreum* (farkleberry), *Callicarpa americana* (American beautyberry), *Smilax bona-nox* (saw greenbrier), and *Smilax rotundifolia* (common greenbrier).

Open water – This habitat includes man-made stock ponds. Dominant species observed along the maintained or grazed banks of ponds (if vegetated) included bermudagrass, bahiagrass, and browneyed Susan.

Riverine – This habitat includes Middle Sandy Creek, East Sandy Creek, West Sandy Creek, Urmey Branch, and Coppers Creek. These creeks were dry at the time of the survey. Dominant species observed along the banks included coastal live oak, yaupon holly, farkleberry, American beautyberry, saw greenbrier, and common greenbrier.

6.2 PROTECTED SPECIES HABITAT ANALYSIS

The following habitat analysis is based on the background review and general protected species habitat evaluation data. This analysis does not include the specific Houston toad habitat evaluation data provided by Dr. Forstner.

The smooth pimpleback, Texas fawnsfoot, and Texas pimpleback are restricted to significant aquatic environments such as reservoirs and flowing streams[40]. There are no significant aquatic environments within at least 4 miles of the project area. Marine mammals are restricted to marine or estuarine environments. There are no marine or estuarine environments within at least 50 miles of the project area. Habitat with the potential to support any of these species does not exist in or near the project area.

The proposed project area consists of a pit flare, roadbase, and construction equipment. No vegetation was observed within the construction area. This area does not possess habitat with the potential to support any federally protected species. Land use and habitat types outside the proposed project area include industrial and agricultural development, wetland, pastureland, mixed woodland, open water, and riverine. The areas surrounding the project location have historically been impacted by industrial and agricultural activities.

Industrial development areas are typically comprised of infrastructure, roadbase, or impervious cover with minimal vegetation and significant disturbance. Therefore, these areas are not likely to support any federally protected species.

The observed agricultural areas have the potential to support migratory birds, bald or golden eagles, and other wildlife. Various migratory birds, including songbirds and hawks, were observed in or near this habitat. No bald or golden eagles or their nests were observed in or near this habitat.

One small emergent/scrub-shrub wetland was observed within the survey area. The wetland habitat area has the potential to support migratory birds, bald or golden eagles, Houston toads, and other wildlife. Various migratory birds, including songbirds, were observed in or near this habitat. No bald or golden eagles or their nests were observed in or near this habitat.

The pastureland habitat is primarily maintained or grazed and dominated by non-native species. The observable quality of this habitat ranges from low to moderate. The potential exists for migratory birds, bald or golden eagles, Attwater's greater prairie-chickens, and other wildlife to utilize this habitat. The potential exists for Sprague's pipit to utilize this habitat during winter months. However, the potential is minimal as these birds prefer undisturbed native grasslands. Various migratory birds, including songbirds and hawks, were observed in or near this habitat. No bald or golden eagles or their nests were observed in or near this habitat.

The woodland habitat includes large tracts that are often fragmented by pastureland. These woodlands are subject to disturbance from utility lines and industrial and agricultural development. The observable quality of this habitat ranges from low to moderate. The potential exists for migratory birds, bald or golden eagles, Houston toads, and other wildlife to utilize the mixed woodland habitat. Although some characteristics of these mixed woodlands meet the qualifications for Louisiana black bear habitat, these woodlands are not large enough, and are frequently subject to human disturbance. These woodlands would not likely support the Louisiana black bear. Various migratory birds, including songbirds and hawks, were observed in or near this habitat. No bald or golden eagles or their nests were observed in or near this habitat.

The open water habitat includes man-made stock ponds. The observable quality of these open water habitats is low. The potential exists for migratory birds, bald or golden eagles, Houston toads, and other wildlife to utilize this habitat. Various migratory birds, including songbirds and hawks, were observed in or near this habitat. No bald or golden eagles or their nests were observed in or near this habitat.

The riverine habitat includes several streams throughout the survey area. These streams vary in size and were dry at the time of the survey. The observable quality of this habitat was low. No tidal or navigable waters of the US were observed within the survey area. The potential exists for migratory birds, bald or golden eagles, and other wildlife to utilize this habitat. Various migratory birds, including songbirds and hawks, were observed in or near this habitat. No bald or golden eagles or their nests were observed in or near this habitat.

6.3 HOUSTON TOAD PEDESTRIAN SURVEY

Since the windshield and aerial survey could not conclusively confirm or deny the presence of potential Houston toad habitat within the action area, Dr. Forstner was contracted to conduct a species specific habitat evaluation. A brief biography for Dr. Forstner is included in Appendix E. Dr. Forstner's resume is available upon request.

The Houston toad pedestrian survey was conducted by Dr. Forstner, David Stout, and two WGI biologists on 6 July 2012. The field survey included a search for amphibians and reptiles in the aquatic habitats and adjacent upland habitats within and immediately surrounding the action area. This field survey does not qualify as a presence/absence survey. Dominant tree species, aquatic habitat conditions, and a list of observed amphibian and reptile species were documented in the field. Aquatic habitats were searched for amphibian eggs, tadpoles, and adult and juvenile amphibians. Adjacent habitats were searched for herpetofauna as well[48].

Aquatic habitats surveyed included two stock ponds, one emergent wetland, portions of Middle Sandy Creek, and an ephemeral tributary to Middle Sandy Creek. The stock ponds and emergent wetland are shallow with steep to gradual banks. Although the stock ponds are adjacent to woodland habitat, they are also impacted by fire ants, adjacent roadways, pipeline right-of-way, and cattle. Observed water quality was average with evidence of potential sedimentation or partial eutrophication.

The dominant tree species observed in the upland habitats was post oak. Few American elm (*Ulmus americana*), sycamore (*Platanus occidentalis*), and black walnut (*Juglans nigra*) were observed. Yaupon holly dominated the midstory.

Five common amphibian species were observed: juvenile and adult cricket frogs (*Acris crepitans*), bullfrogs (*Rana catesbiana*) and leopard frogs (*Rana sphenocephala*) and hundreds to thousands of Gulf Coast toad tadpoles (*Bufo valliceps*) and a few individual leopard frog tadpoles. Tadpoles were observed in shallow ponded areas within Middle Sandy Creek. Reptiles observed included water moccasin (*Agkistrodon piscivorous*) and blotched water snake (*Nerodia erythrogaster*). The observed taxa were expected for this location and demonstrate a normal faunal community. A detailed account of species observed is available upon request[48].

6.4 HOUSTON TOAD HABITAT ANALYSIS

The nearest recorded observation of the Houston toad to the project area is approximately 9.3 miles to the west. The suitability assessment showed a narrow band of potential habitat within a small portion and to the north of the action area following Middle Sandy Creek. No large contiguous dispersal habitat areas with the potential to connect the project site to known populations were observed in the suitability assessment. The only observed mechanisms for connectivity to the project site would require movement across at least 6.2 miles of unsuitable open habitat or movement down Middle Sandy Creek. The field survey confirmed functional aquatic habitats with expected flora and fauna species. The survey area was significantly disturbed by historic and current farming, livestock, roadways, and right-of-way easements. The narrow band of potential habitat indicated by the model represents a pathway to the stock ponds and emergent wetland, which are not considered suitable habitat. These aquatic habitats present a high risk of mortality from fire ants, cattle disturbance, and competition with a more successful and abundant species, the Gulf Coast toad. If the Houston toad were to reach the action area, they would not likely persist long term[48].

Dr. Forstner's report (Appendix F) indicated that it took more than five years to detect the Houston toad in this region (Austin, Colorado, and Lavaca counties). Therefore, it is reasonable to assume that Houston toads are not abundant in this region. Current Houston toad observation data indicates that the Houston toad requires large contiguous patches of suitable habitat. The field observations concluded that the woodlands within and surrounding the action area are not suitable occupied habitat and the aquatic habitats are not suitable breeding habitat. Middle Sandy Creek could serve as potential dispersal habitat. However, this habitat is not likely to be utilized and is a path to unsuitable breeding and occupied habitats[48].

Dr. Forstner's report concluded that there is no known evidence to support the potential presence of the Houston toad within or adjacent to the action area; or, of the potential use of this area by the Houston toad in the near future[48].

7.0 AIR QUALITY ANALYSIS RESULTS

7.1 ESTIMATED TOTAL ANNUAL EMISSION RATE OVERVIEW

RPS completed detailed pollutant emission calculations for the Copano Houston Central Gas Plant project for the TCEQ Standard Permit Registration. This BA does not include detailed estimated emission rates. Estimated emission rates and descriptions of emission calculation methods are available upon request.

7.2 AREA OF IMPACT DISPERSION MODELING RESULTS

RPS performed dispersion modeling of the proposed emissions of air pollutants from the proposed expansion project to support the BA. This section provides the methods and results of the dispersion modeling.

7.2.1 DISPERSION MODELING METHODS

The proposed project emission increases were first modeled to determine predicted ground level pollutant concentrations in the project area. The predicted concentrations were then compared to the SIL shown in Table 5. A SIL is a concentration, defined by the USEPA, resulting from a proposed project, below which the project emissions are considered to have no significant contribution to the total ambient air quality concentration. If the project impact is less than the SIL, no further analysis is required for the pollutant and averaging period. If the project impact is above the SIL, further analysis is typically necessary to demonstrate that the project will not cause or contribute to the violation of an applicable standard. Air pollution standards are also shown in Table 5. For this project, if the predicted maximum concentration due to the project emissions was above the SIL, RPS selected a conservative (worst case) measured ambient concentration from the TCEQ monitoring stations and added that concentration to the project impact to obtain a worst case estimate of the total ambient concentration that would occur in the area. The predicted total ambient concentration was then compared to the applicable standard to assess compliance.

Table 5. Standards for Comparison with Modeling for Criteria Pollutants

Pollutant	Regulation	Averaging Period	Significant Impact Level (µg/m3)	Standard (µg/m3)
SO_2	NAAQS	1-hr	7.8	195
		3-hr	25	1300
		24-hr	5	365
		Annual	1	80
	Increment	3-hr	25	512
		24-hr	5	91
		Annual	1	20
NO_2	NAAQS	1-hr	7.5	188.7
		Annual	1	100
	Increment	Annual	1	25
CO	NAAQS	1-hr	2000	40,000
		8-hr	500	10,000
PM_{10}	NAAQS	24-hr	5	150
	Increment	24-hr	5	30
		Annual	1	17
$PM_{2.5}$	NAAQS	24-hr	1.2	35
		Annual	0.3	15
	Increment	24-hr	1.2	9
		Annual	0.3	4

7.2.1.1 Model Used

Modeling was performed using the Advanced Monitoring Systems /USEPA Regulatory Model (AERMOD) (version number 12060). The AERMAP preprocessor program was also used to process terrain data in conjunction with the receptor grids and sources to provide input to AERMOD.

7.2.1.2 Building Wake Effects

Building wake effects occur when the air flow around buildings influences the dispersion from sources in the model input, resulting in variations to air concentrations. A building wake (downwash) analysis was performed to determine appropriate downwash parameters for the major structures at the facility. Downwash parameters were calculated using the Bee Line Software's BPIP-PRIME (Dated: 04112) Program.

7.2.1.3 Terrain

The terrain surrounding the facility is described as generally flat terrain. The receptor, source, and building base elevations were determined using data from US Geologic Survey (USGS) National Elevation Dataset files and the AERMAP processing program.

7.2.1.4 Receptor Grid

The receptor grids used for the modeling analyses were as follows:

- 25-meter spacing on the entire property;
- 25-meter spacing extending from the property line out 100 meters and within ~500 meters of the nearest source;
- 100-meter spacing within 100 meters to ~1,000 meters of the sources; and
- 500-meter spacing within 1,000 meters to ~5,000 meters of the sources
- 1,000-meter spacing within 5,000 meters to ~10,000 meters of the sources

The modeled grid was necessary to ensure that it was sufficient to capture the maximum predicted concentrations and any exceedances at those locations.

7.2.1.5 Meteorological Data

The meteorological data used in the models includes observed hourly wind speed, wind direction, temperature and numerous other parameters. These data were used, along with other inputs, by the models to determine the dispersion of the emissions from sources in the model input.

7.2.1.6 Background Concentrations

The project emissions were predicted to have concentrations above the SIL for NO_2 and $PM_{2.5}$; therefore, it was necessary to select appropriate background concentrations (existing concentrations in the area) for use in predicting total concentration for comparison to the applicable standards. There are no monitoring stations in Colorado County for NO_2 and $PM_{2.5}$. Therefore, ultra-conservative monitoring data have been obtained from other monitors in Harris County. This data provides an ultra-conservative overrepresentation of the background concentrations of NO_2 and $PM_{2.5}$ air contaminants in Colorado County. To demonstrate the monitors' ultra-conservativeness, population and emissions were compared between Colorado County and Harris County (Table 6).

Table 6. County Comparison for Monitor Data Selection

County	2010 Population	NO_x Emissions (Tons per Year)	$PM_{2.5}$ Emissions (Tons per Year)
Colorado	20,874	4,957	768
Harris	4,092,459	165,612	24,634

The Harris County population and $PM_{2.5}$/NO_x emissions are much greater than the population and emissions in Colorado County; therefore the use of Harris County $PM_{2.5}$/NO_x monitoring data is exceedingly conservative. More detailed information regarding the methods of incorporating these values in the dispersion modeling is available upon request.

7.2.2 DISPERSION MODELING RESULTS

Table 7 shows the maximum predicted concentrations due to the expansion project for each pollutant and averaging period. Project impacts are predicted to be less than the SIL for all pollutants and averaging periods except 1-hour NO_2, annual NO_2, and 24-hour $PM_{2.5}$. For the pollutants and averaging periods for which concentrations were less than the SIL, no further analysis was performed, and it was concluded that the project would not cause or contribute to an exceedance of the standard. For NO_2 and $PM_{2.5}$, a conservative background concentration as described in Section 7.2.1.6 was added to the project impact to determine the total ambient concentration for comparison to the applicable standard. The total ambient concentrations were determined to comply with the applicable standards for both pollutants. These results are also shown in Table 7.

Table 7. Criteria Pollutant Modeling Results

Pollutant	Averaging Period	Maximum Concentration (µg/m³)	Modeling SIL (µg/m³)	Greater Than Modeling SIL?	Total Concentration (Modeled + Background) (µg/m³)	NAAQS (µg/m³)
CO	1-hr	87.43	2,000	No	N/A	N/A
	8-hr	57.66	500	No	N/A	N/A
NO_2	1-hr	61.01(1)(2)	7.5	Yes	171.15	188
	Annual	1.19(3)	1	Yes	28.69	100
PM_{10}	24-hr	3.53	5	No	N/A	N/A
	Annual	0.26	1	No	N/A	N/A
$PM_{2.5}$	24-hr	3.19(2)	1.2 (4)	Yes	27.86	35
	Annual	0.26	0.3 (4)	No	N/A	N/A
SO_2	1-hr	2.20	7.8	No	N/A	N/A
	3-hr	1.72	25	No	N/A	N/A
	annual	0.13	1	No	N/A	N/A

Notes:

1. Value includes the ambient ratio method default value of 0.8 to allow for conversion of NO_x to NO_2.
2. The number presented is the highest five year average of the maximum modeled concentrations.
3. Value includes the ambient ratio method default value of 0.75 to allow for conversion of NO_x to NO_2.
4. Most stringent proposed significant impact limit in 40 Code of Federal Regulations 52.21(k).

Based on the methods and inputs described in Section 7.2.1, the dispersion model predicts concentrations at specific downwind receptor locations for each pollutant and averaging period. The coordinates of each receptor with modeled concentrations greater than the SIL for each pollutant were plotted to delineate the area of significant impact (AOI). Significant AOIs (represented by a blue dot) are shown on Figures 1-3 (Appendix G). Note: The significant AOIs do not infer that the maximum concentration predicted for each pollutant averaging period will reach each location for each emission. Further, the plotted modeling results on Figures 1 -3 (Appendix G) do not infer a frequency of occurrence, but rather a potential location of "significant impact" pollutant concentration.

The significant AOIs located the farthest distance from the source in all directions were plotted to create a maximum AOI (mAOI) (theoretical) boundary, or otherwise referred to as the action area. The modeling predicts that the significant AOI for NO_2 for the averaging period would be located immediately north of the construction area Figure 2 – Appendix G). The modeling predicts all of the significant AOI for the 24-hour $PM_{2.5}$ averaging periodwould be located immediately adjacent to the existing Houston Central Gas Plant property boundary (Figure 3 – Appendix G). The modeling also predicts the densest portion of the significant AOI for 1-hr NO_2 would be located immediately adjacent to the existing Houston Central Gas Plant property boundary (Figure 1 – Appendix G). The furthest distance in any direction from the project emissions sources to concentrations above the SIL for these pollutants was determined to be 0.5 miles. Based on this, the action area for the biological assessment was defined as the area within a circle with a 0.5 mile radius centered on the project sources. This action area was utilized to analyze the potential impacts to protected species and/or their habitat by the proposed expansion project and is demonstrated in Figures 6 and 7 (Appendix B). The results of the analysis of potential impacts to protected species are presented in Section 8 below.

7.3 NON-CRITERIA POLLUTANTS MODELING RESULTS

In addition to the air quality analysis performed for criteria pollutants, RPS performed dispersion modeling of emissions increases of other pollutants that will emitted by the project. This analysis was performed in accordance with TCEQ guidelines for the modeling of non-criteria pollutants. The predicted increases in pollutant concentrations were compared to the TCEQ ESLs.

A comparison of the modeled concentrations of the project's non-criteria pollutant emissions to TCEQ established ESLs is shown in Table 8 below. Based on these results, the maximum predicted concentration of all modeled pollutants is well below the respective ESL.

Table 8. Non-Criteria Pollutant Modeling Results

Pollutant	CAS	Maximum Off-Property Concentration ($\mu g/m^3$)	ESL ($\mu g/m^3$)	Concentration/ ESL (%)
Butane	106-97-8	80.28	23750	0.34%
Formaldehyde	50-00-0	0.49	15	3.29%
Pentane	109-66-0	29.58	4100	0.72%
Methane	74-82-8	1639.30	simple asphyxiant	--
Ethane	74-84-0	224.92	simple asphyxiant	--
CO_2	124-38-9	125245.18	simple asphyxiant	--
H_2S	7783-06-4	0.00	120	0.00%
Propane	74-98-6	130.69	simple asphyxiant	--
Hexane	110-54-3	17.12	5300	0.32%

8.0 EFFECTS OF THE PROPOSED ACTION

This section presents the results of the analysis of potential impacts to federally protected species as a result of the proposed project. The following impact sources are included in the analysis: air quality, water quality, noise pollution, infrastructure-related disturbance, human-related disturbance, and federally protected species effects. This analysis is based on total emissions and dispersion modeling data provided by RPS, field survey and background review data collected by WGI, and literature review and research of potential effects of known pollutants on flora and fauna.

8.1 AIR POLLUTION EFFECTS BACKGROUND RESEARCH

WGI biologists searched resources extensively for data, documentation, or research regarding the potential effects of NO_2 and PM on flora and fauna. WGI biologists also specifically searched for concentrations and length of time of exposure at which flora and/or fauna are impacted. Additional research included, but was not limited to, documentation of long-term exposure to airborne pollutants, short-term exposure to airborne pollutants, accumulation of pollutants in surface water, accumulation of pollutants in various ecosystems and habitat types, the potential for pollutants to impact vegetation composition, and potential impacts to the food chain. Information regarding the general impacts airborne pollutants can have on a variety of ecosystems is included. However, very little information was located that included specific concentrations at which impacts occur on a long-term or short-term basis. A list of research resources is available upon request.

According to the USEPA's "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals," the data presented in Table 9 (Section 8.2.3) indicate the level at or above which airborne pollutant concentrations are known to cause significant impacts on flora and fauna. Concentrations at or in excess of any of the screening concentrations would indicate that the source emission may have adverse impacts on plants or animals. The estimation of potential impacts on flora and fauna is highly variable and dependent upon site-specific conditions[49].

According to a publication by Nigel Dudley and Sue Stolton, in general, air pollution has a greater impact on lower life forms than higher life forms. Lower life forms that would likely be the first to be impacted would include "lichens, bryophytes, fungi, and soft-bodied aquatic invertebrates". Impacts to adult higher life forms are typically the indirect result of impacts to the food chain and reproduction, with the exception of extreme exposure. Potential secondary impacts include acidification, changes in food or nutrient supply, or changes to biodiversity and competition. In general, plant communities are less adaptable to changes in air pollution than animals. Animals typically have the ability to migrate away from unfavorable conditions. Lower order animals, such as amphibians and fish, are known to be impacted by acidification as a result of the subsequent release of metals into water[50].

Nitrogen Dioxide

The Nature Conservancy and the Institute of Ecosystem Studies have published two documents that describe the known effects of airborne nitrogen and other airborne pollutants on various ecosystems in the eastern US. Airborne NO_2 is known to be converted into "acid particles and acid precipitation." Both forms are deposited onto soils, vegetation, and surface waters[51].

The potential effects of airborne NO_2 on terrestrial ecosystems are generally long-term effects as opposed to short-term effects. Many soils are buffered against acid inputs and biodiversity changes are not immediately evident for vegetation species with a longer lifespan. The deposition of nitrogen can result in nitrate leaching, which can cause acidification of soils and surface waters as well as the release of aluminum, calcium, and magnesium[51]. Arthropods with high-calcium needs are some of the animals inhabiting the soil that can be impacted by soil acidification. The release of aluminum into soil water can harm plant roots. The leaching of aluminum into surface waters can be toxic to aquatic plants, fish, and other aquatic organisms[52]. The accumulation of nitrogen can impact plant species competition, thereby impacting plant species composition. Nitrogen accumulation can also lead to nitrogen saturation, which impacts microorganisms, plant production, and nitrogen cycling[51]. Additional potential terrestrial ecosystem effects include reduced forest productivity and increased vulnerability to pests and pathogens[52].

The potential effects of airborne NO_2 on aquatic ecosystems include acidification and eutrophication. The effects of acidification on water quality, whether introduced by direct acid deposition or leaching from adjacent terrestrial ecosystems, include increased acidity, reduced acid neutralization capacity, hypoxia, and mobilization of aluminum[51]. Stream and lake acidification can be chronic or episodic and both can be damaging. In general, larger aquatic ecosystems have a greater buffering capacity than smaller systems. Increased acidity can reduce dissolved organic carbon and increase light penetration and visibility through the water column. Increased light penetration can result in increased macrophyte and algal growth. Increased visibility can alter the predator-prey balance. Eutrophication is the over enrichment of nutrients into an aquatic system, which can result in excess algal growth. The decomposition of the excess algae can result in a decrease in dissolved oxygen, which can be harmful to fish and other aquatic organisms. Wetlands, estuaries, bays, and salt marshes are generally less impaired by acid deposition than other aquatic ecosystems. However, they are subject to eutrophication. Increased nitrogen in salt marshes often results in increased plant growth[52], which can be a positive or negative effect.

Particulate Matter

PM is a mixture of airborne particles resulting from fossil fuel combustion or a breakdown of crustal matter. The atmosphere can also transform VOC, NO2, and SO2 into PM. PM is a broad term referring to an assortment of particles that vary in their formation, chemical properties, size, mass, toxicity, and atmospheric reactivity. The EPA characterizes PM by their size: PM10 (particles equal to and less than 10 microns in aerodynamic diameter), PM2.5 (fine particles that are 2.5 microns or less in diameter), PM10-2.5 (coarse particles with a diameter between 2.5 and 10 microns), and ultrafine particles (diameter less than 0.1 microns).

Fine particles can remain in the atmosphere for days to weeks and travel through the atmosphere hundreds to thousands of kilometers, while most coarse particles typically deposit to the earth within minutes to hours and within tens of kilometers from the emission source. The potential effects of dispersed particles on aquatic ecosystems include acidification, eutrophication, and impacts to ecosystem diversity (Grants et al. 2003). The potential effects of dispersed particles on terrestrial ecosystems include nutrient depletion in soils and damage to crops and sensitive plant species (Grants et al. 2003). PM is also responsible for the creation of haze (i.e. reduced visibility) and has been linked to physiological effects, such as respiratory and cardiovascular dysfunctions (e.g., Ebersviller et al. 2012, Lippmann et al. 2009). Other documented adverse effects included the blinding and/or death of cattle by smoke (i.e. PM) and the occurrence of fluorosis, a teeth and bone disease, when exposed to atmospheric fluoride (Newman 1979). Mortality of birds and a decrease in nesting has been linked to sulfur dioxide, known to be capable of transforming into PM. In addition, a recent study has shown that exposure to PM can affect the genetics of an individual thus resulting in unknown long term effects (Tarantini et al. 2009). Limited research is available about threshold limit values (e.g. the maximum amount of exposure without adverse effects) on sensitive wildlife populations (Riva et al. 2011, Lippann et al. 2009).

8.2 AIR QUALITY EFFECTS

8.2.1 EMISSIONS

RPS performed dispersion modeling of the emissions of air pollutants from the proposed project in support of the BA. The results of the modeling are provided as a summary of the maximum predicted concentrations in Table 7 (Section 7.2.2).

The new facilities associated with the project primarily include one cryogenic processing train. The proposed project meets the requirements of the TCEQ's Oil and Gas Standard Permit. A Standard Permit is a general permit developed by the TCEQ for a specific facility or source type that can be used to authorize new facilities if they meet the pre-determined requirements of the permit. The requirements include emissions controls and standards that meet the TCEQ BACT guidelines. The proposed facilities will utilize emissions controls that satisfy all requirements of the Standard Permit as described in this section.

Emissions resulting from gasoline and diesel-fueled vehicles and equipment during construction and maintenance are considered negligible. The project will not require a significant increase in vehicle and equipment use compared to current daily emissions for the Houston Central Gas Plant.

8.2.2 FUGITIVE DUST

Dust will be emitted during the site work phase of the project. This emission will be minimal and temporary. Dust emissions are expected to be negligible after the site work activities are completed.

8.2.3 IMPACTS OF AIR POLLUTION SOURCES ON FLORA AND FAUNA

Since SILs are concentrations that represent thresholds of insignificant modeled source impacts, the pollutant concentrations predicted to be less than or equal to the SILs are expected to have no significant impact on flora and fauna. Only the pollutant concentrations and averaging periods predicted to be greater than the SILs (annual NO_2, 1-hour NO_2, and 24-hour $PM_{2.5}$) were considered for potential impact to flora and fauna in the areas surrounding the proposed project site.

Nitrogen Dioxide

The data presented in Table 9 below is taken directly from the USEPA's "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals." The concentrations presented in Table 9 reflect vegetation sensitivity only. Vegetation sensitivity was determined based on visible damage or growth effects. For the purposes of this BA, only the screening concentrations for vegetation with the highest sensitivity are included for comparison with predicted project concentrations in Table 9. By focusing on the most sensitive species, we are thereby comparing the lowest level concentrations at which potential impacts may occur. The pollutants screened in the USEPA document for direct and indirect sensitivity to animals did not include any of the pollutants emitted by this project other than SO_2 and NO_2[49].

Table 9. Comparison of the USEPA's Screening Concentrations of Vegetation Sensitivity to Predicted Concentrations[49]

Pollutant	Averaging Period	Project GLCmax (µg/m3)	Total Concentration (µg/m3)	USEPA Screening Concentrations (µg/m3)
SO_2	1-hour	2.20	N/A	917
	3-hour	1.72	N/A	786
	Annual	0.13	N/A	18
NO_2	Annual	1.19	28.69	94-188

The estimated concentrations for comparable pollutants and averaging periods are each a small fraction of the total concentration for the area. Since the potential impacts on annual NO_2 and 24-hour $PM_{2.5}$ concentrations are limited to the areas immediately adjacent to the Houston Central Gas Plant property boundary (Figure 2 and 3 – Appendix G) and no protected species habitat was identified within these areas, the annual NO_2 and 24-hour $PM_{2.5}$ concentrations will not impact protected species habitat.

According to the USEPA screening procedure, the concentration at which a pollutant impacts vegetation rises exponentially with the decrease in length of exposure. The screening concentrations not represented in Table 9 were not included in the document, reportedly as a result of a lack of data available to provide a suitable screening concentration[49]. The values for project pollutants are significantly below the USEPA screening concentrations. Therefore, it is reasonable to assume that vegetation located within or near the action area will not be adversely impacted by the project source emissions.

The action area is shown in Figures 6 and 7 (Appendix B). The action area includes four habitat types: pastureland, woodland, riverine, and open water. Any of these four habitat types may be utilized by migratory birds. These habitats are disturbed by adjacent construction and industrial operations. Bald or golden eagles have the potential to utilize any of the four habitats. The Houston toad has the potential to utilize portions of the woodland or open water habitats. No additional federally protected species are likely to utilize the remaining areas within the action area.

The 1-hour NO_2 and 24-hour $PM_{2.5}$ concentrations predicted to occur as a result of the expansion project are a fraction of the total concentration for the area. The total concentration for the area, which includes the predicted addition from the expansion project, is below the NAAQS, which is set to protect sensitive populations. The predicted maximum concentration for 1-hour NO_2 is a fraction of the screening level the USEPA has determined could impair vegetation. According to the research identified in Section 8.1, fauna, except soft-bodied invertebrates, are not impaired by airborne NO_2 and $PM_{2.5}$ with the exception of extreme levels of exposure. The potential for airborne NO_2 and $PM_{2.5}$ to directly alter the pH of surface waters was also considered. Given the infrequency of the predicted exposure of a concentration greater than the SIL to surface waters and the low concentration of airborne pollutant over significant volumes of surface waters, it is reasonable to assume the emissions resulting from the project will not affect surface water pH. Any potential pH impact would be a rare and short-term event. Potential direct effects resulting from the maximum 1-hour NO_2 and 24-hour $PM_{2.5}$ concentrations are not expected. Therefore, the protected species with the potential to utilize habitats within the action area will not likely be directly impacted by the predicted maximum 1-hr NO_2 and 24-hour $PM_{2.5}$ concentrations.

Based on the background research described above in Section 8.1, the potential effects on terrestrial habitats (mixed woodland and pastureland) from NO_2 emissions include indirect, long-term effects, such as nitrogen accumulation and nitrogen leaching into adjacent surface waters. Nitrogen accumulation occurs when more nitrogen is put into a system than the system can utilize or cycle out. Nitrogen leaching is a subsequent effect of nitrogen accumulation, in which an excess of nitrogen in soils is leached out in soil water and transferred into adjacent surface waters. If the deposition of nitrogen in the area exceeds the capacity of the system, the potential exists for nitrogen to be leached into adjacent surface waters. It is reasonable to assume that these indirect effects are more likely to be the result of an annual NO_2 concentration, rather than an infrequent 1-hour NO_2 concentration.

Based on the background research described above in Section 8.1, the potential effects on terrestrial habitats (mixed woodland and pastureland) from $PM_{2.5}$ emissions include indirect, long-term effects, such as nutrient depletion and damage to crops and sensitive plant species. It is reasonable to assume that these indirect effects are more likely to be the result of an annual $PM_{2.5}$ concentration, rather than an infrequent 24-hour $PM_{2.5}$ concentration.

Since evidence of ecosystem impairment (i.e., vegetation damage, fish kills, crop or plant damage, absence of higher life forms) was not observed in the field and the total concentrations for the area are below the NAAQS, it is reasonable to assume the terrestrial ecosystems surrounding the facility are currently cycling nitrogen and other nutrients sufficiently. The addition of short-term, infrequent NO_2 and 24-hour $PM_{2.5}$ concentrations by the expansion project will not likely cause indirect, long-term effects to terrestrial ecosystems.

Based on the background research described above in Section 8.1, the potential effects on aquatic habitats (riverine and open water) from NO_2 and 24-hour $PM_{2.5}$ emissions include indirect, long-term effects, such as acidification or eutrophication. Acidification can be caused by direct acid deposition or leaching from adjacent terrestrial systems. Eutrophication is caused by the over enrichment of nutrients, such as nitrogen, into a system. Based on evidence provided above, acidification, resulting from deposition or leaching, is not likely to occur as a result of the proposed expansion project. If acidification is not likely to occur as a result of the proposed project, it is reasonable to assume subsequent eutrophication will not occur.

Since it has been determined that potential indirect effects from the maximum 1-hr NO_2 and 24-hour $PM_{2.5}$ concentrations are unlikely to occur as a result of the proposed expansion project, the protected species with the potential to utilize the terrestrial habitats within the action area (bald or golden eagles, migratory birds, Attwater's greater prairie-chickens, and Houston toads) will not likely be indirectly impacted by the proposed project.

8.3 WATER QUALITY EFFECTS

8.3.1 WASTEWATER

The new cryogenic processing train will be located within the existing Houston Central Gas Plant. The Houston Central Gas Plant is exempt from a TPDES permit and does not require a

SWPPP for operations. The new cryogenic processing train will be located within the existing Houston Central Gas Plant. The Houston Central Gas Plant is exempt from a TPDES permit and does not require a SWPPP for operations. The proposed expansion project would produce a maximum of 10 gpm of wastewater.

Since the additional wastewater estimated to be produced by the proposed expansion project would be a small amount of non-hazardous effluent, would be treated and contained, and would not reach habitats with the potential to support protected species, no wastewater effects to protected species are expected as a result of the construction or operation of the proposed expansion project.

Best Management Practices will be utilized in accordance with Section 401 of the Clean Water Act and Chapter 279 of the Texas Water Code. No stormwater effects to wildlife are expected as a result of the infrastructure construction or operation of the project.

8.3.2 SURFACE WATER

The action area for 1-Hour NO_2 and 24-hour $PM_{2.5}$ is shown in Figure 1 (Appendix G) and Figures 6 and 7 (Appendix B). The portion of the action area outside of the facility and refinery boundaries has the potential to impact portions of two observed surface water habitat types: riverine and open water. Both of these habitats may be utilized by migratory birds. Bald or golden eagles have the potential to utilize both habitats. The Houston toad has the potential to utilize the open water or riverine habitats. No additional federally protected species are likely to utilize these areas.

The potential for airborne NO_2 and $PM_{2.5}$ to directly alter the pH of surface waters was also considered. Given the infrequency of the predicted exposure of a concentration greater than the SIL to surface waters and the low concentration of airborne pollutant over significant volumes of surface waters, it is reasonable to assume the emissions resulting from the project will not affect surface water pH. Any potential pH impact would be a rare and short-term event. Potential direct effects resulting from the maximum 1-hour NO_2 and 24-hour $PM_{2.5}$ concentrations are not expected. Therefore, the protected species with the potential to utilize habitats within the action area will not likely be directly impacted by the predicted maximum 1-hr NO_2 and 24-hour $PM_{2.5}$ concentrations.

Based on the background research described above in Section 8.1, the potential effects on aquatic habitats (riverine and open water) from NO_2 and 24-hour $PM_{2.5}$ emissions include indirect, long-term effects, such as acidification or eutrophication. Acidification can be caused by direct acid deposition or leaching from adjacent terrestrial systems. Eutrophication is caused by the over enrichment of nutrients, such as nitrogen, into a system. Based on evidence provided above, acidification, resulting from deposition or leaching, is not likely to occur as a result of the proposed expansion project. If acidification is not likely to occur as a result of the proposed project, it is reasonable to assume subsequent eutrophication will not occur.

Since it has been determined that potential indirect effects from the maximum 1-hr NO_2 and 24-hour $PM_{2.5}$ concentrations are unlikely to occur as a result of the proposed expansion project, the protected species with the potential to utilize surface water habitats within the action area (bald or golden eagles, migratory birds, and Houston toads) will not likely be indirectly impacted by the proposed expansion project.

8.4 NOISE EFFECTS

The best available technology will be used to maintain noise levels during construction below 75 decibels measured at a distance of 50 feet from the source to the maximum extent practicable.

Project engineers estimate that noise levels during operation should be comparable to noise levels from maintenance activities that currently take place at the plant.

No noise effects to wildlife are expected as a result of the infrastructure construction or operation of the proposed project.

8.5 INFRASTRUCTURE-RELATED EFFECTS

Construction of the proposed project involves the addition of a cryogenic processing train to the existing Houston Central Gas Plant. The proposed project area is currently a flare pit and a construction staging area adjacent to existing industrial infrastructure. The Houston Central Gas Plant is industrial infrastructure, concrete, and roadbase. No impacts to protected species as a result of the infrastructure construction of the project are anticipated.

8.6 HUMAN ACTIVITY EFFECTS

Construction and operation of the proposed project will not require significant additional human activity compared to typical maintenance activities that occur at the plant on a regular basis.

No additional effects to wildlife are expected as a result of the increase in human activity associated with the project.

8.7 FEDERALLY PROTECTED SPECIES EFFECTS

8.7.1 FEDERALLY LISTED SPECIES

8.7.1.1 Attwater's Greater Prairie-Chicken

Potential to Occur in the Action Area

Attwater's greater prairie-chickens utilize grasslands and open space with a mixture of native grasses with varying heights. Booming grounds are usually found on bare ground or short grass areas where the females can easily see the males[31]. They may be naturally occurring short grass flats or artificially maintained areas such as roads, runways, oil well pads, and drainage ditches[32]. Heavily grazed areas such as those around windmills, ponds, and other cattle concentration areas are also used for booming sites. The preferred nest location is in mid- to tall grass cover with the grass canopy concealing the nest. Preferred feeding grounds have short- to mid-grasses. Tall grasses (16-24 inches in height) are used for nesting, loafing, and escape cover[31].

No habitat with the potential to support the Attwater's greater prairie-chicken was observed within the Houston Central Gas Plant.

Few areas with short grass were observed within the action area. However, these short grass areas were located within or adjacent to active industrial construction and heavily disturbed. Further, most of these short grass areas had a significant shrub component. These areas did not have an observable potential to support the Attwater's greater prairie-chicken.

Short grass pasturelands that are heavily grazed by cattle were observed within the 3-mile survey area, but outside the action area. These shortgrass areas could be utilized as booming or feeding grounds. However, no mid or tall grass habitats were observed nearby to offer potential nesting or roosting grounds. The shortgrass areas alone would not likely support Attwater's greater prairie-chickens. No sources have been found to indicate the prairie-chicken has been observed within the survey area.

USFWS critical habitat is not yet designated for this species[43]. The closest recorded observations of Attwater's greater prairie-chickens found occurred in Attwater Prairie Chicken National Wildlife Refuge (approximately 25 miles northeast of the action area)[53].

Potential booming, foraging, nesting, and roosting habitat for the Attwater's greater prairie-chicken does not exist within the action area. Attwater's greater prairie-chickens are not known to occur, and are unlikely to occur, within the action area for this project.

Potential Effects to Attwater's Greater Prairie-Chicken

Since no habitat with the potential to support the Attwater's greater prairie-chicken was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach Attwater's greater prairie-chicken habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the Attwater's greater prairie-chicken.

8.7.1.2 Houston Toad

Potential to Occur in the Project Area

Houston toads require three habitat types for persistence: breeding, occupied, and dispersal. Breeding habitat consists of small pools and ephemeral ponds. Occupied habitat includes the adjacent upland woods surrounding the breeding ponds. Loosely connected terrestrial habitats are required for dispersal[47].

Dr. Forstner indicated that the closest and most recent detections of Houston toads to the project area are approximately 9.3 miles to the west in Lavaca County by Dr. Forstner (2011), approximately 15.22 miles to the west in Lavaca County by Dr. Yantis (1990), approximately 24.85 miles to the east northeast at the Attwater Prairie Chicken National Wildlife Refuge in Colorado County, and approximately 26.1 miles to the north in Colorado County by Dr. Forstner (2007).

No habitat with the potential to support the Houston toad was observed within the Houston Central Gas Plant.

Based on the data provided in Sections 5.2, 6.3, and 6.4, the following conclusions were reached. It is reasonable to assume that Houston toads are not abundant in the region (Austin, Colorado, and Lavaca counties). The field observations concluded that the woodlands within and surrounding the action area are not suitable occupied habitat and the aquatic habitats are not suitable breeding habitat. Middle Sandy Creek could serve as potential dispersal habitat.

However, this habitat is not likely to be utilized and is a path to unsuitable breeding and occupied habitats[48].

According to the results of the Houston toad habitat evaluation, there is no known evidence to support the potential presence of the Houston toad within or adjacent to the action area; or, of the potential use of this area by the Houston toad in the near future[48].

Potential Effects to Houston Toads

Potential Houston toad dispersal habitat was identified within a small portion of the northern-most tip of the action area. However, there is no known evidence to support the potential presence of the Houston toad within or adjacent to the action area; or, of the potential use of this area by the Houston toad in the near future. This species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not affect Houston toads. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on Houston toads.

8.7.1.3 Interior Least Tern

Potential to Occur in the Action Area

Interior least terns are migratory birds and their breeding habitat in Texas is known to be the major river systems: Canadian, Red, and Rio Grande rivers. Therefore, the consideration of potential nesting habitat was excluded from this analysis. Potential habitat within the action area would be limited to wintering habitat (foraging and roosting). Preferred foraging habitat includes sparsely vegetated sand and gravel bars within a wide unobstructed river channel, or salt flats along lake shorelines. Feeding habitat includes shallow waters of rivers, streams and lakes [36].

No habitat with the potential to support the interior least tern was observed within the Houston Central Gas Plant.

No habitats with the potential to support the interior least tern are located within at least 25 miles of the project area. USFWS critical habitat is not yet designated for this species[43].

Potential foraging and nesting habitat for the interior least tern does not exist within the action area. Interior least terns will not occur within the action area for this project.

Potential Effects to Interior Least Terns

Since no habitat with the potential to support the interior least tern was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach least tern habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the interior least tern.

8.7.1.4 Louisiana Black Bear

Potential to Occur in the Action Area

Louisiana black bears typically inhabit bottomland hardwood forests. Other habitat types the Louisiana black bear utilizes include brackish and freshwater marshes, salt domes, and agricultural fields. These bears require large, remote tracts of land with minimal human disturbance[41].

No habitat with the potential to support the Louisiana black bear was observed within the Houston Central Gas Plant.

Although some characteristics of the mixed woodlands habitat type meet the qualifications for Louisiana black bear habitat, these woodlands are not large enough and are frequently subject to human disturbance. These woodlands would not likely support the Louisiana black bear. The USFWS designated critical habitat for the Louisiana black bear is located in fifteen counties in Louisiana[43]. No known observations of the Louisiana black bear in or near the project area have been found.

Potential habitat for the Louisiana black bear does not exist within the action area. The Louisiana black bear will not occur within the action area for this project.

Potential Effects to Louisiana Black Bears

Since no habitat with the potential to support the Louisiana black bear was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach Louisiana black bear habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the Louisiana black bear.

8.7.1.5 Red Wolf

Potential to Occur in the Action Area

Red wolves are a very rare species in the wild. Only one known population exists in the wild and is located in North Carolina[42]. Little information is available describing red wolf habitat characteristics.

Habitat with the potential to support the red wolf was not observed within the Houston Central Gas Plant.

Red wolves are known to be limited in the wild to select locations in North Carolina[42]. No known observations of the red wolf in or near the project area have been found.

Potential habitat for the red wolf does not exist within the action area. Red wolves are not known to occur, and are unlikely to occur, within the action area for this project.

Potential Effects to Red Wolves

Since no habitat with the potential to support the red wolf was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach red wolf habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the red wolf.

8.7.1.6 Smooth Pimpleback

Potential to Occur in the Action Area

Characteristics of known locations include mud, sand, or fine gravel substrates in small to large riverine systems and few reservoirs. It is assumed that this mussel can tolerate impoundment at select locations and slow to moderate flow rates.[37].

No habitat with the potential to support the smooth pimpleback was observed within the Houston Central Gas Plant.

No habitats with the potential to support the smooth pimpleback are located within at least 12 miles of the project area. USFWS critical habitat is not yet designated for this species[43]. The closest known observations of smooth pimplebacks found occurred in the Colorado River (at least 12 miles from the project area)[40].

Potential habitat for the smooth pimpleback does not exist within the action area. Smooth pimplebacks will not occur within the action area for this project.

Potential Effects to Smooth Pimplebacks

Since no habitat with the potential to support the smooth pimpleback was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach smooth pimpleback habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the smooth pimpleback.

8.7.1.7 Sprague's Pipit

Potential to Occur in the Action Area

Sprague's pipits are migratory birds and their breeding habitat is known to be the northern US and Canada[41]. Therefore, the consideration of potential nesting habitat was excluded from this analysis. Potential habitat within the action area would be limited to wintering habitat (foraging and roosting). Preferred foraging habitat includes undisturbed mid-grasslands with intermediate thickness[41].

No habitat with the potential to support the Sprague's pipit was observed within the Houston Central Gas Plant.

Sprague's pipits are known to prefer undisturbed grasslands[41]. No undisturbed grasslands were identified within at least 3 miles of the action area. USFWS critical habitat is not yet designated for this species[43]. The closest recorded observations of Sprague's pipit found occurred in the Attwater Prairie-Chicken National Wildlife Refuge (approximately 25 miles northeast of the action area)[53].

Potential foraging and roosting habitat for the Sprague's pipit does not exist within the action area. Sprague's pipits are not known to occur, and are unlikely to occur, within the action area for this project.

Potential Effects to Sprague's Pipits

Since no habitat with the potential to support the Sprague's pipit was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach Sprague's pipit habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the Sprague's pipit.

8.7.1.8 Texas Fawnsfoot

Potential to Occur in the Action Area

Characteristics of known locations include sand substrates in moderate to large riverine systems. It is assumed that this mussel prefers moderate flow rates. It is also assumed that this mussel cannot tolerate impoundments and low flow rates[40].

No habitat with the potential to support the Texas fawnsfoot was observed within the Houston Central Gas Plant.

No habitats with the potential to support the Texas fawnsfoot are located within at least 12 miles of the project area. USFWS critical habitat is not yet designated for this species[43]. The closest known observations of Texas fawnsfoot found occurred in the lower reaches of the Colorado River (at least 40 miles from the project area)[40].

Potential habitat for the Texas fawnsfoot does not exist within the action area. Texas fawnsfoot will not occur within the action area for this project.

Potential Effects to Texas Fawnsfoots

Since no habitat with the potential to support the Texas fawnsfoot was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach Texas fawnsfoot habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the Texas fawnsfoot.

8.7.1.9 Texas Pimpleback

Potential to Occur in the Action Area

Characteristics of known locations include mud, sand, gravel, or cobble substrates in moderate-sized riverine systems. It is assumed that this mussel prefers shallow depths and slow to moderate flow rates. It is also assumed that this mussel cannot tolerate impoundments and scourable substrates[40].

No habitat with the potential to support the Texas pimpleback was observed within the Houston Central Gas Plant.

No habitats with the potential to support the Texas pimpleback are located within at least 12 miles of the project area. USFWS critical habitat is not yet designated for this species[43]. The closest known observations of Texas pimpleback found occurred in the Guadalupe River (at least 40 miles from the project area)[40].

Potential habitat for the Texas pimpleback does not exist within the action area. Texas pimpleback will not occur within the action area for this project.

Potential Effects to Texas Pimplebacks

Since no habitat with the potential to support the Texas pimpleback was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach Texas pimpleback habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the Texas pimpleback.

8.7.1.10 Whooping Crane

Potential to Occur in the Action Area

Whooping cranes are migratory birds and their breeding habitat is known to be the northern US and Canada[42]. Therefore, the consideration of potential nesting habitat was excluded from this analysis. Their wintering habitat is known to be limited to the Aransas National Wildlife Refuge near Rockport, Texas, and few other coastal counties[42]. Therefore, the consideration of potential wintering habitat was excluded from this analysis. Potential habitat within the action area would be limited to temporary foraging and roosting habitat during migration. These cranes prefer to feed and roost in wetlands, rivers, and upland grain fields with other bird species[42].

Whooping cranes are a rare species in the wild. Only 245 individuals have been observed in Texas in 2012[54].

Habitat with the potential to support the whooping crane was not observed within the Houston Central Gas Plant.

No known observations of the whooping crane in or near the action area have been found.

Open maintained or grazed pasturelands observed within the 3-mile survey area have the to potential to be a stopover location for migrating cranes. However, no significant wetlands or water sources with the potential to support the whooping crane were observed within the survey area.

Potential habitat for the whooping crane does not exist within the action area. Whooping cranes are not known to occur, and are unlikely to occur, within the action area for this project.

Potential Effects to Whooping Cranes

Since no habitat with the potential to support the whooping crane was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach whooping crane habitat. The proposed project will produce no wastewater.

Determination of Effect

The proposed action will have "no effect" on the whooping crane.

8.7.2 MIGRATORY BIRDS

Potential to Occur in the Action Area

Habitat with the potential to support migratory birds was not observed within the Houston Central Gas Plant.

A variety of migratory birds have the potential to utilize the habitats within the action area and the survey area. A variety of species of migratory birds were observed in select habitats surrounding the project location, including hawks and songbirds. The habitats surrounding the facility range in quality from low to moderate and have historically been subject to agricultural and industrial activities.

Select migratory birds are likely to occur in all observed habitats within the action area, excluding existing industrial facilities. The frequency of occurrence and species of migratory birds in each habitat is dependent upon habitat characteristics and quality.

Potential Effects to Migratory Birds

Migratory birds will not be directly or indirectly impacted by the construction or operation of the proposed project.

As described in Section 8.0, migratory birds would not be impacted by air emissions resulting from the proposed project. Potential exposure to nitrogen from the proposed project would not be sufficient to harm individual migratory birds or cause long-term effects, such as nitrogen accumulation or leaching, acidification, or eutrophication. No stormwater impacts to migratory bird habitat are anticipated. The proposed project will produce no wastewater.

Determination of Effect

The "take" of migratory birds is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Migratory Bird Treaty Act described above in Section 3.3.

8.7.3 BALD AND GOLDEN EAGLES

Potential to Occur in the Action Area

No habitat with the potential to support bald or golden eagles was observed within the Houston Central Gas Plant.

Select areas surrounding the project area are potential feeding habitats for bald or golden eagles. Select wooded areas are potential nesting habitats for bald eagles. However, these wooded areas would be considered low quality nesting sites. The areas surrounding the project site are impacted by agricultural and industrial development.

No bald or golden eagles or eagle nests were observed during the windshield or aerial survey of the 3-mile radius around the project area.

No sources have been found to indicate bald or golden eagles have been observed near the proposed project area. No occurrences of bald or golden eagles have been recorded within at least 15 miles of the project site[44]. Bald or golden eagles are unlikely to occur within the action area for this project.

Potential Effects to Bald and Golden Eagles

Bald or golden eagles will not be directly or indirectly impacted by the construction or operation of the proposed project.

As described in Section 8.0, bald or golden eagles would not be impacted by air emissions resulting from the proposed project. Potential exposure to nitrogen from the proposed project would not be sufficient to harm individual bald or golden eagles or cause long-term effects, such as nitrogen accumulation or leaching, acidification, or eutrophication. No stormwater impacts to bald or golden eagle habitat are anticipated. The proposed project will produce no wastewater.

Determination of Effect

The "take" of bald or golden eagles is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Bald and Golden Eagle Protection Act described above in Section 3.4.

8.7.4 MARINE MAMMALS

Potential to Occur in the Action Area

Marine mammals are ecologically restricted to marine or estuarine habitats.

No habitats with the potential to support marine mammals are located within at least 50 miles of the project area.

Potential marine mammal habitat does not exist within the action area or within the 3-mile survey area. Marine mammals will not occur within the action area for this project.

Potential Effects to Marine Mammals

Since no habitat with the potential to support marine mammals was identified within the action area, this species will not be directly or indirectly impacted by the construction or operation of the proposed project. Significant air emissions and stormwater from the project will not reach marine mammal habitat. The proposed project will produce no wastewater.

Determination of Effect

The "take" of marine mammals is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Marine Mammal Protection Act described above in Section 3.5.

9.0 CONCLUSIONS

This section is a summary of WGI's recommended determination of effect for all federally protected species, a description of any interdependent and interrelated actions, and a description of any anticipated cumulative effects resulting from the proposed project.

9.1 DETERMINATION OF EFFECT

The recommended determinations of effect for all federally protected species with the potential to occur within habitat located within the action area (maximum radius of approximately 0.5 mile) are summarized below in Table 10.

Table 10. Determination of Effect Summary

Federally Protected Species	Determination of Effect
Houston Toad	No Effect
Smooth Pimpleback	No Effect
Texas Fawnsfoot	No Effect
Texas Pimpleback	No Effect
Whooping Crane	No Effect
Interior Least Tern	No Effect
Attwater's Greater Prairie-Chicken	No Effect
Sprague's Pipit	No Effect
Louisiana Black Bear	No Effect
Red Wolf	No Effect

As described in Section 8.7, the take of migratory birds, bald or golden eagles, or marine mammals is not anticipated as a result of this project.

9.2 INTERDEPENDENT AND INTERRELATED ACTIONS

The proposed project includes the construction of a new cryogenic processing train as outlined in Section 4.0. No additional interdependent or interrelated actions are proposed at this time.

9.3 CUMULATIVE EFFECTS

The project site is located within an industrial and agricultural area. Multiple industrial facilities exist within the area, which is currently a hub for petroleum products coming from the Eagle Ford basin. The area is likely to experience additional industrial development over time.

Any new proposed developments may have the potential to impact federally protected species. However, WGI is not aware of any specific projects planned for this area at this time.

No additional actions with the potential to impact federally protected species are planned for the Houston Central Gas Plant at this time.

9.4 CONSERVATION MEASURES

The construction of the proposed project will likely have no direct or indirect impact on federally protected species habitat.

Copano plans to utilize the BACT to control the project emissions and thus minimize impacts to the surrounding environment to the maximum extent practicable. The proposed emissions of each pollutant subject to review are consistent with the TCEQ guidance and are considered to be the top level of control available.

10.0 REFERENCES

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[4]US Environmental Protection Agency. Air Quality Management - National Ambient Air Quality Standards (NAAQS) for Criteria Pollutants. http://www.epa.gov/eogapti1/course422/apc4a.html

[5]US Environmental Protection Agency. Fact Sheet--Prevention of Significant Deterioration For Fine Particle Pollution-Increments, Significant Impact Levels, and Significant Monitoring Concentration. http://www.epa.gov/NSR/fs20070912.html

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11.0 LIST OF PREPARERS

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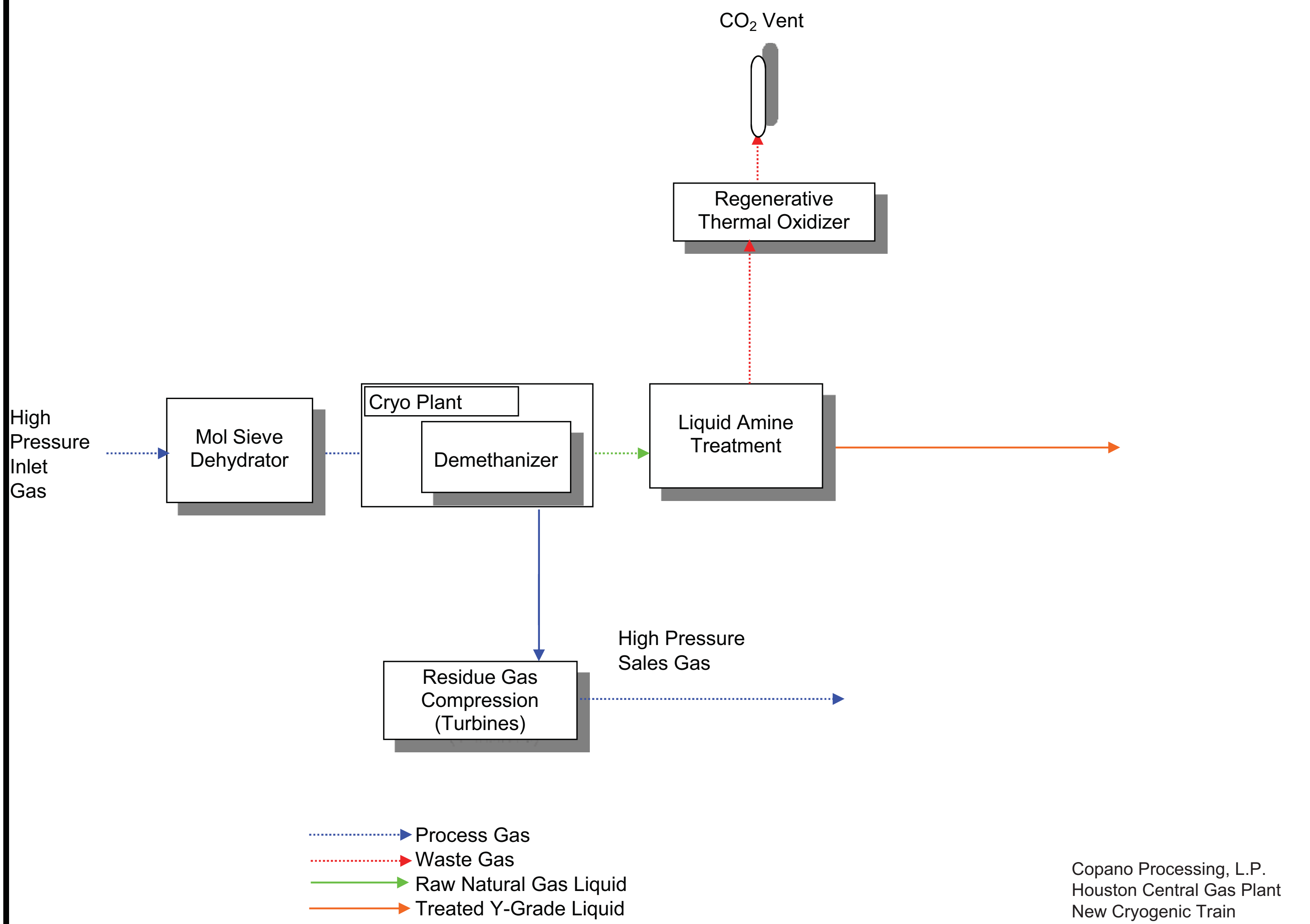
Cimagaroon Howell	B.S. Microbiology

APPENDIX A

FLOW DIAGRAM

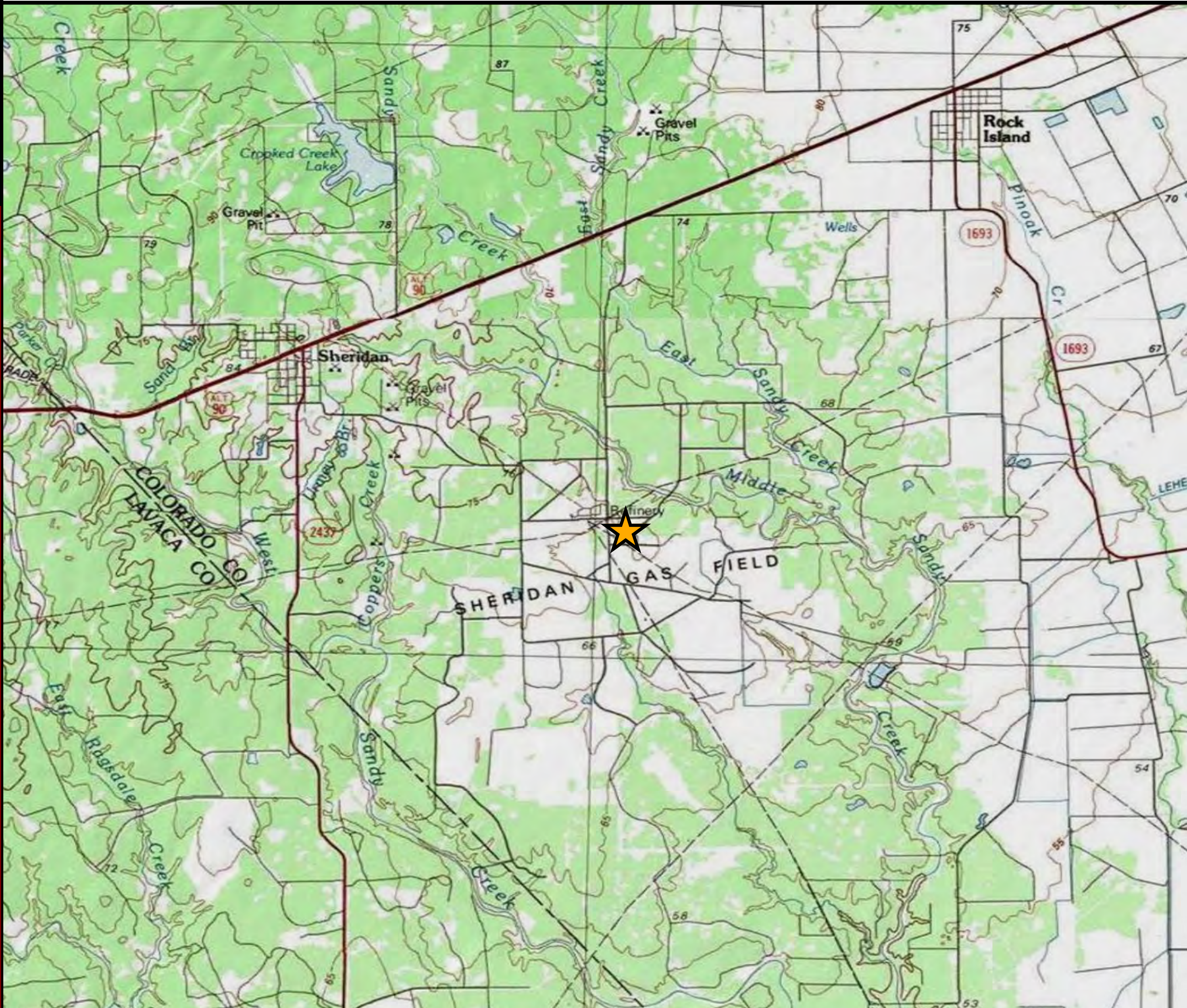


Copano Processing, L.P.
Houston Central Gas Plant
New Cryogenic Train
Figure 4-1

APPENDIX B

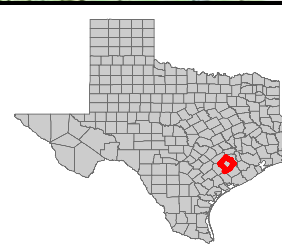
FIGURES

Figure 1
Project Location
Houston Central Gas Plant Expansion Project
Colorado County, Texas



Colorado County

★ Project Location



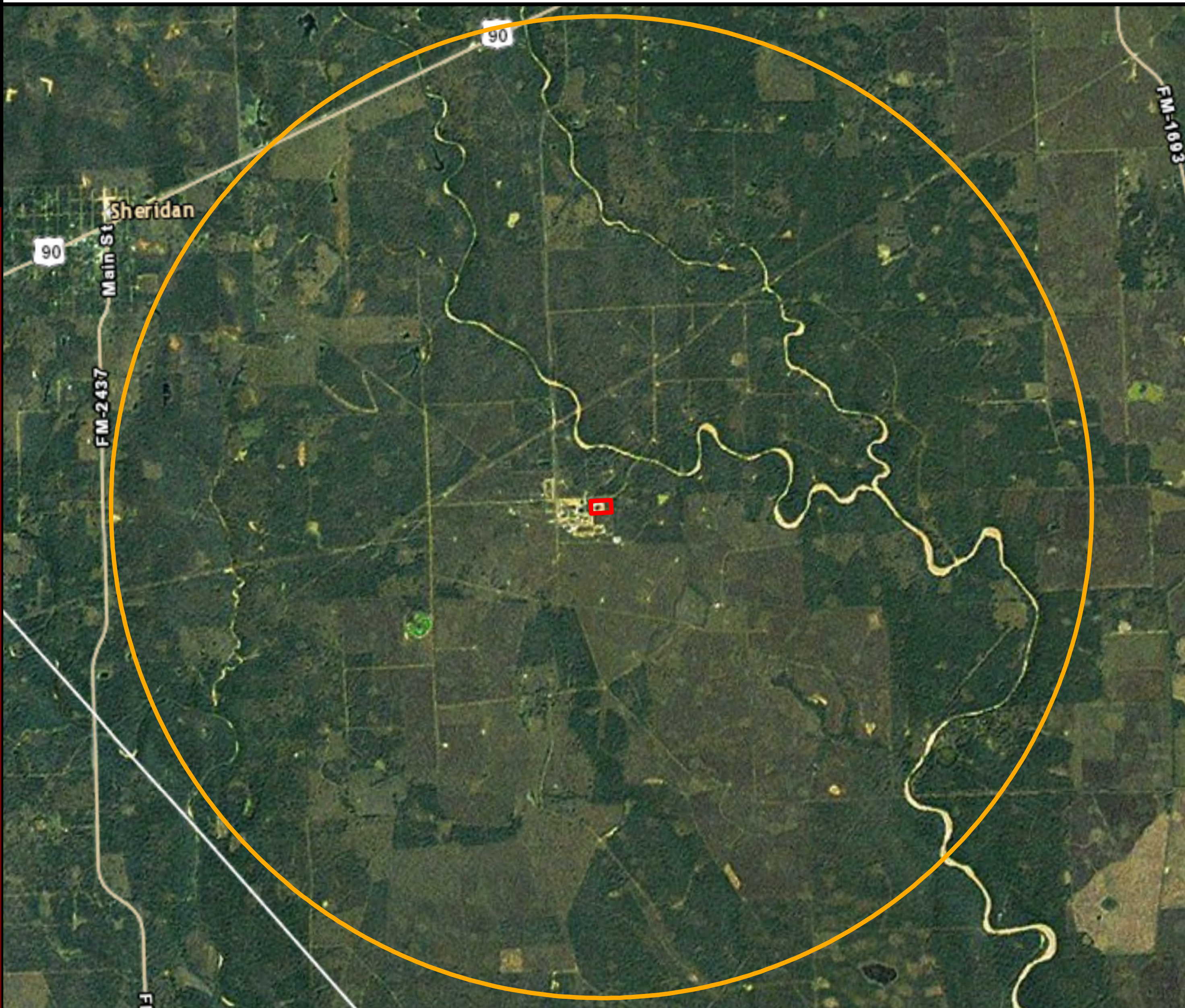
Background Resources:	Surveyor(s):	Project Number and Information:	Whitenton Group, Inc.
USGS 100K DRG Esri USA Topo Basemap	Jayme Shiner PWS Bryan Whisenant	1213 Houston Central Gas Plant Expansion Biological Assessment	ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 06/03/2012 by Jayme Shiner		0 5,000 10,000 Feet N

Figure 2
Construction Area
Houston Central Gas Plant Expansion Project
Colorado County, Texas

Construction Area
(~5.9 Acres)

Background Resources:	Surveyor(s):	Project Number and Information:	Whitenton Group, Inc.
USGS 1 Meter DOQQ (2010) Sheridan NE (NW), Sheridan (NE) ESRI Streetmap Basemap	Jayme Shiner PWS Bryan Whisenant	1213 Houston Central Gas Plant Expansion Biological Assessment	ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 6/03/2012 by Jayme Shiner		0 250 500 Feet N

Figure 3
Survey Area - Aerial Photograph
Houston Central Gas Plant Expansion Project
Colorado County, Texas

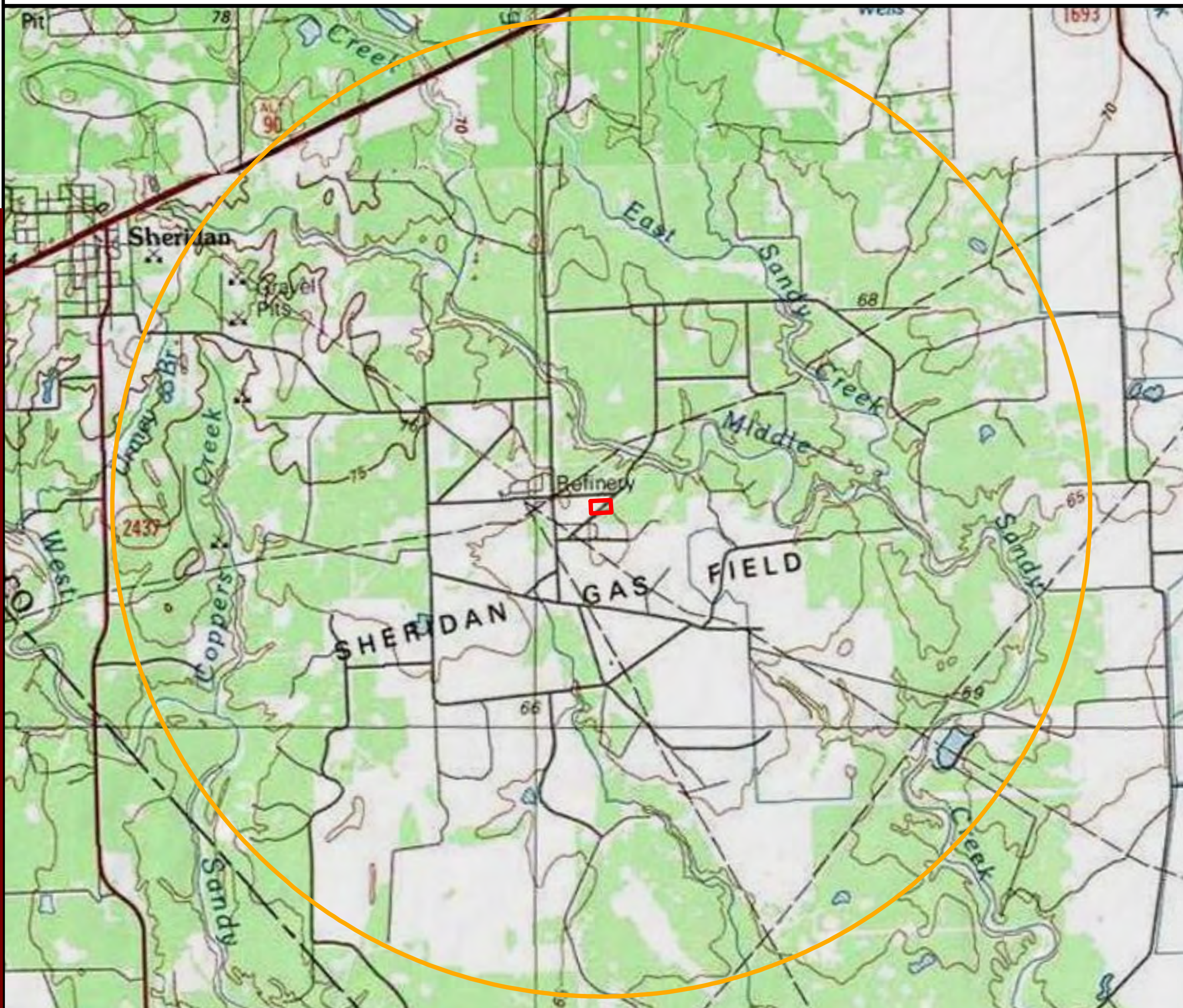


Construction Area (~5.9 Acres)

Survey Area (3-Mile Radius)

Background Resources: USGS 1 Meter DOQQ (2010) Sheridan NE (NW), Rock Island (SW) Sheridan (NE), Sawmill Branch (SE) ESRI Streetmap Basemap	Surveyor(s): Jayme Shiner PWS Bryan Whisenant	Project Number and Information: 1213 Houston Central Gas Plant Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 6/03/2012 by Jayme Shiner		0 4,000 8,000 Feet

Figure 4
Survey Area - Topographic Map
Houston Central Gas Plant Expansion Project
Colorado County, Texas

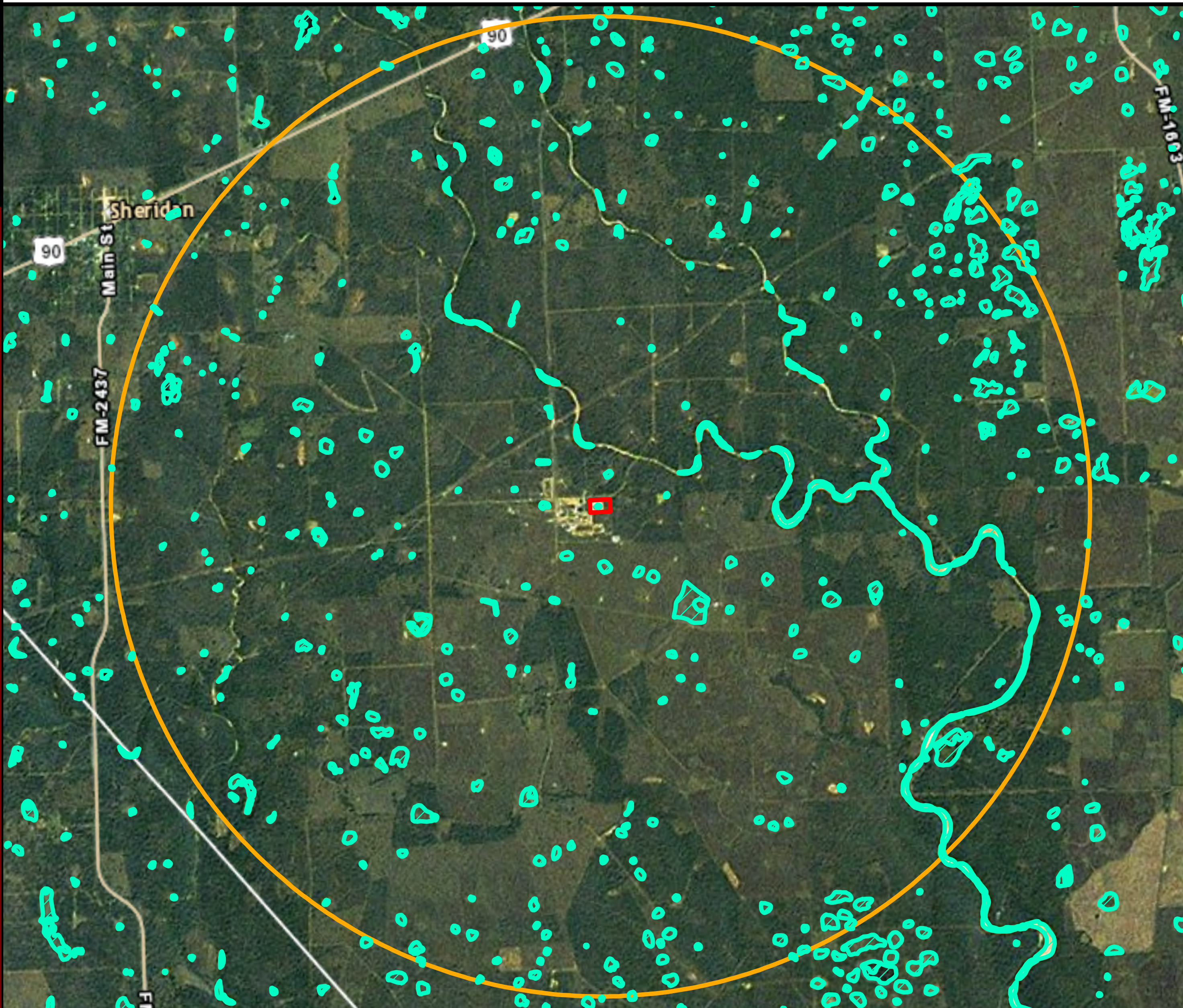


Construction Area (~5.9 Acres)

Survey Area (3-Mile Radius)

Background Resources: USGS 24K DRG Sheridan NE, Rock Island Sheridan, Sawmill Branch ESRI Streetmap Basemap	Surveyor(s): Jayme Shiner PWS Bryan Whisenant	Project Number and Information: 1213 Houston Central Gas Plant Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 6/03/2012 by Jayme Shiner		0 4,000 8,000 Feet N

Figure 5
National Wetland Inventory Data
Houston Central Gas Plant Expansion Project
Colorado County, Texas



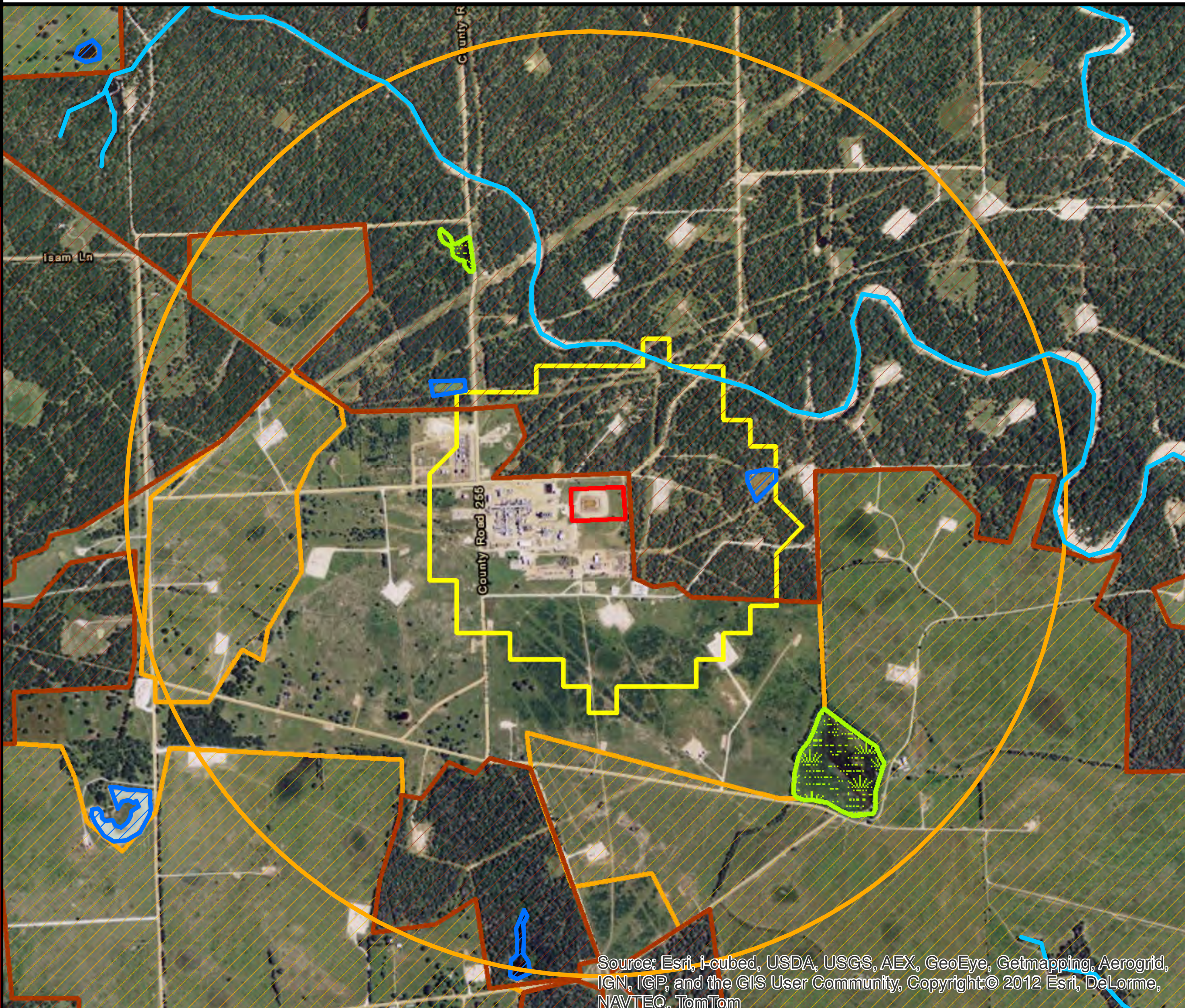
Construction Area (~5.9 Acres)

Survey Area (3-Mile Radius)

National Wetland Inventory Polygon

Background Resources: USGS 1-Meter DOQQ (2010) Sheridan NE, Rock Island Sheridan, Sawmill Branch ESRI Streetmap Basemap USFWS NWI Data	Surveyor(s): Jayme Shiner PWS Bryan Whisenant	Project Number and Information: 1213 Houston Central Gas Plant Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 6/03/2012 by Jayme Shiner		0 4,000 8,000 Feet N

Figure 6
Observed Habitats
Houston Central Gas Plant Expansion Project
Colorado County, Texas



Construction Area (~5.9 Acres)

Survey Area (1-Mile Radius)

Riverine Habitat

Pastureland Habitat

Woodland Habitat

Open Water Habitat

Wetland Habitat

Background Resources:
USGS 1-Meter DOQQ (2010)
Sheridan NE, Rock Island
Sheridan, Sawmill Branch
ESRI Streetmap Basemap

Surveyor(s):
Jayme Shiner PWS
Bryan Whisenant

Project Number and Information:

1213
Houston Central Gas Plant Expansion
Biological Assessment

WHITENTON group environmental consultants
3413 Hunter Road San Marcos Texas 78666

GPS and Coordinate Type:
Trimble Geo XH 6000 Series
UTM NAD 1983
Zone 14 North

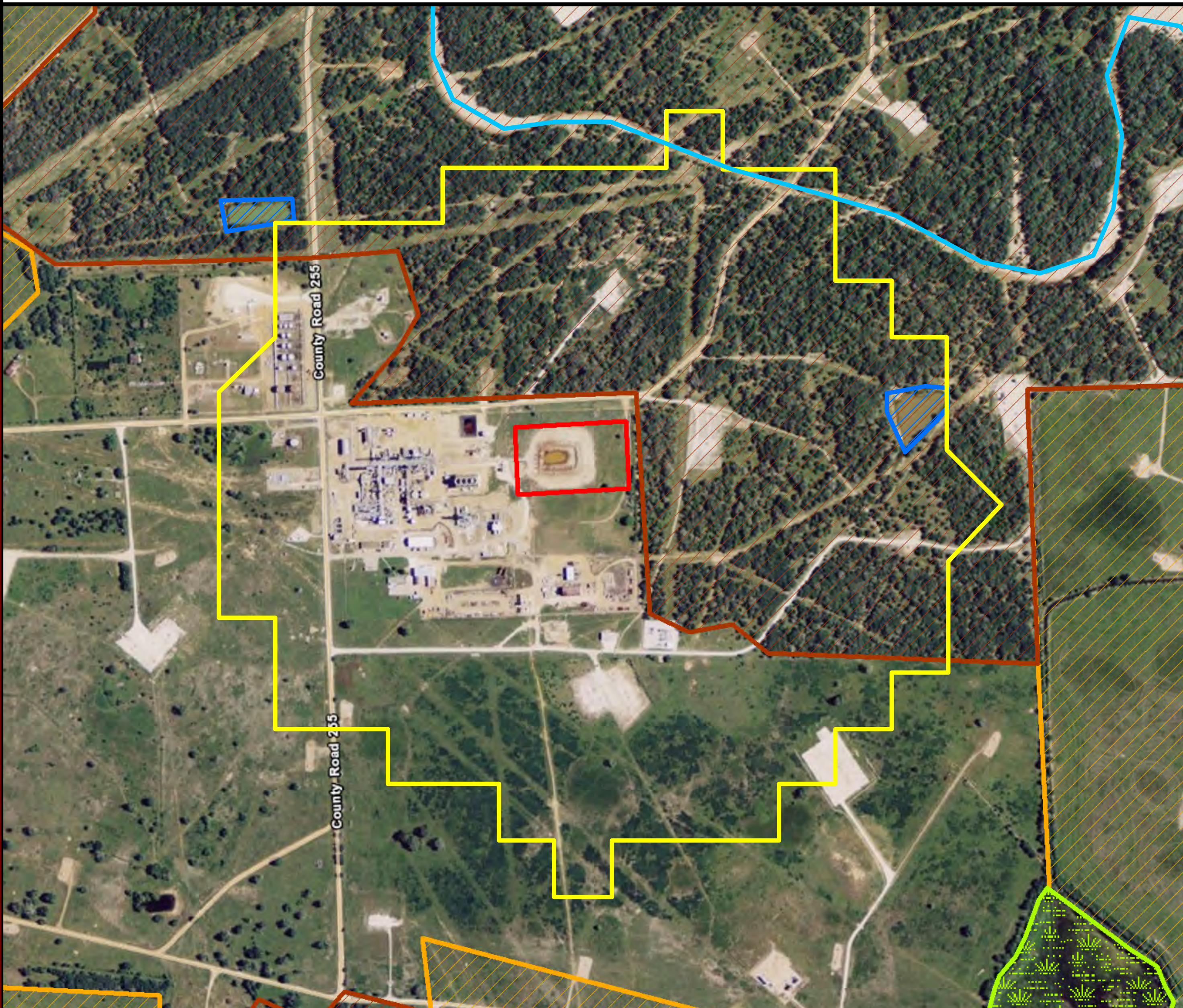
Map Created:

6/03/2012 by Jayme Shiner

0 1,500 3,000 Feet

N

Figure 7
Action Area
Houston Central Gas Plant Expansion Project
Colorado County, Texas



Construction Area (~5.9 Acres)

Action Area (Maximum 0.5-Mile Radius)

Riverine Habitat

Pastureland Habitat

Woodland Habitat

Open Water Habitat

Wetland Habitat

Background Resources: USGS 1-Meter DOQQ (2010) Sheridan NE, Rock Island Sheridan, Sawmill Branch ESRI Streetmap Basemap	Surveyor(s): Jayme Shiner PWS Bryan Whisenant	Project Number and Information: 1213 Houston Central Gas Plant Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 6/03/2012 by Jayme Shiner		0 750 1,500 Feet

APPENDIX C

PHOTOGRAPHS

Houston Central Gas Plant
Expansion Project

04/19/2012

Colorado County, Texas

View: East view of the proposed project area.

Houston Central Gas Plant
Expansion Project

04/19/2012

Colorado County, Texas

View: North view of the proposed project area.

Houston Central Gas Plant
Expansion Project

04/19/2012

Colorado County, Texas

View: West view of the proposed project area.

Houston Central Gas Plant
Expansion Project

04/19/2012

Colorado County, Texas

View: South view of the construction area immediately south of the proposed project area.

Houston Central Gas Plant
Expansion Project

04/19/2012

Colorado County, Texas

View: Northwest view of an industrial area and maintained pastureland northwest of the proposed project area.

Houston Central Gas Plant
Expansion Project

04/19/2012

Colorado County, Texas

View: West view of an industrial area west of the proposed project area.

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Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: Southwest view of the pastureland habitat southwest the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: East view of the woodland habitat northeast of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: East view of the riverine habitat east of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: West view of the riverine habitat north of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: West view of the wetland habitat north of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: Northwest view of the wetland habitat north of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: South view of the pastureland habitat southwest of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: South view of the pastureland and woodland habitats south of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: Northwest view of the pastureland and wetland habitats southeast of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: Southwest view of the woodland and riverine habitats east of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: Southeast view of the woodland and riverine habitats north of the proposed project area.

Houston Central Gas Plant Expansion Project

04/19/2012

Colorado County, Texas

View: South view of the pastureland and woodland habitats west of the proposed project area.

Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS	PHOTOGRAPHIC LOG 7
Houston Central Gas Plant Expansion Project 07/6/2012 Colorado County, Texas View: East view of a surveyed stock tank east of the project area. Photo provided by Dr. Forstner.	
Houston Central Gas Plant Expansion Project 07/6/2012 Colorado County, Texas View: East view of Middle Sandy Creek north of the project area. Photo provided by Dr. Forstner.	
Houston Central Gas Plant Expansion Project 07/6/2012 Colorado County, Texas View: Gulf Coast toad tadpoles observed in ponded area in Middle Sandy Creek north of the project area. Photo provided by Dr. Forstner.	

Houston Central Gas Plant Expansion Project 07/6/2012 Colorado County, Texas View: Gulf Coast toad tadpoles observed in ponded area in Middle Sandy Creek north of the project area. Photo provided by Dr. Forstner.	
Houston Central Gas Plant Expansion Project 07/6/2012 Colorado County, Texas View: South view representative of habitats observed adjacent to the stock ponds.	
Houston Central Gas Plant Expansion Project 07/6/2012 Colorado County, Texas View: North view representative of the woodland habitats surveyed for potential occupied or dispersal habitat.	

APPENDIX D

FIELD SURVEY DATA SUMMARY

Field Survey Data Summary

19 April 2012

Weather: high 90s, humid, sunny, partly cloudy, <5 mph wind

Surveyors: Jayme Shiner PWS, Bryan Whisenant

Site inspection at Houston Central Gas Plant in Sheridan, TX.

Surveyed proposed project area, which is an existing industrial site (roadbase and dirt). Currently an active flare pit on site. Areas surrounding flare pit used for equipment storage. No vegetation observed in project area. Surveyed all areas safely accessible. To the south of the project site is an active construction site. To the west is the existing infrastructure of the Houston Central Gas Plant. Majority of facility is concrete, caliche, or otherwise disturbed ground surface. To the north is a cleared pad that will be the new location for the flare pit. To the east is a small tract of woodland habitat. No wildlife was observed within or adjacent to the existing facility.




Survey continued outside the boundaries of the Frac facility. Surveyed all publicly accessible areas within a 3-mile radius.

Headed east on ranch roads. Observed woodland and streams.

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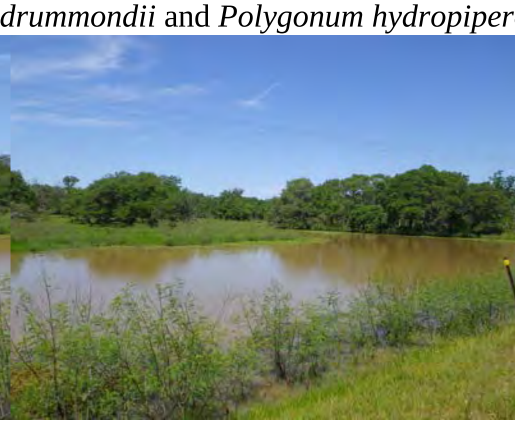
Riverine (dry stream). Vegetation: *Quercus virginiana*, *Ilex vomitoria*, *Quercus stellata*, *Vaccinium arboreum*, *Callicarpa americana*, *Smilax bona-nox*, and *Smilax rotundifolia.* Photos taken.


Mixed woodlands. Vegetation: *Quercus virginiana, Ilex vomitoria, Quercus stellata, Vaccinium arboreum, Callicarpa americana, Smilax bona-nox,* and *Smilax rotundifolia*. Photos taken.

Followed ranch roads north and west. South down CR 255. Observed wetland, woodland, and pastureland habitats.

Wetland. Vegetation: *Sesbania drummondii* and *Polygonum hydropiperoides*.

Maintained pastureland. Vegetation: *Cynodon dactylon*, *Croton capitatus*, *Paspalum notatum*, *Carduus nutans*, and *Rudbeckia triloba*. Photos taken.

Industrial areas.

Headed south, east and north along ranch roads. Observed pastureland, woodland, and open waters.

Open water. Vegetation: *Cynodon dactylon*, *Paspalum notatum*, and *Rudbeckia triloba*.

Headed back to airport to begin aerial survey.

Flew in from the north at a safe altitude, but low enough to observe features and potential bald or golden eagle individuals or nests. Circled clockwise twice (one inner loop, one outer loop). Revisited wooded areas as needed. Observed habitat types, new development not on recent aerial or satellite imagery, and land use not visible from public roadways. No bald or golden eagles or nests were observed. Small raptors were observed. Photos taken from a higher altitude to demonstrate the general area. A sample of photos included below.

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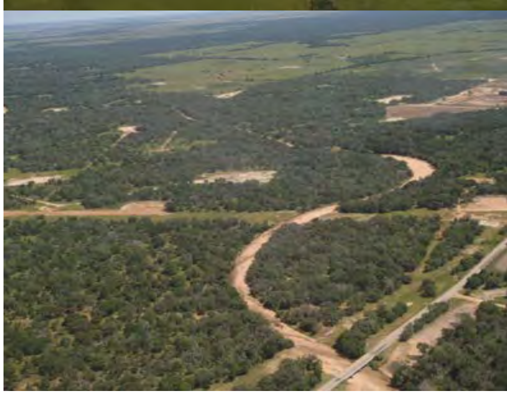

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APPENDIX E

DR. MICHAEL FORSTNER - BRIEF BIOGRAPHY

Brief Biography: Michael R. Forstner, Ph. D.

Dr. Michael Forstner is a biology professor at Texas State University, specializing in vertebrate systematics and genetic populations. He is considered one of the foremost experts on Houston toads with more than 10 years of experience studying this species. He has composed numerous reports, journal articles, abstracts, and book chapters pertaining to Houston toads. His efforts include population monitoring, habitat analysis, genetic coding, and evaluation of the success of recovery efforts for Houston toads. Dr. Forstner has served on numerous advisory committees, including but not limited to the Scientific Review Board for the Miami Museum of Science, the Houston toad Biological Advisory council, the Houston toad delivery team, Houston toad Recovery team, Bastrop County Environmental Recovery and Rehabilitation team, Biological Advisory for the Lost Pines Habitat Conservation Plan, and on the Core team for the Texas Conservation Action Plan. He is a leader and/or member of the following professional societies: Texas Herpetological Society, Society of Systematic Biologists, Society for the Study of Amphibians and Reptiles, and Southwestern Association of Naturalists. His honors include Presidential Award for Excellence, Endowed Chair of genetics, and Professor of International Studies.

APPENDIX F

HOUSTON TOAD HABITAT ASSESSMENT REPORT

Houston toad habitat assessment with an investigation of potential occurrence for the Copano-Houston Central Gas Plant Expansion Project, Colorado County, Texas

submitted to

Whitenton Group, Inc.
Environmental Consultants

By

Michael R.J. Forstner and David J. Stout

July 20, 2012

INTRODUCTION

The Houston toad (*Bufo houstonensis*) is an endemic Texas amphibian species and one currently listed as federally endangered. The largest known population persists in a portion of Bastrop County. Its occurrence within Texas is roughly defined by two geologic bands of deep sandy soils (i.e., the Padina and Frelsburg series) wherein breeding sites for this species are often associated. Like the Houston toad, loblolly pines (*Pinus taeda*) are a relict species of the wetter cooler climates of the past and were isolated only a few million years ago (McHenry and Forstner (in review); Al-Rabab'ah and Williams 2004; Bryant and Holloway 1985). While the Houston toad is often reported to occur in association with these pines, it is also known to occur with other types of canopy forests. The decline of Houston toads has been associated with land conversion from forested habitats to pastures, and other habitat fragmentation outcomes (e.g. urbanization). With the recent years of drought conditions, detection of the species is at an all-time low. Significant efforts have been made to understand historical and current occurrence of this species and of the types of habitat that support its persistence today.

To enable a review of the potential for the occurrence of the species or suitability of habitat at a given location, we provide the autecological context for the Houston toad; a brief synopsis of nearby occurrences for the species (if any); and, an assessment based on a physical survey of the property conducted during daylight.

Biology of the Houston toad

Forstner and Dixon (2000) describe the Houston toad (*Bufo houstonensis*) as one of six members (*B. americanus, B. hemiophrys, B. houstonensis, B. microscaphus, B. terrestris,* and *B. woodhouseii*) of the Americanus Group (Blair 1972). This group of toads ranges from James Bay, Canada south to northern Chihuahua, Mexico; west to Imperial Valley, California, and the Columbia River Valley in Oregon and Washington; east to the Atlantic coast from southern Quebec, Canada and finally into Florida. The

Houston toad is restricted to Texas, specifically, from Liberty County southwest to Lavaca County, north to Lee County, and northeast into Freestone County. The Houston toad has been extirpated from Liberty, Harris, and Fort Bend Counties, but has been reaffirmed from Colorado and Austin Counties (Yantis 1989). Yantis (1989, 1990, 1991, and 1992) also located populations in Freestone, Lavaca, Leon, Milam, and Robertson Counties. Both Kuhl (1997) and Forstner and Dixon (2000) have verified the presence of Houston toads in Lee County. Gaston et al. (2001) reported a road-killed Houston toad in Lee County from just north of the Bastrop County line. The species had not been detected in Burleson County nor in Lavaca County since the 1990s, but was detected in both in 2011 (Yantis and MRJF 2011, respectively). Of the remaining Houston toad populations, the population in Bastrop County is considered to be the most robust and may be the only remaining sustainable population (Seal 1994, USFWS 1995).

The Houston toad is a small to medium sized animal with a 45-70 mm snout-vent length (SVL) in males and a 52-80 mm SVL in females. The dorsal color is usually light brown, but may vary from nearly black to reddish. The back has a variable number of black spots that enclose one wart or a group of fused warts. The chest is heavily suffused with black pigment and occasional black spots. The paratoid glands are elongate, usually two to three times longer than wide and irregular in shape. The belly is cream to yellowish. The inter-orbital and postorbital crests are occasionally thickened. On the molecular level, the Houston toad is diagnosable by mtDNA sequence as a unique evolutionary unit separate from both *Bufo valliceps* and *Bufo woodhouseii* (Forstner and Dixon 2000) and with detectable subpopulation structure within Bastrop County (McHenry 2010).

The Houston toad can be confused with the Gulf Coast toad (*Bufo valliceps*). However, the Gulf Coast toad is much larger, commonly reaching 110mm in length. The Gulf Coast toad has a dark lateral stripe along the full length of the toad from behind the eye to the pelvic junction. It has very dramatic cranial crests, which form a deep valley or groove between the eyes. It also has a much larger and more distinct parotid gland than does the Houston toad. While the color pattern is variable, Gulf Coast toads have a distinct white or crème mid-dorsal stripe present in contrast to nearly all Houston toads.

Finally, male Gulf Coast toads have a dark throat patch, but are otherwise unmarked on the venter (Forstner and Dixon 2000).

Distinguishing between Houston toads and Woodhouse's toads (*Bufo woodhouseii*) can be more difficult as these two species are more similar than either is to the Gulf Coast toad. Woodhouse's toad is also larger than the Houston toad,, commonly attaining lengths greater than 100mm. They also tend to show a light dorsal stripe, but the Houston Toad does not. Likewise, the venter of Woodhouse's Toad is usually unmarked, but the Houston toad will have dark spots on the chest and abdominal areas. Males of both species will have a dark throat patch. Finally, the cranial crests differ between the two species. In Woodhouse's toad, the cranial crests touch the parotoid glands, but in Houston toads they do not (Forstner and Dixon 2000).

Reproduction- The life expectancy of the Houston toad is approximately four years (Price 1992). Males reach sexual maturity at about one year, but females require two years to achieve reproductive maturity (Quinn 1981). Adults may be seen as early as December and can remain intermittently active at the chorusing ponds until late June depending on humidity and temperature (Forstner 2002a). Houston toads generally breed earlier in the year than other toad species in the area. Indeed the timing of the breeding season is one means by which potential hybridization with other species is avoided. Breeding is triggered, in part, by rainfall and warm night-time temperatures, with activity peaking in February and March (Hillis et al. 1984; Dixon 1982; Dixon et al. 1990; Price and Yantis 1993). While significant factors, rainfall and temperature are not the only important variables initiating choruses for the Houston toad. For example, Price (1992) found that Houston toads do not generally call during the 7 to 10 days prior to the full moon. Generally, temperatures above 12°C for 24 hours prior to the chorus event are typical, but toads have been found calling at temperatures below 12°C and without rainfall. The water temperatures during this early spring breeding cycle normally vary from 4°C to 24°C. Not all cues initiating breeding choruses of males are known (Dixon et al. 1990).

Toads, like many amphibians, are explosive breeders. They tend to concentrate their reproductive effort to producing large numbers of eggs, with each egg having a low overall probability of survival. Female Houston toads lay between 500 and 6,000 eggs, although less than 1% of the eggs survive to maturity (Seal 1994). Female toads normally come to the water body only once to deposit their eggs, whereas individual males may visit the same pond 15 times or more in the same spring. Males are infrequently found calling from their daytime retreats at some distance from the water in early evening, but eventually arrive at the pond to sing in chorus with other male toads. The call of the Houston toad consists of a very long 7 to 22 second (avg. 14 second), high pitched (1,646 to 2,300 cps) trill at 14-36 pulses/sec (Brown 1973). This call is unique in duration, but similar in pitch and trill to that of Woodhouse's toad. Receptive female Houston toads are encountered by males at the ponds edge, amplexed, and eggs are subsequently deposited among vegetation or debris near the shore. An occasional female will arrive at the pond already in amplexus with a male. This suggests that the female either approached a calling male while he was still within his daytime retreat, or a male located and amplexed the female while she was traveling toward the pond (Dixon et al. 1990). Reproduction is a major impetus for dispersal and long distance travel to breeding aggregations is presumed to be one of the common overland movements of adults annually. The average distance that Houston toads travel to reach a breeding pond is not clear, but Price (1992) documented individual Houston toads travelling up to 0.95 miles between breeding ponds and Forstner et al. (unpublished) have documented individuals moving larger distances (i.e. up to 2 miles).

Eggs are laid in strings and are each separated by a thin wall. Depending on the size of the female each egg string can contain up to 6,000 eggs (Quinn and Mays 1987). The tadpoles contain three rows of teeth on the lower lip, and the tail musculature is dark, heavily pigmented with black. The dorsal surface of the tail is evenly pigmented while the ventral surface is narrowly un-pigmented along the midline. The ratio of tail length to tail height is 2.7 or less. Tadpoles remain in the pond for a period of 40-80 days depending on environmental factors such as temperature and food resources. Upon emergence, the juveniles will remain near the pond for several days prior to dispersing away from the pond (Thomas and Allen 1997).

Habitat types- The Houston toad requires three distinct habitat types in order to complete its life cycle. For breeding and larval stages they require aquatic habitats (i.e. Breeding habitat) and adults will generally persist in the immediately adjacent uplands after the breeding season (i.e. Occupied habitat). After metamorphosis, juvenile Houston toads require loosely connected terrestrial habitats which provide dispersal connectivity for the juveniles during recruitment to the breeding population (i.e. Dispersal habitats). There is an obvious interaction among Breeding, Occupied, and Dispersal habitat zones given that the aquatic habitats must be within or immediately adjacent to suitable terrestrial habitat for the adults and such habitats must allow some level of interconnectivity for dispersal. There is some flexibility in this constraint as Houston toads are documented to move approximately 1,600 m to the water during the breeding season (Price 1992) and genetic data demonstrates longer distance connectivity through canopy habitats in Bastrop County at distances of five miles or more (McHenry 2010). This allows the toad to occasionally use less suitable breeding sites, such as abandoned quarries in gravelly or stony soils and to disperse across habitats that would be unsuitable for long term occupancy.

Houston toads typically breed in small pools of water and ephemeral ponds. They have been heard or captured in a variety of aquatic sites, e.g., man-made ditches, ponds, lakes, plowed fields, puddles in roads, moist areas in yards, flooded pastures, and such natural areas as perched spring heads, prairie potholes, ponds, streams, and ephemeral rain pools. Permanent ponds and stock tanks have also been documented as breeding sites for Houston toads (Forstner, 2001). Unfortunately survival of eggs, tadpoles, and juveniles may be very low in these more permanent water bodies. Permanent water bodies in the area tend to have increased predators (ie. invertebrates, bullfrogs, fish) and an increased probability of livestock or agricultural usage. Forstner (2001) reported stock tanks with heavily impacted margins were not used by Houston toads, but subsequently recovered to suitable breeding sites after livestock access to the ponds was limited or prevented. However all of these ponds are within suitable habitat or in pastures adjacent to forested areas known to be inhabited by the Houston toad (Forstner 2001). Post-metamorphic survival of the juveniles is directly influenced by the area surrounding the pond (Forstner 2002a; Thomas and Allen 1997). Thus, the area immediately adjacent to the ponds is especially important habitat for the Houston toad.

Houston toad chorusing is strongly correlated to deep sandy soils (e.g. Patilo sands of the Carrizo Sand Formation) and this may be a consequence of their preference of sandy substrates for day-time retreats or burrows. Houston toads apparently spend their daylight hours within forested sites, often in burrows either self-constructed or in the burrows of other animals, such as rats, mice, moles, gophers, insects. They have been rarely found in daylight searches of the areas under and around the roots of trees and grasses near the ponds, under leaf litter, logs, and occasionally under garbage cans or other anthropogenic surface debris. The habitat use in Texas by the Houston toad has been inferred in two ways. First, known breeding chorus locations collected from many of surveys completed during the past thirty years, provide specific breeding locations. The results from these surveys depict the Breeding distribution in Texas most often with a series of deep sandy soils and correspondent forested cover (Buzo 2008). Second, more explicit habitat use information revealing Occupied habitat can be drawn from ongoing research efforts conducted within Bastrop County on the Griffith League Ranch (GLR) (Forstner 2002a). The Griffith League ranch is a 5,000 acre property owned by the Capital Area Council of the Boy Scouts of America and is currently the location for several research projects focused on the ecology of the Houston toad. From the research conducted from 2000-2011 on the GLR, adult Houston toads are most often localized near or at maximum within a mile of the ponds from which they are heard calling (Forstner 2000, 2001, 2002a). This is further supported by the genetic results (McHenry 2010) which confirm nearly half of adult Houston toads to be “resident” to a given breeding pond or group of ponds within this spatial range. Finally, additional evidence detailing the dispersal of adults and juveniles have been obtained by direct measure (Greuter and Forstner 2004: Swannack and Forstner 2004) and genetic determinations (McHenry 2010). Those results indicate that Houston toad choruses remain “connected” by long distance dispersal of juveniles and a subset of adults that move longer than average distances. Thus, significant evidence depicting habitat use exists from both long-term historical audio surveys and from recent, more explicit investigations of the species.

Geological relationship to habitat- While deep billowy sands like the Patilo sands of the Carrizo Sand formation occur throughout the northern sand band, toads do not appear to be supported by all areas having this soil type. The reason for this is most likely part of the definition of such geologic formations, rather than any variance in the type of habitat required by the Houston toad. The deep geology of a region provides one aspect of surface soil characteristics. The surface soils themselves are another part of the whole. Thus, the "same" Patilo sands across the northern range of the species are very different dependent upon the specific geological formation they overlay. For example, there are two primary factors that vary among the Patilo Sands within Bastrop County between occupied and unoccupied habitats. First, the underlying geology varies widely effecting a change in the mineral (parent) composition of the sand soil. Thus, Patilo sands over the Calvert Bluff are primarily mudstone while over the Carrizo Sand, sandstone. The Calvert Bluff mudstone results in a Patilo sandy soil with more clay particles than the Carrizo Sand Patilo soil. This means the mudstone sands tend to become more indurate when desiccated (Ayers and Lewis 1985; Baker 1979) and these soils have not historically had Houston toad detections as have sands of the Carrizo formation.

The best studied examples of Houston toad occurrence contrasted to geology have been completed in Bastrop County. The Houston toad has been documented to occur in habitats overlying the following geologic formations in Bastrop County: the Calvert Bluff, the Carrizo Sand, the Recklaw, the Queen City Sand, and the Sparta-Weches. Historically, the toad had been located on all but the Calvert Bluff (Seal 1994), yet areas of "Calvert Bluff geology" do support known toad breeding locations (Forstner 2000; Forstner 2001). To explain this seeming disparity, it is important to reiterate the inaccuracy of simple characterizations of a particular location's geology. For example, in the years 2000 and 2001 five breeding ponds were reported from locations lying over the Calvert Bluff, on the Boy Scouts Griffith League Ranch (Forstner, 2000; Forstner 2001). While all of these locations are only proximal to the Carrizo Sand formation (within ½ mile) it would be inaccurate to characterize these locations as mudstone soils typical of the Calvert Bluff. As is the normal case with subsurface (Calvert Bluff or Carrizo Sand) geology and surface soils (Demona or Tabor series soils), there are broad areas of overlap at the interface between two types. In our example, all of the locations where Houston toads were found over Calvert Bluff geology had surface soils of overlying Carrizo sands (Patilo-Demona-Silstid), resulting from the overlay of the deep geology by surface soil erosion and migration. Thus, accurately depicting the surface soils cannot always be determined by simply examining the underlying geology.

Seeps and springs (and the historical occurrence of ponds) also follow the varying geology. Seeps and springs are more predominant in the Carrizo Sand formation than other geologic areas. This is significant, as it may have limited the historical distribution of the Houston toad; however, the recent (in geologic time) occurrence of man-made ponds may have served to increase the distribution of amphibians in general. This has both the benefits of additional breeding areas and the detriments of allowing introductions of predators such as the bullfrog. So prior to the 1900s Houston toads would have been restricted in breeding to only those pools available naturally. Those pools would have, in all likelihood, been only found over the Carrizo Sand. Hence, todays heavily modified, permanent pond rich environments have had additional impacts on the species by potentially exacerbating small population effects consequent of the abundance of breeding sites with relatively few male toads to attend chorusing (Gaston et al. 2010).

Current status and federally designated Critical Habitat- The Houston toad is found only in central Texas. When originally named as a species in 1953, its distribution was believed to be limited to Harris and surrounding counties (Sanders 1953). By 1994, the toad was extirpated from Harris, Liberty and Fort Bend counties but then known to occur in 7 other counties including Lavaca County (Seal 1994). The work of Kuhl (1997) and others (Gaston et al. 2001) confirmed the Houston toad in Lee County, but the populations in Lavaca County had not been detected since 1990. Forstner detected a Houston toad in chorus in Lavaca County in May of 2011, concurrent to the first big rains of that spring. The individual was heard in chorus on subsequent nights, and enabled MRJF to have the TPWD biologist for the area accompany the survey to also hear the individual calling. Surveys of Colorado and Austin Counties were begun in 2005 and continue to the present season with detections in this period for the species in both counties.

Currently, the toad is believed to still exist in detectable choruses within the following counties: Austin, Colorado, Bastrop, Milam, Robertson, Lavaca, Lee, and Leon. Outside of Bastrop the majority of the extant choruses occurs inside only a few square kilometers in each county, or as reduced as to only a few ponds still occupied. In Harris County, the toad is believed to have disappeared primarily as a result of habitat loss, concurrent increases in introduced pathogens (including pesticides), and predation, coupled with the severe effects of the 1950s drought. Today, those same effects are now resulting in declines across the entire distribution of the species, including declines in Bastrop County now exacerbated by the 2011 Bastrop Complex Fire.

METHODS AND RESULTS

The assessment conducted here utilized two approaches to reach a conclusion of Houston toad habitat or use of the tract. The initial assessment was made by locating the site and its context suitability for Houston toads under the 2008 suitability map and records of occurrence for the species. Then a site survey was conducted in early July 2012. The site survey targeted aquatic habitats and their immediately adjacent uplands and was completed during the week following a significant precipitation event for the area (>10cm). We undertook exhaustive searches of the aquatic habitat for amphibians and of debris or other potential retreats in the uplands. The summative information was then applied to an assessment of the historical and current context of this site for support of Houston toads at any life stage.

The 163 acre site is in Colorado County, near the Lavaca County border (Figure 1). The facility is a processing facility in support of oil and gas operations (NAICS Code 213112). According to the Form 10-K filing by Copano Energy, LLC in 2007, this facility was the third largest such in Texas at that time and served the Laredo to Katy pipeline. Constructed in 1965 the plant was modified in 2003 to enable natural gas conditioning capabilities. The core interest was for the area immediately adjacent to the processing facility, and describes a generally round perimeter to the plant at a distance averaging 300m (Figure 2). The aerial image (Figure 2) provides the context of adjacent forested area and the infrastructure in place at the site at the time of the imaging. This boundary became the approximate limits for our evaluation of the site. The center of the red bounded construction area (Figure 2) was used for the calculation of all distances to known Houston toad occurrence.

To begin the historical and context assessment, we first located the nearest known Houston toad occurrence records for the site. These are, in order of proximity to this facility: the 2011 Houston toad detection by MRJF in Lavaca County (11.75km W), the 1990 Lavaca County detection by Dr. Yantis (24.5km W), Attwater Prairie Chicken National Wildlife Refuge (40km to the ENE), and finally the 2007, and earlier detections of the species north of IH-10 in Colorado County (42km). These are useful as they define the known occurrence for the Houston toad to be at considerable distances away from this location. We have detected Houston toads moving considerable distances through suitable canopy habitats (~4km) and have also documented chorusing where the species would have had to cross unsuitable habitats at a distance of up to ~2km, but we are not aware of Houston toads crossing unsuitable habitat at distance of 10km or more.

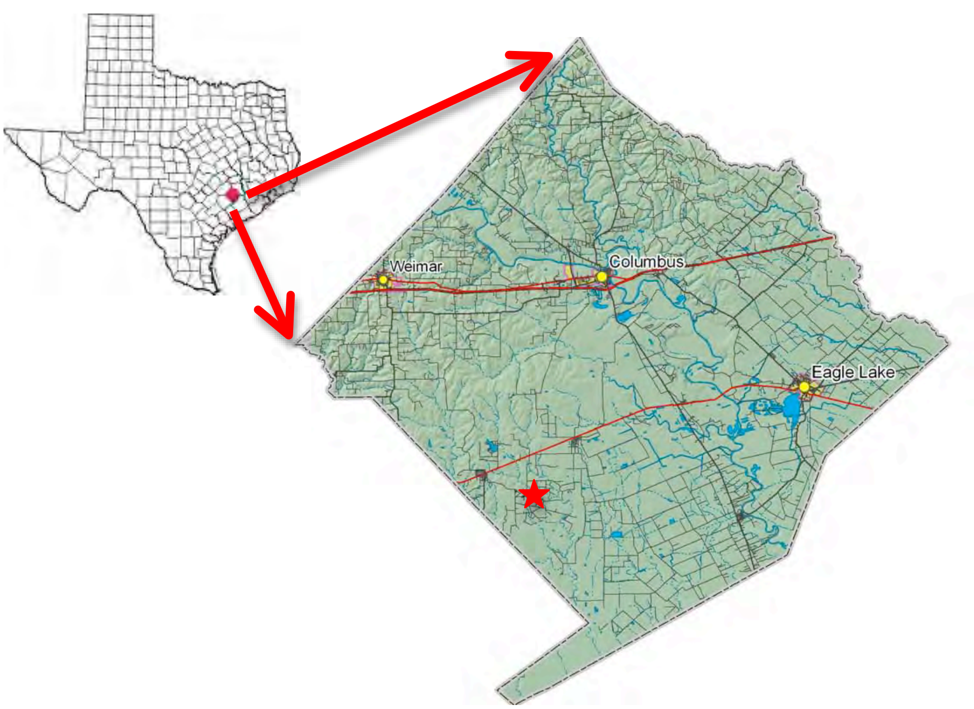

Figure 1. Location (red star) of the Copano-Houston Central Gas Plant in Colorado County, south of Sheridan, Texas.

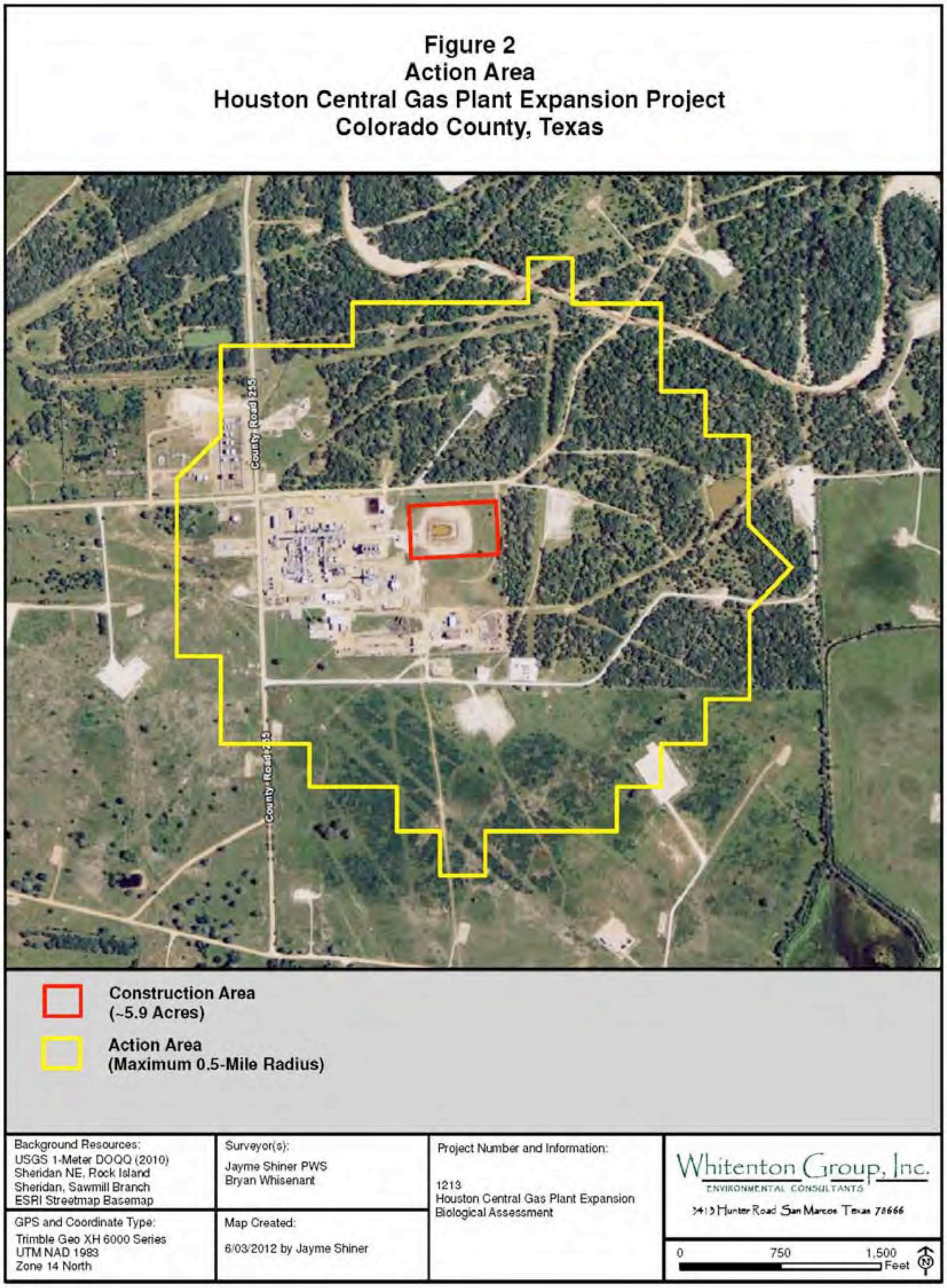

Figure 2. Aerial image and action area boundary for the Copano-Houston Central Gas Plant in Colorado County, Texas. Figure provided for this report by Whitenton Group, Inc.

Then, the overall habitat suitability and adjacent suitable habitat patch mosaic was evaluated. The site is obviously within landscape level proximity to known occurrences for the Houston toad (as above). The site is in Colorado County which is known to have Houston toads, albeit north of IH-10. To evaluate the site, we applied a suitability assessment that incorporates statistically valid variables (depth of sands & canopy) to examine the potential for Houston toad habitat on the site (Figure 3). The results depict the site as being at the end of a narrow band of suitable habitat, generally consequent of the canopy habitat along the riparian band of the East and Middle Forks of Sandy Creek. The narrow band of suitable habitat (green pixels) in the model results begins just NE of the plant area (as seen in Figure 4) and then represents a long "finger" of depicted suitable habitat following Sandy creek northward. This narrow finger of depicted suitable habitat is approximately 10km east of the habitat patch within which the Houston toad was detected for Lavaca County in 2011 (Figure 3). We do not know if the larger habitat patch north of the site is occupied by Houston toad, it was not detected in that patch during the nights of May 11, 12, 13 in the surveys by MRJF in 2011.

Site survey- The site was visited by both authors and two additional personnel from the Whitenton Group, Inc. on July 6, 2012. The site survey included habitat searches for amphibians and reptiles in the aquatic habitats of the area (Figure 4; 1-5) and the upland habitats adjacent to those sites. Work in the field included documentation of canopy dominant tree species, aquatic habitat conditions, and the identification of all amphibian and reptile species encountered during our time on site. We worked as two teams with the authors divided between the two teams. Aquatic surveys included searches for amphibian eggs, tadpoles, pondside/creekside adult or juvenile amphibians, and any chance encounters of herpetofauna sheltering in the adjacent habitats. We used standard equipment including dipnets, potato rakes, and snake tongs in our searches. We utilized HanDbase and a custom designed field entry form for iOS5 on the iPhone 4S for recording observation or collection information and Garmin hand held GPS units for specific specimen locations.

We encountered five common and abundant amphibian species during our work. We observed many individual juvenile and adult cricket frogs (*Acris crepitans*), bullfrogs

(*Rana catesbiana*) and leopard frogs (*Rana sphenocephala*). We also observed hundreds to thousands of tadpoles from the gulf coast toad (*Bufo valliceps*) and a few individual tadpoles of *Rana sphenocephala*. We encountered several snakes during our work all of which were aquatic. We saw several individuals of the water moccasin (*Agkistrodon piscivorous*) and blotched water snake (*Nerodia erythrogaster*). All of these taxa are expected for the location and demonstrate that the sites support a normal faunal

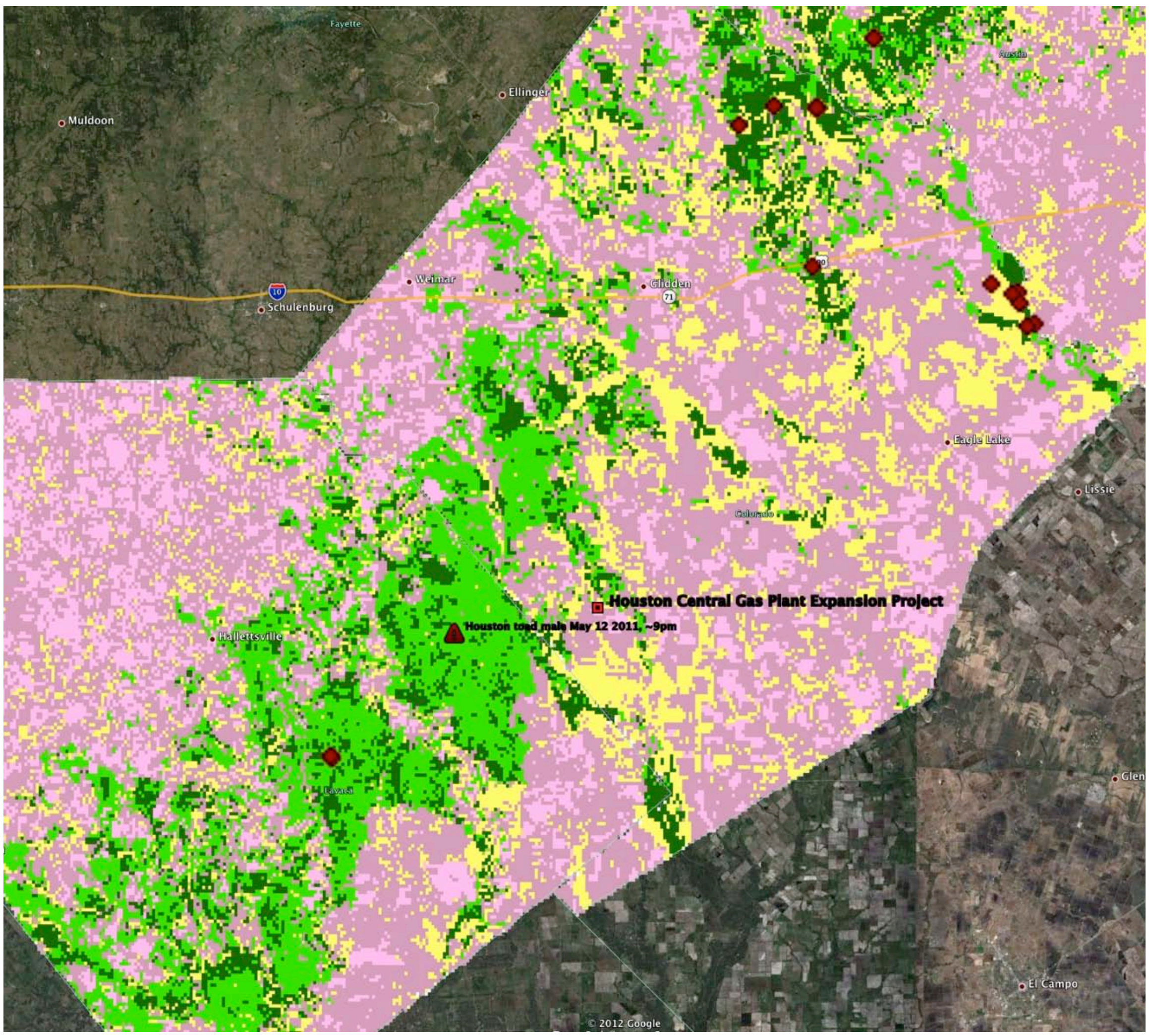

Figure 3. Houston toad habitat suitability for Lavaca, Colorado, and part of Austin counties, Texas. The 2008 suitability assessment is applied here and grades from unsuitable (light pink, darker pink), to low suitability (yellow), and finally suitable habitats (darker green is highest suitability category). Two specific sites are depicted: 1) the Houston Central Gas Plant Expansion Project and 2) the May 12, 2011 Houston toad detection. All other red diamonds are historically reported locations for the Houston toad in the region.

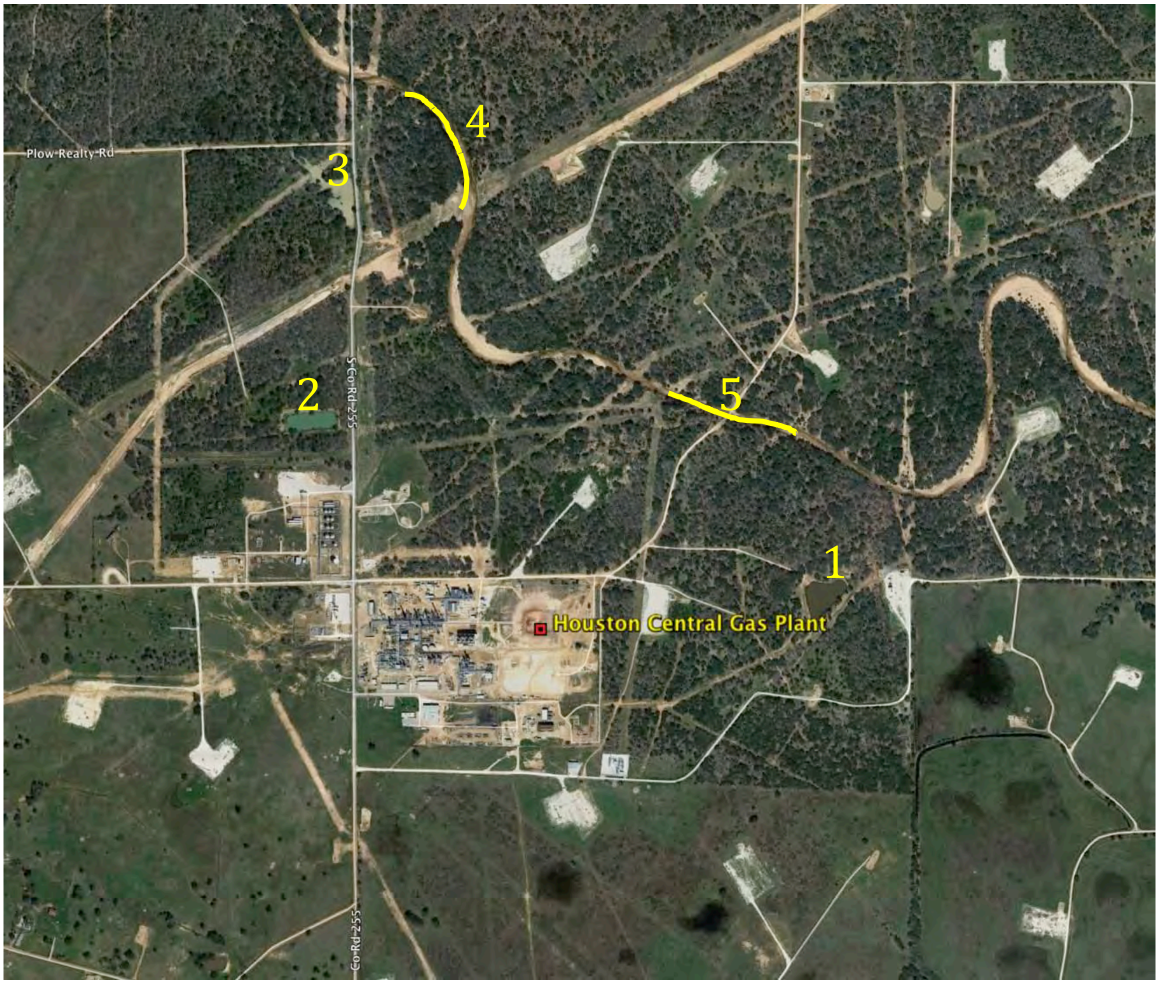

Figure 4. The context adjacent ponds (1-3) and riparian areas (4-5) that were targeted in the daylight survey of the Copano-Houston Central Gas Processing Plant in Colorado County, TX during July of 2012.

Table 1. Reptiles and amphibians detected during a daylight survey in Colorado County, Texas on the morning of July 6, 2012. Site numbers refer to Figure 4 of this report.

Species \ Site	1 (pond)	2 (pond)	3 (pond)	4 (creek)	5 (creek)
Acris crepitans	X	X	X		X
Agkistrodon piscivorous	X		X		
Bufo valliceps		X			X
Nerodia erythrogaster		X	X		
Rana catesbiana	X				X
Rana sphenocephala	X	X	X		X
Trachemys scripta elegans	X	X		X	X

constituency (Table 1). The main canopy tree for the uplands surrounding the ponds and for the riparian corridor of Sandy Creek was the post oak (*Quercus stellata*) although a few individuals of American Elm (*Ulmus americana*), American Sycamore (*Plantanus occidentalis*) and black walnut (*Juglans nigra*) were observed. Expectedly, yaupon (*Ilex vomitoria*) dominates the understory in much of the upland areas surrounding the ponds and along the creek (Figure 6 & 7).

Finally we assessed the aquatic systems themselves to evaluate their potential suitability as breeding habitat for Houston toads. Structurally the ponds are shallow artificial ponds with banks that range from quite steep (Figure 4: 2) to very shallow (Figure 4: 3). These ponds are adjacent to wooded habitat although each of the ponds is bordered by easements or roadways and are utilized by livestock. Generally water quality was average (Figure 6) by visual evaluation of turbidity over time (historic imagery and water color presented) with each pond demonstrating the impacts of runoff or partial eutrophication (Figure 4). Gulf Coast toads (*Bufo valliceps*) were detected at one of these artificial impoundments and the species was detected as tadpoles abundantly within Sandy Creek itself. The size and remaining volume of water at the sites where these tadpoles were present would be very likely to evaporate resulting in sibship mortality barring significant additional rains in the next few days (Figure 8 & 9).

Figure 6. Artificial impoundment (Figure 4: Site 1 of this report) with shallow banks, post oak uplands, and evidence of cattle use in Colorado County, Texas.

Figure 7. Sandy Creek (Figure 4: Site 4 & 5 of this report) with variable bank slopes, post oak uplands, and the deep sandy bottom for which it is named in Colorado County, Texas.

CONCLUSIONS

The Houston toad is an endangered amphibian endemic to Texas and only occurs in a few isolated fragments of remaining habitat. The species has been detected in Colorado County. However the nearest recent detection of Houston toads to the Copano-Houston Central Gas Plant was in adjacent Lavaca County at a straight line distance of more than 11km to the west. The suitability assessment does resolve a model result depicting potentially suitable habitat in a linear feature that follows the drainage of Sandy Creek. A physical evaluation of the site confirmed a normal faunal and floral contingent including the detection of Gulf Coast toads (*Bufo valliceps*) reproducing in Sandy Creek.

Assessing the presence or absences of rare species is a difficult task. Rarity makes detection difficult, increasing the expense and effort required to find the species when present. The reciprocal is also true, failing to detect the species can be simply consequent of rarity and that difficulty in detection. Consequently, it is practical and valuable to use the best available data in making an assessment of a particular acreage and its context with regard to Breeding, Occupied, or Dispersal habitat suitability for the Houston toad. In this case the site is heavily disturbed. Portions of the areas immediately surrounding the facility have been disturbed by construction activities since the most recent aerial photographs were taken in 2010 (Figure 2 & 4). During our site visit some of the acreage immediately north of the plant and southeast and southwest of sites 2 & 5, respectively, (see Figure 4) had been cleared and leveled. The plant itself was established in 1965 and has been in continued operations since that time. Expansion of the capabilities of the facility in 2003, coupled to increased value to natural gas makes future operations seemingly assured.

The key assessment then is to understand and describe any potential interactions with Houston toads at this location by those continuing operations. The site is not adjacent to known Houston toad occurrences (Figure 3 nor is it in a large contiguous habitat patch suitable to the species (Figure 3). There are two such patches at some distance from this site (~10km North or West to either edge). Thus, are Houston toads present at the site today (Occupied habitat) and are they likely to disperse to or through the site (Dispersal habitat)? The only mechanism for dispersal or maintenance of connectivity for this site would require either movement across 10km minimum

Figure 8. Tadpoles of the Gulf Coast toad (*Bufo valliceps*) in a drying puddle of Sandy Creek (Figure 4: Site 5 of this report). These are believed to be a week or so old given the rains occurring at this site during the last week of June 2012.

unsuitable open habitat from the western occupied habitat patch (see Figure 3) or dispersal down the drainage of Sandy Creek from the north (Figure 3). Neither of these seem likely to then result in stable occupancy of the area encompassed by the plant or the boundary depicted in yellow in Figure 2. There are several things that would act to preclude use of this particular site over durable periods by the Houston toad. Foremost the narrow width of the suitable habitat depicted in the model (Figure 3) is really only capturing the riparian edges of Sandy Creek. Thus toads moving down the drainage, if the northern patch of suitability is actually occupied, would be entering a population sink. Here the sink would be of increased mortality, consequent of the exposure to fire ants, cattle impacts, and competition with Gulf Coast toads. The configuration of the patch would disable persistence of the species here if they were able to reach the location at all.

Figure 9. Drying puddle of Sandy Creek (Figure 4: Site 5 of this report) containing several sibships of Gulf Coast toad (*Bufo valliceps*) can be seen as black patches within the puddle (end of the rake and both the near and far sides of the puddle) on July 6, 2012.

Importantly, such dispersal would require crossing 10km or more of open terrain, with limited or no suitability to reach this narrow zone of habitat along Sandy Creek.

Given it required more than five years of surveys to detect Houston toads in Lavaca County and this was the most proximal recent detection, we can presume that Houston toads are not abundantly present in the general region. This is true for Austin and northern Colorado counties, as well, and from a similar survey duration (2006-2011). Thus, it is not reasonable to predict the occurrence of the Houston toad in a narrow finger of riparian habitat, when it has been all but extirpated in large contiguous patches (Figure 3). It is certainly possible that 50 years ago prior to initial construction at this site, the habitat that supported Houston toads at that time in Harris County was more contiguous here. However, as with the extirpations since then across Harris, Liberty, and Ft. Bend counties, it is not reasonable to expect the Houston toad to still occur in such a small fragment of habitat with little or no connectivity prospects from known occupied patches.

In conclusion, there are no historical records of Houston toads in this region of Colorado County. Limited survey data is available for the only connected, adjacent habitat patch, but there were no Houston toads detected there during nights when Houston toads were active at the most proximal site in Lavaca County (Figure 3). The existing size and spatial configuration of wooded habitat along the riparian corridor of Sandy Creek will act to increase mortality and decrease persistence of Houston toads in this area. This precludes this area from being reasonably expected to serve as Occupied habitat for Houston toads, and is further minimized by the site being actually just south and outside of that "finger" of model derived suitable habitat along Sandy Creek. The ponds that are adjacent to the plant are within the range of potential breeding sites from which we have detected Houston toad reproduction, but none of those have been outside of areas known adjacent to occupied by historical records or large contiguous forested patches. Finally, the riparian drainage of Sandy Creek could serve as Dispersal habitat for Houston toads, as we have seen with the riparian areas leading north out of Attwater Prairie Chicken National Wildlife Refuge. However, in this case the dispersal would be presumed to be southward and that is literally a river to nowhere. The habitat fragment terminates just NE of the site and with it, the chances of occupancy or survival of Houston toads. Taking the context of historical occurrence, the durable nature of the anthropogenic disturbance of this site, and the spatial features for potential habitat on the site, we do not believe that the Houston toad is present at this site or in the adjacent drainage. Moreover, without radical changes to the land use and significant increases to the size and shape of the forested habitat configuration along Sandy Creek the species would only be dispersing into habitat sinks in this area. There do not seem to be any reasonable interpretations that would support conclusions of the Houston toad present at this site today, nor of its use of the site in the near term given habitat conditions.

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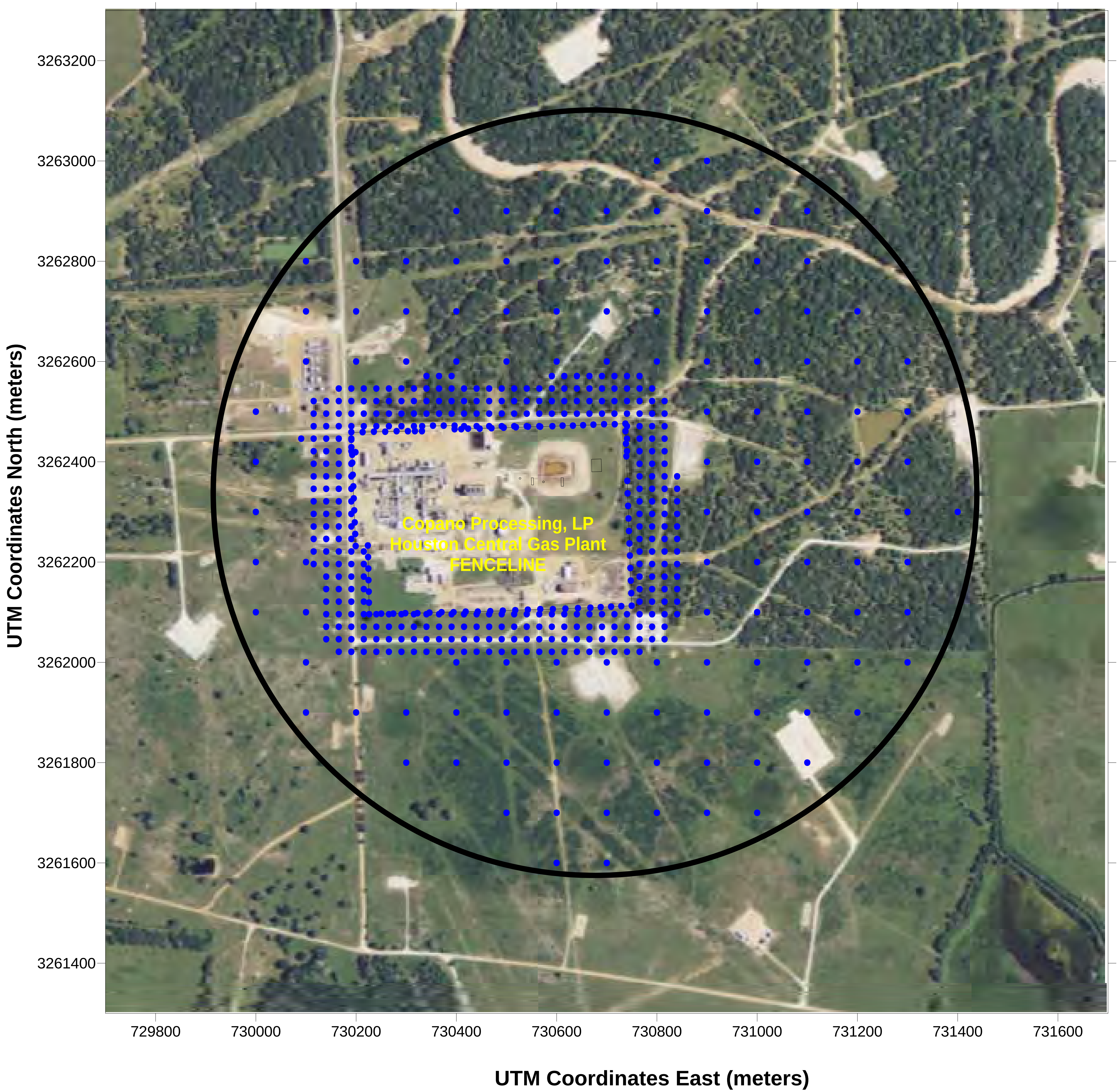
APPENDIX G

FIGURES 1-3 – SIGNIFICANT IMPACT AREAS

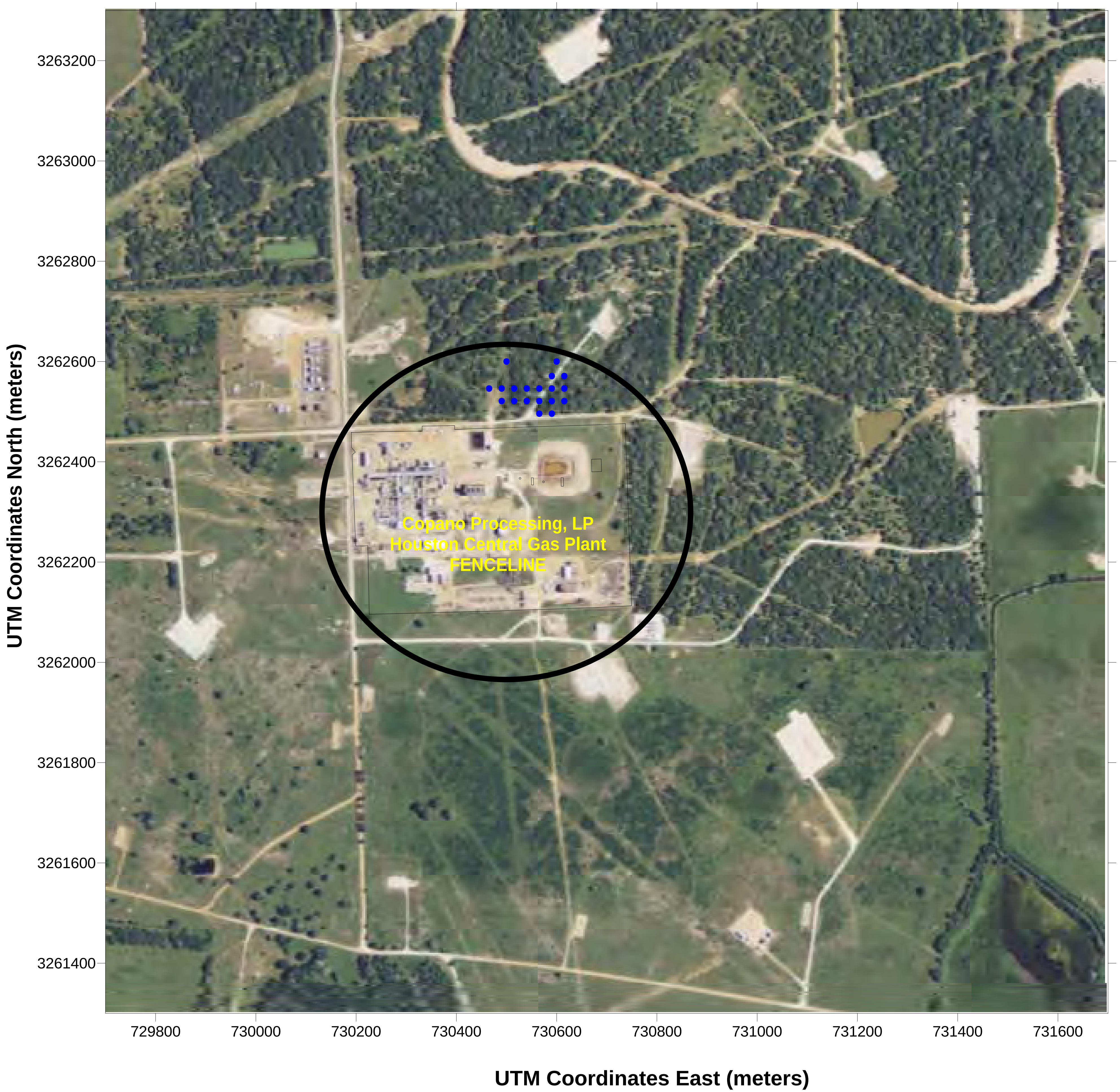


Note : All receptors with modeled concentrations greater than the Significant Impact Level (SIL) are within 1.2 KM of the center of Copano

Copano Processing, LP
Houston Central Gas Plant

Figure 1
1-Hour NO2 Receptors with Modeled Concentrations Greater Than Significant Impact Level (SIL)

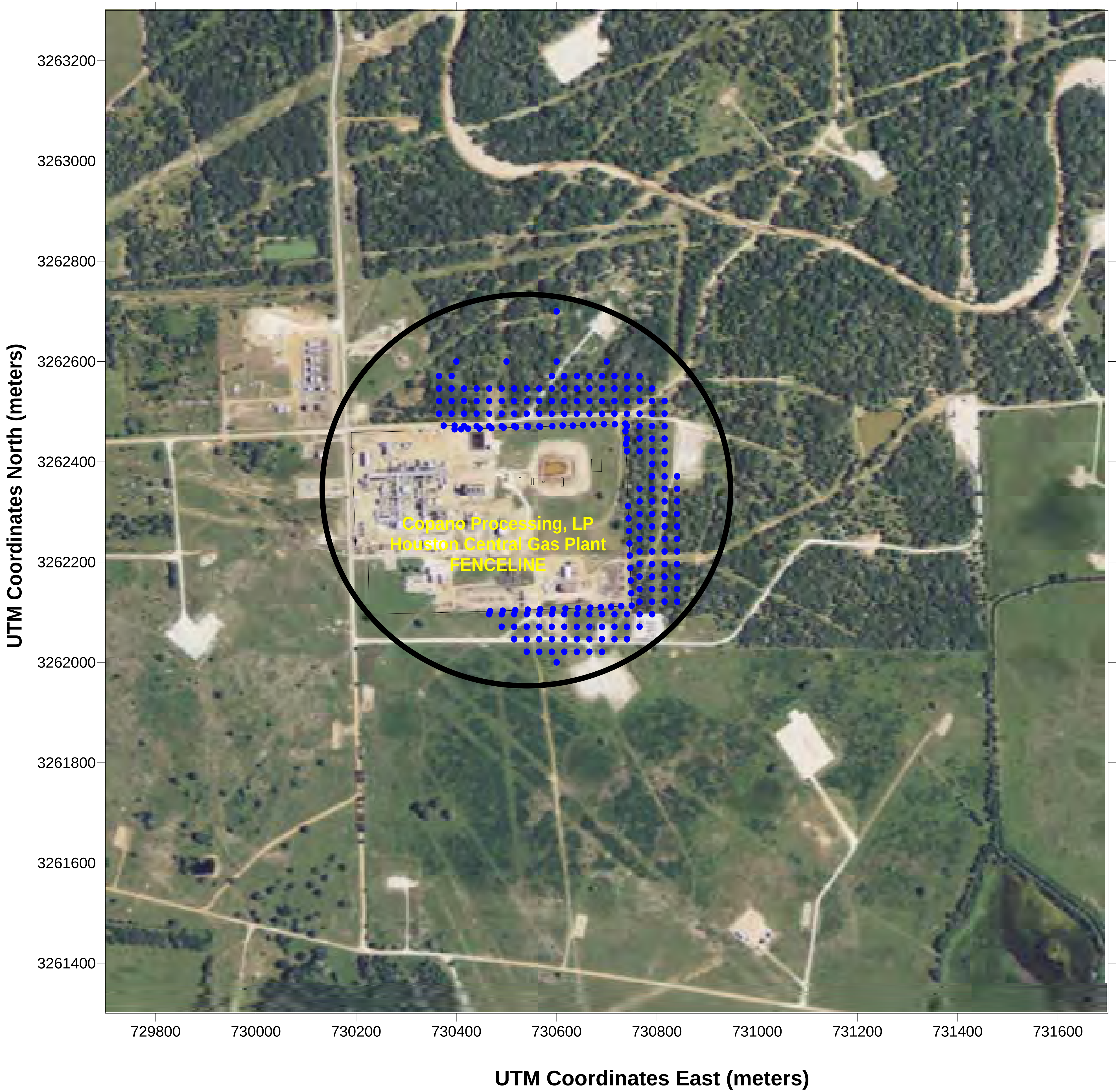
RPS
411 North Sam Houston Parkway East, Suite 400, Houston, Texas , 77060. USA



Note : All receptors with modeled concentrations greater than the Significant Impact Level (SIL) are within 0.3 KM of the center of Copano

N

Copano Processing, LP Houston Central Gas Plant
Figure 2 Annual NO2 Receptors with Modeled Concentrations Greater Than Significant Impact Level (SIL)
RPS 411 North Sam Houston Parkway East, Suite 400, Houston, Texas , 77060. USA



Note : All receptors with modeled concentrations greater than the Significant Impact Level (SIL) are within 0.4 KM of the center of Copano

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Copano Processing, LP
Houston Central Gas Plant

Figure 3
24-hour PM2.5 Receptors with Modeled Concentrations Greater Than Significant Impact Level (SIL)

RPS

411 North Sam Houston Parkway East, Suite 400, Houston, Texas , 77060. USA