BIOLOGICAL ASSESSMENT

FOR

TARGA MIDSTREAM SERVICES LLC

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FOR THE PROPOSED

MONT BELVIEU FRACTIONATOR TRAIN 5

P.O. Box 1078
10319 Highway 146
Mont Belvieu, TX 77523
Chambers County, Texas

PREPARED BY:

TARGA MIDSTREAM SERVICES LLC

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JU NE, 2013

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EXECUTIVE SUMMARY

Targa Midstream Services LLC (Targa) operates a natural gas fractionating plant in Mont Belvieu, Chambers County, Texas (Mont Belvieu Plant). The Mont Belvieu Plant is designed to fractionate natural gas liquids into various products and to remove sulfur compounds from high sulfur natural gasoline. The Mont Belvieu Plant is considered an existing major source with respect to the Prevent of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR) permitting programs.

Targa is proposing to construct a new fractionation train (Train 5) immediately adjacent to, and south of, the existing facility. Greenhouse gas (GHG) emissions from the proposed Train 5 project are subject to the jurisdiction of the U.S. Environmental Protection Agency (EPA). The Texas Commission on Environmental Quality (TCEQ) is the permitting authority for non-GHG pollutants. Accordingly, Targa has submitted the appropriate applications to both EPA and TCEQ to obtain the requisite authorizations to construct Train 5.

Pursuant to Section 7 of the Endangered Species Act (ESA), the EPA will review the project's potential effects to federal listed Threatened and Endangered Species as part of the PSD permitting process. Targa requested the services of Raven Environmental Services Inc. (Raven) to prepare this Biological Assessment (BA). Raven is an environmental management and consulting firm located in Huntsville, TX.

The objective of this BA is to determine the potential effects of EPA's issuance of this permit to animal and plant species that are protected under the ESA and listed by the US Fish and Wildlife Service (FWS) in Chambers County, Texas. This BA will provide the necessary information to describe how construction and operation of the proposed Train 5 will fully comply with regulations set forth in section 7(a)(2) of ESA and also in accordance with 50 C.F.R. Part 402 (Interagency Cooperation – Endangered Species Act of 1973, as amended).

Raven conducted a literature review to locate published research concerning the potential effects of air pollution on wildlife generally and the species considered for evaluation in this BA specifically. Resources utilized include the World Wide Web, public libraries, the Raven technical library, and the personal library of the author. Information and literature reviewed regarding the life histories and habitat requirements of the species for consideration include state and federal agency reports, management documents, peer-reviewed scientific literature, and online data provided by NatureServe, FWS and TPW. Raven also discussed this project with scientists and resource managers familiar with the action area and/or species for consideration including: Mr. Bob Gottfried, (Administrator, Texas Natural Diversity Database, TPW, Austin, Texas) and Mr. Arturo Vale (FWS, Clear Lake, Texas). This BA is also based on the on-site field survey conducted by Raven, and the direct observations made of the project area and the action area. This BA was prepared in accordance with guidelines provided in 50 C.F.R. Part 402.12 (Consultation Procedures, Biological Assessments).

As discussed in more detail in this assessment, based on a literature and data review, discussions with experts, the field survey, and the analysis of effects in this BA, no species listed as endangered, threatened or proposed by the FWS for Chambers County Texas is known to occur within the action area, nor were the species themselves or their preferred habitat(s) directly observed during the field survey. Accordingly, EPA's issuance of the permit for Train 5 will have no effect on federally listed species.

1.0 PROJECT DESCRIPTION

1.1 Proposed Action

This proposed project to construct Train 5 is generally located in the northwest portion of Chambers County, Texas and is within the corporate city limits of Mont Belvieu, Texas, approximately 0.9 miles north of U.S. Interstate Highway 10 and 0.1 miles west of U.S. Highway 146. The project area is located in the east-central portion of the Mont Belvieu, USGS 7.5' Quadrangle (Quad). Specifically, the coordinate for the center of the Train 5 surface location will be Easting 316473.33 and Northing 330198918 (UTM, NAD83, Zone 15N, Meters). For the project area location, please see the attached *Exhibit A - Vicinity Map* in the Appendix.

The existing Mont Belvieu Plant is designed to fractionate natural gas liquids (NGLs) into specification NGL components including ethane, propane, iso-butane, normal-butane and natural gasoline. A portion of the natural gasoline produced is further processed to remove contained sulfur compounds and to saturate contained benzene. In addition to the fractionation system, gas dehydrating units and hydrotreating systems, other sources of air emissions include flares (process and back-up), fugitives and utility systems (boilers for steam production, fire water pumps, and emergency generator pumps). The Mont Belvieu Plant is an existing major source with respect to GHG emissions under the PSD program because the site currently has a potential to emit greater than 100,000 tons per year (tpy) of carbon dioxide equivalent (CO_2e).

The proposed Train 5 fractionation train at the Mont Belvieu Plant will be operated independent of existing operations. Installation of Train 5 will not be a major modification with respect to any criteria pollutant. The proposed project will be a major modification with respect to GHG emissions. Targa has determined that the net increase of GHG emissions from proposed Train 5 will exceed 75,000 tpy. Train 5 will include the following equipment, features and processes:

- Fractionation train and ancillary equipment including flare
- Amine Unit (removal of CO2 from natural gas through amine treating)
- TEG Dehydrator (removal of water from natural gas through tri-ethylene glycol (TEG) dehydration and in molecular sieve dehydrator beds)
- Cooling towers (4)
- Hot oil heaters (2)
- Atmospheric storage tanks
- Holding pond (~0.35 acres) and fire water building
- transport of component products in and out of the facility by existing pipeline

Train 5 will be designed to process up to 6.99 million standard cubic feet per day (MMscfd) of rich natural gas and up to 100,000 barrels per day (bbl/day) of raw liquefied petroleum gas (LPG). The anticipated output of fractionated products and by-products per day is:

- Ethane: 50,000 bbl/day
- Propane: 25,000 bbl/day
- Iso-Butane: 5,000 bbl/day
- Natural Butane: 10,000 bbl/day
- Natural Gasoline: 10,000 bbl/day

There is industrial wastewater associated with the Train 5. Storm water will not come into contact with any hydrocarbon streams.

Constructing the Train 5 will require clearing, grading and developing 18 acres immediately south of, and adjacent to, the Mont Belvieu Plant. This Train 5 site has been extensively disturbed over time; first by agricultural land use and later by industrial development. Scattered across the site are areas of hardened, aggregate surface that are likely abandoned oil well sites, industrial development infrastructure and/or demolished building foundation subgrades. There are four man-made, excavated, shallow impoundments that combined occupy an area of ~3.4 acres. Vegetation can be described generally as a closed canopy of two tree species that are classified as non-native invasive species (NNIS): tallowtree (*Triadica sebifera*) and chinaberrytree (*Melia azedarach*) (Miller, 2003).

Visually, the project area appears consistently flat with the exception of the four shallow impoundments. There is a man-made (cut) drainage ditch about 3 feet in depth near the western boundary which flows westerly, transitioning into a natural ephemeral / intermittent stream which then empties into the perennial stream named Cedar Bayou located ~0.8 miles from the project area, as measured along the unnamed intermittent stream's centerline. From the confluence of this unnamed intermittent stream and Cedar Bayou, it is more than 18 miles along the centerline of Cedar Bayou before it reaches Trinity Bay across from Atkinson's Island.

Construction of Train 5 will require approximately one year. It is anticipated that Train 5 will be in operation for a period of 20 or more years, and during that time, the maximum operating schedule will be 365 days per year, 24 hours per day. Access and vehicular traffic routes associated with construction and future operations will be from Texas Highway 146. For a map of Train 5 please see the attached *Exhibits B, C, and D* in the Appendix.

1.2 Alternatives Considered

No alternative locations for Train 5 were considered. Train 5 is an expansion of the operational Mont Belvieu Plant, which is located in an intensively developed industrial area with much of the necessary infrastructure already in place.

2.0 METHODOLOGY

2.1 Action Area Determination

Approximately 18 acres will be developed by implementing this proposed action. This 18 acre area is referred to in this BA as the "project area" – or the actual area of site disturbance required to construct Train 5.

The "action area" for a BA as defined by 50 C.F.R. Part 402.02 means all areas to be affected directly or indirectly by the Federal action (EPA Greenhouse Gas permit issuance) and not merely the immediate area involved in the action. Guidance from the EPA directed Targa to consider the potential impact of air borne pollutants resulting from project emissions on listed species. To determine the action area based on the potential dispersion of constituent pollutants from this proposed action, Targa engaged Trinity Consultants (Jessica Coleman, Trinity Consultants, Dallas, TX) as a subcontractor. Trinity selected the most appropriate EPA and TCEQ AERMOD and AERMET programs to model air emissions and dispersion that will result from Train 5 construction and operation. The Trinity Consultants "Air Quality Impact Area Modeling Analysis; Targa Midstream Services LLC, Mont Belvieu Plant Train 5", prepared by Melanie Roberts (Environmental Manager, Targa) and Whitney Boger (Senior Consultant, Trinity) is included as Exhibit E in the Appendix. The result of the Trinity analysis is that all relevant pollutants will drop below their EPA significant impact levels at or before the Targa Mont Belvieu Plant property boundary. Therefore, in terms of emission and dispersion of constituent pollutants, the action area is defined as the Targa Mont Belvieu Plant property boundary which includes 300 acres.

Based on CFR guidance, FWS guidance, and the Trinity emissions analysis, Raven is using a greater action area with a 0.5 mile radius (502 acres). In addition to the 502 acres, Raven has also included in the action area that portion of the Mont Belvieu Plant property that lies north of the 0.5 mile radius periphery, which represents an additional 116 acres. The total action area for Train 5 is 618 acres including all of the Mont Belvieu Plant property and outward to a radius of 0.5 miles. As recommended by the FWS Consultation Handbook, the boundaries as defined for this action area will adequately address direct, indirect or interrelated/interdependent effects for listed species considered in this BA (see Section 3.0).

2.2 Air Emissions Analysis

An air dispersion modeling analysis was performed to determine the area surrounding the Mont Belvieu Plant where emissions of criteria pollutants may have a significant impact, as determined by each pollutant's National Ambient Air Quality Standards NAAQS) significant impact level (SIL). The use of the SILs is a tool associated with modeling air emissions to determine protection of human health. However, in the absence of specific thresholds from scientific studies on the effect of air emissions on endangered and threatened species, Targa decided to use the SILs. The modeled criteria pollutants included particulate matter with an aerodynamic diameter of 10 microns or less (PM10), particulate matter with an aerodynamic diameter of 2.5 microns or less (PM2.5), carbon monoxide (CO), nitrogen dioxide (NO2), and sulfur dioxide (SO2). The NAAQS air quality dispersion modeling analysis was conducted in accordance with current TCEQ and United States Environmental Protection Agency (U.S. EPA) modeling procedures.

The Trinity Analysis concluded that for the state NAAQS impact area the maximum significant impact area of the proposed emission sources should not extend past the property line of the facility. The criteria pollutants and averaging periods modeled in the NAAQS analysis are shown in Table 1. The resulting maximum modeled concentrations for the one year of modeled meteorological data are compared to the respective SILs. A summary of the comparison between the resulting GLC_{max} and the corresponding SIL for each averaging period and criteria pollutant is shown in Table 1 below. As can be seen in the table, the total GLC_{max} for all pollutants and averaging periods is less than the corresponding SIL. Table 2 provides an emission point summary for both criteria and GHG pollutants for the Train 5 project. The complete report and analysis provided by Trinity Consultants is included as *Exhibit F – Trinity Consultants Emissions Analysis*

Table 1. Constituents evaluated in NAAQS analysis.

Pollutant and Averaging Period	Total Max. Modeled Concentration (μg/m^3)	State NAAQS Significant Impact Level [SIL] (μg/m^3)	Is Max. Modeled Concentration < SIL?
NO_2 Annual	0.12119	1	Yes
NO_2 1-hour	3.36643	7.5	Yes
CO 8-hour	78.88237	500	Yes
CO 1-hour	127.61852	2,000	Yes
PM_{10} 24-hour	0.71904	5	Yes
$PM_{2.5}$ Annual	0.12850	0.3	Yes
$PM_{2.5}$ 24-hour	0.71904	1.2	Yes
SO_2 Annual	0.09537	80	Yes
SO_2 24-hour	1.93277	365	Yes
SO_2 3-hour	3.63167	25	Yes
SO_2 1-hour	4.99898	7.8	Yes

Table 2. Emission point summary for Train 5 facility.

Emission Point	Component or Air Contaminant Name	Air Contaminant Emission Rate	
		Pound	TPY
Flare - Normal Operation	CO	4.15	18.17
	NOx	0.51	2.21
	VOC	0.38	1.65
	SO_2	0.00E+00	0.00E+00
	H_2S	<0.01	<0.01
RTO-5 Regenerative Thermal Oxidizer	CO	2.21	9.70
	NOx	0.07	0.32
	VOC	0.01	0.06
	SO_2	0.09	0.19
	H_2S	4.66E-04	1.02E-03
RTO Startup Emissions	CO	0.30	0.00
	NOx	0.30	0.00
	VOC	0.01	0.00
	SO_2	1.15E-03	4.61E-06
Amine Still Vent During RTO Downtime	VOC	1.32	0.10
	H_2S	0.05	3.54E-03

Hot Oil Heater	CO	5.34	23.41
	NOx	0.72	3.16
	PM/PM10/PM2.5	0.58	2.53
	SO_2	0.08	0.37
	VOC	0.09	0.38
	NH_3	0.46	1.99
Frac5 Fugitives	VOC	0.31	1.38
Cooling Tower 9	PM	0.55	2.43
	PM10/PM2.5	0.17	0.73
	VOC	1.63	7.13
Controlled Maintenance Emissions	CO	0.47	0.01
	NOx	0.23	<0.01
	VOC	13.96	0.63
Controlled Startup Emissions	CO	2.45	0.05
	NOx	1.23	0.03
	VOC	48.01	0.51
Controlled Shutdown Emissions	CO	4.69	0.05
	NOx	2.35	0.03
	VOC	43.68	0.99
Maintenance Emissions to Atmosphere	VOC	1.15	0.01
Shutdown Emissions to Atmosphere	VOC	10.52	0.07
Ucarsol Storage Tank	VOC	0.01	0.01
GHG Emissions			
Flare - Normal Operation	CO_2e	3607.87	5035.31
	CO_2	3586.79	5025.15
	CH_4	0.93	0.10
	N_2O	<0.01	0.02
RTO-5 Regenerative Thermal Oxidizer	CO_2e	2688.70	11776.52
	CO_2	2686.29	11765.94
	CH_4	0.02	0.08
	N_2O	6.56E-03	0.03
RTO Startup Emissions	CO_2e	234.01	0.94
	CO_2	233.78	0.94
	CH_4	4.40E-03	1.76E-05
	N_2O	4.40E-04	1.76E-06
Amine Still Vent During RTO Downtime	CO_2e	2501.66	190.13
	CO_2	2482.57	188.68
	CH_4	0.91	0.01
	N_2O	--	-
Hot Oil Heater	CO_2e	16901.02	74026.45
	CO_2	16884.46	73953.92
	CH_4	0.32	1.39
	N_2O	0.03	0.14

Frac5 Fugitives	CO_2e	0.53	2.33
	CO_2	2.35E-03	0.01
	CH_4	0.03	0.11
Controlled Maintenance Emissions	CO_2e	20312.49	303.36
	CO_2	20279.46	302.95
	CH_4	1.57	0.02
	N_2O	<0.01	<0.01
Controlled Startup Emissions	CO_2e	41087.42	280.76
	CO_2	41017.32	280.24
	CH_4	3.33	0.02
	N_2O	<0.01	<0.01
Controlled Shutdown Emissions	CO_2e	41534.48	401.13
	CO_2	41465.66	400.59
	CH_4	3.26	0.03
	N_2O	<0.01	<0.01
Maintenance Emissions to Atmosphere	CO_2e	66.66	0.65
	CH_4	3.17	0.03
Shutdown Emissions to Atmosphere	CO_2e	155.85	1.04
	CH_4	7.42	0.05

The potential for airborne pollutants to directly affect aquatic habitats in the action area and any subsequent indirect downstream effects was also considered. The potential effects of airborne pollutants on aquatic resources include both acidification and eutrophication. Acidification is the deposition of air pollutants in acid form or that have acid-forming properties. Eutrophication is the over enrichment of nutrients into an aquatic system. In general, acidification and eutrophication can result in a set of cascading adverse effects that can reduce dissolved oxygen within an aquatic ecosystem that impairs and disrupts normal aquatic processes and functions. No large open surface waters such as bays or estuaries are located within the action area. Aquatic features within the action area are confined to intermittently flowing creeks, improved industrial canals, and small impoundments or industrial ponds.

For the proposed project, given the infrequency of the predicted exposure of a concentration greater than the SIL to the aquatic features (e.g. streams, canals, ponds) within the action area, it is reasonable to assume the emissions resulting from this project will not affect the water quality of the streams and canals within the action area. No pH impact is expected. Since no direct or short-term effects are expected to aquatic features within the action area, no adverse downstream effects to larger watersheds such as Cedar Bayou are expected.

2.3 Noise Effects Analysis

Increased noise levels will occur during the initial construction phase of the project, followed by the continuous operation of the facility. It is important to provide some point of reference when discussing sound. The decibel (dB) is a logarithmic unit that cannot be added and subtracted like ordinary numbers. An increase of 3dB is a doubling of the "strength" of the sound (e.g. an increase of 10dB means the sound is 10 times as loud). As a reference, normal human conversation at a range of three (3) feet is in the 60-65 decibel (dB) range.

Noise created by and during the construction and installation phase will be temporary, lasting only an estimated one year, beginning with the initial site preparation / construction phase followed by equipment installation. These activities will include the use of all or some of the following equipment: bulldozer, dump truck, grader, scraper, loader, backhoe, mobile crane, concrete mixer, and concrete pump. The average noise level range for each type of equipment at a distance of 50 feet for industrial construction is between 91 (truck) and 79 (loader) while the average dBA at 50 feet for all 9 pieces of equipment listed is 84.22 dBA (USEPA, 1971, Noise From Construction Equipment…).

After construction is complete, Train 5 will operate continuously. During operation, the project will emit noise at a relative ambient or steady level, normally between 10-20 dBA. Noise levels associated with operation of the project will be far below 85 dBA by the time they reach the action area boundary. Given this low level of ambient noise and regardless of the ESA listing status of a given species, it is reasonable to assume that noise alone produced by construction and operation of the project would not displace any species of plants or animals in the action area or preclude the ability of new species to occupy habitat in the action area.

2.4 Wastewater and Stormwater Analysis

It is anticipated that process wastewater discharges from Train 5 will be similar (water quantity and quality) to the existing operations at Targa's current facility. The site receives natural gas liquids (NGLs) via pipeline and truck. The NGLs are separated via a conventional fractionation process into marketable fractions including ethane, ethane/propane mix, propane, normal butane, isobutane, and natural gasoline (e.g. heavier hydrocarbon fractions). The NGL fractions are transported off-site via pipeline, railcar, or transport truck. The facility currently uses raw water produced from a groundwater supply system with a capacity of approximately 513,000 gallons per day. Train 5 will discharge cooling tower blow down and storm water. Targa anticipates amending the existing water permit to incorporate the discharge of cooling tower blow down and storm water from Train 5. Storm water and wastewater from the project will be discharged from a new Outfall located south of the project site (for new Outfall location see Appendix, Exhibit B – USGS Quadrangle Map and Exhibit C – Color Aerial Imagery Map). It is approximately 11 miles (straight-line) from the project area to the mouth of Cedar Bayou at Galveston Bay. From the project's confluence with the unnamed tributary of Cedar Bayou, it is approximately 15 miles south along the circuitous centerline of the unnamed tributary and Cedar Bayou to Galveston Bay. This 15-mile length of watershed provides additional and substantial dilution and mixing of project discharge, further limiting affects to water quality of the streams, canals and bays within or downstream from the action area.

The primary water usage at the facility is associated with the operation of cooling towers and process boilers. Smaller quantities of raw water usage include reverse osmosis (RO) treatment system, facility wash water, and emergency/plant service water. RO reject, boiler blowdown and sumped water from cooling towers are discharged to the reservoir of a cooling tower. As a result of the evaporation of cooling water and other influent water feeds, dissolved solids are concentrated over time and the cooling water reservoirs are periodically blown down based on measured electrical conductivity.

A single new Outfall for stormwater and process wastewater will be constructed for Train 5. This new Outfall will discharge into an unnamed stream at coordinates X: 316267.572; Y: 3301858.642 (UTM, NAD83, Zone 15 North, Meters) (for new Outfall location see Appendix, Exhibit B – USGS Quadrangle Map and Exhibit C – Color Aerial Imagery Map). Outfall 2 is an existing process wastewater outfall located at Targa's current facility with effluent water quality data that will reflect and parallel values observed for the new Outfall for Train 5. Discharge volumes from Outfall 002 have been and are currently measured using automated continuous monitoring equipment. Based on the volumetric flow monitoring for this existing outfall over the past two years (January 2010 – December 2011), the average flow for Outfall 002 has been 193,532 gal/day. Average flow for the new Outfall is estimated to be slightly greater at 216,000 gal/day. Process wastewater discharged via Outfall 002 has exhibited the following average concentrations over the past two years: pH minimum of 6.45 SU to 8.80 SU; BOD of 4.15 mg/L; copper 13.3 ug/L; and zinc 12.6 ug/L. A summary of the discharge monitoring data collected from January 2010 through December 2011 for Outfall 002 is provided in Table 3.

As part of the proposed process expansion, it is anticipated that both the quantity and quality of process wastewater discharge from Train 5 will be similar to conditions observed for Outfall 002. Train 5 will have similar processes to the operations of the existing fractionator and facility; hence, effluent water quality will be commensurate with the existing process wastewater discharge from Outfall 002.

No significant increase in concentration limits in the process wastewater is anticipated from the proposed project. Given there will be no increase in concentration and the treatment standards described above for the project, it is reasonable to assume the discharge resulting from this project will not affect the water quality of the streams, canals and bays within or near the action area. Since no direct or short-term effects are expected to aquatic features within or near the action area, no adverse downstream effects to larger watersheds such as Cedar Bayou are expected. The TPDES permitting process ensures that potential impacts be considered and that any change in discharge is protective of aquatic life.

Table 3. Projected pollutant concentrations for new Outfall for Train 5.

Pollutant	*Projected Concentrations (mg/L)
Bromide	22.6
Fluoride	12.1
Total Organic Nitrogen	0.95
Oil and Grease	< 2.90
Total Phosphorus	1.41
Sulfate	799
Total Aluminum	0.057
Total Barium	0.939
Total Iron	0.103
Total Magnesium	19.477
Total Molybdenum	0.06
Total Manganese	0.012
Total Arsenic	< 0.01
Total Cadmium	< 0.01
Total Chromium	< 0.01
Total Copper	< 0.01
Total Nickel	< 0.01
Total Zinc	< 0.02
Total Phenols	< 0.05
Benzene	< 0.01
Bromoform	0.015
Chloroform	< 0.01
Ethylbenzene	< 0.005
Toluene	< 0.005

*Projected values based on discharge monitoring data (maximum daily values) from Outfall 2, January 2010 - December 2011.

2.5 FWS Species Review

Mr. Arturo Vale (FWS Wildlife Biologist, Houston, Division of Ecological Services), was contacted by Raven via phone and asked whether the FWS required or recommended that any additional species be considered for effects in this BA, that is, over and above the listed species for Chambers County that are provided by the USFWS website (http://www.fws.gov/southwest/es/ES_Lists_Main.cfm) that provides count-by-county listing of federally-listed threatened and endangered species. He responded that the species list provided by this website would be adequate for an evaluation of effects for this project.

2.6 TPW Species Review

Raven accessed two TPW resources for historic occurrence records for proposed, endangered, or threatened species (as defined by ESA, Section 4). The first source is the TPW online webpage for "Rare, Threatened, and Endangered Species of Texas by County", which was accessed and reviewed by Raven. The second source is the TPW Texas Natural Diversity Database (TXNDD), which is a GIS integrated Oracle database that stores spatial and tabular information for: threatened and endangered species; rare species of concern; rare natural vegetation communities; and other rare natural resources.

Raven requested and received TXNDD GIS shapefiles and historic (element) occurrence record documents for the USGS quadrangle (the Mont Belvieu Quad) that includes the action area, and also the adjacent, contiguous 8 USGS Quads – an area that encompasses approximately 560 square miles for all 9 Quads combined. The GIS shapefiles were projected in ArcView and the element occurrence records were reviewed. According to TXNDD, the nearest known record for any federally listed species; the Houston toad (*Anaxyrus houstonensis*), is located in Liberty County more than 10 miles north-northeast of the project area (the Houston toad is not listed for Chambers County). Further, it was determined upon review of the TPW Chambers County PETS list, and based on the field survey, that no suitable habitat for any Chambers County state or federally listed species occurs within the action area and none of the species considered was directly observed (please see Section 3.0 for a list of species considered for analysis in this BA).

2.7 Literature Review

Raven conducted a literature review to locate published research that is focused on the potential effects of air pollution on wildlife. Resources utilized include the World Wide Web, public libraries, the Company reference library, and the personal environmental library of the author. A few abstracts describing research aimed at determining the effects of air pollutants on both free-ranging and captive birds were found on the web. However, these studies were/are being conducted in Europe and are focused mostly on heavy metals and acid rain pollution emitted from coal-powered electric plants and a copper smelter. One study by The Nature Conservancy was reviewed that generally describes the effects of 4 pollutants on 8 different imperiled plant communities or forest types in the northeastern U.S. None of the literature that we located and reviewed was directly applicable to the needs of determining the direct, indirect, and cumulative effects to these species for consideration from the potential emissions of Train 5 facility.

2.8 Field Assessment

The field survey for this BA was conducted on April 4, 2012 by Mr. Ross Carrie (Raven). Targa owns the entire 18 acre project area property and the entire 300 acre Mont Belvieu Plant property. The 18 acre project area was surveyed in detail by walking parallel transects spaced 50 feet apart, on average. The 300 acre Mont Belvieu Plant was surveyed by driving the extensive road system within the plant boundary and walking through the few additional existing vegetated areas. There are 318 acres of non-Targa ownership within the 0.5 mile radius. In order to identify potentially important landscape features within this area, such as hydrology, topography, and also to remotely sense basic habitat types, aerial imagery and topographic quadrangle maps were imported and projected in ESRI® ArcMap™. The aerial imagery included 2008-2009 Texas Orthoimagery Program (TOP), color infrared, 0.5 meter resolution (cell or pixel size) images and also National Aerial Imagery Project (NAIP), true color, 1 meter resolution images. By using direct observation, indirect observation and remote sensing techniques, the entire action area and beyond was assessed for habitat type and quality to the greatest degree that is legally possible. Also, local public roads outside of Targa ownership were driven and assessed through direct observation, including Highway 146, Warren Road and Pablo Road to the south. Using these methods, about 300 acres were assessed using pedestrian and/or roadway surveys on Targa property, and an additional 318 acres of non-Targa ownership were surveyed through remote sensing and/or roadway surveys.

3.0 SPECIES CONSIDERED

Species considered for this BA are those that are federally listed as endangered or threatened as determined under authority of the ESA by the FWS and listed for Chambers County, Texas on the Region 2, FWS website (accessed April 3, 2012). These species include:

- Kemp's Ridley Sea Turtle (*Lepidochelys kempii*): Endangered
- Hawksbill Sea Turtle (*Eretmochelys imbricata*): Endangered
- Leatherback Sea Turtle (*Dermochelys coriacea*): Endangered
- Green Sea Turtle(*Chelonia mydas*): Threatened
- Loggerhead Sea Turtle (*Caretta caretta*): Threatened
- Piping Plover (*Charadrius melodus*): Threatened

At the request of EPA, this BA also considers federally listed endangered, threatened or candidate species that are not listed by FWS for Chambers County, Texas, but that are listed by TPW for Chambers County, Texas. The TPW website was accessed April 3, 2012, and the TPW species listed for Chambers County (without FWS duplication) include:

- Smalltooth Sawfish (*Pristis pectinata*): Endangered
- Red Wolf (*Canis rufus*): Endangered
- Louisiana Black Bear (*Ursus americanus luteolus*): Threatened
- Sprague's Pipit (*Anthus spragueii*): Candidate

Of the eleven species for consideration have suitable habitat within the 618 acre action area, only Sprague's Pipit has potential suitable habitat in the action area. This is based primarily on the direct observations made by Mr. Carrie during the Raven field survey of the action area, but also based on review of the most current survey information available and also historic occurrence data obtained from sources familiar with the project and the action area and/or other resources including literature listed in the reference section, and information provided by web sources such as NatureServe, Ebird, FWS, NMFS, and TPW / TXNDD including element occurrence records and GIS shapefiles for known species occurrences. The attached *Exhibit A – Vicinity Map* in the Appendix shows these known occurrence locations, none of which lie within the action area.

4.0 EVALUATION OF EFFECTS

4.1 Field Survey Results

The field survey was conducted on April 4, 2012 by Mr. Ross Carrie (Raven). The Train 5 project area - to be cleared and developed - was easily identifiable from on-the-ground physical features (roads, fences, pipelines, etc.) at the time of the field survey. The action area, defined as the entire Targa Mont Belvieu Plant property boundary, was likewise easily assessable by driving the existing and extensive on-site road system, including the property perimeter. Habitat conditions within the 18 acre Train 5 project area, and the 300 acre facility action area were directly observed by Mr. Carrie. Local public roads outside the facility were also driven to assess and validate vegetation communities and habitat conditions beyond the action area. The non-Targa ownership was also evaluated using remote sensing technology.

The action area is located within the Western Gulf Coastal Plain, as described in Level III Ecoregions of the United States, and in the Northern Humid Gulf Coastal Prairies as Level IV (USEPA, Omernick, 1987). The Gulf Coastal Plain is a low, flat plain extending more than 360 miles long and 50 to 100 miles wide along the Texas and Gulf of Mexico coastline. Rivers that drain from the north-west highlands of Texas to the Gulf of Mexico deposited sediments on coastal plain during the Pleistocene and Holocene Epochs. Being a transition area between the continent and the ocean, the coastal plain is home to a myriad of people, plants wildlife, and fish. All these living organisms depend on streams that dissect this region to some extent for the supply of fresh water, sediments, and nutrients to maintain their lives and productivity. A large quantity of water, nonetheless, has been diverted to municipal, agricultural and industrial uses as human population increases and economic development rises (TPW).

The Northern Humid Gulf Coastal Prairies lies within the gently sloping coastal plain. The original vegetation was mostly grasslands with a few clusters of oaks (*Quercus* spp.), known as oak mottes or maritime woodlands. Little bluestem (*Schizachyrium scoparium*), yellow indiangrass (*Sorghastrum nutans*), brownseed paspalum (*Paspalum plicatulum*), gulf muhly (*Muhlenbergia capillaris*), and switchgrass (*Panicum* virgatum) were the dominant grassland species. Almost all of the coastal prairies have been converted to cropland, rangeland, pasture, or urban land uses. The exotic tallowtree and Chinese privet (*Ligustrum chinensis*) have invaded large areas in this region. Some loblolly pine (*Pinus taeda*) occurs in the northern part of the region. Soils are mostly fine-textured: clay, clay loam, or sandy clay loam. Annual precipitation varies from 37 inches in the southwest portion to 58 inches in the northeast, with a summer maximum (USEPA).

Direct observation of the 18 acre Train 5 project area confirms the above description of the invasion of exotic species and the conversion to urban land use – or mostly industrial land use in this case. The 18 acre project area is almost entirely covered with tallowtree, intermixed with numerous chinaberrytrees and sugarberry (*Celtis laevigata*), with a groundcover comprised almost entirely of another NNIS; Japanese honeysuckle (*Lonicera japonica*). The previously described excavated ponds are variously bordered by black willow (*Salix nigra*), wax myrtle (*Morella* spp.), cattail (*Typha* spp.) and palmetto (*Sabal* spp.).

The larger 300 acre action area, as observed by driving Targa facility roads, is the existing fractionator facility which is almost entirely paved and/or consists of structures on concrete slabs or other impermeable surfaces and is almost devoid of vegetation. Where vegetation does exist, it can be characterized as being generally identical to that of the project area; that is: invaded by tallowtree and other NNIS species. Where grass occurs, the species include mostly bermudagrass (*Cynodon* spp.) and bahiagrass (*Paspalum notatum*), with almost no native grass species observed. The Targa fractionator facility does include tall emission stacks and other vertical structures to a maximum height of 122 feet.

The 318 acres of non-Targa ownership is a mixture of residential, industrial and commercial properties, with a few undeveloped and vegetated areas. The vegetated areas are generally of the same character and species composition previously described. Where tree and shrub communities exist, they are primarily a mixture NNIS species predominated by tallowtree. Where pastures or open areas exist, they are primarily composed of NNIS species such as bermudagrass and bahiagrass.

For a map of the proposed action overlaid on a USGS Topographic quadrangle, please see the attached *Exhibit B – USGS Quadrangle Map*. For a map of the proposed action overlaid on a color aerial image, please see the attached *Exhibit C – Color Aerial Imagery Map*.

4.2 Species Analysis

4.2.1 Piping Plover – Threatened (FWS)

4.2.1.1 Species and Habitat Description

The Piping Plover (*Charadrius melodus*) is a small, stocky, sandy-colored bird resembling a sandpiper. The adult has yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of its neck. Like other Plovers, it runs in short starts and stops. When still, the Piping Plover blends into the pale background of open, sandy habitat on outer beaches where it feeds and nests. The bird's name derives from its call notes, plaintive bell-like whistles which are often heard before the birds are seen.

In 1985, the Piping Plover was listed as endangered (50 FR 50726-50734) in the Great Lakes watershed region (IL, IN, MI, MN, NY, OH, PA, WI, ONCA) where it breeds, and was also concurrently listed as threatened throughout the remainder of its entire range, which in addition to the Great Lakes breeding population, includes an Atlantic coast breeding population and a Northern Great Plains breeding population. In each Piping Plover population, the preferred habitat is sparsely vegetated; open; sandy, gravel or cobble beaches; adjacent to large bodies of open water. Piping Plovers may live to be 8-10 years old.

In the winter, during the non-breeding season, all three populations inhabit beaches, mudflats, and sandflats along the Gulf of Mexico and Atlantic coasts. Also barrier island beaches and spoil islands on the Gulf Intercoastal Waterway.

In the spring, Piping Plovers return to their northerly breeding grounds in late March or early April. Following establishment of nesting territories and courtship rituals, the pair forms a depression in the sand. The nest is sometimes lined with small stones or fragments of shell. Both sexes incubate to constantly protect eggs from extreme temperatures. The average clutch size is four eggs and the precocial downy young immediately use the “peck-and-run” foraging behavior of adults. Plovers often gather in groups on undisturbed beaches prior to their southward migration. By mid-September, both adult and young Plovers will have departed from their southern, coastal wintering areas. The lack of Piping Plover sightings at inland shorebird stopover sites during migration suggests Plovers may adopt a nonstop migration strategy between their breeding range in the Great Lakes and wintering grounds on the Texas Gulf Coast.

Figure 1. Historical occurrence of wintering Piping Plover in Texas counties as indicated by the shaded areas (Texas Parks and Wildlife Department, Wildlife Division, Diversity and Habitat Assessment Programs, County Lists of Texas' Special Species, visited online Jun. 6, 2012).

All three Recovery Plans for this species were reviewed for this BA. They are:

- U.S. Fish and Wildlife Service. 1996. Piping Plover *(Charadrius melodus),* Atlantic Coast
- Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U.S. Fish and Wildlife Service. 1988. Great Lakes and Northern Great Plains Piping Plover Recovery Plan. Twin Cities, Minnesota. 160 pp.
- U.S. Fish and Wildlife Service. 1988. Recovery Plan for the Great Lakes Piping Plover *(Charadrius melodus*). Ft. Snelling, Minnesota. viii + 141 pp.

Critical habitat for wintering Piping Plovers has been designated along the Gulf Coast in Texas, Louisiana, Alabama and Florida (FWS). The nearest FWS designated critical (wintering) habitat for the Piping Plover to the Train 5 project is: 1) Site TX-35, Big Reef on the far eastern tip of Galveston Island; 2) Site TX-36, Bolivar Beach on the western end of Bolivar Peninsula; and 3) Site TX-37, Rollover Bay (Pass) at about a midpoint along the Bolivar Peninsula. The closest designated critical habitat, Bolivar Beach, is over 33 miles from the project and well outside the action area.

4.2.1.2 Occurrence and Sighting Data

Recent inventories in or near the 618 acre action area for this species are available from the following sources:

1. 2006 International Piping Plover Survey located near the project
2. North American Breeding Bird Survey routes located near the project
3. Audubon Society Christmas Bird Count surveys located in or near the project

4. TPW Natural Diversity Database (TXNDD) maintained by TPW
5. Ground surveys by Raven Environmental Services, Inc. on April 4, 2012.

The International Piping Plover Census (IPPC) has been conducted at five year intervals since 1991. The 2011 IPPC has occurred, however, the final report and survey results are not yet available as of this date. The most recent IPPC data available relevant to this project is the winter 2006 Texas IPPC, which resulted in a total of 2,090 Piping Plovers observed. The Texas survey is divided into three regions; the upper coast, middle coast and lower coast. The IPPC upper Texas coast survey covers habitat from the Louisiana border to Matagorda County. The upper Texas coast includes this proposed action and was surveyed by a total of 36 participants including Federal and State employees and many volunteers from non-governmental organizations. The 2006 IPPC upper Texas coast survey resulted in a total of 551 birds being observed. This represents 26 % of all Piping Plovers observed in Texas during the 2006 winter survey. The number of Piping Plovers recorded at Bolivar Flats (33 miles distant) was 275 and the number at San Luis Pass was 70 (54 miles distant). The nearest IPPC survey collection point to this proposed action is the Chambers County, Mid-Bay site. One (1) adult Piping Plover was observed at Mid Bay during the 2006 IPPC and none (0) were observed at Mid Bay during the previous three Texas surveys conducted in 1991, 1996, and 2001.

The North American Breeding Bird Survey is a long-term, large-scale, international avian monitoring program initiated in 1966 to track the status and trends of North American bird populations. Each year during the height of the avian breeding season, volunteers skilled in avian identification collect bird population data along 24.5-mile roadside survey routes. Over 4100 survey routes are located across the continental U.S. and Canada. Two routes are located near the action area: the Stowell route (Number 83021) located 14 miles east and the Winnie route (Number 83020) located 20 miles southeast. Both routes were established in 1967 and surveys have been completed almost every year since establishment. No (0) Piping Plover has ever been observed during any year for either of the two survey routes.

The National Audubon Society Christmas Bird Count (CBC) is a 100 year-old, citizen scientist program, where thousands of volunteers across go out over a 24 hour period in early winter to count birds. Volunteers follow specified routes through a designated 15-mile (24-km) diameter circle, counting every bird they see or hear all day. It's not just a species tally—all birds are counted all day, giving an indication of the total number of birds in the circle that day. If observers live within a CBC circle, they may arrange in advance to count the birds at their feeders and submit those data to their compiler. All individual CBC's are conducted in the period from December 14 to January 5 (inclusive dates) each season, and each count is conducted in one calendar day. The data is compiled annually and is available to the general public through the Audubon website. The two nearest CBC counts to this proposed action is the Houston-Baytown (TXHO) circle to the southwest and the Old River (TXOR) circle to the northeast. The results query for both CBC count areas (TXHA and TXOR) from 1998 until 2010 (thirteen years total) was that one (1) Piping Plover was counted within the TXHO survey area and no (0) Piping Plovers have been observed within the TXOR survey area during any of the surveys for the most recent twelve year period of available data.

There are no (0) TPW Natural Diversity Database element occurrence records for Piping Plover within the ~560 square mile and nine quadrangle information request area.

A ground survey of the 300 acre Targa-owned action area was conducted by Mr. Ross Carrie (Raven) on April 4, 2012. The remotely sensed survey of the non-Targa owned 318 acre action area was accomplished by Raven personnel afterwards. No individual Piping Plover were observed or heard and no suitable Piping Plover habitat was detected during these surveys.

At the time of this on-site survey conducted by Raven, the Texas wintering population of Piping Plovers would have already departed for their breeding grounds located elsewhere in the United States. No Piping Plover habitat exists within the project area or action area, and there is sufficient additional inventory data, as listed and discussed above, to indicate that any occurrence of wintering Piping Plovers flying through or over this project area or action area is extremely unlikely. The Raven field survey and the additional remote surveys described above are adequate to guide the following determination of effects.

4.2.1.3 Determination of Effects

Field surveys of the construction site and the action area indicate no suitable Plover habitat exists within the proposed Train 5 construction area. In addition, no suitable Plover habitat was detected by remote sensing techniques in the 618-acre action area. Historic occurrence data and surveys provided by the IPPC, CBC, and BBS (Breeding Bird Survey) surveys also support the fact that Plovers have not and likely will not occur in or near the action area or this far inland from their normal coastal beach habitats. Their specific winter requirement for suitable coastal beach habitat is further reinforced by the FWS designation of the coastal areas of Bolivar Beach, Rollover Bay and Big Reef as critical habitat for the Plover. The action area does not include this type of habitat and is in excess of 30 miles of what could be considered suitable Plover winter habitat. The evidence that Plovers use a non-stop migratory strategy between their northern breeding range and southern coastal winter range suggest it is also very unlikely that the action area would provide a stopover destination for migrating Plovers. Given this lack of suitable habitat in or near the action area, that the Plover has no history of occurrence in or near the action area and no individuals were seen during surveys of the action area, the construction and operation of Train 5 will have no effect on Piping Plovers.

4.2.2 Five Sea Turtles – 3 Endangered and 2 Threatened (FWS)

4.2.2.1 Species and Habitat Description

Below are the five federally listed sea turtles for Chambers County, Texas. Because they share almost identical life histories, habitat requirements, and environmental threats, they are analyzed for effect in this BA collectively.

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*): Endangered
Hawksbill Sea Turtle (*Eretmochelys imbricata*): Endangered
Leatherback Sea Turtle (*Dermochelys coriacea*): Endangered
Green Sea Turtle(*Chelonia mydas*): Threatened
Loggerhead Sea Turtle (*Caretta caretta*): Threatened

The endangered Kemp's Ridley Sea Turtle is the most endangered species of sea turtle. The Kemp's ridley's range is mainly in the Gulf of Mexico, but immature turtles, probably carried by the currents, often appear along the Atlantic coast, as far north as New England and Nova Scotia. Adults occur primarily in the Gulf of Mexico. Kemp's ridleys feed mostly on crabs, but their diet also includes marine invertebrates and plants, especially when they are young. Crab species consumed varies geographically. In south Texas, Kemp's ridleys consume a variety of crab species. Of the five sea turtle species that roam the Gulf of Mexico, the Kemp's ridley is the smallest with an average length of 23 to 27.5 inches (58.5 to 70 cm) and average weight of 100 pounds (45 kg). The Kemp's ridley is the only sea turtle with an almost circular upper shell. The young are dark gray in color but change as they mature. Adults are olive green above and yellow below.

The endangered Hawksbill Sea Turtle is one of seven species of sea turtles found throughout the world. One of the smaller sea turtles, it has overlapping scutes (plates) that are thicker than those of other sea turtles. This protects them from being battered against sharp coral and rocks during storm events. Adults range in size from 30 to 36 inches (0.8-1.0 meters) carapace length, and weigh 100 to 200 pounds (45-90 kilograms). Its carapace (upper shell) is an attractive dark brown with faint yellow streaks and blotches and a yellow plastron (under shell). The name "hawksbill" refers to the turtle's prominent hooked beak.

The endangered Leatherback Sea Turtle is the largest, deepest diving, and most migratory and wide ranging of all sea turtles. The adult leatherback can reach 4 to 8 feet in length and 500 to 2000 pounds in weight. Its shell is composed of a mosaic of small bones covered by firm, rubbery skin with seven longitudinal ridges or keels. The skin is predominantly black with varying degrees of pale spotting; including a notable pink spot on the dorsal surface of the head in adults. A toothlike cusp is located on each side of the gray upper jaw; the lower jaw is hooked anteriorly. The paddle-like clawless limbs are black with white margins and pale spotting.

The threatened Green Sea Turtle is generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. These turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting. Green turtles apparently have a strong nesting site fidelity and often make long distance migrations between feeding grounds and nesting beaches. Hatchlings have been observed to seek refuge and food in Sargassum rafts. Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae. The term "green" applies not to the external coloration, but to the color of the turtle's subdermal fat. The nesting season varies with the locality. In the Southeastern U.S., it is roughly June through September. Nesting occurs nocturnally at 2, 3, or 4-year intervals. Only occasionally do females produce clutches in successive years. A female may lay as a many as nine clutches within a nesting season (overall average is about 3.3 nests per season) at about 13-day intervals. Clutch size varies from 75 to 200 eggs, with an average clutch size of 136 eggs reported for Florida. Incubation ranges from about 45 to 75 days, depending on incubation temperatures. Hatchlings generally emerge at night. Age at sexual maturity is believed to be 20 to 50 years. The Green Sea Turtlehas a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands, Puerto Rico, Georgia, South Carolina, and North Carolina, and in larger numbers in Florida (FWS).

The threatened Loggerhead Sea Turtle is named for their relatively large head, which support powerful jaws and enable them to feed on hard-shelled prey, such as whelks and conch. The carapace (top shell) is slightly heart-shaped and reddish-brown in adults and sub-adults, while the plastron (bottom shell) is generally a pale yellowish color. The neck and flippers are usually dull brown to reddish brown on top and medium to pale yellow on the sides and bottom. Mean straight carapace length of adults in the southeastern U.S. is approximately 36 in (92 cm); corresponding weight is about 250 lbs (113 kg).

Threats to all five of these turtles includes direct exploitation for food (including eggs) and curio materials, incidental take (chiefly by drowning in shrimp trawls), and by habitat degradation, including beach development, beachfront lighting (Peters and Verhoeven 1994, Salmon and Witherington 1995), ocean pollution (including marine debris, which may be ingested), and dredging (direct kills and injuries). Beach armoring, including sea walls, rock revetments, riprap, sandbag installation, groins, and jetties, can result in loss of nesting beaches due to accelerated erosion, prevention of natural beach and dune accretion, and interference with females attempting to reach suitable nesting sites. Beach cleaning operations can destroy nests or produce tire ruts that inhibit movement of hatchlings to sea. The effect of beach restoration may depend on sand type used and subsequent management. Additional threats include predation and/or trampling of eggs and young by raccoons and feral mammals, trampling/crushing of eggs or young by vehicles or human pedestrians, deaths caused by collisions with boats (e.g., in southeastern and southern Florida and shallow coastal bays of the Gulf of Mexico) and intentional attacks by humans (fishermen) (Mitchell 1991). Long-term threats include sea level rise which, coupled with inland urbanization, may reduce available nesting beaches. Since sexual differentiation depends on incubation temperature, there is concern that global warming may result in an imbalance in the sex ratio (Mrosovsky and Provancha 1989). Annual mortality due to drowning in shrimp nets has been estimated at 5000-50,000 in the southeastern U.S.; an additional 550-5500 may die each year from other human activities (CSTC 1990). The fall bottom fishery and black drum fishery may be having adverse effects on loggerheads that use Chesapeake Bay (Mitchell 1991).

4.2.2.2 Occurrence and Sighting Data

The FWS Recovery Plan for each of these five species was reviewed. The National Marine Fisheries Service *Five Year Review: Summary and Evaluation* for each of the five species was reviewed. There was no inventory data included in any of these documents that could be directly correlated to this proposed action and action area.

The project area is located within the Cedar Bayou watershed and lies 0.6 miles from the main channel (straight-line) at the nearest point. Following the circuitous centerline of the nearest (unnamed) ephemeral stream, from the project area to that streams' confluence with Cedar Bayou, is 0.8 miles. From that confluence with Cedar Bayou, it is 16 miles south along the circuitous centerline of Cedar Bayou to Galveston Bay. It is 11 miles (straight-line) from the project area to the mouth of Cedar Bayou at Galveston Bay.

In the eleven year period between 1980 and 1991, Caillouet et al reported a total of 27 sea turtle records from Galveston Bay, including: 16 Kemp's ridley; 4 Green, 3 Loggerhead; 2 Leatherback; and 2 unknown.

Since 1991, four of the five species of sea turtles found in the Gulf of Mexico have been reported in Galveston Bay. All turtles that are reported to the Sea Turtle Stranding and Salvage Network (STSSN) are documented. Dead turtles are recovered and necropsied, while live turtles are brought to the National Marine Fisheries Service Sea Turtle Research and Rehabilitation Facility for rehabilitation. Dead strandings make up the majority of the reports (85%). Due to the condition of the carcasses, a definitive cause of death is rarely determined. These carcasses are still important sources of life history data (sex ratios, food sources and feeding habits). Few of the reported turtles are alive (15%). Generally it is known why the turtle stranded alive (cold stunned, caught on power plant intake screen, injured post hatchlings, or caught by recreational hook-and-line); however, there are still unknown causes. (From the Texas A&M University, Galveston website: http://repositories.tdl.org/tamug-ir/handle/1969.3/22972?show=full)

In 2004, the Houston Chronicle (Friday, May 14, 2004) reported 3 incidence of Kemp's ridley nesting attempts in Galveston County: Bolivar Peninsula (Crystal Beach); west end of Galveston Island; below the seawall – City of Galveston.

There are no (0) TPW Natural Diversity Database element occurrence records for sea turtles within the ~560 square mile and nine quadrangle information request area.

A ground survey of the 300 acre Targa-owned action area was conducted by Mr. Ross Carrie (Raven) on April 4, 2012. The remotely sensed survey of the non-Targa owned 318 acre action area was accomplished by Raven personnel afterwards. No sea turtle habitat was detected during these surveys.

No sea turtle habitat whatsoever exists within the project area or action area, and there is sufficient additional inventory data and historic occurrence data, as discussed above, to indicate that any occurrence of sea turtles in or near the mouth of Cedar Bayou is extremely unlikely. The Raven field survey and the additional remote surveys described above are adequate to guide the following determination of effects.

4.2.2.3 Determination of Effects

No suitable sea turtle habitat exists within at least ten miles of the proposed Train 5 construction area. In addition, no suitable sea turtle habitat was detected by remote sensing techniques in the 618-acre action area. Historic occurrence data and surveys also support the fact that these species of sea turtles have not and likely will not occur in or near the action area or this far inland from their normal marine habitats. In addition, given the wastewater and storm water treatment standards for the project and the project's inland location, discharge resulting from this project will not affect the water quality of the streams and canals within the action area and will produce no adverse downstream effects to larger watersheds including the Cedar Creek watershed. Given the lack of suitable habitat in the action area, that these species of sea turtles have no history of occurrence in or near the action area and no individuals were seen during surveys of the action area, the construction and operation of Train 5 will have no effect on these five species of sea turtles: Kemp's Ridley Sea Turtle, Hawksbill Sea Turtle, Leatherback Sea Turtle, Green Sea Turtle and Loggerhead Sea Turtle.

4.2.3 Smalltooth Sawfish – Endangered (TPW)

4.2.3.1 Species and Habitat Description

The distinct population segment (DPS) of Smalltooth Sawfish (*Pristis pectinata*) was listed as endangered under the ESA on April 1, 2003 (68 FR 15674) in response to a 1999 listing petition from The Ocean Conservancy (formerly the Center for Marine Conservation). Smalltooth Sawfish were once prevalent throughout Florida and were commonly encountered from Texas to North Carolina. Currently, Smalltooth Sawfish can only be found with any regularity in south Florida between the Caloosahatchee River and the Florida Keys. Based on the contraction in range and anecdotal data, it is likely that the population is currently at a level less than 5% of its size at the time of European settlement. As of January 30, 2006, Texas Parks and Wildlife Division has listed Smalltooth Sawfish as endangered under the Parks and Wildlife Code Chapter 68 (NMFS, 2009).

The Smalltooth Sawfish has different life history stages and different patterns of habitat use. The young can be found very close to shore in muddy and sandy bottoms, seldom descending to depths greater than 32 feet. It can also be found in sheltered bays, on shallow banks, and in estuaries or river mouths. Adult sawfish are encountered in various habitat types including: mangrove, reef, seagrass, and coral; in varying salinity regimes and temperatures; and at various water depths. Adults feed on a variety of fish species and crustaceans (TPW, 2012).

4.2.3.2 Occurrence and Sighting Data

Smalltooth Sawfish in the US used to be common from Texas to the Carolinas and ranged occasionally as far north as New York. The range has contracted by approximately 90% and is now restricted primarily to peninsular Florida. Smalltooth Sawfish can only be found with any regularity off the extreme southern portion of Florida. Occurrences of Smalltooth Sawfish in the northern and western Gulf of Mexico have become rare in the last 30 years. Since 1971, there have been only three published or museum reports of Smalltooth Sawfish captured from this region, and all have been from Texas (1978, 1979, and 1984). Recent studies to document encounters with Smalltooth Sawfish since 1990 have yielded only a handful of records. The Mote Marine Laboratory (MML) database has single verified records (one each) from Texas, Louisiana, and Alabama, and several from the Florida Panhandle (Simpfendorfer and Wiley 2005a; Simpfendorfer unpublished data). Most records from the Florida Panhandle are juveniles, from all times of the year (NMFS, 2009).

There are no (0) TPW Natural Diversity Database element occurrence records for Smalltooth Sawfish within the ~560 square mile and nine quadrangle information request area.

A ground survey of the 300 acre Targa-owned action area was conducted by Mr. Ross Carrie (Raven) on April 4, 2012. The remotely sensed survey of the non-Targa owned 318 acre action area was accomplished by Raven personnel afterwards. No individual Smalltooth Sawfish or Smalltooth Sawfish habitat was detected during these surveys.

4.2.3.3 Determination of Effects

The saline, marine habitat that the Smalltooth Sawfish relies on for all of its life stages does not exist within or near the project area or the action area. No suitable Smalltooth Sawfish habitat was detected by remote sensing techniques in the 618-acre action area or within at least ten miles of the proposed Train 5 construction area. Historic occurrence data and surveys also support the fact that this species has not and likely will not occur in or near the action area or this far inland from their normal marine habitats. In addition, given the wastewater and storm water treatment standards for the project and the project's inland location, discharge resulting from this project will not affect the water quality of the streams and canals within the action area and will produce no adverse downstream effects to larger watersheds including the Cedar Creek watershed. Given the lack of suitable habitat in the action area, that this species has no history of occurrence in or near the action area and no individuals were seen during surveys of the action area, the construction and operation of Train 5 will have no effect on the Smalltooth Sawfish.

4.2.4 Red Wolf – Endangered (TPW)

4.2.4.1 Species and Habitat Description

The Red Wolf (*Canis rufus*) is smaller but morphologically similar to its larger cousin the gray wolf. As its name implies, the Red Wolf has a coat that is brown to reddish in color. The Red Wolf weighs 45-80 pounds, stands approximately 26 inches tall at the shoulder and measures 4 feet in length. Red wolves feed mostly on mammals including rabbits, deer, small pigs and opossums (FWS, 2007). The Red Wolf was formerly known throughout the eastern one-half of Texas in brushy and forested areas, as well as coastal prairies, and is now considered extirpated (TPW 2012).

4.2.4.2 Occurrence and Sighting Data

Formerly the Red Wolf was believed to have occurred from central Texas eastward to the coasts of Florida and Georgia and north to North Carolina, and along the Mississippi River Valley north to southern Illinois, and occasionally in Mexico. The last remnant population along Texas/Louisiana coast was rendered functionally extinct due to hybridization with the coyote. A single experimental reintroduced population now occurs in an area of northeastern North Carolina and two propagation populations are currently maintained by the FWS. Other red wolves exist in many captive-breeding facilities. Historically the Red Wolf was found throughout much of Texas. The last known wild Red Wolf was killed in 1980 and the species is currently considered extirpated from the state.

There are no (0) TPW Natural Diversity Database element occurrence records for Red Wolf within the ~560 square mile and nine quadrangle information request area.

A ground survey of the 300 acre Targa-owned action area was conducted by Mr. Ross Carrie (Raven) on April 4, 2012. The remotely sensed survey of the non-Targa owned 318 acre action area was accomplished by Raven personnel afterwards. No individual red wolves or Red Wolf habitat was detected during these surveys.

4.2.4.3 Determination of Effects

No suitable Red Wolf habitat exists within the project area or the action area. Based on the historic occurrence data, field surveys and evaluations, the absence of suitable habitat in the immediate area, and the extirpated status of the Red Wolf from Texas and its range overall throughout the southeastern United States, it is highly unlikely that red wolves will ever occur within or traverse through the action area. Therefore, Train 5 would have no effect on Red Wolves.

4.2.5 Louisiana Black Bear – Threatened (TPW)

4.2.5.1 Species and Habitat Description

The Louisiana Black Bear (*Ursus americanus luteolus*) is federally listed as a threatened species. It is one of 16 recognized subspecies of the American black bear (*Ursus americanus*). This bear was formerly widespread in North America, from Alaska to Mexico. The Louisiana Black Bear is distinguished from other black bears by a longer and narrower skull and it possesses proportionately larger molar teeth. They are big, bulky mammals. They have brown muzzles and long black hair, although fur can vary in shades of brown or red, and some have white chest patches. Weight ranges between 200 to 400 pounds for males and 120 to 200 pounds for females. The Louisiana Black Bear is a habitat generalist and often overwinters in hollow cypress trees either in or along sloughs, lakes or riverbanks in bottomland hardwoods. These bears are mobile, opportunistic, largely herbivorous omnivores that exploit a variety of foods, including insects. The distribution and abundance of foods, particularly mast such as nuts and berries, largely affect their movements. Important elements of black bear habitat include hard and soft mast, escape cover, den sites, travel corridors and minimum human disturbance.

Louisiana Black Bear and American black bear have been given the same protection within the historic range of the Louisiana Black Bear in eastern Texas, and both subspecies will essentially be treated as the *U. luteolus* subspecies. All free-ranging black bear subspecies within the historic range of Louisiana Black Bear are federally listed as threatened due to similarity in appearance, and given the same legal protection.

4.2.5.2 Occurrence and Sighting Data

Black bear populations in the neighboring states of Arkansas, Louisiana and Oklahoma are stable or increasing. Concurrently, the frequency of occurrence of black bears, primarily dispersing juvenile males, within eastern Texas is on the increase. This has been documented in the Red River and Sulphur River Basins in northeast Texas, and at other locations in eastern Texas. There have been some 24 confirmed black bear sightings within eastern Texas since 1977. There have been reliable black bear sightings in the following counties: Anderson, Angelina, Bowie, Cass, Fannin, Franklin, Harrison, Henderson, Hopkins, Jasper, Lamar, Marion, Morris, Nacogdoches, Newton, Panola, Polk, San Jacinto, and Shelby Counties. Approximately 67 percent of these sightings have occurred since 1990. Additionally, approximately 70 percent of these sightings have occurred within the northeastern counties of eastern Texas (TPW).

There are no (0) TPW Natural Diversity Database element occurrence records for Louisiana Black Bear within the ~560 square mile and nine quadrangle information request area.

A ground survey of the 300 acre Targa-owned action area was conducted by Mr. Ross Carrie (Raven) on April 4, 2012. The remotely sensed survey of the non-Targa owned 318 acre action area was accomplished by Raven personnel afterwards. No individual Louisiana Black Bear or Louisiana Black Bear habitat was detected during these surveys.

4.2.5.3 Determination of Effects

The critical components of suitable Louisiana Black Bear habitat, such as mast production, den sites and travel corridors, do not exist within the project area or the action area. In addition, intensive industrial and agricultural lands uses coupled with the growing urban landscape of Chambers County generate an environment of persistent human disturbance that Louisiana Black Bears would be expected to avoid. Based on the historic occurrence data, field surveys and evaluations, and the absence of suitable habitat, it is highly unlikely that Louisiana Black Bear will ever occur within or traverse through the action area. Therefore, there will be no effects to Louisiana Black Bear from the construction and operation of Train 5.

4.2.6 Sprague's Pipit – Candidate (TPW)

Sprague's Pipit (*Anthus spragueii*) is ***not listed*** under authority of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). Since 2010, Sprague's Pipit has been considered by FWS as a ***candidate*** for listing as endangered or threatened; however, they have yet to ***propose*** this species for listing. Inclusion of candidate species in a BA is considered optional by the FWS. Targa, as a conservative measure, elected to include candidate species and assess the potential impacts of the Train 5. While this analysis provides a determination of potential impacts for the pipit, it is for completeness purposes only and has no legal significance because candidate species have no legal protection as defined under the ESA and therefore the impacts determination included in this analysis has no legal force or effect.

4.2.6.1 Species and Habitat Description

Sprague's Pipit spends its winters generally in northern Mexico and across all of Texas, except for the Texas Panhandle region, from mid-September through early April. Their spring and summer breeding range is located in the northern native grass prairies of the Great Plains, including portions of southern-central Canada and nearly all of North Dakota and Montana. Year-round habitat is open grasslands and fields that are well drained and essentially devoid of shrubbery and trees. This bird prefers native grass species over non-natives, and prairies and fields that have an intermediate density and height in clump-grass structure. Their diet consists primarily of arthropods, but some seeds are consumed during the winter. This pipit is small, ranging in length from 10 to15 centimeters and weighing between 22 to 26 grams and is considered a ground-inhabiting passerine. Both sexes and all ages are similar in appearance; being generally an overall buff color, accentuated with darker browns. When flushed, they typically rise in an undulating flight, often circling while giving diagnostic, single-syllable, squeaky, "*squick*" calls. They are generally solitary on wintering and migratory grounds. During breeding, this species nests on the ground, usually at the base of a dense tussock of grass, and lays between 4 and 5 eggs. Since being first described in 1843, Sprague's Pipit has suffered a dramatic decline throughout its range, due primarily to the disappearance of native prairie due to conversion to agriculture and cultivation, overgrazing by domestic livestock, and invasion and introduction of non-native grasses (Robbins, 1999).

4.2.6.2 Occurrence and Sighting Data

Recent inventories in or near the project and action area for this species are available from the following sources:

1. North American Breeding Bird Survey routes located near the project
2. Audubon Society Christmas Bird Count surveys located in or near the project
3. TPW Natural Diversity Database (TXNDD) maintained by TPW
4. Data submissions to Ebird (http://ebird.org ; Cornell Lab of Ornithology and National Audubon Society)
5. Ground surveys by Raven Environmental Services, Inc. on April 4, 2012

There are two volunteer bird census counts that occur annually across the U.S.: the Audubon Society Christmas Bird Count (CBC) and the U.S. Geological Survey Patuxent Wildlife Research Center's Breeding Bird Survey (BBS). In the 2010 FWS 12-month petition finding for this species, the CBC data from the winters of 1966 through 2006 (40 years), were analyzed for Sprague's Pipit occurrence in Texas with the result of an estimated annual decline of 2.54 percent (75 FR 56028 56050). Survey-wide BBS data indicate a significant decline averaging 3.9 percent per year for 1967-2007 (40 years), which amounts to an 80 percent decline for this time period. BBS abundance declined from an average of 2.5 to 4.0 birds per route in 1967-1977 to 0.9 to 1.2 birds per route in 2000-2007 (Natureserve).

The nearest BBS routes are the Stowell route (Number 83021) located 14 miles east and the Winnie route (Number 83020) located 20 miles southeast. Both routes were established in 1967 and surveys have been completed almost every year since establishment. No (0) Sprague's Pipit has ever been observed during any year for either of the two survey routes.

The nearest CBC bird count circle to this proposed action is the Houston – Baytown (TXHO) circle. The centerpoint for the 15 mile diameter TXHO circle is located approximately 1.3 miles northeast of downtown Baytown. The treatment area lies within the perimeter of the TXHO CBC circle by a distance of approximately 0.8 miles. During the last twelve years, a total of four (4) Sprague's Pipit s have been recorded by CBC observers: three (3) in 1999 and one (1) in 2002.

No element occurrence records for Sprague's Pipit are documented within the TPW TXNDD sample area (~560 square miles), which includes the western one-half of Chambers County and also portions of Harris and Liberty Counties.

Based on data submitted to Ebird (http://ebird.org ; site visited January 8, 2013) between 2000 and 2012, between 2 and 5 Sprague's Pipit s have been detected on average per observer checklist in Chambers County. Observations were recorded between November and March in any given year with the greatest frequency in February.

Abundance values (provides a measure of how common a species is reported compared to all other species in a region) calculated from this same data and time period scored over 0.09 relative to other species suggesting Sprague's Pipit is uncommon but can be routinely observed in Chambers County during a full day of bird observation in the area.

A ground survey of the 300 acre Targa-owned action area was conducted by Mr. Ross Carrie (Raven) on April 4, 2012. The remotely sensed survey of the non-Targa owned 318 acre action area was accomplished by Raven personnel afterwards. No individual Sprague's Pipits were detected during these surveys. However, a small approximate 50-acre patch of adequate, although not high quality, winter habitat was observed in the southern portion of the Action Area. Presently this area appears to be managed for intermittent grazing but could provide foraging opportunities for wintering Sprague's Pipits despite the lack of native grass species normally common in their winter habitat.

4.2.6.3 Determination of Impacts

This proposed action will not cause the permanent loss of any Sprague's Pipit wintering habitat where construction of the facility will remove 18 acres of forest habitat that is not considered suitable for Sprague's Pipit. The small 50-acre patch of winter habitat in the southern portion of the Action Area is outside the construction area and will not be disturbed or altered by construction or operation of Train 5. Given that the candidate status of Sprague's Pipit is based more on the continued loss of limited nesting habitat in the northern reaches of the Great Plains and less on the loss of more abundant winter habitat distributed throughout its southern range, the construction and operation of Train 5 will not contribute to the decline of this species. As such, the construction and operation of Train 5 will not contribute to a trend of population decline or decreased species viability for the Sprague's pipit.

5.0 DETERMINATION OF EFFECTS SUMMARY

The following summary describes the determinations of effect for the species evaluated in this BA. For the following federally listed species, this proposed action will have ***no effect***.

- Kemp's Ridley Sea Turtle (*Lepidochelys kempii*): Endangered
- Hawksbill Sea Turtle (*Eretmochelys imbricata*): Endangered
- Leatherback Sea Turtle (*Dermochelys coriacea*): Endangered
- Green Sea Turtle(*Chelonia mydas*): Threatened
- Loggerhead Sea Turtle (*Caretta caretta*): Threatened
- Piping Plover (*Charadrius melodus*): Threatened
- Smalltooth Sawfish (*Pristis pectinata*): Endangered
- Red Wolf (*Canis rufus*): Endangered
- Louisiana Black Bear (*Ursus americanus luteolus*): Threatened

For the following candidate species, this proposed action will not contribute to a trend of population decline or decreased species viability:

- Sprague's Pipit (*Anthus spragueii*): Candidate

6.0 LITERATURE CITED AND REFERENCES

Barnes, J.D., L.N. Miller, and E.W. Wood. 1976. Prediction of noise from power plant construction. Bolt Beranek and Newman, Inc. Cambridge, MA. Prepared for the Empire State Electric Energy Research Corporation, Schenectady, NY.

Caillouet, Charles W. et al. Sea Turtle Head Starting and Ecology Research. National Marine Fisheries Service.

Coleman, Jessica Trinity Consultants. Senior Consultant. 12770 Merit Drive, Suite 900, Dallas, TX 75251.

Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1992. Birds in Jeopardy: the Imperiled and Extinct Birds of the United States and Canada, Including Hawaii and Puerto Rico. Stanford University Press, Stanford, California. 259 pp.

Eliott-Smith, E., Haig, S.M., and Powers, B.M., 2009, Data from the 2006 International Piping Plover Census: U.S. Geological Survey Data Series 426, 332 p.

Erfling, Edith (Pers. comm.). U.S. Fish and Wildlife Service. Project Leader. Clear Lake Environmental Services Field Office, 17629 El Camino Real #211, Houston TX 77058-3051.

Gottfried, Bob (Pers. comm.). Texas Parks and Wildlife Department. Texas Natural Diversity Database Administrator. 4200 Smith School Road, Austin, Texas.

Keiser, Jessica (Pers. comm.). Targa Resources. Assistant Vice President, Environment Safety and Health. 1000 Louisiana, Suite 4300, Houston, TX 77002

Lovett, Gary M., and T.H. Tear et.al. 2007. Effects of Atmospheric Deposition on Biological Diversity in the Eastern United States. Institute of Ecosystem Studies and The Nature Conservancy. New York. 56pp.

Miller, James H. 2003. Nonnative Invasive Plants of Southern Forests. Revised. Gen. Tech. Rep. SRS-62. Asheville, NC. Department of Agriculture, Forest Service, Southern Research Station. 93 pp.

National Audubon Society, Inc. Christmas Bird Count. Historical Results. Data for a Species. Whooping Crane. Available at: http://birds.audubon.org/christmas-bird-count (Accessed Jan 6, 2012).

National Marine Fisheries Service. 2009. Recovery Plan for Smalltooth Sawfish (*Pristis pectinata*). Prepared by the Smalltooth Sawfish Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991. Recovery Plan for U.S. Population of Atlantic Green Turtle. National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1992. Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*), Second Revision. National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service, U.S. Fish and Wildlife Service, and SEMARNAT. 2010. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. National Marine Fisheries Service. Silver Spring, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. August 2007. Green Sea Turtle(*Chelonia mydas*) Five Year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. August 2007. Hawksbill Sea Turtle (*Eretmochelys imbricata*) Five Year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. August 2007. Kemp's Ridley Sea Turtle (Lepidochelys kempii) Five Year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. August 2007. Leatherback Sea Turtle (*Dermochelys coriacea*) Five Year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. August 2007. Loggerhead Sea Turtle (*Caretta caretta*) Five Year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, Maryland.

Nature Serve. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. (Accessed: Jan. 6, 2012). Available at: http://www.natureserve.org/explorer

Nowak, R. M. 1992. The Red Wolf is not a hybrid. Conservation Biology 6:593-595.

Paradiso, J. L. and R. M. Novak, 1972. *Canis rufus*. Mammalian Species No. 22:1-4.

Robbins, M.B., and B.C. Dale. 1999. Sprague's Pipit (*Anthus spragueii*). *In* The Birds of North America, No. 439 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Roberts, Melanie (Pers. comm.). Targa Resources. Environmental Manager. 1000 Louisiana, Suite 4300, Houston, TX 77002

Texas Parks and Wildlife Department. Wildlife Division. Wildlife Habitat Assessment Program. Texas Natural Diversity Database. 4200 Smith School Road, Austin, Texas.

Texas Parks and Wildlife Department. 2012. The Rare, Threatened, and Endangered Species of Texas by County [web application]. Austin, Texas. Available at: http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species/

Texas Parks and Wildlife Department. 2012. Ecosystem Resources. [web application]. Austin, Texas. Available at: http://www.tpwd.state.tx.us/landwater/water/conservation/coastal_studies/

U.S. Environemntal Protection Agency. 1971. Effects of Noise on Wildlife and Other Animals. Washington, D.C. 74pp.

U.S. Environmental Protection Agency. 1987. Level III Ecoregions of the Continental United States [Map]. Omernick.

U.S. Fish and Wildlife Service Website. 2012. Southwest Region Ecological Services, Endangered Species List and Life Histories. Available at http://ecos.fws.gov/docs/life_histories

U.S. Fish and Wildlife Service. 1998. Endangered Species Act Consultation Handbook.

U.S. Geological Survey, Patuxent Wildlife Research Center. North American Breeding Bird Survey Raw Data Online Retrieval System. Available at http://www.pwrc.usgs.gov

Vale, Arturo J. (Pers. comm.). U.S. Fish and Wildlife Service. Project Leader. Clear Lake Environmental Services Field Office, 17629 El Camino Real #211, Houston TX 77058-3051.

SIGNATURE PAGE

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Approved By: Date:

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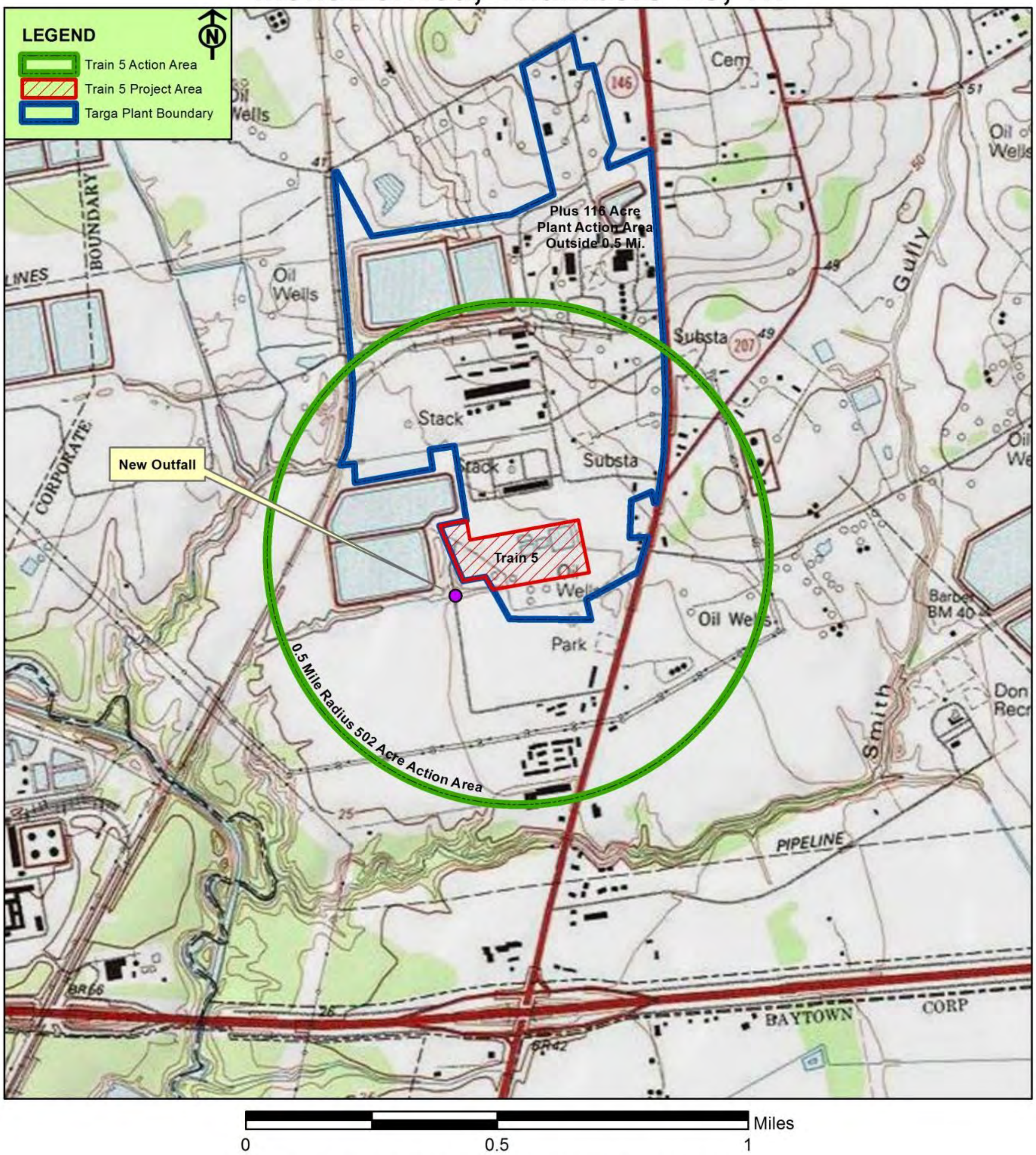
APPENDIX

EXHIBIT A – Vicinity Map
EXHIBIT B – USGS Quadrangle Map
EXHIBIT C – Color Aerial Imagery Map
EXHIBIT D – List of Preparers
EXHIBIT E – Project Site Photographs
EXHIBIT F – Trinity Consultants Emissions Analysis

Exhibit A – Vicinity Map

Exhibit B – USGS Quadrangle Map

TARGA MIDSTREAM SERVICES, LLC
Mont Belvieu Fractionator Train 5
Mont Belvieu, Chambers Co, Tx



MONT BELVIEU 7.5' QUADRANGLE

Raven Environmental Services, Inc.

Joe Hamrick: June 10, 2013 (16,000)

Exhibit C – Color Aerial Imagery Map

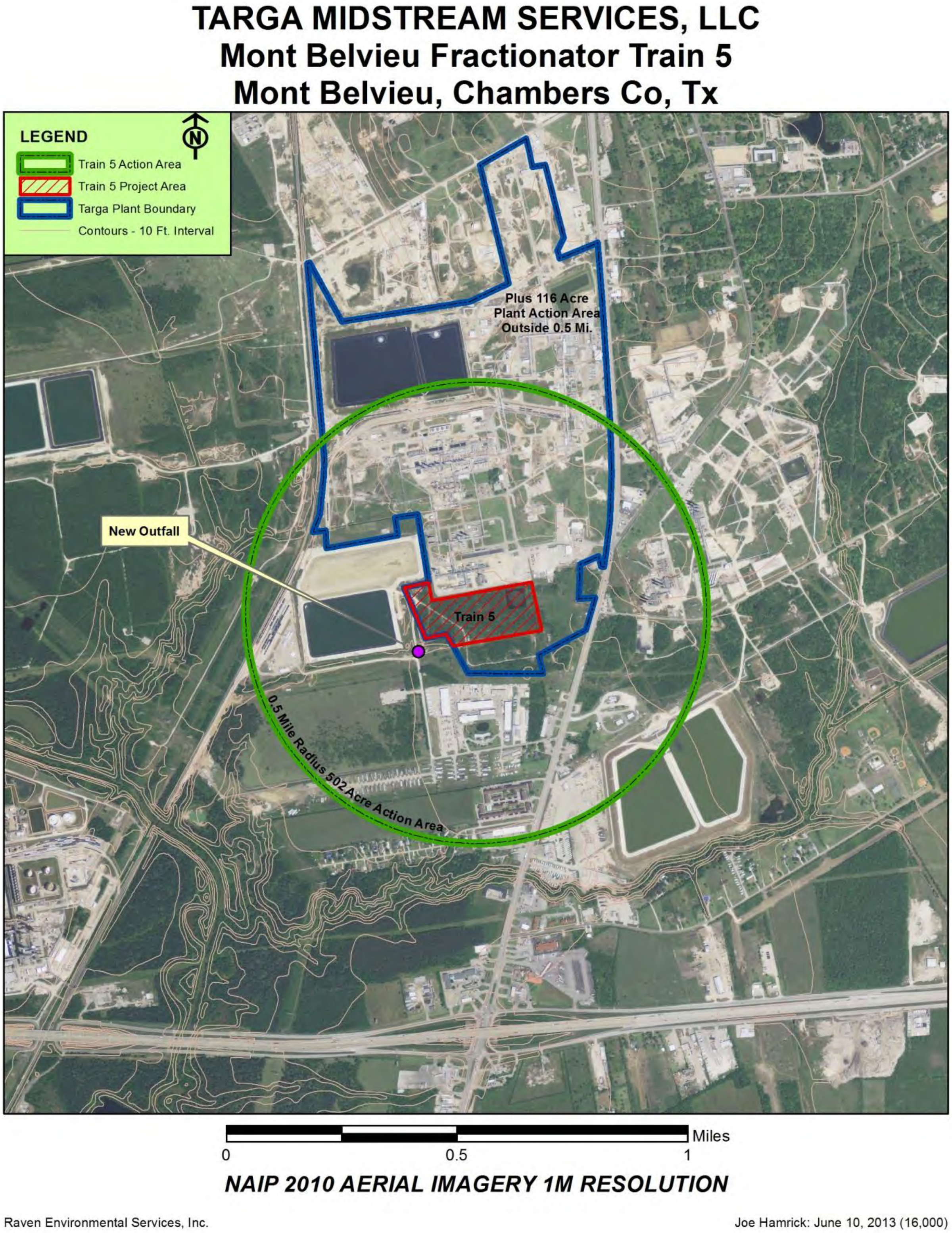


Exhibit D – List of Preparers

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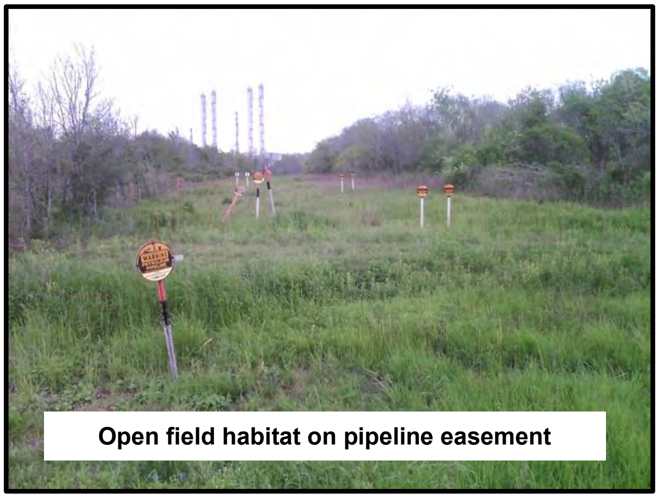
Ross Carrie, Wildlife Biologist

Trinity Consultants, Inc.
Whitney Boger, Senior Consultant

Qualifications of the Primary Author

Mr. Ross Carrie is the primary author of this BA. Mr. Ross Carrie received his Bachelor of Science degree in Zoology and a Masters of Science degree in Wildlife and Fisheries Sciences from Texas A&M University. He has worked more than eighteen years as a manager, consultant, and educator in non-game wildlife management and research, endangered species, environmental and regulatory compliance, and zoonosis management and research. Ross has accumulated over eight years' experience working at management-level positions in county, state, and federal government. His experience includes conducting and publishing original research on endangered species and rare grassland bird species, managing endangered and non-game species on U.S. Forest Service and Department of Defense lands in Texas and Louisiana, developing NEPA-related documents to assess potential impacts of projects proposed on U.S. Forest Service lands, teaching in the Biology Department of Texas A&M University and developing and managing an avian encephalitis surveillance program for all of Harris County, Texas. These experiences inspired him to found Raven in 1996 as a turnkey natural resources management company, providing exemplary and cost-effective services in environmental planning, management, compliance and research. Ross is both President of Raven and a Project Manager, specializing in services that include research design, data collection and management, statistical analysis and publication, and technical writing support.

Exhibit E – Project Site Photographs



Open field habitat on pipeline easement

Representative forest habitat

Forest habitat with evidence of past land use

Representative wet forest habitat

Exhibit F – Trinity Consultants Emissions Analysis Memorandum

AIR QUALITY IMPACT AREA MODELING ANALYSIS

Targa Midstream Services LLC > Mont Belvieu Plant Train 5

TARGA

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Revised May 2013

Project 114401.0169

Trinity Consultants

Environmental solutions delivered uncommonly well

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1. EXECUTIVE SUMMARY

Targa Midstream Services LLC (Targa) operates a natural gas liquids (NGL) fractionator called the Mont Belvieu Plant in Mont Belvieu, Chambers County, Texas. The site is designed to fractionate NGLs into specification NGL components (ethane, propane, iso-butane, normal-butane and natural gasoline). A portion of the natural gasoline produced is further processed to remove contained sulfur compounds and to saturate contained benzene. In addition to the fractionation system, gas dehydrating units and hydrotreating systems, other sources of air emissions include flares (process and back-up), fugitives and utility systems (boilers for steam production, fire water pumps, and emergency generator pumps). A state minor source air quality permit application for the Mont Belvieu Plant was submitted to the Texas Commission on Environmental Quality (TCEQ) in March 2012. The proposed project in the permit application will involve the construction of a new fractionation train (Train 5) at the facility, which will be operated independent of existing operations at the facility.

An air dispersion modeling analysis was performed to determine the area surrounding the Mont Belvieu Plant where emissions of criteria pollutants may have a significant impact, as determined by each pollutant's National Ambient Air Quality Standards (NAAQS) Significant Impact Levels (SILs). The modeled criteria pollutants included particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). The NAAQS air quality dispersion modeling analysis was conducted in accordance with current TCEQ and United States Environmental Protection Agency (U.S. EPA) modeling procedures.[1, 2]

An air dispersion modeling analysis was performed to determine the area surrounding the Mont Belvieu Plant where emissions of non-criteria pollutants may have a significant impact, as determined by each pollutant's state effects screening level (ESL). The modeled non-criteria pollutants included various speciated volatile organic compounds (VOCs). The non-criteria pollutants from the facility were evaluated per TCEQ guidance for the purpose of a health effects review.[3]

This report contains the following information:

- Plot plan showing the emission sources and property line used in the dispersion modeling analyses;
- Aerial photograph showing the property line and surrounding land use type;
- A list of emission sources and their corresponding parameters included in the modeling analysis;
- A detailed description of the methodology used in conducting the air dispersion modeling analyses;
- A determination of the criteria pollutant emissions impacts area; and
- A determination of the non-criteria pollutant emissions impacts area.

---

[1] TCEQ, *Air Quality Modeling Guidelines*, RG-25 (Revised), February 1999.

[2] Code of Federal Regulations, Title 40–Protection of Environment, Part 51, Appendix W.

[3] TCEQ, Air Permit Reviewer Reference Guide, *Modeling and Effects Review Applicability: How to Determine the Scope of Modeling and Effects Review for Air Permits*, APDG 5874, July 2009.

2. GENERAL AIR QUALITY DISPERSION MODELING APPROACH

This section discusses the air quality dispersion modeling methodologies used to perform the modeling analysis.

2.1. STATE NAAQS SIGNIFICANCE ANALYSIS

The State NAAQS air quality dispersion modeling analysis conducted in support of the permit application is organized into two major sections for each applicable criteria pollutant: the Significance Analysis and the Full Impact Analysis.

In the Significance Analysis, emissions of criteria pollutants from the Mont Belvieu Plant were evaluated to determine whether they have the potential for a significant impact upon the area surrounding the facility. Per TCEQ modeling guidance, all impacts for the Significance Analysis are reported as the highest first high (H1H) modeled concentration.[4] The criteria pollutants and averaging periods evaluated include:

- CO (1-hour and 8-hour averaging periods)
- SO_2 (1-hour, 3-hour, 24-hour, and annual averaging periods)
- NO_2 (1-hour and annual averaging periods)
- PM_{10} (24-hour averaging period)
- $PM_{2.5}$ (24-hour and annual averaging periods)

Per U.S. EPA and TCEQ guidance, the Significance Analysis considers the emissions increases and decreases associated only with the proposed project to determine whether it will have a significant impact upon the surrounding area. Since the Mont Belvieu Plant is an existing facility, only the sources and emission rates associated with Train 5 are modeled, and the resulting maximum ground-level concentration (GLC_{max}) for each pollutant and averaging period is compared to the corresponding SILs to determine whether any modeled ground-level concentrations at any receptor locations exceed the SIL (i.e., "significant" receptors).

If the GLC_{max} for each pollutant is less than corresponding SILs, the modeled concentration is determined to not have a significant impact on the surrounding area and the demonstration is complete. If the Significance Analysis reveals that the GLC_{max} for a particular pollutant and averaging period exceeds the applicable SIL, then further analysis is required to demonstrate compliance with the NAAQS. The distance from the center of the facility where no SIL exceedances are expected, and where no significant impact is expected, determines the area of impact for each pollutant and each averaging period. The determination of this area of impact is further discussed in Section 7 of this report.

2.2. HEALTH EFFECTS EVALUATION

The speciated constituents of VOC emitted from the proposed emission sources at the Mont Belvieu Plant are evaluated per the July 2009 Modeling and Effects Review Applicability (MERA) guidance from the TCEQ Toxicology and Risk Assessment (TARA) section.[5] The TCEQ MERA guidance package presents a flow chart, which is used to evaluate constituents identified as requiring a health effects evaluation in this submittal. Not all permitting actions will follow all flow chart steps.

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[4] TCEQ, *Air Quality Modeling Guidelines*, RG-25 (Revised), February 1999.

[5] TCEQ Modeling and Effects Review Applicability: How to Determine the Scope of Modeling and Effects Review for Air Permits, APDG 5874v3, July 2009.

Targa has evaluated non-criteria pollutant emissions associated with the Mont Belvieu Plant using MERA Steps 4C, 4D, 5, and 11. The following sections address the steps in the flow chart that lead to constituents being screened out from further analysis or that lead to site-wide air dispersion modeling. For this health effects evaluation, all Effects Screening Levels (ESL) are obtained from the TCEQ's March 22, 2012 ESL list.[6]

2.2.1. Steps 4C and 4D

Based on the TCEQ MERA guidance package, Step 4C asks the question:

> *"Are the short-term emissions increases (total for a constituent from all EPNs) within one of the three following de minimis levels, and the annual ESL is ≥ 10 percent of the short-term ESL?"*

Table 2.2-1. De Minimis Levels Specified in Step 4C

Short-term ESL (µg/m³)	Short-term Emissions Increases (lb/hr)
≥ 2 < 500	≤ 0.04
≥ 500 < 3500	≤ 0.1
≥ 3500	≤ 0.4

If the total proposed increase in emission rate for a constituent is within one of the de minimis levels shown in Table 2.2-1 and its annual ESL is greater than or equal to 10 percent of its short-term ESL, no further review is required.

Constituents not meeting the criteria of Step 4C are further evaluated under Step 4D, which asks:

> *"Is the project increase ≤ 0.04 lb/hr and the constituent's ESL < 2 µg/m³?"*

If the total proposed increase in emission rate for a constituent is less than or equal to 0.04 pounds per hour (lb/hr) and its ESL is less than 2 micrograms per cubic meter (µg/m³), Air Permits Division (APD) may require further analysis on a case-by-case basis, and the constituent may be further evaluated in Step 11. For this air dispersion modeling analysis, if a constituent meets the criteria of Step 4D, it is further evaluated in Step 11.

2.2.2. Step 5

Step 5 of the MERA analysis asks the following question:

> *"Is the total concentration due to the emission increases ≤ 0.1 ESL? Only increases in emissions are considered for this step."*

Comparisons will be made to the short-term ESL except for constituents with long-term ESLs that are less than 10 percent of their corresponding short-term ESLs. For these constituents, the concentration limits obtained from this step will be compared to both the short- and long-term ESL.

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[6] URL: http://www.tceq.state.tx.us/implementation/tox/esl/list_main.html#esl_1

For a single emission point, the following equation will be used to calculate the concentration limit:

$$E \leq 0.1 \frac{ESL}{X}$$

The variable 'X' is obtained from the tables located in Appendix C of the MERA guidance document. Based on the stack height and distance to the property line of the source from which the constituent is emitted, 'X' can be interpolated from the values in the tables.

For those constituents not screened out through Step 4C, identified for APD review under Step 4D, or screened out in Step 5, further analysis is conducted under Step 11.

2.2.3. Step 11

For all the constituents not screening out during Step 4C and those identified for APD review under Step 4D of the evaluation, site-wide air dispersion modeling is conducted to determine off-property impacts.

2.2.3.1. Screening Analysis

As a first step, screening dispersion modeling is performed to obtain the speciated constituents' maximum ground level concentration (GLC_{max}) based on a ratio technique screening analysis (µg/m^3 per lb/hr). This analysis is used in evaluating worst-case impacts. The following methodology was used for the generic screening modeling analysis for constituents evaluated under Step 11.

1. Each emission source (EPN) emitting an evaluated non-criteria constituent is modeled with a unit emission rate of one pound per hour (lb/hr).
2. The maximum ground level concentration in micrograms per cubic meter (µg/m^3) per unit emission rate in lb/hr ("normalized impact") is obtained for each EPN for the 1-hr and annual averaging periods using SCREEN3.
3. The normalized impact from each EPN is multiplied by the total maximum short-term (hourly) and long-term (annual) proposed emission rate (lb/hr) for each constituent emitted by the EPN to obtain the GLC for the hourly and annual averaging periods.
4. The GLCs from all EPNs that emit a particular constituent are summed to obtain a GLC_{max} for the constituent for the hourly and annual averaging periods.
5. The resulting hourly and annual GLCmax for each constituent evaluated in Step 11 is compared to the respective short-term and long-term ESLs.

The GLC_{max} used in the screening evaluation is the sum of maximum impacts from each EPN emitting the particular constituent, regardless of the location of the maximum impact and time or day that the maximum impact from each EPN is predicted to occur. If the hourly and annual GLC_{max} of each constituent obtained from the screening modeling analysis are less than the corresponding ESL value, no further analysis is required.

2.2.3.2. Refined Analysis

For each constituent that does not pass the screening analysis described above, a refined air dispersion modeling analysis using AERMOD is performed where all EPNs that emit a particular constituent are modeled with their respective constituent specific emission rates. The following methodology was used for the refined modeling analysis for constituents evaluated under Step 11.

1. Each constituent and each averaging period was separately modeled in AERMOD and included all emission sources that contributed to the modeled constituent.
2. For each model run, receptors were located at the property line and beyond. In accordance with TCEQ modeling guidance, receptor grids near the modeled facility require closer spacing to ensure the highest

concentration is captured. In most situations, the maximum concentrations are found on or near a facility's property line.

3. The GLC_{max} in µg/m^3 was obtained for each constituent and each averaging period.
4. Per TCEQ modeling guidance, all impacts for the analysis are reported as the highest first high (H1H) modeled concentration.[7]

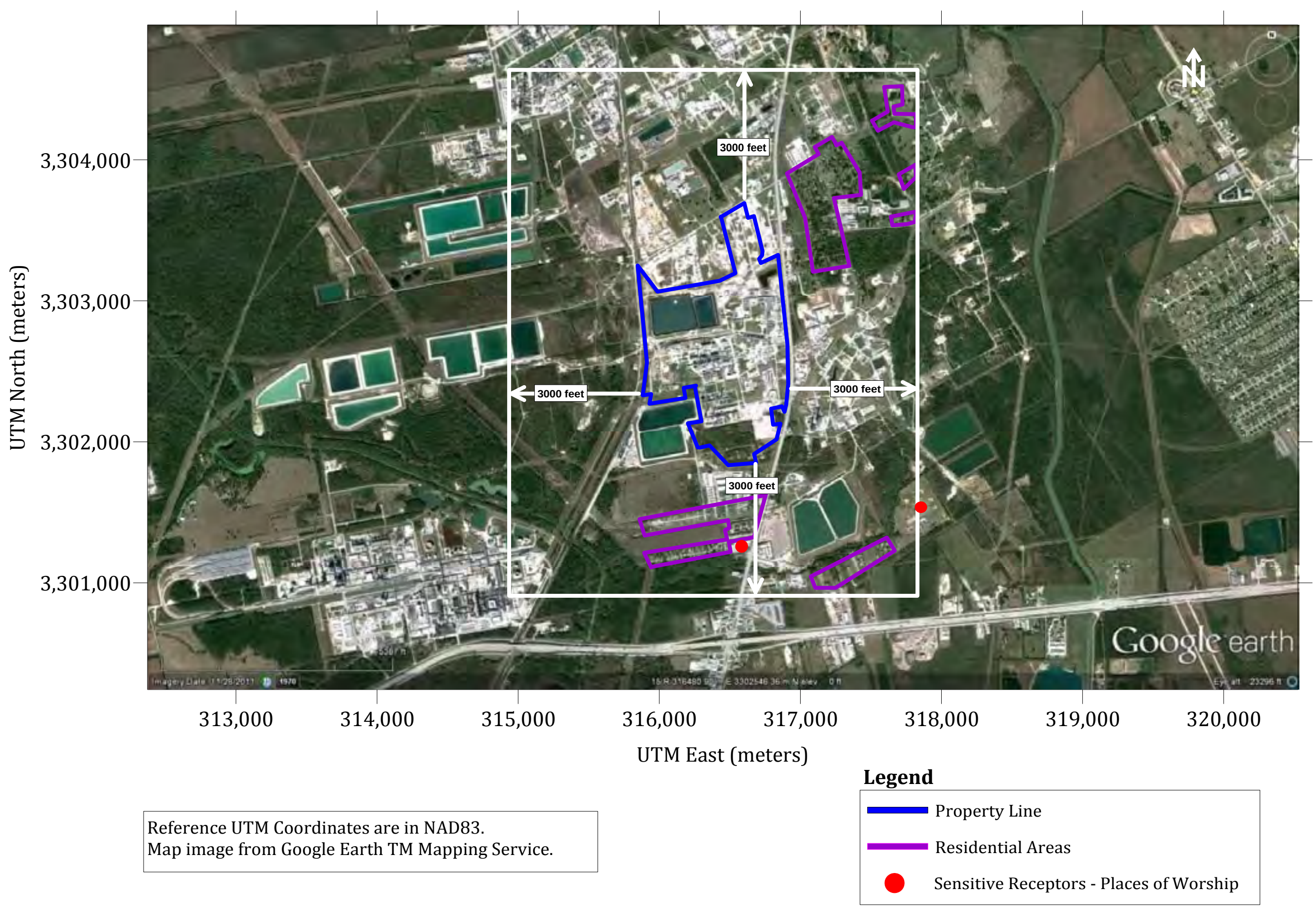
The GLC_{max} obtained through the refined modeling analysis is compared with the corresponding ESL. Constituents with a GLC_{max} less than the corresponding ESL do not require any further evaluation, and compliance with Step 11 of the State Health Effects Review is demonstrated. For any constituent with a GLC_{max} greater than the corresponding ESL, further analysis is required to demonstrate compliance with the state health effects evaluation. Since ESLs are guideline values, and not limits or standards, an exceedance of an ESL does not necessarily indicate a problem, but triggers a more detailed review. The distance from the center of the facility where no ESL exceedances are expected, and where no significant impact is expected, determines the area of impact for each pollutant and each averaging period. The determination of this area of impact is further discussed in Section 7 of this report.

[7] TCEQ, *Air Quality Modeling Guidelines*, RG-25 (Revised), February 1999.

The Area map showing the location of the Mont Belvieu Plant in relation to surrounding the area and the property line is shown in Figure 3-1. The datum for the UTM coordinates is NAD83.

Figure 3-1. Mont Belvieu Plant Area Map

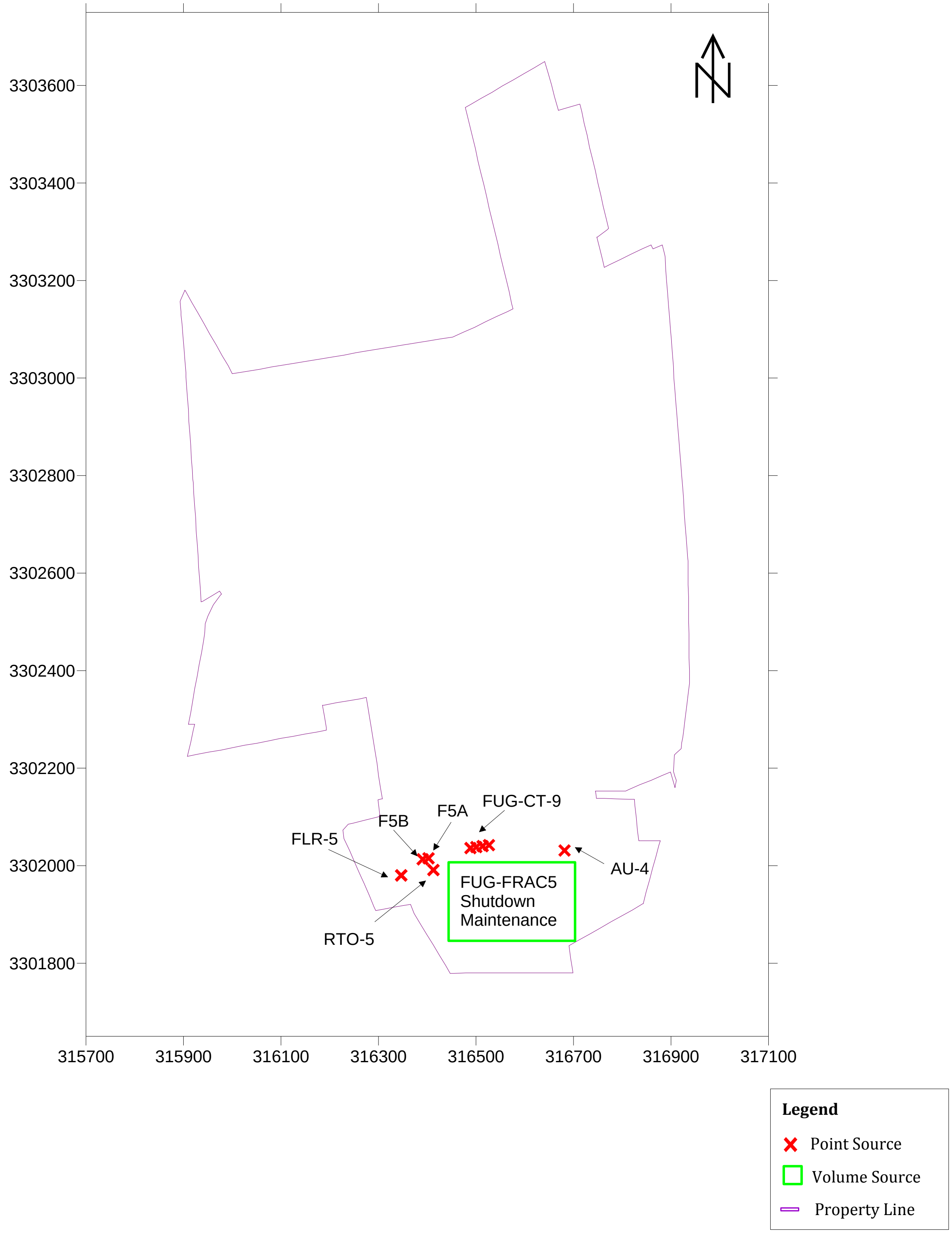
Figure 3-1.
Targa Midstream Services LLC
Mont Belvieu Area Map



4. PLOT PLAN

The plot plan showing the locations of the Mont Belvieu Plant's emission sources considered in this air dispersion modeling analysis and the property line is shown in Figure 4-1. Per U.S. EPA and TCEQ requirements, the locations of emission sources and structures included in this air quality dispersion modeling analysis are represented in the UTM coordinate system. The datum for the UTM coordinates is NAD83.

Figure 4-1. Mont Belvieu Plant Plot Plan



This section provides information about the air dispersion model, meteorological data, terrain, building wake effects, and the receptors inputs used in the air dispersion modeling analysis presented in this report.

5.1. AERMOD DISPERSION MODEL SELECTION

On November 9, 2005, the U.S. EPA promulgated American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD) for adoption into the Guideline on Air Quality Models (Revised). AERMOD includes a state-of-the-science downwash algorithm and utilizes AERMET, a meteorological data preprocessor that utilizes current planetary boundary layer (PBL) theory to calculate the dispersion coefficients (σ_y and σ_z).[8]

The most current version of the AERMOD model (version 12060) is used in conducting the air dispersion modeling analysis for the Mont Belvieu Plant. The modeling is performed using the regulatory default option, which includes the following:

- Stack-tip downwash and
- A routine for processing averages when calm wind conditions occur or when meteorological data is missing.

The current version of AERMOD contains algorithms for modeling the effects of aerodynamic downwash on point source emissions due to nearby buildings. In accordance with U.S. EPA requirements, direction-specific building dimensions are used for the Schulman downwash algorithms. The downwash algorithm is discussed in Section 5.4.

5.2. METEOROLOGICAL DATA

The EPA AERMOD program requires meteorological data preprocessed with the AERMET program. In addition to meteorological station data, three additional variables are considered when preprocessing the meteorological data for a site. These variables are:

- Surface roughness;
- Albedo; and
- Bowen Ratio.

TCEQ has created county-specific preprocessed meteorological data sets using AERMET (version 06341) for use in AERMOD air dispersion modeling. The air dispersion modeling for the Mont Belvieu Plant, which is located in Chambers County, is performed using TCEQ's 1988 AERMOD-ready meteorological data for Houston Intercontinental, Texas made available and approved through the TCEQ. The 1988 preprocessed meteorological data for Houston Intercontinental are based on surface observations taken from Houston Intercontinental (IAH - National Weather Service [NWS] Station Number 12960) and upper air measurements taken from Lake Charles (LCH - NWS Station Number 3637). The wind rose for the 1988 meteorological data is provided in Figure 5.2-1.

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[8] U.S. EPA, User's Guide for the AMS/EPA Regulatory Model-AERMOD, September 2004.

Each TCEQ-provided data set processed with the AERMET program comes with three different files, each representing a different surface roughness category:

- L – low surface roughness (0.05 m)
- M – medium surface roughness (0.5 m)
- H – high surface roughness (1.0 m)

As shown in Figure 3-1, the facility is located in a rural area that includes a medium density of existing commercial, industrial, and residential structures. Other areas near the facility are residential and include low vegetation, cultivated land, and trees. The typical surface roughness for this type of land use is generally between 0.1 – 0.7 m, which corresponds to the medium surface roughness category.[9]

Per EPA guidance, the appropriate values for surface roughness length (z_0) should be used in the AERMET meteorological processor to prepare the meteorological data for AERMOD.[10] The EPA recommended upwind distance for processing the land cover data to determine the effective z_0 for input to AERMET is 1 kilometer (km) relative to the meteorological tower (measurement site). However, for this modeling analysis the TCEQ guidance of using the 1 km distance relative to the application site (i.e., Mont Belvieu Plant) is used to process the land cover data. EPA has developed a tool called AERSURFACE (EPA, 2008) that can be used as an aid in determining realistic and reproducible surface characteristic values, including z_0.

An analysis is performed using AERSURFACE to confirm the appropriate surface roughness data set to be used in the air dispersion modeling analysis. Individual AERSURFACE runs using a 1 km radius circle centered at the facility and divided into 12 equal arc sectors are performed for annual, seasonal, and monthly periods. AERSURFACE requires the input of land cover data from U. S. Geological Survey (USGS) National Land Cover Data 1992 archives (NLCD92), which is used to determine the land cover types for the user-specified location.[11] In this modeling analysis, the NLCD92 data is downloaded from the USGS Seamless Data Server (SDS) through the following website: http://seamless.usgs.gov/. Based on the AERSURFACE output files, it can be concluded that the typical surface roughness for the location of the Mont Belvieu Plant should be categorized as medium.

Based on these qualitative and quantitative analyses, the TCEQ preprocessed meteorological data set corresponding to the medium surface roughness category is used in the modeling analyses.

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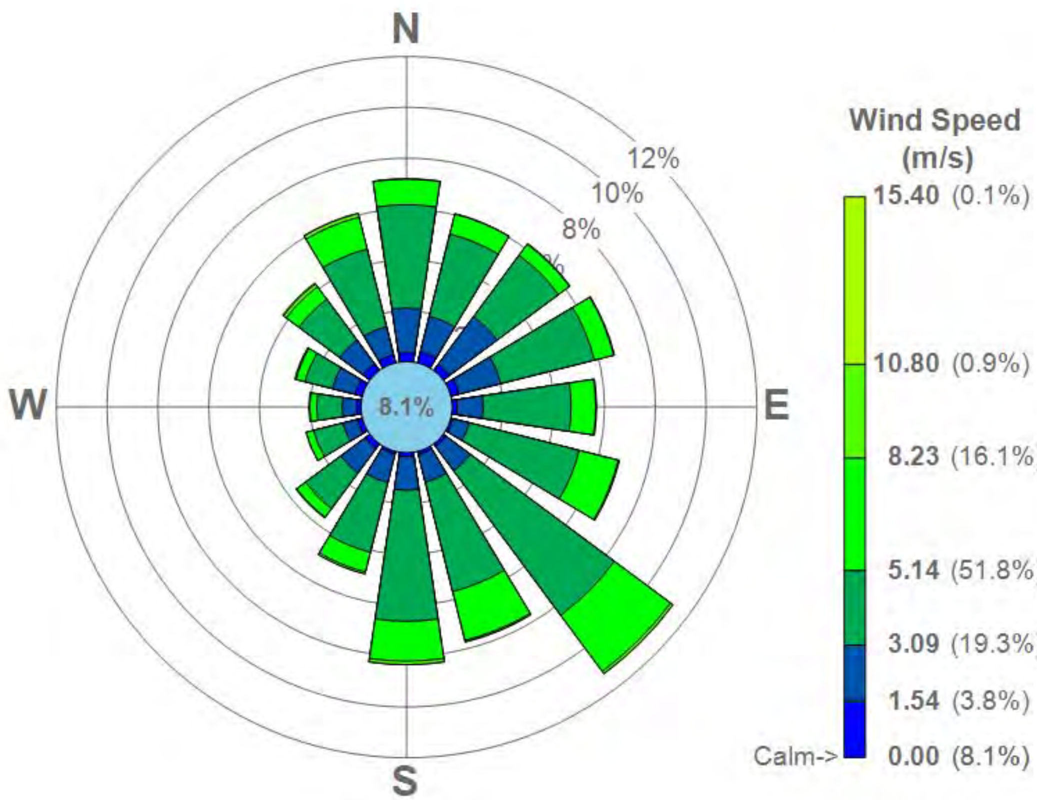
[9] AERMET.pdf (ftp://ftp.tceq.state.tx.us/pub/OPRR/APD/AERMET/AERMETv06341/BackgroundInformation/).

[10] EPA, AERMOD Implementation Guide, January 9, 2008.

[11] AERSURFACE User's Guide, EPA-454/B-08-001, January 2008.

Figure 5.2-1. Frequency of Wind Speed and Direction for 1988 for Houston Intercontinental, Texas



5.3. TERRAIN

The base elevation in the area of the facility is approximately 37 meters above mean sea level. The terrain elevation for each modeled on-site source and modeled receptor is determined using USGS National Elevation Dataset (NED). The USGS NED 1/3 arcsecond (10-meter resolution) file is used. The terrain height for each modeled receptor is calculated using the AERMOD terrain preprocessor AERMAP (version 11103). AERMAP computes the terrain height from the digital terrain elevations surrounding the modeled receptors and sources.

In addition to terrain elevation, an additional parameter called the hill height scale is required for each receptor to feed AERMOD's terrain modeling algorithms. AERMOD computes the impact at a receptor as a weighted interpolation between horizontal and terrain-following states using a critical dividing streamline approach. This scheme assumes that part of the plume mass will have enough energy to ascend and traverse over a terrain feature and the remainder will impinge and traverse around a terrain feature under certain meteorological conditions. The hill height scale is computed by the AERMAP terrain preprocessor for each receptor as a measure of the one terrain feature in the modeling domain that would have the greatest effect on plume behavior at that receptor.

The hill height scale does not represent the critical dividing streamline height itself, but supplies the computational algorithms with an indication of the relative relief within the modeling domain for the determination of the critical dividing streamline height for each hour of meteorological data.

According to Section 2.2.1 of EPA guidance, the NED array boundary for AERMAP must include all terrain features that exceed a 10 percent elevation slope from any given receptor in order to properly calculate the hill height scale at each receptor.[12] As previously mentioned, AERMAP (version 11103) is used to calculate terrain information for modeled receptors and sources. This version automatically selects the hill height domain as the extent of all terrain files, ensuring that all domain boundaries used in AERMAP processing are at a minimum equal to that required for proper handling of elevation slope.

5.4. BUILDING WAKE EFFECTS (DOWNWASH)

The emissions sources at the Mont Belvieu Plant are evaluated in terms of their proximity to nearby structures. The purpose of this evaluation is to determine if stack discharges may become caught in the turbulent wakes generated by these structures. Horizontal tanks and open structures are not considered as downwash structures because they do not generate significant wake effects. The Mont Belvieu Plant contains a variety of large structures and buildings that could serve as potential sources of downwash. Proposed structures in Train 5 along with existing structures to the north of Train 5 were included in the model.

5.5. RECEPTOR GRIDS

In the air dispersion modeling analyses, ground-level concentrations are calculated for at least five receptor grids. These five grids cover a region extending at least 10 kilometers (km) from all edges of the Mont Belvieu Plant property line. In accordance with TCEQ modeling guidance, receptor grids near the modeled facility require closer spacing to ensure the highest concentration is captured. In most situations, the maximum concentrations are found on or near a facility's property line. For the dispersion modeling analyses, the receptor grids are defined as follows:

1. The "property line grid" is a discrete receptor grid with the receptors spaced at 25-m intervals along the property line.
2. The "tight grid" contains 25-m spaced receptors extending at least 300 m from the property line exclusive of the receptors within the property line.
3. The "fine grid" contains 100-m spaced receptors extending at least 1 km from the property line exclusive of the receptors in the tight grid.
4. The "medium grid" contains 500-meter spaced receptors extending 5 km from the property line exclusive of receptors in the fine grid.
5. The "coarse grid" contains 1,000-meter spaced receptors extending 10 km from the property line exclusive of receptors in the medium grid.

[12] U.S. EPA, Office of Air Quality Planning and Standards, *User's Guide for the AMS/EPA Regulatory Model – AERMOD*, Research Triangle Park, North Carolina, EPA-454/B-03-001, September, 2004.

6. MODELING EMISSIONS INVENTORY

The following sections discuss the Mont Belvieu Plant emission sources and source characterization methodologies that are included in the air quality dispersion modeling analyses.

The TCEQ permit application explains the methodology for calculating the emissions in tons per year (tpy) and pounds per hour (lb/hr) for each of the Mont Belvieu Plant emission sources. Modeled emission rates for all criteria pollutants and speciated constituents are the same as those included in the permit application, except for NO_2. The proposed annual emission rates of oxides of nitrogen (NO_x) are multiplied by 0.75 to convert to NO_2 emission rates for air dispersion modeling purposes, per the Ambient Ratio Method. The proposed hourly emission rates of NO_x are multiplied by 0.80 to convert to NO_2 emission rates for air dispersion modeling purposes, per EPA guidance. A copy of Table 1(a) from the March 2012 permit application is included in Appendix A of this report.

All sources are modeled as point or volume sources. All sources with vertical momentum are modeled as point sources, and all fugitive emissions sources are modeled as volume sources. The following sections provide justification on the Mont Belvieu Plant's source parameters and modeled source types.

6.1. POINT SOURCES

In the modeling analyses, the majority of the equipment has a vertical stack that exhausts emissions into the atmosphere. The modeled stack parameters and criteria pollutant emission rates for the point sources are illustrated in the tables below. The non-criteria pollutants were modeled using the screening analysis method outlined in Section 2.2 of the report. The locations of the modeled point sources are shown in Figure 4-1.

Table 6.1-1. Point Source Modeling Parameters

EPN	Model Name	Description	Height Above Ground (meters)	Stack Diameter (meters)	Stack Velocity (m/s)	Temperature (K)
RTO-5	RTO5	Regenerative Thermal Oxidizer	9.14	0.56	9.62	449.82
RTO5-MSS	RTO5MSS	RTO Startup Emissions	9.14	0.56	9.62	449.82
AU-4	AU-4	Amine Still Vent During RTO Downtime	22.86	0.30	24.48	322.04
F5A	F5A	Hot Oil Heater	37.19	1.26	18.85	483.15
F5B	F5B	Hot Oil Heater	37.19	1.26	18.85	483.15
FUG-CT-9	FUGCT9A	Cooling Tower 9 - Fan #1	12.19	9.00	7.35	Ambient
FUG-CT-9	FUGCT9B	Cooling Tower 9 - Fan #2	12.19	9.00	7.35	Ambient
FUG-CT-9	FUGCT9C	Cooling Tower 9 - Fan #3	12.19	9.00	7.35	Ambient
FUG-CT-9	FUGCT9D	Cooling Tower 9 - Fan #4	12.19	9.00	7.35	Ambient
TK-2	TK2	Ucarsol Storage Tank	TBD	0.001	0.001	Ambient

Table 6.1-2. Point Source Modeled Emission Rates - Criteria Pollutants

		Hourly Emission Rates					Annual Emission Rates		
EPN	Model Name	NO_2 (g/s)	CO (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	SO_2 (g/s)	NO_2 (g/s)	$PM_{2.5}$ (g/s)	SO_2 (g/s)
RTO-5	RTO5	7.333E-03	2.790E-01	-	-	1.093E-02	6.874E-03	-	1.093E-02
RTO5-MSS	RTO5MSS	2.762E-05	3.452E-05	-	-	1.327E-07	2.589E-05	-	1.327E-07
AU-4	AU-4	-	-	-	-	-	-	-	-
F5A	F5A	7.280E-02	6.734E-01	7.280E-02	7.280E-02	1.060E-02	6.825E-02	7.280E-02	1.060E-02
F5B	F5B	7.280E-02	6.734E-01	7.280E-02	7.280E-02	1.060E-02	6.825E-02	7.280E-02	1.060E-02
FUG-CT-9	FUGCT9A	-	-	1.747E-02	5.240E-03	-	-	5.240E-03	-
FUG-CT-9	FUGCT9B	-	-	1.747E-02	5.240E-03	-	-	5.240E-03	-
FUG-CT-9	FUGCT9C	-	-	1.747E-02	5.240E-03	-	-	5.240E-03	-
FUG-CT-9	FUGCT9D	-	-	1.747E-02	5.240E-03	-	-	5.240E-03	-
TK-2	TK2	-	-	-	-	-	-	-	-

6.2. VOLUME SOURCES

The fugitive emissions are modeled as volume sources. According to EPA guidance for AERMOD, initial vertical dimension (σ_{z0}) is calculated per EPA guidance as the height divided by 2.15.[13] The initial lateral dimension (σ_{y0}) is calculated as the equivalent side length divided by 4.3.[14] The location of the modeled volume sources are shown in Figure 4-1. The modeled stack parameters for the volume sources are illustrated in the table below. The non-criteria pollutants were modeled using the screening analysis method outlined in Section 2.2 of the report.

Table 6.2-1. Volume Source Modeling Parameters

EPN	Model Name	Name	Height Above Ground (meters)	Release Height (meters)	Initial Lateral Dimension (meters)	Initial Vertical Dimension (meters)
FUG-FRAC5	FUGFRAC5	Frac5 Fugitives	9.80	1.53	27.61	1.42
Shutdown	FUGSD	Shutdown Emissions to Atmosphere	9.80	1.53	27.61	1.42
Maintenance	FUGMNT	Maintenance Emissions to Atmosphere	9.80	1.53	27.61	1.42

[13] Table 3-1, User's Guide for the AMS/ EPA Regulatory Model-AERMOD, EPA-454/B-03-001, September 2004.

[14] Ibid.

6.3. FLARE SOURCES

The flare emissions are modeled as point sources. According to TCEQ guidance for flares, the default exit velocity is 20 meters per second and the default exit temperature is 1,273 Kelvin.[15] The guidance also outlines the method to calculate the effective stack diameter based on the heating value of the combusted gas. The location of the modeled flare is shown in Figure 4-1. The modeled stack parameters and criteria pollutant emission rates for the flare source are illustrated in the tables below. The non-criteria pollutants were modeled using the screening analysis method outlined in Section 2.2 of the report.

Table 6.3-1. Flare Source Modeling Parameters

EPN	Model Name	Name	Height Above Ground (meters)	Effective Stack Diameter (meters)	Stack Velocity (m/s)	Temperature (K)
FLR-5	FLR5	Flare - Normal Operation	56.39	0.52	20.00	1,273.00
FLR-5	FLR5MNT	Controlled Maintenance Emissions	56.39	0.28	20.00	1,273.00
FLR-5	FLR5SU	Controlled Startup Emissions	56.39	0.59	20.00	1,273.00
FLR-5	FLR5SD	Controlled Shutdown Emissions	56.36	0.57	20.00	1,273.00

[15] Technical Basis for Flare Parameters, APD Technical Staff, September 10, 2004.

Table 6.3-2. Flare Source Modeled Emission Rates - Criteria Pollutants

EPN	Model Name	Name	Hourly Emission Rates			Annual Emission Rates
			NO_2 (g/s)	CO (g/s)	SO_2 (g/s)	NO_2 (g/s)
FLR-5	FLR5	Flare - Normal Operation	5.092E-02	5.226E-01	-	4.774E-02
FLR-5	FLR5MNT	Controlled Maintenance Emissions	2.350E-02	5.865E-02	-	1.467E-04
FLR-5	FLR5SU	Controlled Startup Emissions	1.265E-01	3.158E-01	-	3.193E-03
FLR-5	FLR5SD	Controlled Shutdown Emissions	2.395E-01	5.977E-01	-	3.203E-03

*.

The following sections discuss the determination of the impact area for both criteria pollutants and speciated non-criteria pollutants.

7.1. STATE NAAQS IMPACT AREA

As described in Section 2.1 of this modeling report, the GLC_{max} for CO (1-hour and 8-hour averaging periods), SO_2 (1-hour, 3-hour, 24-hour, and annual averaging periods), NO_2 (1-hour and annual averaging periods), PM_{10} (24-hour averaging period) and $PM_{2.5}$ (24-hour and annual averaging periods) are obtained using AERMOD. All sources associated with the project are modeled concurrently to determine the GLC_{max} for comparison to the SILs.

7.1.1. Significance Analysis

In the Significance Analysis, the Mont Belvieu Plant proposed emission sources are modeled. The resulting maximum modeled concentrations for the one year of modeled meteorological data are compared to the respective SILs. A summary of the comparison between the resulting GLC_{max} and the corresponding SIL for each averaging period and criteria pollutant is shown in Table 7.1-1 below.

Table 7.1-1. Significance Analysis Results

Pollutant and Averaging Period	Total Max. Modeled Concentration (µg/m³)	State NAAQS Significant Impact Level [SIL] (µg/m³)	Is Max. Modeled Concentration < SIL?
NO_2 Annual	0.12119	1	Yes
NO_2 1-hour	3.36643	7.5	Yes
CO 8-hour	78.88237	500	Yes
CO 1-hour	127.61852	2,000	Yes
PM_{10} 24-hour	0.71904	5	Yes
$PM_{2.5}$ Annual	0.12850	0.3	Yes
$PM_{2.5}$ 24-hour	0.71904	1.2	Yes
SO_2 Annual	0.09537	80	Yes
SO_2 24-hour	1.93277	365	Yes
SO_2 3-hour	3.63167	25	Yes
SO_2 1-hour	4.99898	7.8	Yes

As can be seen in the table, the total GLC_{max} for all pollutants and averaging periods is less than the corresponding SIL. Normal operations and MSS activities were conservatively modeled simultaneously. The hourly emissions from the RTO startup (EPN RTO5-MSS), however, were modeled as annualized values since these emissions will only occur during 8 hours of the entire year. Per the results in the table above, no further NAAQS evaluation is required for NO_2 (1-hour and annual averaging periods), CO (1-hour and 8-hour averaging periods), SO_2 (1-hour, 3-hour, 24-hour, and annual averaging periods), PM_{10} (annual averaging period), and $PM_{2.5}$ (24-hour and annual averaging periods).

7.2. HEALTH EFFECTS EVALUATION

This section documents the modeling results for the State health effects evaluation. As described in Section 2.2 of this modeling report, the speciated constituents were first evaluated using MERA Step 4C, 4D, and 5. The results of the MERA are provided in Table 7.2-1.

All constituents not screened out during MERA Steps 4C, 4D, and 5 are evaluated according to Step 11 as described in Section 2.2.3 of this modeling report.

Site-wide modeling using AERMOD was conducted and the resulting GLC_{max} value is compared to its corresponding ESL value. The 1-hour and annual GLC_{max} values for all pollutants are less than the respective ESLs. Therefore, compliance with Step 11 of the MERA guidance for all pollutants released at the Mont Belvieu Plant is demonstrated. The maximum significant impact area should not extend past the property line of the facility.

Table 7.2-1. MERA Results and Radius of Significant Impact

Constituent	Short-term ESL (µg/m³)	Long-term ESL (µg/m³)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	MERA Step 4C Result	MERA Step 4D Result	MERA Step 5	MERA Step 11	
								1-Hour GLC_{max} < Hourly ESL	Annual GLC_{max} < Annual ESL
Ammonia	170	17	0.91	3.99	No	No	No	Yes	Yes
Ucarsol AP-810	100	10	0.01	0.01	Yes	-	-	-	-
i-Butane	4800	1900	32.13	2.69	No	No	No	Yes	Yes
n-Butane	23750	2375	38.39	2.83	No	No	Yes, APD Review Acceptable	-	-
i-Pentane	3800	7200	11.61	0.41	No	No	Yes, APD Review Acceptable	-	-
n-Pentane	4100	7200	8.67	0.27	No	No	Yes, APD Review Acceptable	-	-
n-Hexane	5300	200	1.35	0.62	No	No	Yes, APD Review Acceptable	-	-
n-Heptane	3500	350	7.46	0.22	No	No	Yes, APD Review Acceptable	-	-
COS	1330	2.6	1.39E-05	6.10E-05	No	No	Yes, APD Review Acceptable	-	-
Methyl Mercaptan	2	1	2.06E-04	9.00E-04	Yes	-	-	-	-
Ethyl Mercaptan	0.8	1.3	6.30E-05	2.76E-04	No	Yes, APD Review Acceptable	-	-	-
Dimethyl Sulfide	7.6	25	1.11E-05	4.86E-05	Yes	-	-	-	-
n-Propyl Mercaptan	2	1.6	1.89E-05	8.29E-05	Yes	-	-	-	-
n-Butyl Mercaptan	2	1.8	9.35E-07	4.10E-06	Yes	-	-	-	-
Dimethyl Disulfide	20	14	8.11E-07	3.55E-06	Yes	-	-	-	-
Diethyl Disulfide	20	14	1.14E-06	5.00E-06	Yes	-	-	-	-
Benzene	170	4.5	4.59E-04	2.01E-03	No	No	Yes, APD Review Acceptable	-	-
Toluene	640	1200	4.86E-04	2.13E-03	Yes	-	-	-	-
Ethylbenzene	740	570	3.17E-04	1.39E-03	Yes	-	-	-	-
m-Xylene	180	180	1.54E-04	6.75E-04	Yes	-	-	-	-

APPENDIX A – TCEQ TABLE 1(A)

TCEQ

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:	November 2012	**Permit No.:**	TBD	**Regulated Entity No.:**	RN100222900
Area Name:	Mont Belvieu Fractionator			**Customer Reference No.:**	CN601301559

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate	
(A) EPN	(B) FIN	(C) NAME		(A) Pound	(B) TPY
TEG-2	FLR-5, TEG-2	Flare - Normal Operation	CO	4.15	18.17
			NO_x	0.51	2.21
			VOC	1.70	1.75
			SO_2	0.00E+00	0.00E+00
			H_2S	0.05	<0.01
RTO-5	RTO-5	RTO-5 Regenerative Thermal Oxidizer	CO	2.21	9.70
			NO_x	0.07	0.32
			VOC	0.01	0.06
			SO_2	0.09	0.19
			H_2S	4.66E-04	1.02E-03
RTO5-MSS	RTO5-MSS	RTO Startup Emissions	CO	0.30	1.20E-03
			NO_x	0.30	1.20E-03
			VOC	0.01	4.23E-05
			SO_2	1.15E-03	4.61E-06
AU-4	AU-4	Amine Still Vent During RTO Downtime	VOC	1.32	0.10
			H_2S	0.05	3.54E-03
F5A	F5A	Hot Oil Heater	CO	5.34	23.41
			NO_x	0.72	3.16
			$PM/PM_{10}/PM_{2.5}$	0.58	2.53
			SO_2	0.08	0.37
			VOC	0.09	0.38
			NH_3	0.46	1.99
F5B	F5B	Hot Oil Heater	CO	5.34	23.41
			NO_x	0.72	3.16
			$PM/PM_{10}/PM_{2.5}$	0.58	2.53
			SO_2	0.08	0.37
			VOC	0.09	0.38
			NH_3	0.46	1.99

Table 1(a) Emission Point Summary

Date:	November 2012	**Permit No.:**	TBD	**Regulated Entity No.:**	RN100222900
Area Name:	Mont Belvieu Fractionator			**Customer Reference No.:**	CN601301559

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate	
(A) EPN	(B) FIN	(C) NAME		(A) Pound	(B) TPY
FUG-FRAC5	FUG-FRAC5	Frac5 Fugitives	VOC	0.31	1.38
FUG-CT-9	FUG-CT-9	Cooling Tower 9	PM	0.55	2.43
			$PM_{10}/PM_{2.5}$	0.17	0.73
			VOC	1.63	7.13
FLR-5	Maintenance	Controlled Maintenance Emissions	CO	0.47	0.01
			NO_x	0.23	<0.01
			VOC	13.96	0.63
FLR-5	Startup	Controlled Startup Emissions	CO	2.45	0.05
			NO_x	1.23	0.03
			VOC	48.01	0.51
FLR-5	Shutdown	Controlled Shutdown Emissions	CO	4.69	0.05
			NO_x	2.35	0.03
			VOC	43.68	0.99
Maintenance	Maintenance	Maintenance Emissions to Atmosphere	VOC	1.15	0.01
Shutdown	Shutdown	Shutdown Emissions to Atmosphere	VOC	10.52	0.07
TK-2	TK-2	Ucarsol Storage Tank	VOC	0.01	0.01

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:	November 2012	**Permit No.:**	TBD	**Regulated Entity No.:**	RN100222900
Area Name:	Mont Belvieu Fractionator			**Customer Reference No.:**	CN601301559

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA			EMISSION POINT DISCHARGE PARAMETERS									
1. Emission Point			4. UTM Coordinates of Emission Point			Source	6.Stack Exit Data			7. Fugitives		
EPN (A)	FIN (B)	NAME (C)	Zone	East (Meters)	North (Meters)	5. Height Above Ground (Feet)	Diameter (Feet) (A)	Velocity (FPS) (B)	Temperature (°f) (C)	Length (ft.) (A)	Width (ft.) (B)	Axis Degrees (C)
TEG-2	FLR-5, TEG-2	Flare - Normal Operation	15	316296	3301977	185	1.79	65.62	1831.73	--	--	--
RTO-5	RTO-5	RTO-5 Regenerative Thermal Oxidizer	15	316362	3301988	30	1.83	31.57	350			
RTO5-MSS	RTO5-MSS	RTO Startup Emissions	15	316362	3301988	30	1.83	31.57	350			
AU-4	AU-4	Amine Still Vent During RTO Downtime	15	316631	3302028	75	1.00	80.30	120			
F5A	F5A	Hot Oil Heater	15	316340	3302010	122	4.12	61.85	410	--	--	--
F5B	F5B	Hot Oil Heater	15	316352	3302012	122	4.12	61.85	410	--	--	--
FUG-FRAC5	FUG-FRAC5	Frac5 Fugitives	15	316476	3301982	10	--	--	--	464	327	345
FUG-CT-9	FUG-CT-9	Cooling Tower 9	15	316339	3301923	40	29.53	24.10	Ambient	--	--	--
FLR-5	Maintenance	Controlled Maintenance Emissions	15	316296	3301977	185	1.79	65.62	1831.73	--	--	--
FLR-5	Startup	Controlled Startup Emissions	15	316296	3301977	185	1.79	65.62	1831.73	--	--	--
FLR-5	Shutdown	Controlled Shutdown Emissions	15	316296	3301977	185	1.79	65.62	1831.73	--	--	--
Maintenance	Maintenance	Maintenance Emissions to Atmosphere	15	316476	3301982	10	--	--	--	464	327	345
Shutdown	Shutdown	Shutdown Emissions to Atmosphere	15	316476	3301982	10	--	--	--	464	327	345
TK-2	TK-2	Ucarsol Storage Tank	15			TBD	0.003	0.003	Ambient			