DRAFT FINAL REPORT

Emissions Inventory
Review and Improvement Plan

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December 15, 2011

Acknowledgements

This study was supported by a grant from the Texas Commission of Environmental Quality (TCEQ) through the El Paso Metropolitan Planning Organization (MPO). The authors are indebted to Mr. Victor Valenzuela of TCEQ Region 6 and Mr. George Pinal of MPO. Mr. Valenzuela not only assisted the authors in securing valuable data in a timely fashion but also actively participated in every phase of this study. Mr. Pinal has been instrumental to the project not only in providing timely and succinct instructions to the authors but also in making valuable comments and analysis to the report. Their constant presences in the biweekly project meetings have been helpful and inspirational to the research team. Their dedication and commitment to this project is gratefully appreciated. We wish to thank as well Mr. Steven Smeltzer with the Alamo area Council of Governments (AACOG), Mr. Fernando Mercado with TCEQ and Mr. Bright Dornblaser with TCEQ for their valuable input and foresight.

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1.0 Introduction

Emission Inventories (EIs) are summaries of the amount of air pollutants emanated from various sources during a given time period. These sources include, but are not limited to, household activities, industrial, commercial, or agricultural operations, onroad vehicular movements, and nonroad equipment operations. EIs are prepared to quantify, to the best extent possible, the pollutants generated within a metropolitan area or in a region where air pollution may impact human health as well as the natural environment. EIs can range from a list of estimated emissions compiled from previously-published EI data to a comprehensive inventory of a facility using specific source test data that will be used to support compliance activities (EPA 1997).

An emission inventory improvement plan (EIIP) is designed to promote the development of EIs that have targeted quality objectives, are cost-effective, and contain reliable and accessible data for end users (EPA 1997). In this report, the EIIP is built on the EI for El Paso County, Texas by adding to the existing emission database sources that might not have been targeted for inclusion previously. It also includes modifications to existing methods used for estimating emissions from several source categories.

This report has two purposes. First, the existing EI data are reviewed to identify major emission sources (or source categories) that may be significant ozone precursors, under- or over-estimated, accompanied by high levels of uncertainty, or require additional information in the Paso del Norte (PdN) region. The years reviewed are 2002, 2005 and 2008 for area and nonroad mobile sources, 1999, 2002, 2004, 2005 and 2009 for point sources, and 2005 and 2010 for onroad mobile sources. Second, six emission sources in the PdN are identified with plans or methodologies outlined to improve the data quality of the EIs. Support data and illustrations of calculation methods are included in the Appendices.

This report is a deliverable specified in the Rider 8 work plan established between TCEQ, the El Paso Metropolitan Planning Organization (EPMPO), and the University of Texas at El Paso (UTEP).

1.1 Emission Inventory Improvement Plans

Emission inventory improvement plans (EIIPs) recommend methods of developing emissions information for facilities, sources, or regions which are likely not considered in the normal EI tabulation. EIIPs may be developed when surrogate data calculations generate questionable results. Potential reasons for lack of inclusion of an EI for some sources may be the lack of a responsible party which could undertake or be responsible for emission reductions as specified in a State Implementation Plan (SIP) should the SIP recommend such a reduction. Examples of sources which are not quantified include truck stops and the international ports of entry.

Other reasons for the lack of inclusion in EI tabulations may be the potential national security value of the data. This could be the case when a major military base is located within the urban airshed. In the case of El Paso, the Ft. Bliss Military Reservation is located within the central region of El Paso and extends beyond northeast El Paso County and into Otero County, New Mexico. Military reservations which may cite national security confidentiality may be an air pollution emissions source where lack of information could skew modeling results should an attainment demonstration be attempted. Ft. Bliss generates air emissions from tactical vehicles such as tanks, armored personnel carriers, helicopters, air defense artillery systems, and diesel generators which may be quantified or estimated and added to the EI for El Paso to improve modeling performance and results.

EIIPs require substantial thought in order to not pursue quantifying emissions for sources which may be irrelevant toward air quality planning strategies. A series of questions involved in preparing an EIIP are listed below.

A. Why does this particular source category or group of categories need to be "improved"?
B. Are other agencies working on similar improvements right now? (If the answer is yes then it would be a good idea to either collaborate with these agencies or corroborate their work by providing convincing evidence.)
C. How does one propose to "improve" the emissions inventory for this category or group of categories?
D. Is the strategy for the EIIP a "bottom up" or "top down" strategy? If it is a "top-down" strategy why was it chosen as opposed to a "bottom-up" strategy?
E. What information, specifically, will be improved - activity data, emissions factors, etc.?
F. Will data be collected? If so, has a sampling design been prepared to obtain statistically significant data that meets the desired margin of error?
G. Will an existing data set be used? If so, what strengths and limitations does this data have? Why is it better than the current data being used?
H. What is the spatial resolution of the data to be used? Does this represent an improvement in the current inventory?
I. Will the strategy produce emissions inventory improvements that are of sufficiently high quality that TCEQ will feel comfortable including the data in TexAER?

This report identifies six source categories for improvement. Some are not included in the EI tabulation; some are found inaccurate from the EI reviews; and some utilize methodologies that may be improved for better emission estimates. The questions listed above were asked for each of the sources identified for improvement.

The six sources of emissions identified for improvement are:

- Light duty and heavy duty vehicles at the El Paso-Juarez international ports of entry;
- Tactical operations at Ft Bliss Military Reservation;
- Locomotives;
- Aircraft, auxiliary power units, and airport ground support equipment;

- Extended idling of heavy duty truck at truck stops and rest areas; and
- Dry cleaners

1.2 Organization of This Report

This report is organized as follows:

- Sections 2 through 7 provide a brief emissions inventory review for onroad mobile, nonroad mobile, area, and point sources. The methodologies of current EI development are reviewed, and potential source types are identified for further improvements;
- Section 8 discusses the emission inventory improvement plan for 6 source types. The methodology for the EI development was described for each one of them;
- Appendices 3 through 8 contain EIIP protocols for each of the 6 sources. The detailed protocols describe the methods, emission factors, assumptions, and sample calculations to be used for emission estimation for each source type.

2.0 Onroad Emission Inventory

Onroad mobile emissions are calculated for a broad range of vehicles which transit the public roadways. The category of onroad mobile sources includes passenger vehicles, buses, light-duty and heavy-duty trucks, motorcycles, and tractor-trailer trucks among others. Vehicles are diesel, gasoline, or alternate fuel powered.

2.1 Introduction to Onroad Mobile Emissions

The onroad EI in the El Paso region is maintained by the El Paso Metropolitan Planning Organization (MPO). The planning area of El Paso MPO covers the El Paso metropolitan area, including Sunland Park, Santa Teresa, Anthony and Chaparral in New Mexico, and Socorro, Horizon City and Fabens in Texas. El Paso MPO published Transportation Conformity Reports in 2006 and 2010 (EPMPO 2006, 2010b). The El Paso County, TX, has attained the one-hour NAAQS of 125 ppb for ozone since 2001 even though this standard was revoked by EPA in 2005. El Paso MPO's study area includes part of the Doña Ana County, NM which is officially designated in attainment of the ozone NAAQS since June 15, 2005. With this status, El Paso MPO is no longer required to perform onroad emission modeling to estimate the level of VOC and NOx, the two ozone precursors, in the 2006 and 2010 Transportation Conformity Reports.

The 2006 and 2010 Transportation Conformity Reports, however, did estimate the Motor Vehicle Emissions Budgets (MVEB) for CO and PM_{10} for El Paso County. The emission budgets were estimated by means of MOBILE6. PM_{10} was estimated for the summer and CO for the winter conditions. The analysis years were 2005, 2015, 2025 and 2030 in the 2006 report. The planning years were 2010, 2020, 2025 and 2035 in the 2010 report.

2.1.1 Travel Demand Model

El Paso MPO applied a Travel Demand Model (TDM), developed using the TransCAD transportation planning software, for regional transportation planning. The TDM model area covers the entire MPO study area. Figure 2-1 shows the transportation network modeled in TransCAD for 2005 (EPMPO, 2005). The modeled networks were progressively expanded over the horizon years. For each analysis year, the TDM was executed to estimate the Vehicle-Miles Traveled (VMT) for a typical weekday. The TDM took into account the future demographics, highway projects, road types, capacity, and transit use in the years of interest.

After El Paso MPO performed TransCAD modeling, subsequent estimation of emissions using MOBILE6 was carried out by Texas Transportation Institute (TTI). Before running MOBILE6, the link-based VMT outputs from the TDM were adjusted by the hours, and checked for consistency against available data in Texas Department of Transportation's (TxDOT's) traffic counts by means of in-house utility programs developed by TTI. The adjusted outputs were fed into MOBILE6 for the estimation of CO and PM_{10} emissions. The MOBILE6 estimation process incorporated the local vehicle class distribution, age distribution, diesel fractions, VMT mix, etc. Outputs of MOBILE6 were post-processed to produce link-based, hourly onroad emission estimates.

The El Paso MPO published the following two reports which have more details on the VMT estimations by the TDM model: Gateway 2030 Metropolitan Transportation Plan (MTP) (EPMPO 2006) and Mission 2035 MTP (EPMPO 2010a). VMT estimates were calculated for years 2000, 2005, 2015, 2025 in Gateway 2030 MTP, and for years 2010, 2020 and 2025 in the Mission 2035 MTP. It is important to note that Gateway 2030 contains estimates of total VOC and NOx emissions (in tons/day) for years 2005, 2015 and 2030.

2.1.2 Population Trends

Figure 2-2 plots the population trend for El Paso based on the data reported in the Gateway 2030 MTP and Mission 2035 MTP. The Gateway 2030 MTP applies a faster population growth rate. The Mission 2035 MTP adjusted the forecast due to the economic conditions in recent years.

2.1.3 Vehicle Miles Traveled

Figure 2-3 presents the increase in projected total VMT in the TDM's network over the years. In the Mission 2035 MTP, the population growth had been moderate and therefore, as shown in Figure 2-3, the growth in total VMT was not as high as projected in the Gateway 2030 MTP. As indicated in Figure 2-4, the total VMT is strongly correlated with the population, with an R^2 = 0.91

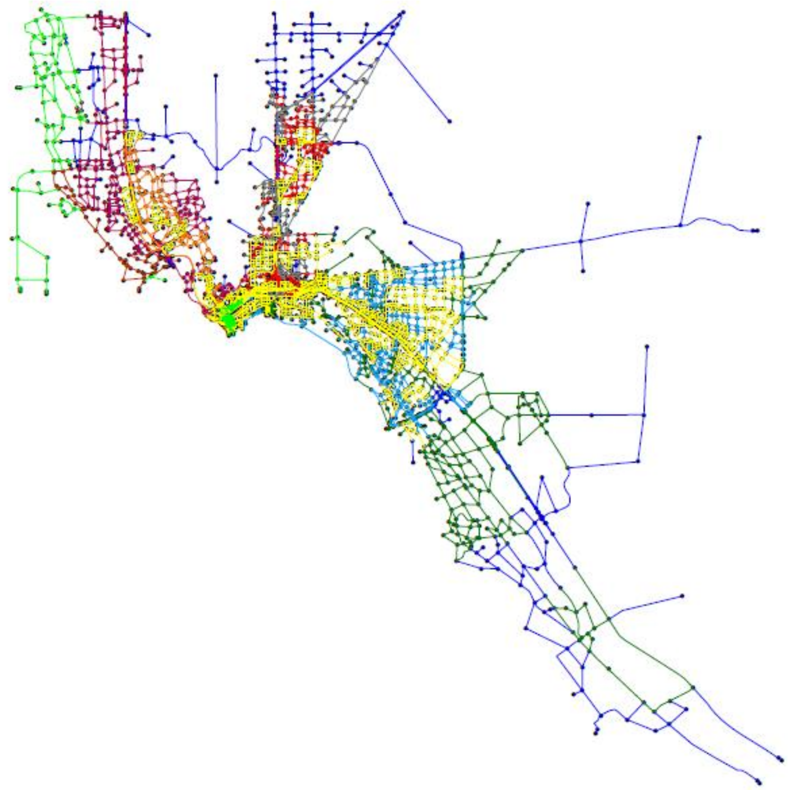

Figure 2-1 Transportation network in the El Paso MPO's 2005 Travel Demand Model

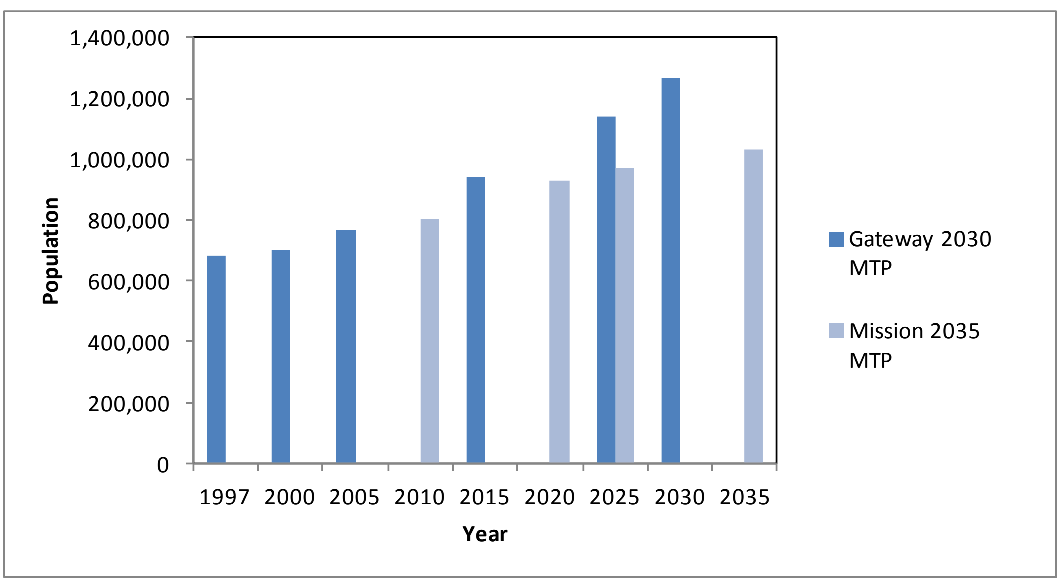

Figure 2-2 Population forecasts in the El Paso Travel Demand Models

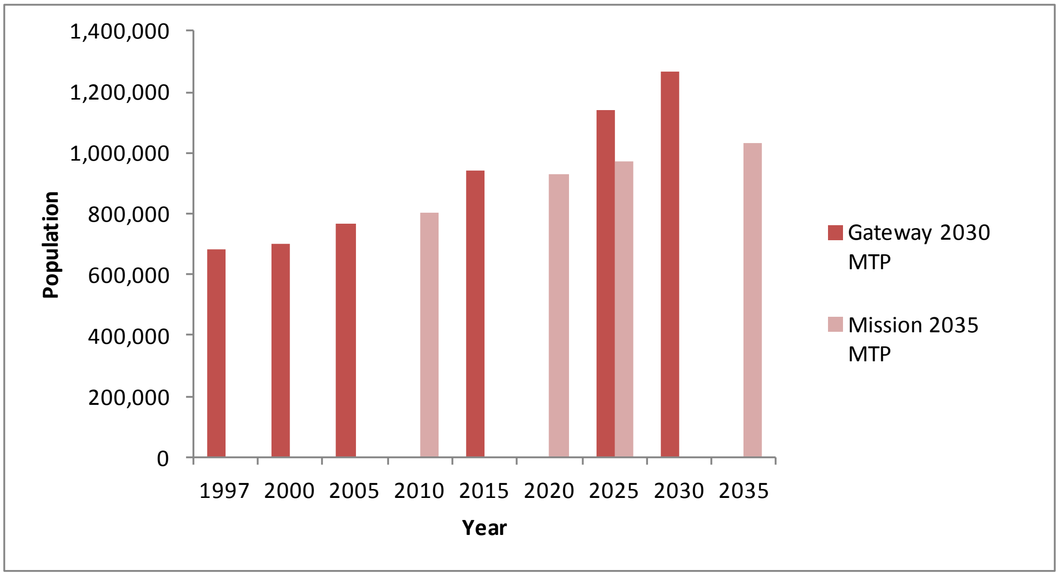

Figure 2-3 Total VMT forecasts in the El Paso Travel Demand Models

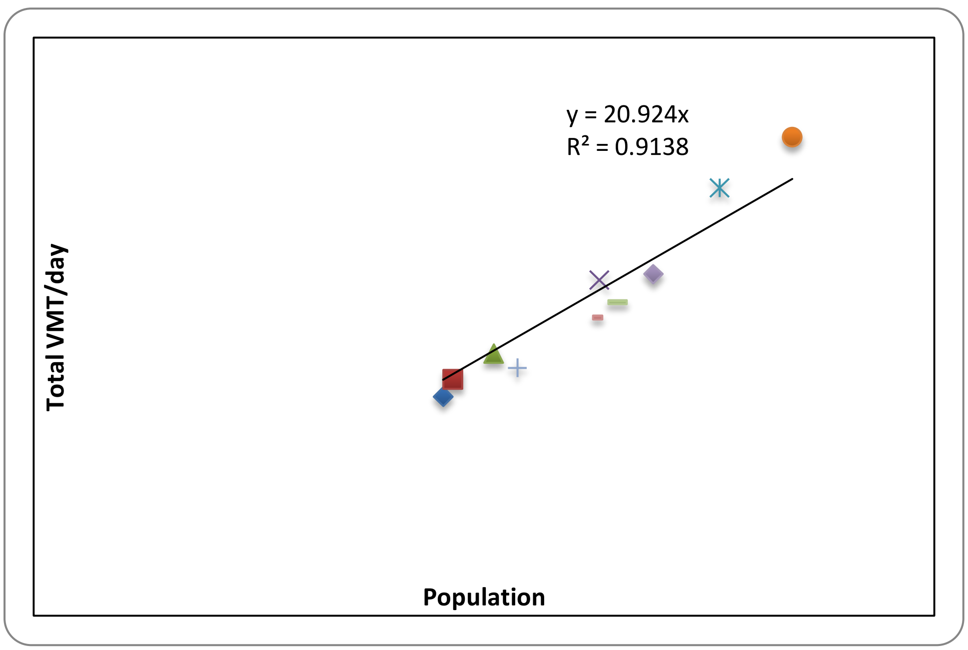

Figure 2-4 Correlation between total VMT and population

2.2 Review of Mobile Source VOC and NOx Emissions

Figure 2-5 identifies trends of the estimated total onroad VOC and NOx emissions, as reported in the Gateway 2030 MTP. Only data for four analysis years is available. The projected NOx emissions would reduce over the years but the rate of reduction would almost diminish in 2030.

The total VOC emissions were projected to reach a minimum in 2025 but would increase slightly in 2030.

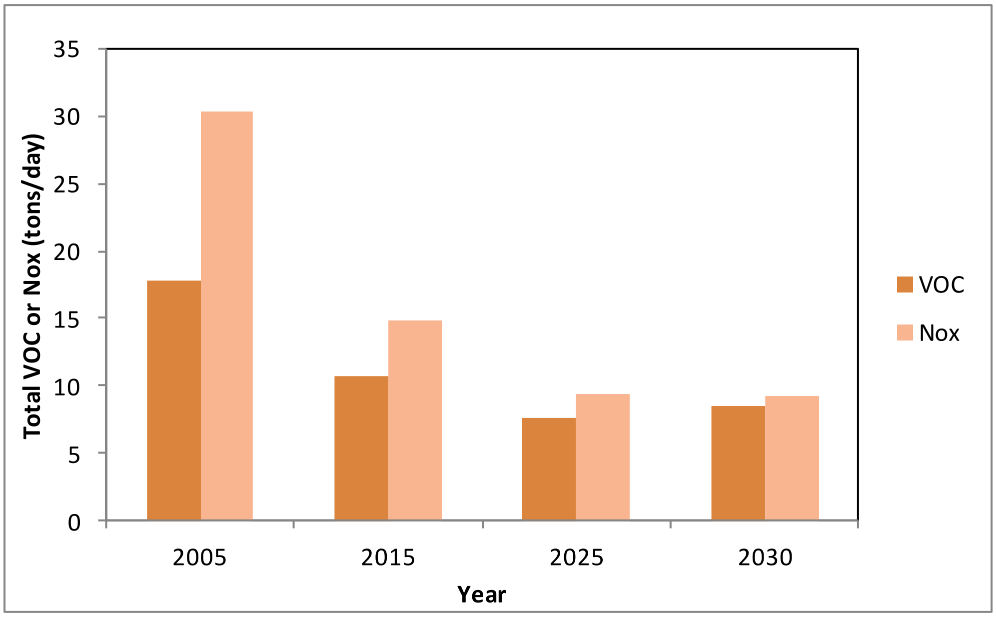

Figure 2-5 Total daily VOC and NOx emission estimates in the El Paso region

2.3 Potential Strategies to Reduce Onroad Mobile Source Emissions

Eco-driving as a strategy of reducing onroad mobile emissions has recently received added attention after being reported at a meeting held by the Joint Advisory Committee for the Improvement of Air Quality in the Paso del Norte Air Basin (JAC). The Texas Transportation Institute (TTI) reported in a recent JAC meeting that *eco-driving* could save fuel and reduce emissions based on the preliminary results of an onroad vehicle testing conducted as part of a study (TTI, 2011).

Eco-driving comprises a series of strategies to reduce fuel consumption. One specific strategy is to avoiding idling when possible, like allowing the vehicle to creep using the vehicle's propulsion system rather than applying the accelerator to travel less than 100 feet. Examples of when this kind of eco-driving may be employed include traveling in the vehicle queue on the El Paso-Juarez international bridges, or traveling in rush-hour traffic where vehicles advance one or two car-lengths at a time.

Eco-driving requires further investigation to establish a reasonable emission factor when properly employed. Preliminary results provided by TTI indicate a vehicle may obtain a 3%-5% fuel savings which translates to emission reductions.

3.0 Area Source Emissions

Area sources are those air pollution sources considered too small and too numerous to be handled individually as point source emissions. Area sources are primarily subdivided into two groups characterized by the emission mechanism: 1) evaporative emissions, and 2) fuel combustion emissions. Sources of evaporative losses include, but are not limited to, i) operations at gasoline service stations; ii) uses of solvents in dry cleaning, degreasing, surface coating operations, automotive paint shops, and architectural coatings; and iii) leakage from underground storage tanks. Fuel combustion sources include stationary source fuel combustion in residences, industrial processes, commercial operations, forest fires, structural fires, and solid waste disposal by burning (TCEQ, 2002).

3.1 Review of Emissions

Area source emissions inventories (ASEIs) are prepared at three-year intervals by the TCEQ. ASEIs for the years 2002, 2005, and 2008 were obtained from Texas Air Emissions Repository (TexAER) website (TCEQ, accessed August, 2011). TCEQ's 1999 ASEI is a comprehensive baseline of area source emissions data from which follow-up ASEIs are updated. The 2002 ASEI provides comprehensive information which builds off of the 1999 ASEI using EPA's Economic Growth Analysis System (EGAS-4) for most of the SCCs. EGAS-4 is an emissions activity forecast software that provides State and local governments with an EPA-approved set of emissions activity growth factors.

able 3-1 lists seven primary non-point source categories, presented as the first 2 digits of the Source Classification Codes (SCC). A 10-digit SCC presents a detailed description of an air pollutant emitter and/or facility. However, this report summarizes data only to the 7-digit level which is also considered a high level of detail for ASEI information. Appendix 1 contains a list of most important area sources in the Paso del Norte Region by 7-digit SCC with brief descriptions.

Table 3-2 summarizes the 2002 area source emissions in TPY based on 2-digit SCCs. As indicated, "Solvent Utilization" comprises the highest VOC emission source category. "Stationary Source Fuel Combustion" is the source for highest nitrogen oxides emissions. PM_{10} comprised the largest component of criteria pollutant from area sources in 2002. Road Construction, vehicular movements on paved road, and heavy construction are the major contributors of PM_{10} emissions.

Table 3-1 Two-digit non-point source classification categories

2-Digit Non-Point Source Classification Categories	
SCC	Source Classification
21xxxxxxxx	STATIONARY SOURCE FUEL COMBUSTION
22xxxxxxxx	MOBILE SOURCES
23xxxxxxxx	INDUSTRIAL PROCESSES
24xxxxxxxx	SOLVENT UTILIZATION
25xxxxxxxx	STORAGE AND TRANSPORT
26xxxxxxxx	WASTE DISPOSAL - TREATMENT AND RECOVERY
28xxxxxxxx	MISCELLANEOUS AREA SOURCES

Table 3-2 2002 Area source emissions inventory summary (in TPY)

Source Classification	VOC	N0x	CO	SO2	PM10	PM2.5	NH3
STATIONARY SOURCE FUEL COMBUSTION	480	1,174	1,642	404	443	334	14
MOBILE SOURCES	-	-	-	-	3,726	280	-
INDUSTRIAL PROCESSES	109	0	69		9,244	1,980	-
SOLVENT UTILIZATION	5,524	-	-	-	-	-	-
STORAGE AND TRANSPORT	1,052	-	-	-	-	-	-
WASTE DISPOSAL - TREATMENT AND RECOVERY	706	21	4,251	4	601	595	0
MISCELLANEOUS AREA SOURCES	15	2	221	4	1,713	392	2,577
TOTALS	7,887	1,198	6,183	412	15,727	3,582	2,591

Table 3-3 summarizes the 2005 area source emissions based on broad category 2-digit SCCs. Data indicates growth in VOC, NOx, CO, NH_3, and SO_2 emissions and a significant reduction in PM_{10} and $PM_{2.5}$ emissions.

Table 3-4 summarizes the 2008 area source emissions based on the broad category 2-digit SCCs. Data indicates continued growth in VOC, NOx, CO, NH_3, PM_{10} , and SO_2 emissions. $PM_{2.5}$ emissions were roughly the same as that reported for 2005. Source emissions increased from those reported in the 2005 ASEI using EGAS-4, contractor updates, implementation of control strategies and other available methods. One notices that Tables 3-3 and 3-4 show an increase of almost 1,000 tons (~14%) in the “solvent utilization” category.

Figure 3-1 summarizes criteria pollutant emissions described in the above tables for the years 2002, 2005, and 2008. Figure 3-2 presents 3-years of major area source VOC emissions in El Paso by 7-digit SCC. A table with brief descriptions of the 7-digit SCCs is attached in Appendix 1. Architectual coatings represent the greatest amount of VOC emissions. Evaporative losses from Stage 1 and Stage 2 refuelings represent the the second highest source of VOC emissions. Personal care products generate the third highest source of VOC emissions.

Table 3-3 2005 area source emissions inventory summary

Source Classification	VOC	N0x	CO	SO2	PM10	PM2.5	NH3
STATIONARY SOURCE FUEL COMBUSTION	478	1196	1644	405	286	279	14
MOBILE SOURCES	-	-	-	-	1957		
INDUSTRIAL PROCESSES	115	0	72		4794	1096	
SOLVENT UTILIZATION	5938	-	-	-	-	-	-
STORAGE AND TRANSPORT	1020	-	-	-	-	-	-
WASTE DISPOSAL - TREATMENT AND RECOVERY	740	23	4465	4	280	280	0
MISCELLANEOUS AREA SOURCES	18	3	236	4	946	232	2809
TOTALS	8308	1221	6417	413	8263	1887	2823

Table 3-4 2008 area source emission inventory summary

Source Classification	VOC	N0x	CO	SO2	PM10	PM2.5	NH3
STATIONARY SOURCE FUEL COMBUSTION	485	1214	1738	414	206	199	20
MOBILE SOURCES					2041		
INDUSTRIAL PROCESSES	156	0	76		4863	1101	
SOLVENT UTILIZATION	6871						
STORAGE AND TRANSPORT	1226						
WASTE DISPOSAL - TREATMENT AND RECOVERY	759	23	4656	4	292	292	0
MISCELLANEOUS AREA SOURCES	17	3	237	4	1035	253	3108
TOTALS	9,513	1,240	6,707	422	8437	1844	3128

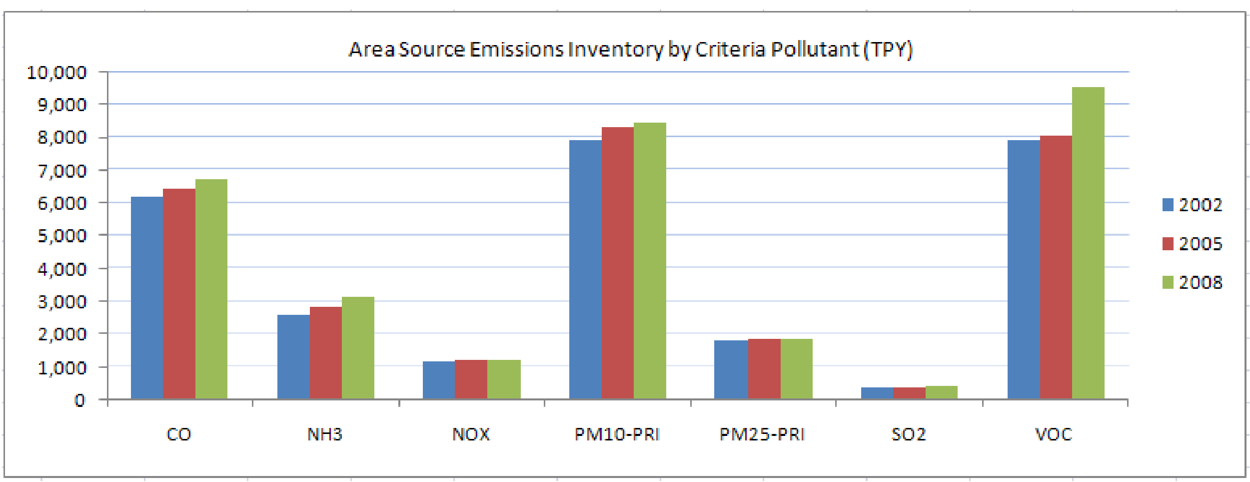

Figure 3-1 Source emissions total by criteria pollutant – 2002, 2005, 2008

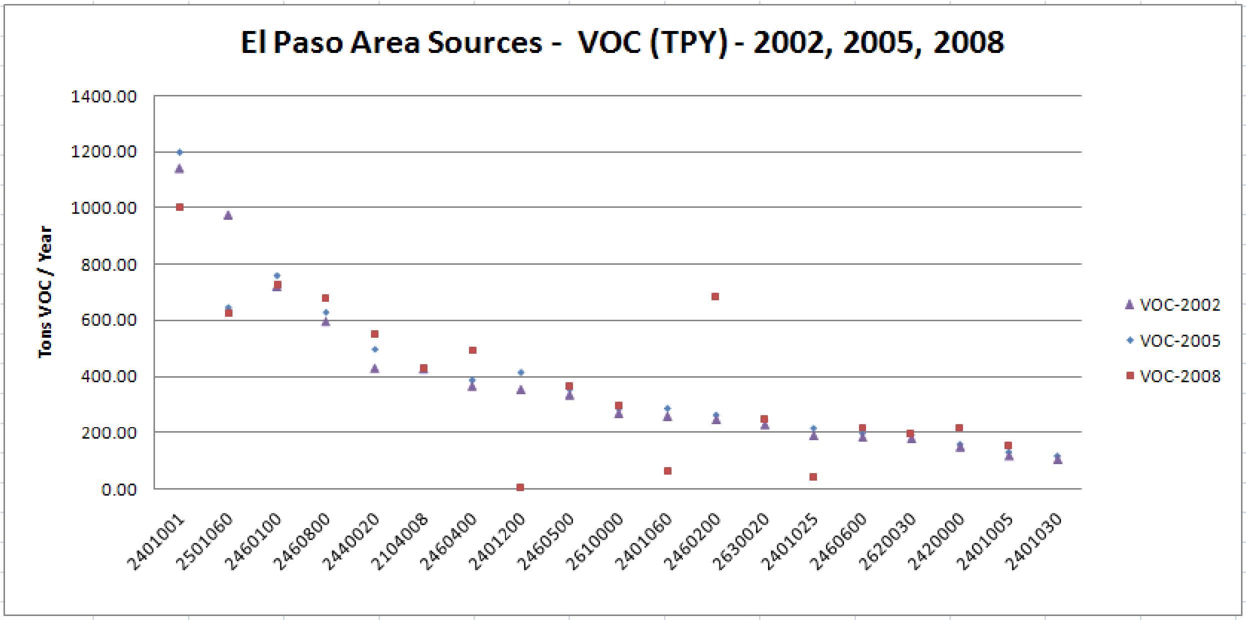

Figure 3-2 Emissions from major area sources in El Paso county – 2002, 2005, 2008

A high degree of success has been achieved in reducing and controlling VOC emissions by installing Stage 1 & 2 Vapor Recovery Systems (VRS) in all El Paso County gasoline stations. Additional control strategies include the requirements of distributing Low Reid Vapor Pressure (Low RVP) gasoline in summer and sale of low VOC paints for architectual application.

Figure 3-3 presents the data for 3 years of major area source NOx emissions in El Paso. Residential and commercial natual gas combustion represent the greatest NOx source in the county. Control strategies for these two sources may achieve minimual emissions reductions given the wide number of homes and businesses in the region. Improving the combustion efficiency of and requiring the deployment of advanced combustion equipment when water boilers are replaced may provide slight improvement in emissions from the top two sources.

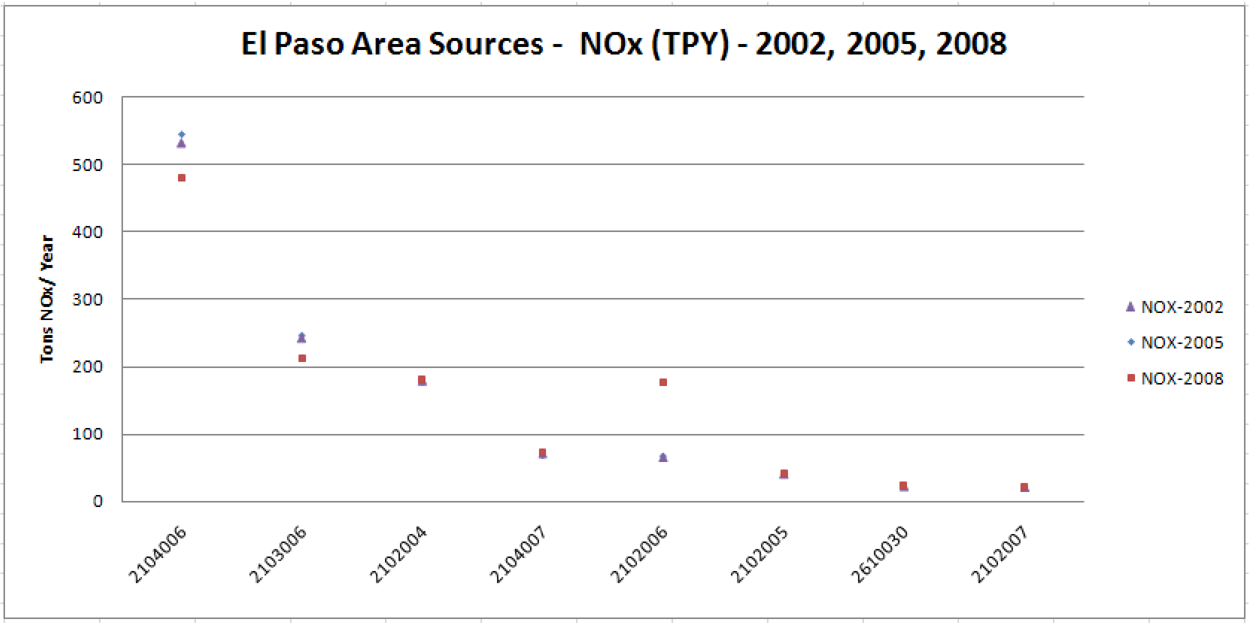

Figure 3-3 NOx emissions from major area sources in El Paso County – 2002, 2005, 2008

Figure 3-4 presents 3-years of major area source CO emissions in El Paso. Open burning and residential wood combustion present the greatest CO area sources in El Paso County. Specifically, agricultural burning and land clearing operations are the major emission activities within these two source categories. Residential and commercial natural gas combustion processes compose the remainder of top CO area sources in the county. Efforts to control CO emissions from area sources include burning bans on winter days when conditions are favorable for the the potential of a CO exceedance. However, the burn-ban strategy has not been implemented in El Paso for well over a decade given the fact that ambient CO concentrations in El Paso have not been more than 25% of the CO NAAQS.

Figure 3-5 presents 3-years of major area source PM_{10} emissions in El Paso. Road construction, vehicle movements on paved roads, and industrial/commercial/institutional constructions represent the greatest contributors to PM_{10} emission in El Paso County. Under the PM_{10} State Implementation Plan, El Paso is being considered for redesignation to attainment of the PM_{10} NAAQS.

Recently, TCEQ submitted a modification to the PM_{10} SIP allowing the City of El Paso to apply asphalt millings to the alley-ways rather than requiring complete paving. Asphalt millings are crumbled and crushed asphalt which is peeled off of the top of an alphalt roadway prior to a new layer of alphalt applicaton. Milled asphalt pieces and crumbs can be spread over the unpaved alleys and pressed onto the surface. The heat of the sun partially melts the asphalt, allowing the pieces to bind thereby sealing the surface. This is a low-cost method of allowing the City of El Paso to comply with the PM_{10} SIP.

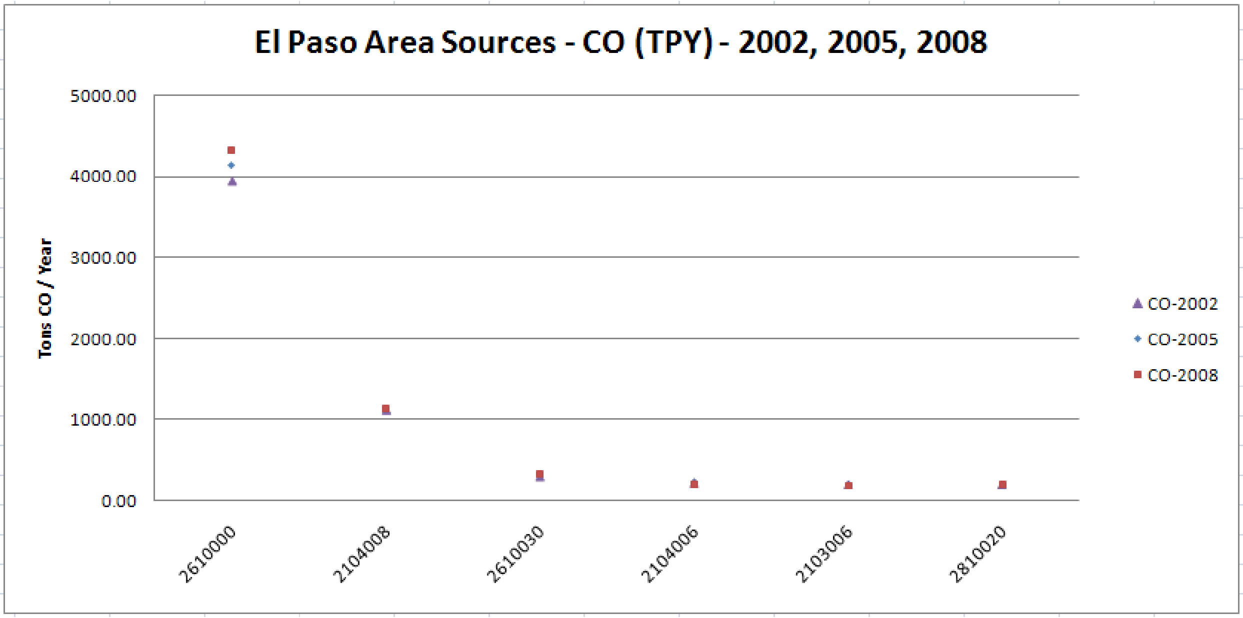

Figure 3-4 CO emissions from major area sources in El Paso county – 2002, 2005, 2008

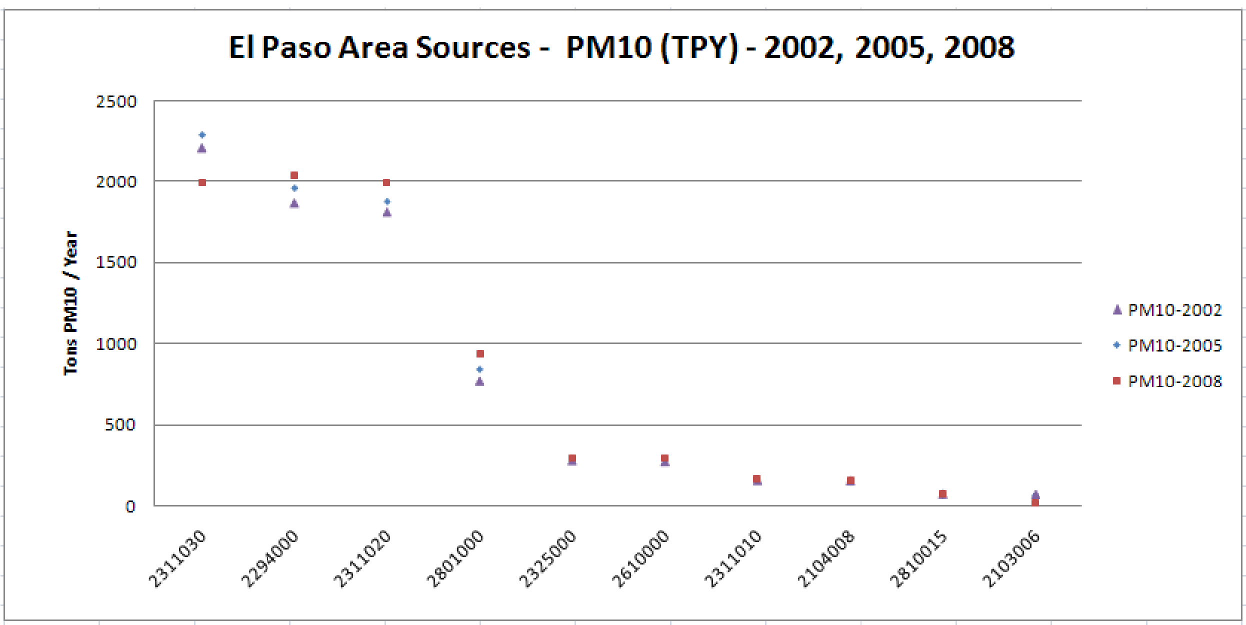

Figure 3-5 PM10 emissions from major area sources in El Paso county – 2002, 2005, 2008

Figure 3-6 shows the NH_3 emissions from major area soures for the 3 reviewed years in El Paso. Agricultural operations, primarily the application of fertilizer, contribute the bulk of NH_3 emissions in the county.

Other criteria pollutant emissions are not reported in this review.

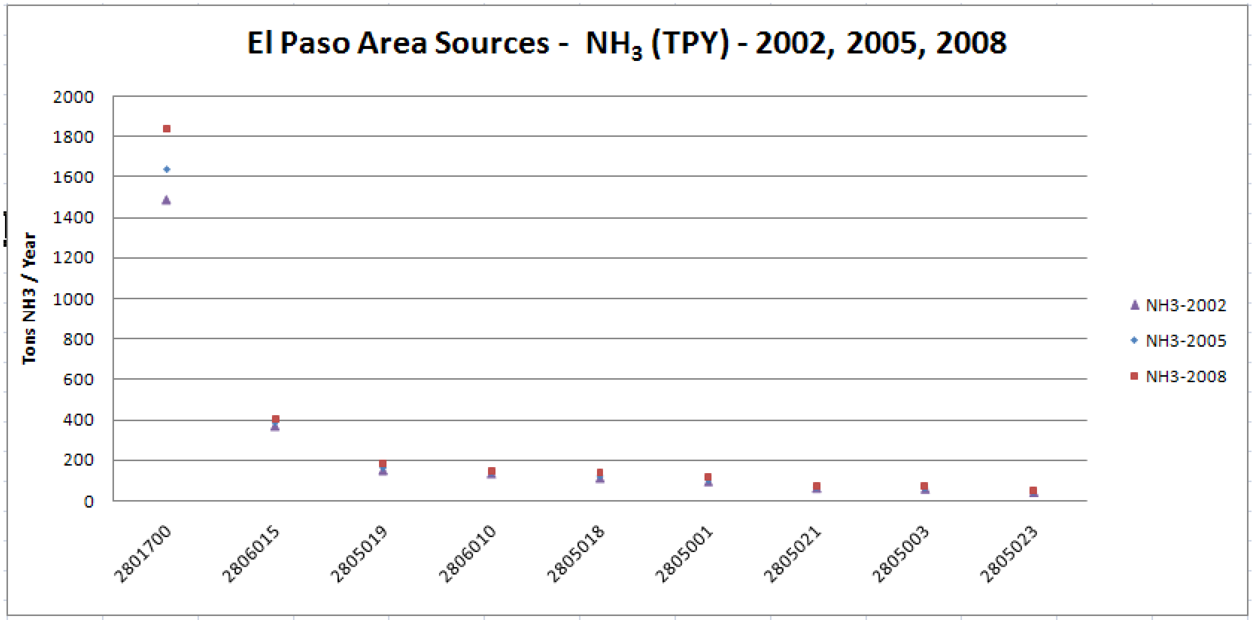

Figure 3-6 NH_3 emissions from major area sources in El Paso county – 2002, 2005, 2008

3.2 *Review of Emission Development Methodology*

The 2002 PEI (TCEQ, 2004) provides descriptions of several methodologies applied to the development of the ASEIs. The U.S. EPA's 2002 National Emissions Inventory (NEI) was the starting point for the 2002 PEI. NEI categories and emissions were reviewed and updated with current methodologies and activity data where it was deemed significant to do so. This resulted in the 2002 PEI being compiled from multiple sources such as TCEQ staff, contractors, and local Councils of Government (TCEQ, 2004). EGAS-4 was used to develop 2002 categories not covered by contracted work.

3.3 *Review of Activity Data*

Activity data is described in the Periodic Emissions Inventory reports prepared by TCEQ (TCEQ, 2002 & 2005). Activity data is obtained from multiple sources including the following:

- Texas Comptroller of Public Accounts

- Texas Department of Transportation
- Texas Department of Agriculture
- Texas Workforce Commission industrial employment data
- State projected population data
- Contractor information
- Mobile 6
- AP-42
- Previous year EIs

A discussion on activity data or ASEI data collection activities applied by TCEQ for preparation of these EIs is beyond the scope of this report. A comprehensive discussion on ASEI activity data is referred to the 2002 Final Periodic Emissions Inventory for Area, Nonroad Mobile, and Biogenic Sources prepared by TCEQ (TCEQ, 2002).

3.4 Inventory Evaluation and Improvement Program

An Area Source Emission Inventory Improvement Program (EIIP) represents an effort to improve on data which is currently available as well as improvements in technology which may have not been taken into account in current EIs. Examples of the latter may include improvements in combustion efficiency and reductions in evaporative emissions due to product modifications, fuel blend modifications, or replacement of process equipment. It is important to stress that area source categories should be prioritized to direct resources on source categories representing the largest emitters and most likely to fall under regulatory parameters rather than pursue research on low-volume emissions generators.

Several unresolved emissions points in the PdN continue to limit the accuracy of any EIs effort. It should be noted that much of the EI data was built on older baseline data using EGAS-4. The following recommendations are provided as part of an EIIP:

- Identify categories for which the emission estimates rely on the 1999 baseline EI data and acquire additional information on these categories. This could include a better understanding of solvent improvements, solvent management practices, process analysis, or combustion efficiency improvements.

- Review emissions factors for certain combustion processes. In Juárez a large number of people in this economically disadvantaged city burn solid fuels of all types in 55-gallon barrels for home heating, resulting in PM fumigation in the southwest El Paso.

- Other candidates that can come under further review include brick kilns in Mexico. El Paso Electric undertook a study of brick kiln emissions to estimate potential emissions reduction from construction of a modified low-emissions kiln. Further testing should be undertaken to assess total PM, VOC, NOx, and CO emissions from the older kilns given the propensity of brick makers to burn particle board and reconstituted wood fiber materials. This will provide an improved VOC speciated profile of brick kiln emissions.

- A yet to be quantified phenomenon is motor vehicle emissions at the US-Mexico international bridges. Emissions due to motor vehicle queuing on both sides of the bridges may be considered part of a "Hot Spot Analysis". In such analysis one must consider which jurisdiction should be the "owner" of those emissions. US security policy requires the vehicles be queued on both sides of the US-Mexico border. Traveling north into the US vehicles are primarily queued on the U.S. side of the limit between the US and Mexico. Traveling south into Mexico vehicles are queued due to US security operations intended to inspect vehicles for weapons, drugs and cash. El Paso police, sheriff, State of Texas and US law enforcement agencies are all involved in such inspections. Vehicle queuing traveling south may have a comparable wait time for vehicles to cross into the neighboring country.

- Anaerobic digesters at the El Paso and Juárez wastewater treatment plants (WWTP) generate a flame approximately 10 feet high and 2 feet in diameter. NOx emissions generated by this flame may be unquantified and not currently considered in the EI if WWTP emissions are based on wastewater throughput.

4.0 Nonroad Mobile Source Emissions

Nonroad mobile sources are, collectively, vehicles that do not normally operate on roads and highways. These are various types of equipment propelled by combustion engines using various fuels. They are used for purposes such as in agricultural operations, construction, lawn and garden maintenance, industry, and recreation. The category also includes aircraft, locomotives, recreational boats, and commercial marine vessels. The fuels used by nonroad mobile sources are gasoline, diesel, compressed natural gas, and liquid petroleum gas LPG (TCEQ, 2004).

4.1 Review of Emissions

The emission inventories of nonroad mobile sources for the years 2002, 2005, and 2008 were obtained from Texas Air Emissions Repository (TexAER) website (TCEQ, accessed August, 2011). Three years of data were reviewed to evaluate the Periodic Emission Inventory (PEI) and to discover potential discrepancies in the inventories for further improvements.

Table 4-1 lists criteria pollutant emissions for the years 2002, 2005, and 2008. CO_2 is listed as a reference for fuel consumption, which has an upward trend from 2002 to 2008. There is a decline trend in ozone precursors of NOx, VOC, and CO emissions. The reduction of VOC and CO may be caused by advanced internal combustion engines employed in recent years, while the reduction of NOx may be caused by efficient control measures.

Nevertheless, the opposite trends warrant a closer examination of the major emission sources to discover any potential discrepancies. The other pollutants are beyond the scope of this review; they are presented along with the ozone precursor emissions for the purpose of completeness. NH_3 is not listed since nonroad mobile sources contribute a minor fraction to its overall emissions.

Table 4-1 Nonroad Mobile Source Emissions in El Paso (tons per year)

Year	NOx	VOC	CO	SO2	PM10-PRI	PM25-PRI	CO2
2002	2897.45	1712.38	25412.12	269.41	189.66	183.97	207095.61
2005	2875.24	1547.40	22516.59	49.35	191.84	162.62	214967.43
2008	2381.74	1376.51	19563.01	50.87	200.99	193.71	304649.06

The nonroad mobile sources that together contribute over 95% emissions in the category are listed in Table 4-2 by 7-digit SCC with brief descriptions. The third and fourth digits in the SCC denote fuel type for all equipment except aircraft, railroad equipment, and marine vessels (not listed due to the small amount of emissions in El Paso). The listing goes by fuel first and then by equipment.

As the analysis shows, gasoline and diesel are major fuels for construction & mining (22**002) and commercial (22**006) equipment. Recreational (22**001) and lawn & garden (22**004) equipment is mainly confined to gasoline, while agricultural (22**005), airport ground-support (22**008), and railroad (2285002) equipment mainly uses diesel. Gasoline, LPG, and diesel are the three major types of fuels used in the industrial equipment (22**003).

Table 4-2 Major nonroad mobile sources in El Paso

#	SCC7	SCC7 Description
1	2260001	GASOLINE (2 STROKE) RECREATIONAL EQUIPMENT
2	2260002	GASOLINE (2 STROKE) CONSTRUCTION & MINING EQUIPMENT
3	2260004	GASOLINE (2 STROKE) LAWN & GARDEN EQUIPMENT
4	2260006	GASOLINE (2 STROKE) COMMERCIAL EQUIPMENT
5	2265001	GASOLINE (4 STROKE) RECREATIONAL EQUIPMENT
6	2265002	GASOLINE (4 STROKE) CONSTRUCTION & MINING EQUIPMENT
7	2265003	GASOLINE (4 STROKE) INDUSTRIAL EQUIPMENT
8	2265004	GASOLINE (4 STROKE) LAWN & GARDEN EQUIPMENT
9	2265006	GASOLINE (4 STROKE) COMMERCIAL EQUIPMENT
10	2267003	LPG INDUSTRIAL EQUIPMENT
11	2270002	DIESEL CONSTRUCTION & MINING EQUIPMENT
12	2270003	DIESEL INDUSTRIAL EQUIPMENT
13	2270005	DIESEL AGRICULTURAL EQUIPMENT
14	2270006	DIESEL COMMERCIAL EQUIPMENT
15	2270008	DIESEL AIRPORT GROUND SUPPORT EQUIPMENT
16	2275020	COMMERCIAL AIRCRAFT
17	2275050	GENERAL AVIATION
18	2285002	RAILROAD EQUIPMENT DIESEL

Figure 4-1 presents CO_2 emissions from major nonroad mobile sources in El Paso for the three years. The label of x-axis from 1 to 18 corresponds to the 18 major sources listed in Table 4-2. As noted, CO_2 emissions are used as substitutes of fuel consumption. Figure 4-1, in conjunction of Table 4-2, indicates that diesel is the major fuel for nonroad mobile sources, including construction & mining, industrial, agricultural, and commercial equipment (series #11 – 14).

Gasoline consumption by 4 stroke lawn & garden and commercial equipment (#8 & 9) and LPG consumption by industrial equipment (#10) are substantial. CO_2 emissions from aircraft (#16 & 17), which may consume a large amount of fuels as well, are not available for analysis,

One suspicious source is diesel agricultural equipment (#13). Its CO_2 emission increased ~ 15 times in 2008 from the average of 2002 and 2005.

Figure 4-2 presents the NOx emissions in El Paso. NOx emissions are roughly consistent with CO_2 emissions where sources #8 through 14 contribute the majority of emissions as well. A more careful inspection reveals that diesel construction & mining equipment (Source #11 in Table 4-2) may require further investigation. The CO_2 emissions from this source increased in 2005 and 2008 from 2002, while the NOx emissions continued to drop from 2002.

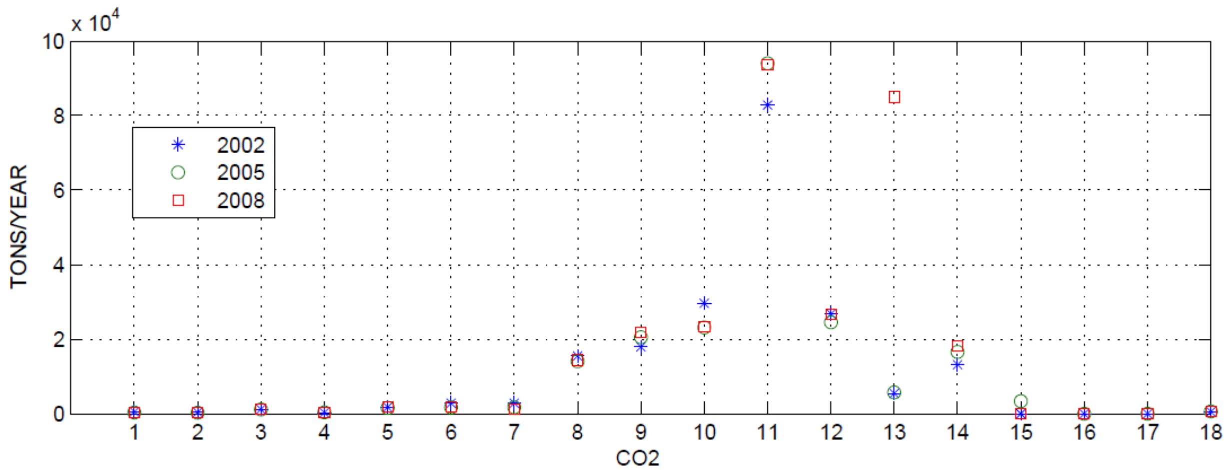

Figure 4-1 CO2 emissions from major nonroad mobile sources in El Paso

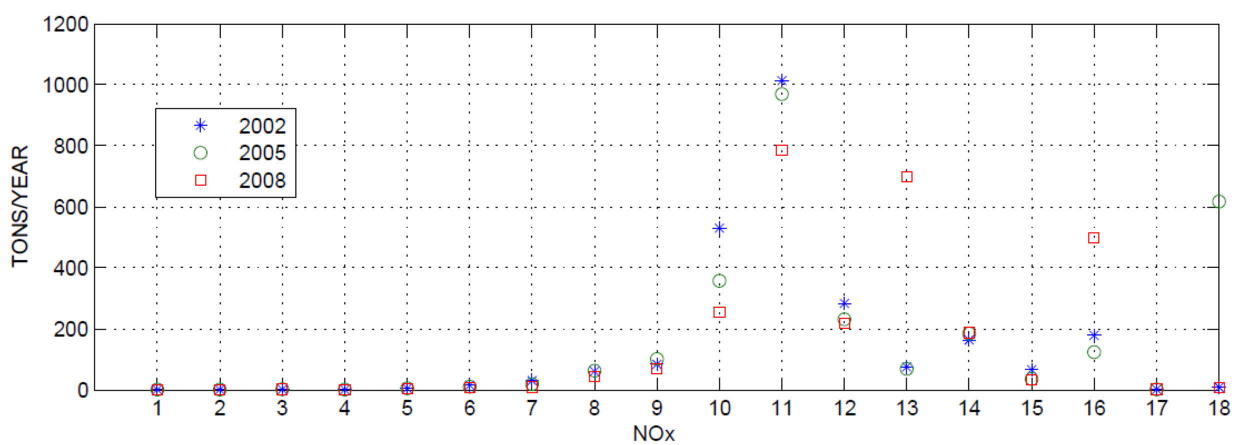

Figure 4-2 NOx emissions from major nonroad mobile sources in El Paso

Another questionable source is commercial aircraft (#16), with NOx emissions ~ 3 times greater in 2008 from the average of 2002 and 2005. Similarly, railroad diesel equipment (#18) requires further investigation. CO_2 emissions from railroad diesel equipment are roughly the same in the three years, while the NOx emissions in 2005 are over 20 times higher than 2002 and 2008 values. One reason is that NOx emissions from diesel locomotives are included in the 2005 PEI, but not in the 2002 PEI and 2008 PEI. If this is the case, the missing emissions from diesel locomotives for 2002 and 2008 need to be estimated for fair comparison with the total NOx emissions reported for 2005.

Figure 4-3 presents the VOC emissions in El Paso. It is seen that the gasoline equipment (#1-9) accounts for the majority of VOC emissions in El Paso, in contrast to their overall smaller CO_2 emissions or fuel consumption than diesel equipment. This is consistent with the gasoline and diesel emission characteristics, with gasoline combustion generally having higher VOC emission factors and diesel combustion having higher NOx emission factors.

One observation is that the VOC emissions from gasoline 2-stroke recreational, construction & mining and lawn & garden equipment (#1 – 3) decreased significantly in 2005 and 2008 from 2002. On the contrary, the VOC emissions from gasoline 4-stroke lawn & garden and commercial equipment (#8 & 9) increased from 2002. In the meantime, the CO_2 emissions from all gasoline equipment are close to each other (Figure 4-1). Therefore, there may be discrepancy in the VOC emissions from this category of gasoline equipment requiring further investigation.

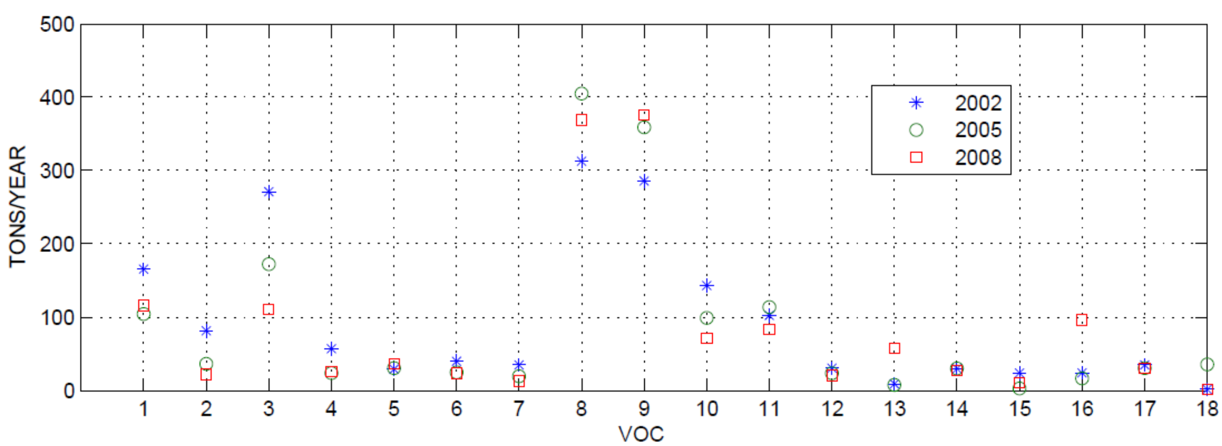

Figure 4-3 VOC emissions from major nonroad mobile sources in El Paso

Figure 4-4 presents the CO emissions from major nonroad mobile sources in El Paso for the three years. Gasoline 4-stroke lawn & garden and commercial equipment (with series #8 & 9) are the top and the second CO emission sources. One notices that the CO_2 emissions from the gasoline 4-stroke commercial equipment (#9) are relatively unchanged in the three years (Figure 4-1). However, the CO emissions increased from 2002 to 2005, but decreased from 2005 to 2008 (Figure 4-4). The discrepancy in the emission trend between CO and CO_2 may warrant a further investigation for improvement of CO emissions.

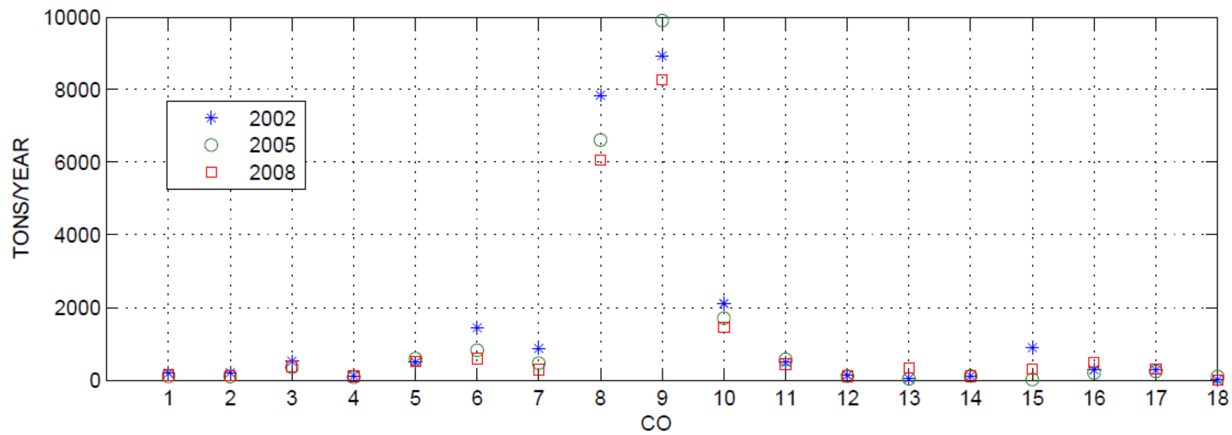

Figure 4-4 CO Emissions from major nonroad mobile sources in El Paso

Figures 4-5, 4-6, and 4-7 present the annual emissions of SO_2, PM_{10}, and $PM_{2.5}$ respectively in El Paso. It is assumed any potential discrepancies identified from the review of emissions of CO_2, NOx, VOC, and CO also affect the emissions of these pollutants. Therefore further investigation aiming to improve the accuracies of emissions of ozone precursor will improve the representativeness of emissions of these pollutants as well.

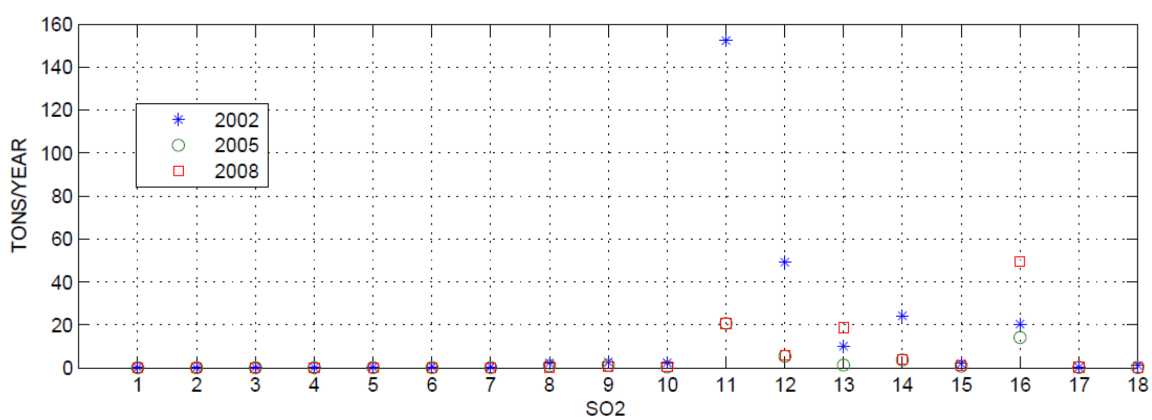

Figure 4-5 SO2 emissions from major nonroad mobile sources in El Paso

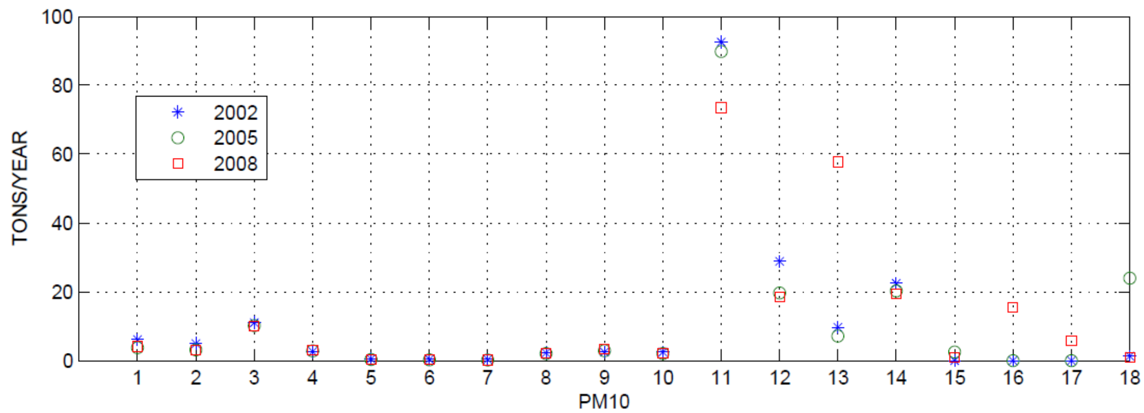

Figure 4-6 PM10 emissions from major nonroad mobile sources in El Paso

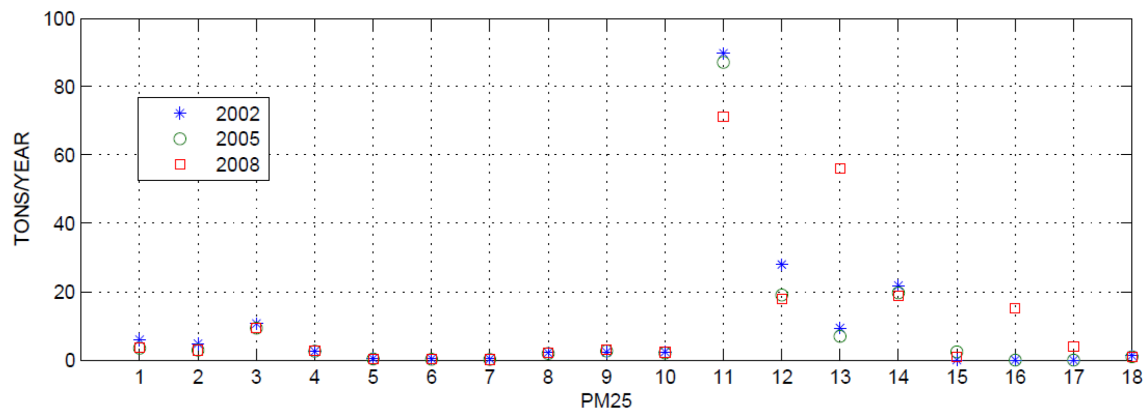

Figure 4-7 PM2.5 emissions from major nonroad mobile sources in El Paso

4.2 Review of Emission Development Methodology

A TCEQ document on the development methodology for 2002 PEI was located on the TexAER website (TCEQ, 2004). A 4-page 2005 PEI document was reviewed and a 2008 PEI document was not found. It is assumed the same or similar methodology was used in these two years as well. According to the 2004 TCEQ document, the EPA NONROAD model was used to develop the 2002 PEI for all sources except aircraft, locomotives, airport ground support equipment, oil field equipment, and commercial marine vessels. For those sources incorporated in the model, there are two basic approaches to the development of the PEI.

Specific categories have been updated using information and data that represent 2002 activities. Some of these categories were addressed through contracted work conducted during the past few years. This data was specifically collected for 2002 or for an earlier year with the emissions grown to 2002 by using EPA EGAS 4.0 growth factors. Data from these projects were used as updated inputs into the NONROAD2002 model. For those categories not included in special projects, the NONROAD2002 model was used to generate 2002 emissions using the model's default values (TCEQ, 2004).

A hybrid approach was adopted for airport ground support equipment and oilfield equipment. The NONROAD model does not accurately depict equipment populations for these categories, and emissions were calculated outside of the model, but making use of appropriate model inputs other than equipment populations (TCEQ, 2004).

The Federal Aviation Administration (FAA) Emissions and Dispersion Model System (EDMS) was used to estimate aircraft emissions. There was also a recent project developing emissions data from locomotive engines. The emissions data provided by this project were developed for 2002 and used in the PEI (TCEQ, 2004).

4.3 Review of Activity Data

Table 4-3 lists sources of activity data for major nonroad mobile equipment in El Paso according to the 2002 PEI. As mentioned in the methodology section, the two major sources of activity data for nonroad equipment except aircraft are EPA NONROAD model default values and special surveys targeting different equipment in various areas. Questions are raised regarding the applicability to El Paso County for EPA defaults and the survey data collected from different areas in Texas, especially for those sources that are identified for further investigation from the emission reviews.

Table 4-3 Sources of activity data for major nonroad mobile equipment in El Paso

#	SCC7	SCC7 Description	Source of Activity Data
1	2260001	GASOLINE (2 STROKE) RECREATIONAL	EPA NONROAD model's default values
2	2260002	GASOLINE (2 STROKE)	Updated values from survey[1]
3	2260004	GASOLINE (2 STROKE) LAWN &	Updated values from survey[2]
4	2260006	GASOLINE (2 STROKE) COMMERCIAL	EPA NONROAD model's default values
5	2265001	GASOLINE (4 STROKE) RECREATIONAL	EPA NONROAD model's default values
6	2265002	GASOLINE (4 STROKE)	Updated values from survey[1]
7	2265003	GASOLINE (4 STROKE) INDUSTRIAL	EPA NONROAD model's default values
8	2265004	GASOLINE (4 STROKE) LAWN &	Updated values from survey[2]
9	2265006	GASOLINE (4 STROKE) COMMERCIAL	EPA NONROAD model's default values
10	2267003	LPG INDUSTRIAL EQUIPMENT	EPA NONROAD model's default values
11	2270002	DIESEL CONSTRUCTION & MINING	Updated values from survey[1]
12	2270003	DIESEL INDUSTRIAL EQUIPMENT	EPA NONROAD model's default values
13	2270005	DIESEL AGRICULTURAL EQUIPMENT	EPA NONROAD model's default values
14	2270006	DIESEL COMMERCIAL EQUIPMENT	EPA NONROAD model's default values
15	2270008	DIESEL AIRPORT GROUND SUPPORT	EPA NONROAD model's default values
16	2275020	COMMERCIAL AIRCRAFT	Federal Aviation Agency (FAA)
17	2275050	GENERAL AVIATION	Texas Transport Institute (TTI)
18	2285002	RAILROAD EQUIPMENT DIESEL	From the ERG survey data[3]

[1] Construction and mining equipment populations and other data resulting from the 2000 Houston study (ERG, 2000a) were used to update the EPA NONROAD model. However, it is not clear how El Paso was updated with the survey conducted in the Houston-Galveston Ozone Non-attainment Area.

[2] The commercial lawn and garden equipment populations collected from survey data (ERG, 2003) were used to update the EPA NONROAD model.

[3] The Eastern Research Group (ERG) conducted surveys requesting information from the three Class I railways (ERG, 2002b). The 2001 emissions were grown to 2002 using contractor developed growth factors.

4.4 *Inventory Evaluation and Improvement Recommendations*

The 2002, 2005, and 2008 nonroad mobile source emissions developed by TCEQ for El Paso County were reviewed. Internal consistency was confirmed for many major sources. Nine out of the 18 major nonroad emission sources in El Paso are identified for further investigation to improve the representativeness. They are listed in Table 4-4 with a brief description of reasons to be selected.

Table 4-4 Suggested nonroad mobile sources for further investigation in El Paso

#	SCC7	SCC7 Description	Potential Discrepancy
1	2260001	GASOLINE (2 STROKE) RECREATIONAL EQUIPMENT	VOC emissions decrease significantly from 2002 while the CO_2 emissions are roughly the same.
2	2260002	GASOLINE (2 STROKE) CONSTRUCTION & MINING EQUIPMENT	
3	2260004	GASOLINE (2 STROKE) LAWN & GARDEN EQUIPMENT	
8	2265004	GASOLINE (4 STROKE) LAWN & GARDEN EQUIPMENT	VOC emissions increase from 2002 while the CO_2 emissions are roughly the same.
9	2265006	GASOLINE (4 STROKE) COMMERCIAL EQUIPMENT	
11	2270002	DIESEL CONSTRUCTION & MINING EQUIPMENT	Trends of CO_2 and NOx emissions are opposite
13	2270005	DIESEL AGRICULTURAL EQUIPMENT	CO_2 emissions increased ~ 18 times in 2008
16	2275020	COMMERCIAL AIRCRAFT	NOx emissions increased ~ 3 times in 2008
18	2285002	RAILROAD EQUIPMENT DIESEL	Emissions from locomotives are missing in 2008 PEI

Lastly, Ft. Bliss Texas is quickly becoming established as a high-profile facility for tactical warfare and training operations. Large numbers of Abrams M1A1 tanks, power generation equipment, air defense artillery, gasoline and diesel vehicle refueling, and other high-emitting tactical vehicles operate along the El Paso and Otero County line between MacGregor Range and White Sands Missile Range. Given diesel engines generate elevated NOx emissions it is advisable to estimate VOC and NOx emissions from these tactical operations in order to improve modeling input data. For purposes of national security the estimates do not need to be precise, but reasonable values should be developed to improve any photochemical modeling efforts.

5.0 Point Sources in El Paso

Under the current attainment status of El Paso for the ozone NAAQS, the Texas Administrative Code Title 30, Part 1, Chapter 101, Subchapter A, Rule §101.10 (30 TAC §101.10) requires any owner or operator of a stationary emission source to submit an EI to TCEQ if emissions are equal to or exceed 100 tons per year (TPY) for any contaminant, including volatile organic compounds (VOC), for which a NAAQS has been issued.

Sources that have submitted an initial emission inventory (IEI) are required to submit an annual emissions inventory update (AEIU) that consists of actual and allowable emissions. Owners and operators must supply a certifying statement for each EI to attest that the information in the inventory is true and accurate. The regional point source EI is compiled by TCEQ from all source-specific EI submissions required by 30 TAC 101.10. TCEQ publishes on their website (http://www.tceq.texas.gov/airquality/point-source-ei/psei.html) the most current regional point source EI and updates it on an annual basis.

5.1 Point Source Contributions and Trends

Point source emission inventories from 1999, 2002, 2004, 2005, 2008, and 2009 were reviewed to evaluate the Standard Industrial Classification (SIC) specific emission contributions and emission trends in El Paso County. All inventories were obtained from the TCEQ website. The 2009 inventory is the most current EI available from the TCEQ website. Table 5-1 presents VOC and NOx emissions for the years indicated above. A graphical summary of the point source EIs is presented in Figure 5.1.

Table 5-1 Point Source Emissions in El Paso

		VOC			**NOx**	
	Sources	Emissions	Change*	Sources	Emissions	Change*
Year	#	TPY	%	#	TPY	%
1999	29	1322	-	20	4495	-
2002	28	780	-41%	19	3695	-18%
2004	25	803	-39%	18	3339	-26%
2005	17	961	-27%	14	3397	-24%
2008	24	1056	-20%	21	4687	4%
2009	18	991	-25%	14	2980	-34%

* the relative change was computed using 1999 as the base year

5.1.1 Point Source VOC Emissions in El Paso County, Texas

As defined by the 30 TAC 101.10, in 1999 there were 29 VOC point sources in El Paso with total emissions of 1,322 TPY. By 2009 the number of VOC point sources reduced to 18 and total VOC emissions were 991 TPY. Considerable VOC emissions reductions were achieved by 2004 when emissions totaled 803 TPY, 39% less than in 1999. However, VOC emissions increased to 1,023 TPY in 2005 and dropped to 991 TPY by 2009; 25% less than in 1999.

Figure 5-2 identifies annual VOC emissions by SIC code for 5 years. Data for the 2008 VOC emissions was not reported. In El Paso the most dominant VOC emission source category was Petroleum Refining (SIC code 2911), which on average contributed 64% of the VOC point source emissions during the last decade.

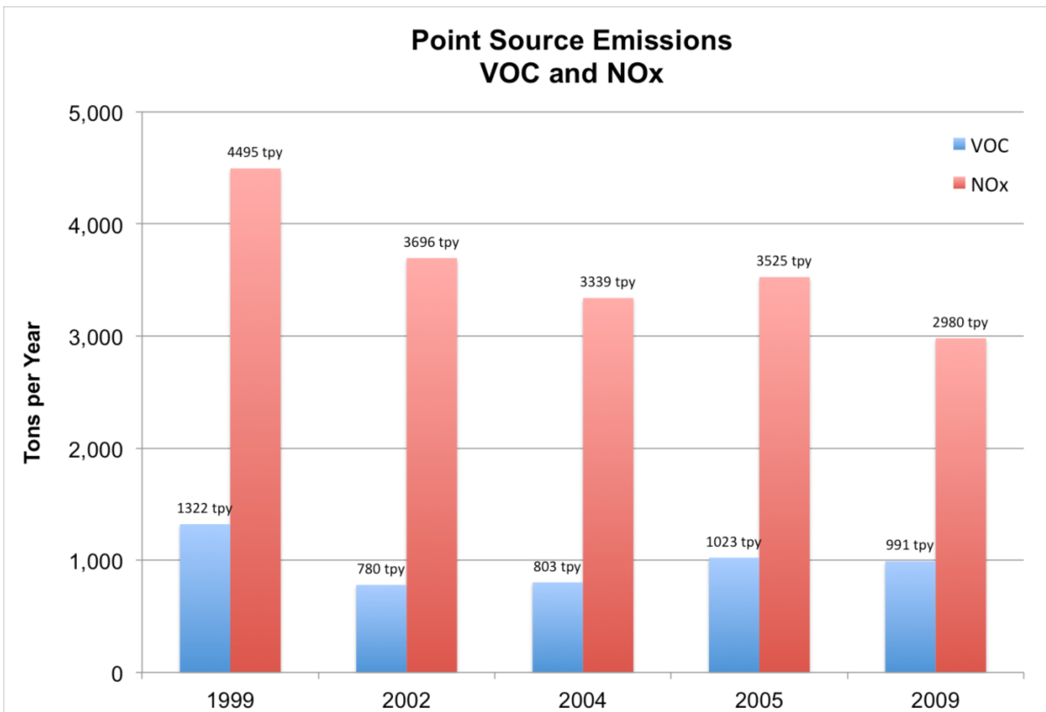

Figure 5-1 Ozone precursor point source emissions for El Paso, Texas (1999-2009)

Other dominant source categories were Steel Works (SIC 3312), Electric Services (SIC 4911), Petroleum Bulk Stations (SIC 5171) and National Security (SIC 9711). Combined, these five major source categories constituted, on average, 89% of the total regional VOC point source emissions during the last decade as indicated in Table 5.2. The contribution of VOC emissions from Petroleum Refining to the regional point source total was minimal at 56% in 2009. The source category with the greatest increase in VOC emissions during the last decade was Steel Works (SIC 3312). SIC 3312 emissions increased nine fold from 13 TPY in 1999 to 118 TPY in 2009.

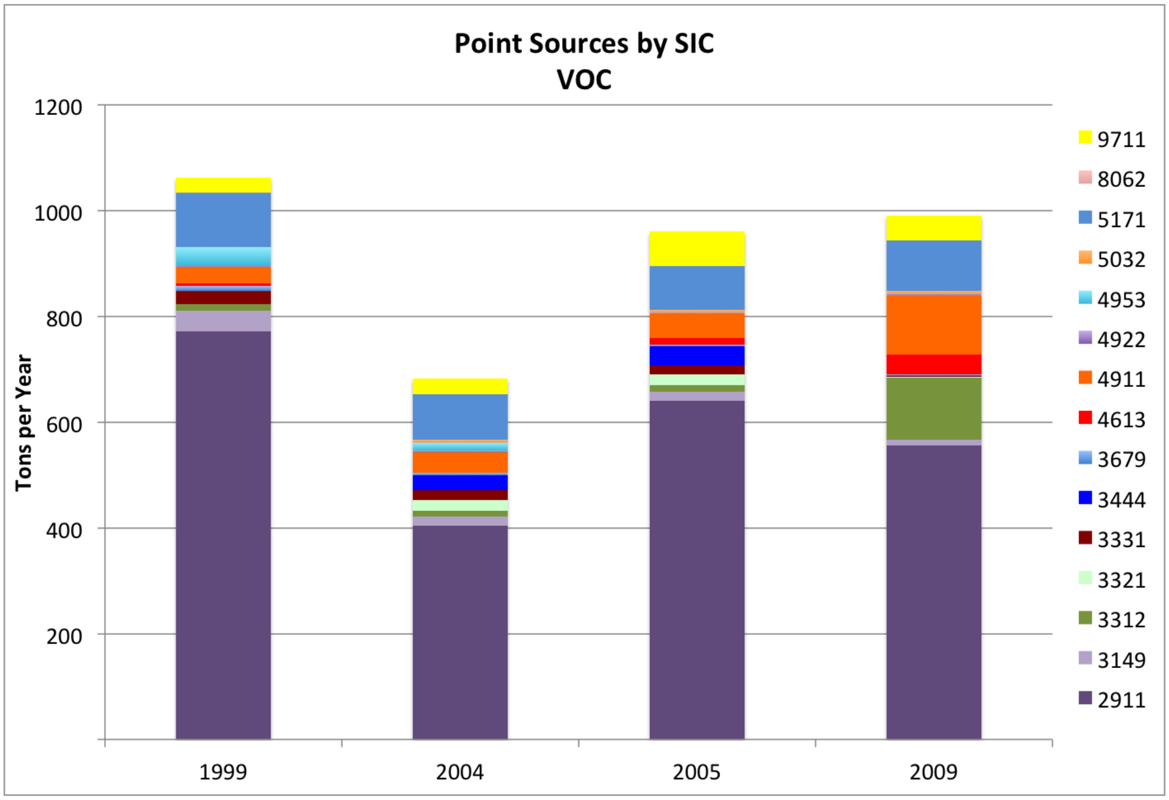

Figure 5-2 VOC point source emissions by SIC code

Table 5-2 Contributions by source category to total El Paso VOC point source emissions

Category	SIC	1999	2004	2005	2009	Average
Petroleum Refining	2911	73%	59%	67%	56%	64%
Steel Works	3312	1%	2%	1%	12%	4%
Electric Services	4911	3%	6%	5%	11%	6%
Petroleum Bulk Stations	5171	10%	13%	9%	10%	10%
National Security	9711	3%	4%	7%	5%	5%
	Top 5	89%	84%	88%	94%	89%

Figure 5-3 presents a plot of annual VOC emissions and an adjusted linear trend computed by least squares. Total point source emissions reported over the last decade suggest that VOC emissions are declining. However, the minimal amount of data points and the increase of emissions experienced during the middle of the last decade combined to produce a poorly adjusted linear regression line (R^2 = .14). The poor fit of the linear regression trend lessens the certainty of an actual downward emissions trend.

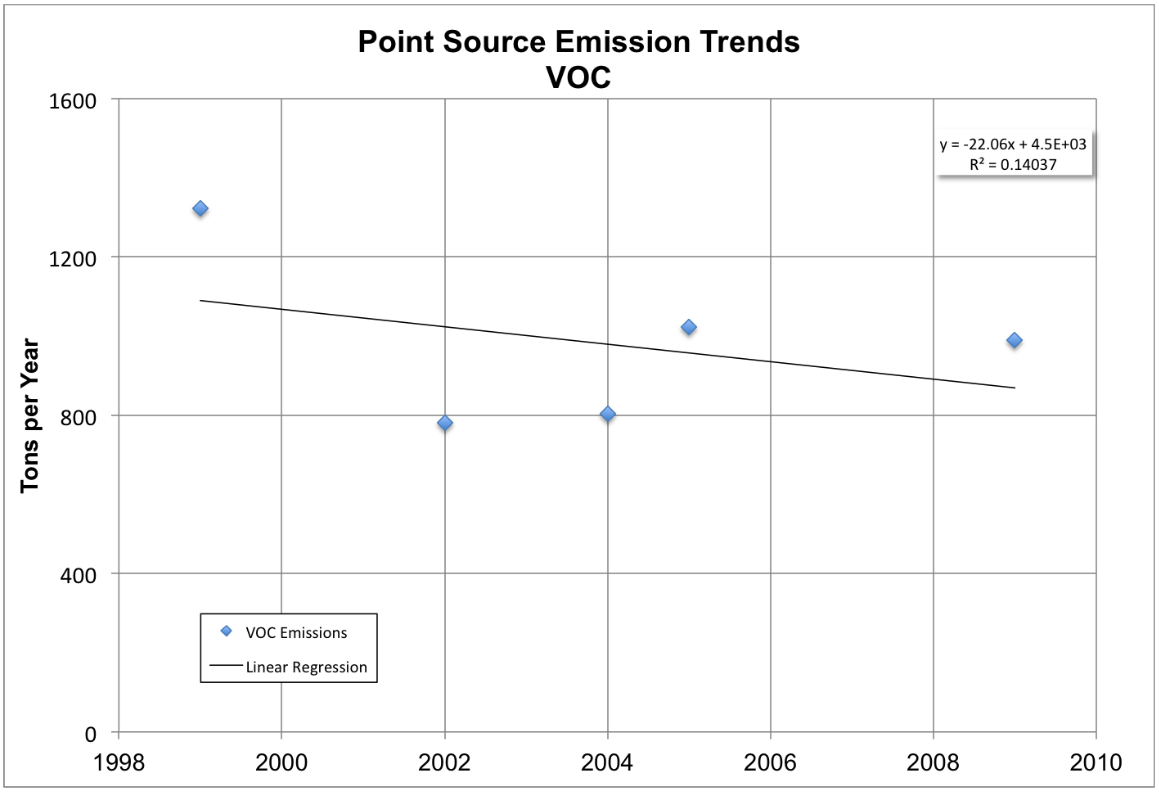

Figure 5-3 VOC point source emissions trend

5.1.2 Point Source NOx Emissions

In 1999, El Paso had 20 NOx point sources with total emissions of 4,495 TPY. By 2009 the number of point sources reduced to 14 and NOx emissions were reported at 2,980 TPY, 34% less than in 1999, as indicated in Figure 5-4.

Figure 5-4 identifies annual NOx emissions by SIC code. The most dominant source category is Electric Services (SIC code 4911), which on average constituted 55% of the total point source NOx emissions during the last decade. Specifically, the contribution of NOx emissions from Electric Services to the regional total was 61% in 1999 and 58% in 2009. Other dominant source categories were Petroleum Refining (SIC 2911), Steel Works (SIC 3312), and Natural Gas Transmission (SIC 4922).

Combined, the four major source categories mentioned above constituted, on average, 95% of the total point source NOx emissions during the last decade, as indicated in Table 5-3. The source category with the greatest increase in NOx emissions during the last decade was Brick, Stone, and Related Construction Materials (SIC 5032), which increased more than three-fold from 32 TPY in 1999 to 104 TPY in 2009.

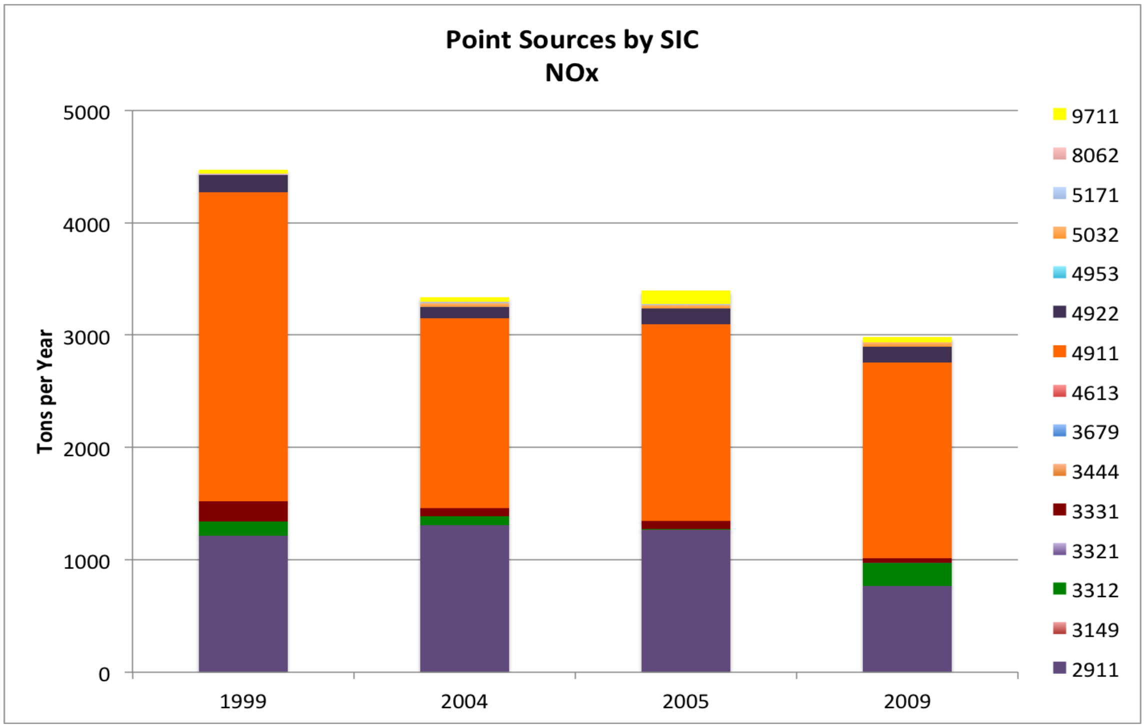

Figure 5-4 NOx point source emissions by SIC code

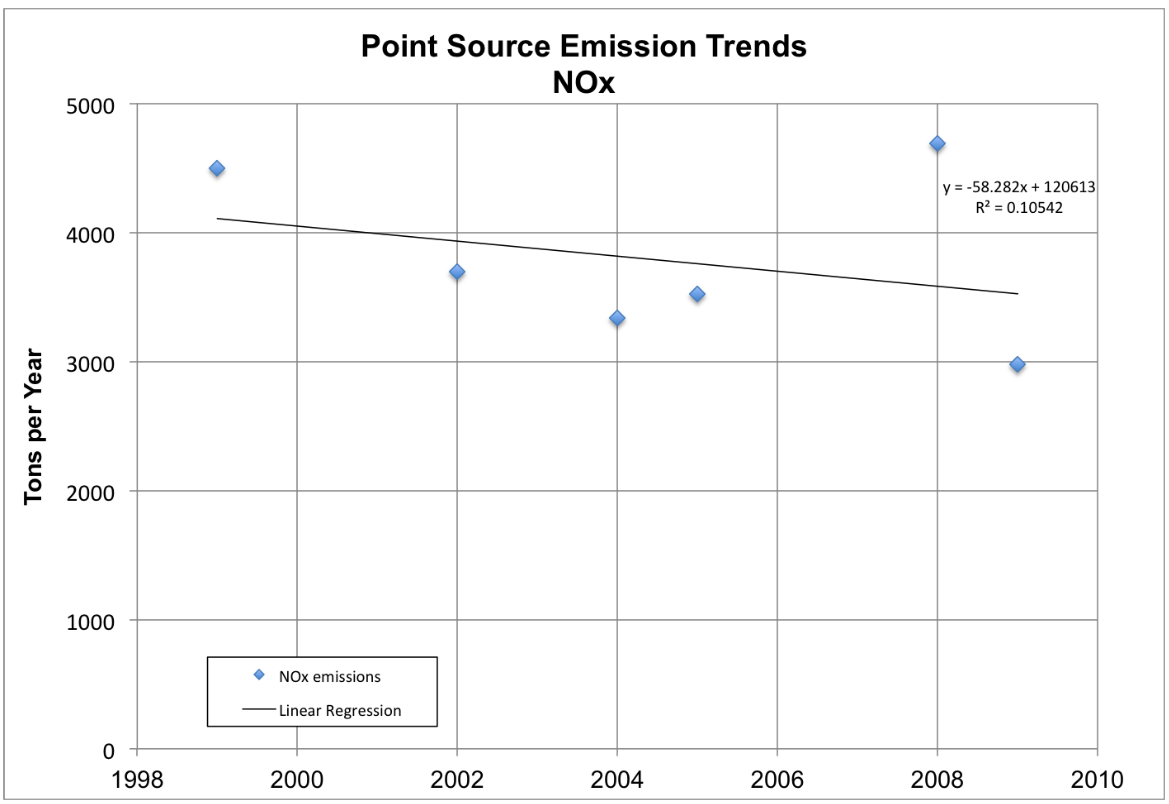

Figure 5-5 NOx point source emissions trend

Figure 5-5 is a plot of annual NOx emissions and an adjusted linear trend computed by least squares. Total point source emissions reported over the last decade suggest that NOx emissions are declining at a rate close to 125 TPY. The data did not produce a well-adjusted linear regression line (R^2 = .105) thus failing to substantiate the observed overall downward emissions trend. The poor fit of the regression line was caused by a considerable increase in NOx emissions in 2008. Still total emissions in 2009 return to a value that followed the downward trend observed during the decade.

Table 5-3 Contributions by source category to total regional NOx emissions

Category	SIC	1999	2004	2005	2009	Average
Petroleum Refining	2911	27%	39%	37%	26%	32%
Steel Works	3312	3%	2%	0%	7%	3%
Electric Services	4911	61%	51%	51%	58%	55%
Natural Gas Transmission	4922	3%	3%	4%	5%	4%
	Top 4	95%	95%	93%	96%	95%

6.0 Previous Emission Inventories

El Paso and Juarez were the targets of several EI studies in the past 15 years. In 1996 a limited emission inventory was developed for the Paso del Norte Ozone Study, conducted by Sonoma Technology, Inc. (STI) and Environ, Inc. under a contract from the EPA and TCEQ. In 2002 Eastern Research Group (ERG) conducted an extensive area source emission inventory (ASEI) in Juarez which established a baseline for the subsequently developed 1999 Mexican National Emission Inventory. The ERG ASEI identified many sources which were not identified in the El Paso EI. In 2010 TCEQ, the University of Texas at Austin (UT-CEER), ERG, and the Juarez Technical Institute (ITCJ) collaborated to update the Juarez ASEI.

6.1 The 1996 Paso del Norte Emission Inventory

The 1996 emission inventory was performed as part of the 1996 Paso del Norte Ozone study (MacDonald et al, 2001), with the objective of fulfilling the accords set by the La Paz Agreement (Annex V) that aimed at evaluating air quality improvement control strategies in the PdN region (Funk et al, 2001). Existing ozone precursor emission data for the PdN region was gathered and compiled into a gridded modeling domain, and a top-to-bottom evaluation of the inventory was employed to provide recommendations for improvements (Funk et al, 2001).

Table 6-1 presents emissions and surrogate data gathered for point, area, and mobile sources for El Paso and Hudspeth counties in Texas; Doña Ana and Otero counties in New Mexico; and Ciudad Juárez, Chihuahua (Haste et al, 1998). An overview of the methodology of the 1996 emission inventory and of the emission estimates for Ciudad Juárez, Chihuahua, Hudspeth, Doña Ana, and Otero counties is presented in this section.

Emission estimates were acquired at county/municipality levels. Point source emissions were separated into low-level and elevated point sources. Low-level sources were defined as major manufacturing and industrial facilities that emit near ground level. Elevated point sources were facilities that emit through elevated stacks. Area sources included smaller industrial facilities, service stations, dry cleaners, and nonroad mobile emissions. Mobile source emissions included all onroad vehicles. Biogenic emissions from vegetation and biological processes for the entire PdN region were estimated with the EPA’s BEIS-II model. Table 6-2 summarizes the datasets used in the development of the 1996 PdN region emission inventory duplicated from Haste et al (1998).

Table 6-1 Emission Estimates for the PdN in 1996

Source Category	VOC tpy	NO_x tpy	CO tpy
El Paso County, TX			
Area Sources	14,965	12,045	50,005
Point Sources	6,935	29,930	15,330
Mobile Sources	9,855	14,235	101,835
Biogenic Sources	3,285	1,095	--
County Total	35,040	57,305	167,170
Hudspeth County, TX			
Area Sources	183	73	438
Point Sources	3,285	0	0
Mobile Sources	110	183	1,095
Biogenic Sources	5,110	1,825	--
County Total	5,402	2,081	548
Dona Ana County, NM			
Area Sources	5,110	3,650	13,870
Point Sources	0	1,825	183
Mobile Sources	5,110	2,555	53,290
Biogenic Sources	6,205	2,190	--
County Total	16,425	10,220	67,525
Otero County, NM			
Area Sources	3,285	1,460	10,585
Point Sources	292	37	3,650
Mobile Sources	2,190	2,555	21,900
Biogenic Sources	23,725	1,460	--
County Total	29,492	5,512	36,135
Ciudad Juarez, MX			
Area Sources	16,790	1,095	6,570
Point Sources	1,825	15,695	4,380
Mobile Sources	57,305	25,185	483,260
Biogenic Sources	12,045	4,380	--
County Total	87,965	46,355	494,210

For quality assurance all data entries were checked and compared to external references (i.e., inventory developed in similar regions) for validity. To further validate the data from Doña Ana, the Sunland Park State Implementation Plan was examined (New Mexico Environment Department, 1997) and emission estimates compared. For Ciudad Juárez a comprehensive review of 32 point and area source operating schedules and activity levels was performed. All emissions appeared consistent with emission factors acquired from the AP-42 (EPA 1997).

Table 6-2 Summary of data used in the 1996 PdN Emission Inventory

County, State	**Emission Inventory Data** point	area	mobile	biogenic
El Paso, TX	1995 point source emission inventory (TCEQ)	1995 area source emission inventory (TCEQ)	1995 mobile source emission inventory developed using MOBILE5 (TCEQ)	BEIS-II default biomass data
Hudspeth, TX	No major sources in Hudspeth portion of PdN domain	1995 EPA Trends database	1995 Trends database	BEIS-II default biomass data
Dona Ana, NM	1995 point source emission inventory from Sunland Park SIP (NMED)	1995 EPA Trends database	1995 Trends database	BEIS-II default biomass data
Otero, NM	No major sources in Otero portion of PdN domain	1995 EPA Trends database	1995 Trends database	BEIS-II default biomass data
Juarez, MX	Top 25 point source emissions (SEMARNAT)	Area source emissions data (SEMARNAT)	1995 mobile source emission inventory developed using MOBILE5-Juarez (SEMARNAT)	BEIS-II using biomass data assumed similar to El Paso biomass

Figure 6-1 shows that in 1996 mobile sources were the most dominant source of VOC (42%) and CO (86%) emissions in the PdN region and area sources accounted for 23% of the VOC emissions. Point sources were the most dominant source of NOx (39%) emissions followed by mobile sources (37%). Biogenic VOC emissions were considerable (28%) in the rural outskirts of the modeling domain. (Haste et al, 1998)

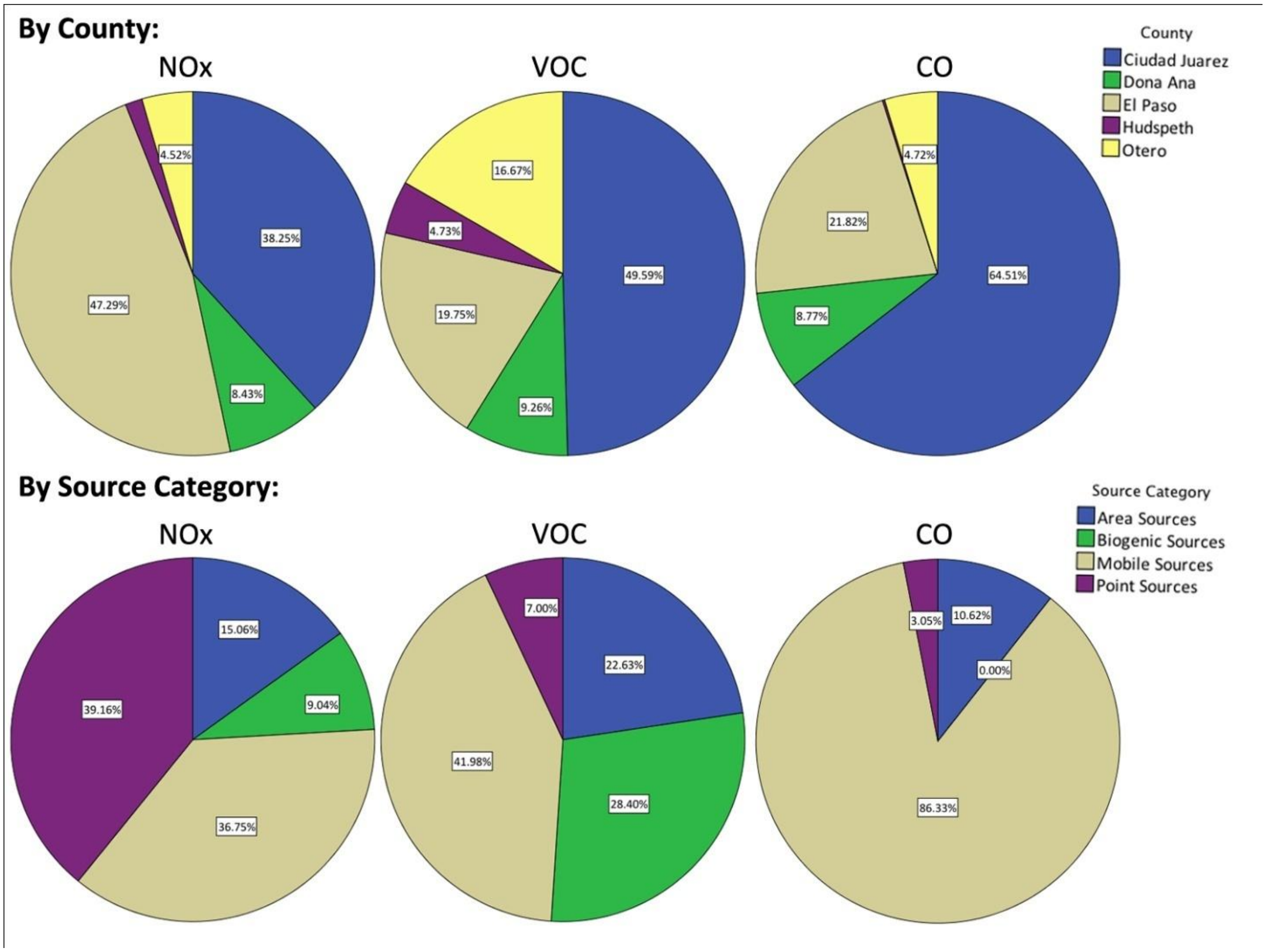

Figure 6-1 Graphical summary of 1996 PdN Emission Inventory

Approximately 47% and 38% of NO_x were emitted from El Paso County and Ciudad Juárez, respectively. VOC (50%) and CO (65%) emissions were dominant by sources from Ciudad Juárez (Table 6-1). Doña Ana contributed less than 10% to the regional emission totals for all three pollutants.

The top-down evaluation consisted of comparisons of VOC/NO_x and CO/NO_x ratios between ambient measurements and emission estimates (Funk et al, 2001). In Juárez (the 20/30 Site) the ambient VOC/NO_x ratio was three-fold that of the emission inventory suggesting that either VOC emissions were underestimated or NO_x emissions were overestimated. The CO/NOx ratio was 1.3 times lower than that of the emission inventory and considered acceptable. In El Paso, the CO/NOx ratio showed a significant spatial variability. At downtown El Paso, the ambient CO/NO_x and VOC/NO_x ratios were both higher than the inventory-derived ratios, but agreed within 25%.

The revision of the VOC speciation data suggested that emissions from certain activities (e.g., industrial coating, degreasing, petroleum product storage, fuel exhaust, and dry cleaning) were overestimated and/or the speciation profiles used were inappropriate for the region (Funk et al, 2001). Conversely, emissions from ethane and propane combustion sources were underestimated (Funk et al, 2001).

6.2 Emission Inventories for Doña Ana County, New Mexico

Point, area, and mobile sources of VOC, NO_x, and CO emissions for Doña Ana County, New Mexico were acquired from EPS's National Emissions Inventory database and summarized in Table 6-3. Emissions for NO_x and VOC have decreased steadily since 2002. The most notable decline was a 48% reduction in VOC emissions between 1996 and 2002.

Table 6-1 Emissions of CO, VOC, and NOx for Doña Ana, NM

Baseline Year	**CO** (tpy)	**NOx** (tpy)	**VOC** (tpy)
1996*	67,525	10,220	16,425
2002	65,238	10,991	8,507
2005	54,079	9,635	7,320
2008	49,188	8,501	7,359

* from (Haste et al, 1998)

6.3 Emission Inventories for Ciudad Juárez

Besides the 1996 PdN emission inventory three additional inventories have been prepared for Ciudad Juárez for baseline years 2002, 2005, and 2008. The Eastern Research Group (ERG) prepared the 2002 emission inventory, and in collaboration the University of Texas at Austin and ERG prepared the 2008 emission inventory, both for the TCEQ. The 2002 emission inventory included exclusively area sources, and the 2008 included all source types (area, onroad, nonroad, and biogenic) except point sources. The 2005 emission inventory was prepared by SEMARNAT but has not been released since.

6.3.1 The 2002 Juarez Area Source Emission Inventory

The best applicable emission estimation methods (e.g., AP-42 emission factors) were selected in accordance to the recommended guidelines from EPA's EIIP for use in the 2002 Juarez ASEI. Emissions were estimated from data obtained from: a) a purpose-designed survey, b) government agencies, and c) other projects such as the brick kiln testing project by El Paso Electric Company (EPEC). Emissions were reported in TPY and pounds (lbs)/day during the ozone season (May through October).

The 2002 Ciudad Juárez ASEI calculated VOC, NOx, CO, sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, and ammonia (NH_3) emissions. This EI targeted small industries and area sources that i) emitted less than 100 TPY of the pollutants listed above; ii) were located in Ciudad Juárez and iii) classified under the source categories listed in Table 6-4.

Table 6-2 Source categories included in the area source inventory for Ciudad Juárez

Small Industries	Area Sources
Asphalt batch plants	Agricultural tilling
Autobody shops	Agricultural burning
Bakeries	Border crossings
Concrete batch plants	Brick kilns
Dry cleaners	Cattle feedlots
Gas and diesel marketing	Construction activities
Grain mills	Consumer solvents
Graphic arts	Domestic ammonia
Ice plants	Fertilizer application
Liquefied petroleum gas marketing	Fuel combustion – commercial
Landfill	Fuel combustion – residential
Lumber manufacturing	Livestock ammonia
Metalworking foundries	Open burning
Quarries	Paved road dust
Restaurants	Unpaved road dust
Street vendors	Pesticide application
Wastewater treatment plants	Structure fires
Woodworking facilities	Wind erosion

Several small industrial and traditional area source categories were excluded from the ASEI either because they were considered insignificant sources or because data collection was judged unfeasible. The sources excluded from the inventory are:

- Architectural and industrial surface coatings
- Solvent degreasing
- Asphalt paving and roofing
- Traffic markings
- Glass making operations
- Prescribed and wild fires (not including agricultural burning)
- Lumber manufacturing
- Bus terminals
- Tortillerias (tortilla manufacturing shops)
- Meat by-products processing.

The maquiladora industry was another key exclusion from the ASEI. Maquiladoras are minor point sources emitting less than 100 TPY of PM_{10}, $PM_{2.5}$, or VOC. It is difficult to obtain data for these facilities due to Mexico's confidentiality laws.

Table 6-5 summarizes the emission estimates for the 2002 Juarez ASEI. Total VOC emissions for Ciudad Juárez were reported at 14,500 TPY with most (87%) contributed to area sources as opposed to small-sources (13%). The total NO_x emissions were estimated at 1,428 TPY with only 1% contributed by small sources. The most dominant small source of VOC emissions was Water Treatment at an estimate of 1,353 TPY, whereas the most dominant area source was residential fuel combustion with an estimated value of 6,629 TPY. Consumer Solvents (4787 TPY) and Brick Kilns (372 TPY) also contributed a significant amount (36%) of VOC emissions. The most dominant area source category of NO_x emissions was also residential fuel combustion with an estimate of 973 TPY.

Table 6-3 Emission estimates for the 2002 Ciudad Juárez ASEI

	Small Source			**Area Source**	
	NOx	VOC		NOx	VOC
Source Category	tpy	tpy	**Source Category**	tpy	tpy
Asphalt	9.5	4.9	Brick Kilns	28.5	371.5
Concrete			Open Burning	34.5	43.6
Foundries	0.2	0.1	Fertilizers		
Woodworking			Pesticides		3.4
Wastewater Treatment	0.4	1352.9	Agricultural Burning		14
Quarries			Agricultural Tilling		
Landfill			Feedlots and Dairies		
Autobody Refinishing		3.2	Livestock		
Drycleaners		33.4	Structural Fires	0.1	0.3
Bakeries		1.3	Wind Erosion		
Gas/Diesel Marketing		198.1	Fuel Combustion – Commercial and Institutional	252.8	7.9
LPG Marketing		237.5			
Restaurants	0.4	0.5	Fuel Combustion – Residential	973.1	6629.3
Street Vendors	0.3	1			
Ice Plants			Construction		
Graphic Arts		1.4	Consumer Solvents		4781.6
Grain Mills			Border Crossings	128.2	814.6
Sub-Total	11	1834	**Sub-Total**	1417	12666

The total VOC emissions reported for 2002 (area and small source categories) were 14% higher than the area source emissions reported for Ciudad Juárez in 1996. Conversely, the total NO_x emissions reported for 2002 (area and small source categories) were 30% lower than the area source emissions reported for Ciudad Juárez in 1996 (Haste et al, 1998). These relative changes coincide with the suggested overestimation of NOx and/or underestimation of VOC emissions for Ciudad Juárez identified during the top-down evaluation of the 1996 emission inventory (Funk et al, 2001).

6.3.2 The 2008 Juarez Area Source Emission Inventory

The objective of the 2008 Juarez ASEI was to develop an EI for base year 2008 in a format appropriate for ozone modeling to be used by TCEQ (CEER & ERG, 2011). The pollutants of concern were the ozone precursors NO_x, VOC, CO, SO_2, PM_{10}, and $PM_{2.5}$. A major improvement over the 2002 inventory was that the 2008 inventory included ozone relevant area source categories (e.g., solvent use - degreasing), as well as onroad and nonoad mobile sources, and biogenic sources. Point sources were excluded.

The estimation methodologies used for the area sources contained in the 2008 Juárez ASEI are summarized in Appendix 2 (Table 2-1 in CEER & ERG, 2011). The two most important sources of local activity data were government agencies (e.g., SEMARNAT, INEGI, and SAGARPA) and a purpose-designed data collection survey conducted by the Technical Institute Ciudad Juárez (ITCJ). Local activity data was given preference over state or federal level information.

Table 6-6 shows that the area source VOC and NO_x emissions totaled at 24,895 TPY and 1,080 TPY in Ciudad Juárez. The 2008 ASEI reported an increase of 72% for VOC emissions and a reduction of 24% for NO_x emissions, as compared to 2002. The most dominant VOC and NO_x area source categories were industrial residual fuel combustion (59%) and solvent use – degreasing (36%), respectively.

Table 6-4 Comparison of 1996 and 2008 Emissions Inventories for Ciudad Juárez

	VOC (tpy)			**NOx** (tpy)		
Ciudad Juarez, MX	1996	2008	Change	1996	2008	Change
Area Sources	16,790	24,895	48%	1,095	1,080	-1%
Point Sources	1,825	--		15,695	--	
Mobile Sources*	57,305	8,151	-86%	25,185	12,564	-50%
Biogenic Sources	12,045	3,035	-75%	4,380	1,720	-61%
County Total	87,965	36,081	-59%	46,355	15,364	-67%

* Includes both on-road and non-road emission estimates

Emissions from onroad sources in Juárez were calculated with a methodology initially developed as part of the 1999 Mexico NEI (ERG, 2006) and subsequently refined in other parts of Mexico (ENVIRON and ERG, 2007; ERG, 2009). The methodology consisted of using traffic and congestion modeling to estimate vehicle-kilometers traveled (VKT) by road segment for the municipality of Juárez. The road-segment VKT estimates were then used in conjunction with the emission factors generated by the MOBILE6-Mexico model for the total emissions (ERG, 2003).

Onroad mobile emissions for NO_x and VOC totaled 7,627 TPY and 7,621 TPY, respectively. Heavy-duty diesel vehicles (HDDV) contributed 65% and 50% of the total onroad NO_x and VOC emissions, respectively (CEER & ERG, 2011). The onroad mobile emissions estimated for 2008 are considerably lower than the 25,185 TPY of NO_x and 57,305 TPY of VOC estimated in 1996, as indicated in Table 6-6.

Nonroad mobile sources totaled 4,937 TPY of NO_x and 530 TPY of VOC. Emissions from construction activities represented the most NO_x (90%) and VOC (87%) nonroad emissions. Biogenic emissions were estimated using the Global Biosphere Emissions and Interactions System (GloBEIS), Version 3.1, model (Yarwood et al, 2002) and the Mexico-specific land use data. The total estimated biogenic NO_x emissions were 1,720 TPY and the total estimated biogenic VOC emissions were 3,039 TPY. The estimated biogenic emissions for 2008 were lower than both VOC (12,045 TPY) and NO_x (4,380 TPY) emissions estimated in 1996.

In general, emission totals for both NO_x and VOC were considerably lower in 2008 as compared to 1996, except for area source NO_x emissions, which were similar to those reported for 1996. Point sources were not estimated for the 2008 emission inventory.

6.4 Recommended improvements to the Juarez emissions inventory

It is important to gain a better understanding of point source emissions in Juarez to improve modeling input data and factors which would contribute to ozone formation. The consistent lack of available emission data from the maquiladora industry and the power plants, which includes the Samalayuca power plant to the south of Juarez and the two electric peaking units located within the Juárez metroplex (both plants use #6 fuel oil or combustoleo), continues to be the source of uncertainties for a reliable emission estimate for the electricity industry in Juarez.

Fugitive emissions from the PEMEX fuel tank farm located in southern Juarez have not been quantified and could be a significant source of air emissions In addition, emissions from the brick kilns scattering throughout the community continue to be poorly studied in terms of the numbers and locations of these kilns in the city, the frequency and operation schedule of each kiln, fuel speciation, and emission composition. Furthermore, it is unknown if those modified brick kilns constructed by EPEC over 10 years ago are considered in the calculation of emissions from this source category.

7.0 Summary of Emission Inventory Review

An emission inventory review was performed in Sections 2 through 6 of this report to gain a historical perspective of the quantity and quality of the EI data for the PdN bi-national airshed. Based on the knowledge acquired, six sources or source categories were selected for improvement or inclusion into the EI database. The improved EI database will later be used in a photochemical air quality model for evaluating the effectiveness of various ozone control measures on the PdN air quality.

This section summarizes the EI review for the PdN region. Considerations for making the decision to conduct a follow-up emission inventory for the five or more sources are discussed.

7.1 Emission Trends

Table 7-1 summarizes the annual VOC and NOx emissions from onroad, area, nonroad, and point sources in El Paso, as previously presented in Section 6. 2002, 2005, and 2008 are the most recent 3 years of periodic emission inventories (PEI) obtained from TexAER.

Area sources contribute about half of the total VOC emissions, and onroad sources contribute about a third. However, there is a slight downward trend of the total VOC emissions even though area source emissions increased steadily from 2002 to 2008. The decrease of onroad VOC emissions apparently overcome the increase of area source VOC emissions in the past decade. Onroad sources accounted for approximately two thirds of the total NOx emissions, while the total NOx emissions decreased gradually from 2002 to 2008.

Table 7-1 Emissions from onroad, area, nonroad, and point sources in El Paso

	VOC (TPY)			NOx (TPY)		
El Paso	2002	2005	2008	2002	2005	2008
onroad	6,868	5,563	4,475	16,600	14,352	10,159
area	7,887	8,308	9,513	1,198	1,221	1,240
nonroad	1,712	1,547	1,377	2,897	2,875	2,382
point	780	961	1056	3695	3397	4687
Total	17,247	16,379	16,421	24,390	21,845	18,468

7.2 Onroad Emissions

The El Paso region's population will continue to grow in the future years. The total VMT is expected to increase in line with the population growth. Estimates of the VOC and NOx emissions have been made for years 2005, 2015, 2025 and 2035, with an optimistic population growth rate. The total VOC and NOx emissions are projected to decline from 2005 to 2025 but turn to an upward trend between 2025 and 2030. This may indicate that the El Paso road network, with planned highway capacity expansions, is able to handle the growth in traffic demand with no adverse effect on the total VOC and NOx emissions. However, the network capacity may reach a maximum after 2025 and unable to cope with the demand, causing the total emissions to increase. Nevertheless, the projection was based on an optimistic growth rate and a slower population growth rate is likely to retard the emission trend.

The estimation approach, statistics and trends reported by El Paso MPO in its conformity reports and MTPs appear reasonable. However, we noticed that:

1. El Paso MPO and IMIP have their own TransCAD-based TDMs. However, the cross border trips were modeled independently in each of the models. Based on the current set up, in each TDM the Ports of Entry (POEs) are modeled as links connected to the external zones. If both the El Paso and Ciudad Juárez models capture the POEs traffic operations successfully, this will lead to double counting of emissions. It appears that the current El Paso TDM underestimates the queue length and waiting time at the POEs, thereby underestimates the emissions at POEs.
2. The Customs and Border Protection (CBP) began inspecting vehicles traveling from El Paso to Ciudad Juárez in 2009. The queue and delay caused by this southbound inspection activity has not been reflected in the TDM.

7.3 Area Source Emissions

As stated in Section 6.3, several unresolved area emissions in the PdN continue to limit the accuracy of any EIs effort. Specifically, 1) those emission categories that rely on the 1999 baseline EI data need to be revisited; 2) emissions factors for certain combustion processes in the PdN need to be developed; 3) candidate sources for further review include brick kilns in Mexico; and 4) emissions from anaerobic digesters at the El Paso and Juárez wastewater treatment plants.

7.4 Nonroad Emissions

Nine out of the 18 major nonroad emission sources in El Paso were identified for further investigation in Section 6.4. They are recreational equipment; construction & mining equipment, lawn and garden equipment; commercial equipment; agriculture equipment; commercial aircraft; and railroad equipment. In addition, emissions from military facility in El Paso could become a major emission source for ozone formation in the region. For purposes of national security the value does not need to be precise, but a reasonable estimate should be developed to improve any photochemical modeling applications.

7.5 Point Source Emissions

Given the comprehensive emission reporting requirements of the permit program carried out by TCEQ for major sources as defined in the 30 TAC 101.10, the regional point source emission inventory is considered complete and of high quality. No evident weakness were observed and thus no improvements are suggested at this juncture. A suggestion in regard to data availability is for TCEQ to maintain and publish a historical archive of point source emission inventories online.

The data strongly suggests that NOx emissions from point sources are decreasing at a rate close to 125 TPY. The data also suggests, although with some uncertainty, that VOC emissions are also on a downward trend. The point source emission trend needs to be compared against the total regional EIs to determine if the atmospheric VOC/NOx ratios are expected to be affected by these trends.

7.6 Emission Inventories for the Greater Paso del Norte region

The revision of the VOC speciation data from 1996 suggested that either emissions from certain activities (e.g., industrial coating, degreasing, petroleum product storage, fuel exhaust, and dry cleaning) were overestimated or the speciation profiles used were inappropriate for the region (Funk et al, 2001). Also the evaluation suggested that emissions from ethane and propane combustion sources were underestimated. It was not clear if these issues were specifically addressed in the subsequent inventories. In this regard, a comprehensive evaluation of the speciation profiles as they apply to VOC emission sources from Ciudad Juárez is a key area of improvement for future regional inventories.

Considering the significant change in estimated emissions for Ciudad Juárez during the last decade, particularly among area source emissions, a field survey to identify or verify the activity and/or presence of area source categories might be useful in evaluating the completeness of the inventory. A similar task could also be useful for the entire region as it might help verify completeness and improve the spatial allocation of area source emissions by providing location-specific information.

8.0 Emission Inventory Improvement Plan

As indicated in Section 1 of this report, EIIPs require substantial consideration in order to not pursue sources which may be irrelevant in regards to air quality planning strategies. EIIPs also require a series of questions specified in Section 1 be answered prior to committing time and effort in this venture. Each of those questions must be answered prior to updating the knowledge base.

The six sources of emissions identified for improvement are:

- Light duty and heavy duty vehicles at the El Paso-Juarez international ports of entry;
- Tactical operations at Ft Bliss Military Reservation;
- Locomotives;
- Aircraft, auxiliary power units, and airport ground support equipment;
- Extended idling of heavy duty truck at truck stops and rest areas; and
- Dry cleaners

Appendix 9 presents the spatial analysis of the selected sources. Figures A-1 to A-4 illustrate the spatial distributions of the above sources in El Paso. They are overlapped with the approximate high ozone concentration area above 70 ppb. The high ozone area is derived from the isopleth maps of the 8-hour ozone design values in 2006 and 2008 analyzed in the conceptual model. Figure A-1 shows that all ports of entry with the exception of the Tornillo-Guadalupe POE within the PDN area are subject to the areas of high ozone concentration and need to be examined in terms of emissions inventories. Figure A-2 shows that part of the Ft Bliss Military Reservation is located in the high ozone area in El Paso. Figure A-3 shows that all railroad tracks and train stations are within the approximate area of higher ozone concentration. Figure A-4 shows that dry cleaners located on the east side of the city are within the high ozone area. Airports are not listed since they will be treated as point sources. There are only two truck rest stops in El Paso and they are not plotted either.

8.1 International Port of Entry Emissions

The El Paso-Juarez international ports of entry (POEs) present a question regarding a potential responsible party for SIP planning purposes. Over 40,000 passenger vehicles cross each day in to the US from Mexico. It is expected that the same number of vehicles cross back into Mexico each day (CBP, Customs and Border Protection).

The majority of the northbound vehicles wait in a queue on the U.S. side of the border. The distance from the international limit to the port of entry (POE) inspection booth is approximately 500 meters, and the queue may extend for a fraction of a kilometer up to 2 kilometers into Mexico. A reasonable assumption may also be made that those vehicles wait on the border due to US policies on the interdiction of drugs, weapons, and certain agricultural commodities. Therefore, those emissions should be added to El Paso's mobile source emissions budget.

Recently, queuing of southbound vehicles has been developed due to the enforcement of the U.S. national security measures involving the inspection of vehicles for weapons or cash en route to Mexico. Therefore, the international bridges in El Paso are congested with both northbound and southbound traffic all of which encompass the Paso Del Norte Region. It has been observed that almost every vehicle at the POE accelerates upon exiting the US inspection booth, resulting in excessive vehicle emissions at the POEs.

A 2-pronged approach was decided in establishing emissions under 2 SCCs at the POEs. This EIIP considers emission from both light-duty and heavy-duty vehicles as well as buses on the passenger vehicle side of the POE. The purpose for differentiating emissions between light-duty and heavy-duty vehicles is to provide consideration for the ports of entry containing only light-duty vehicle traffic due to the fact there are certain POEs that offer only inspection services for passenger traffic. The POEs keep separate inspection operations for heavy-duty and light-duty vehicles, where each operation has different queuing times. Since the emission factors are different for light-duty and heavy-duty vehicles, establishing emission factors for each inspection operation containing both light-duty and heavy-duty vehicles would provide an improved emission estimate for use in a "hot-spot" analysis.

The proposed methodology for simulating POE idling and accelerating emissions consists of developments of emission factors and activities. Emission factors will be developed from U.S. EPA MOVES2010a (Motor Vehicle Emission Simulator) for southbound and northbound vehicles. The northbound emission factors will be compared with those derived from MOBILE5-Juárez-II, version 5a.1 (ERG, 2002). The number of vehicles at each POE will be obtained from BTS (Bureau of Transportation Statistics) and/or TTI (Texas Transportation Institute), with the vehicle wait times at various POEs from CBP. The technical description of the methodology with sample calculations is attached in Appendix 3.

8.2 Tactical operations at Ft Bliss Military Reservation

Ft. Bliss, Texas may be considered a "city within a city". Many activities which occur on-base can also be found off-base, but at a smaller scale. The concerns with identifying Ft. Bliss as a point source are whether a point source is an adequate representation for the emissions from the base and where is the appropriate location for a point source to be used in the photochemical model given the facility spans over 600 square miles.

While Ft. Bliss submits an annual point source EI report, emissions generated by tactical operations in northeast El Paso County and south-central Otero County, New Mexico remain unquantified. Emissions from several thousand motorized diesel-fueled vehicles and diesel generators produce a large amount of NOx and VOC emissions that should be quantified.

The proposed methodology for estimating the emissions from tactical operations at Ft Bliss Military Reservation is attached in Appendix 4. Sample calculations are provided in the appendix.

8.3 Locomotives

Locomotive emission is considered one of the major nonroad emission sources in El Paso and is predicted to increase several fold in the future. On average, El Paso and Cd. Juarez transport approximately 102 trains per day within the El Paso MPO study area. The number is estimated to increase to more than 200 per day in the future.

Union Pacific is planning for a 2% train growth per year or a high-end figure of 80-85 trains per day in the El Paso area by 2016. El Paso BNSF's capacity for railroad infrastructure could double in 7-10 years from 2008. By the year 2020 the number of trains crossing in El Paso-Cd. Juarez by Ferromex could increase to approximately more than 100 trains per day.

Two out of the three Class I railways operating in Texas have major presence in El Paso, which are the Union Pacific (UP) and the Burlington-Northern Santa-Fe (BNSF). El Paso is the regional hub of UP. Construction of a UP's $400 million rail facility in Santa Teresa New Mexico was launched in 2011 that will eventually transforms Santa Teresa into a new operational hub by 2015 (El Paso Times, 2011). Santa Teresa is a neighboring city to the west of El Paso and it shares the same air shed with El Paso.

Gross ton-miles (GTM) for the line haul locomotives and the number of switch engines will be collected from UP and BNSF. This information will then be converted to gallons of fuel consumed, using existing guidance from the U.S. EPA (EPA, 2009). Fuel consumption will be used to estimate emissions in terms of grams of pollutants per gallon of diesel fuel consumed, based upon EPA locomotive emission factors. The emission factors of both line haul and switch locomotives are given in the 2009 EPA guidance. The technical description of the methodology with sample calculations is attached in Appendix 5.

8.4 Aircraft, Auxiliary Power Units, and Airport Ground Support Equipment

Although TCEQ had contracted ERG to estimate emissions from airports in Texas in 2008 (TCEQ, 2009), emissions from the El Paso International Airport do not appear to be well quantified, based on the review of previous EIs conducted for the PdN. The 2005 and 2008 EIs for the airport should be revised by adopting improved aircraft specific activity data in the calculations of aircraft emissions and by collecting additional airport related activity data for use in the estimation of emissions from ground support activities.

The proposed methodology is similar to the one used in the 2009 study. The emphasis is on the commercial airports including the El Paso International Airport. The activities of aircraft landing and takeoff will be collected from BTS and FAA and confirmed with regional airports. The emissions will be calculated by using the FAA Emissions and Dispersion Modeling System (EDMS) if detailed activity information is available. Generic approach that relies upon representative criteria emission factors provided by EPA will be adopted if the aircraft make and model are unknown. This is usually the case for the general aviation and military aircraft activity database.

Descriptions of the methodology to be applied are provided in Appendix 6. Sample calculations of emissions in EDMS for commercial aircraft, auxiliary power units (APUs), and ground support equipment are listed.

8.5 Heavy Duty Truck Extended Idling Emissions

Item (xi) of Section 108 (f) of the 1990 amended Clean Air Act defines "programs to control extended idling of vehicles" as a candidate transportation control measure. The idea is that vehicular emissions can be reduced by eliminating vehicle idling, either by turning the engine off while the vehicle is stopped or by limiting the periods of time in which a vehicle must be stopped and idling.

TCEQ did a comprehensive study of the heavy duty truck extended idling emissions in the past (TCEQ, 2004). The proposed methodology is similar to the one used in the 2004 study, which consists of developments of emission factors and activities. Emission factors will be developed by using the U.S. EPA MOVES2010a. Field surveys will be performed to collect the necessary information from each major truck stop and rest area located in El Paso. Descriptions of the methodology and sample calculations are provided in Appendix 7.

8.6 Dry Cleaners

VOCs emitted by dry cleaners are from the solvents used in the dry cleaning process. Dry cleaning operations typically use synthetic halogenated or petroleum distillate organic solvents. VOCs may be emitted in the dry cleaning process or during solvent reclamation processes. Petroleum solvents most commonly used in the dry cleaning process are Stoddard solvent (mineral spirits) and 140-F. Synthetic solvents used in the dry cleaning process include perchloroethane (PERC), Trichloroethane (TCA), and chlorofluorocarbons (CFC-113).

A complete inventory of the locations of the dry cleaners in the PdN and the amount of chemicals used in the business is needed for a better quantification of the VOC emissions from this industry. Descriptions of the methodology to be used for this EI improvement with sample calculations are provided in Appendix 8.

It is noticed that auto body shops may emit a significant amount of VOCs and be regulated in the future in El Paso. The methodology for estimating emissions from the auto body shops is similar to that for the dry cleaners. A separate EIIP for the body shops will be prepared if it is deemed necessary by the TCEQ and El Paso MPO.

9.0 References

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10.0 Appendices

Appendix 1: Some 7 Digit Source Classification Codes for Area Sources

SCC7	SCC7 Description
2102004	INDUSTRIAL FUEL COMBUSTION: DISTILLATE OIL: BOILERS/IC ENG.
2102005	INDUSTRIAL FUEL COMBUSTION: RESIDUAL OIL
2102006	INDUSTRIAL FUEL COMBUSTION: NATURAL GAS: BOILERS/IC ENG.
2102007	INDUSTRIAL FUEL COMBUSTION: LIQUIFIED PETROLEUM GAS (LPG)
2102011	INDUSTRIAL FUEL COMBUSTION: KEROSENE
2103006	COMMERCIAL/INSTITUTIONAL FUEL COMBUSTION: NATURAL GAS
2103007	COMMERCIAL/INSTITUTIONAL FUEL COMBUSTION: LPG
2103011	COMMERCIAL/INSTITUTIONAL FUEL COMBUSTION: KEROSENE COMBUSTORS
2104006	RESIDENTIAL FUEL COMBUSTION: NATURAL GAS ALL COMBUSTORS
2104007	RESIDENTIAL FUEL COMBUSTION: LIQUIFIED PETROLEUM GAS (LPG)
2104008	RESIDENTIAL WOOD COMBUSTION: FIREPLACES
2294000	PAVED ROADS: TOTAL: FUGITIVES
2311010	RESIDENTIAL CONSTRUCTION: TOTAL
2311020	HEAVY CONSTRUCTION: TOTAL
2311030	ROAD CONSTRUCTION: TOTAL
2325000	MINING & QUARRYING: ALL PROCESSES
2401001	ARCHITECTURAL COATINGS: TOTAL: ALL SOLVENT TYPES
2401005	AUTO REFINISHING: ALL SOLVENT TYPES
2401025	METAL FURNITURE: TOTAL: ALL SOLVENT TYPES
2401060	LARGE APPLIANCES: TOTAL: ALL SOLVENT TYPES
2401200	SPECIAL PURPOSE: TOTAL: ALL SOLVENT TYPES
2420000	DRY CLEANING: ALL SOLVENT TYPES
2440020	MISC. INDUSTRIAL: TOTAL: ALL SOLVENT TYPES
2460100	CONSUMER/COMMERCIAL: ALL PERSONAL CARE PRODUCTS
2460200	CONSUMER/COMMERCIAL: ALL HOUSEHOLD PRODUCTS
2460400	CONSUMER/COMMERCIAL: ALL AUTOMOTIVE AFTERMARKET PRODUCTS
2460800	CONSUMER/COMMERCIAL: ALL FIFRA RELATED PRODUCTS
2501060	PETROLEUM PRODUCTS: GASOLINE SERVICE STATIONS: STAGE 1, 2 & Filling
2610000	OPEN BURNING: ALL CATEGORIES
2610030	OPEN BURNING: RESIDENTIAL
2630020	WASTEWATER TREATMENT: TOTAL PROCESSED: PUBLIC OWNED
2801000	AGRICULTURE PRODUCTION-CROPS: TOTAL
2801700	AGRICULTURE PRODUCTION-CROPS: FERTILIZER APPLICATION
2805000	AGRICULTURE PRODUCTION-LIVESTOCK: TOTAL
2806000	DOMESTIC ANIMAL EMISSIONS
2810020	OTHER COMBUSTION: PERSCRIBED BURNING OF RANGELAND

Appendix 2: 2008 Area source matrix of methods and activity

Source Category	Pollutants	Methodology	Activity Data	Spatial Surrogate	Comments
Fuel Combustion – Distillate Fuel Oil (Industrial)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	AP-42 emission factors (Section 1.3, Tables 1.3-1, 1.3-3, 1.3-6, and 1.3-7)	Local use statistics (PEMEX)	Employee data (industrial – total)	Not reconciled with point sources.
Fuel Combustion – Residual Fuel Oil (Industrial)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	AP-42 emission factors (Section 1.3, Tables 1.3-1, 1.3-3, 1.3-5, and 1.3-7)	Local use statistics (PEMEX)	Employee data (industrial – total)	Not reconciled with point sources.
Fuel Combustion – Natural Gas (Industrial, Commercial/ Institutional, and Residential)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	AP-42 emission factors (Section 1.4, Tables 1.4-1 and 1.4-2)	Local use statistics (ITCJ survey)	Employee data (industrial – total, commercial – total); population (residential)	Not reconciled with point sources (industrial).
Fuel Combustion – LPG (Industrial, Commercial/ Institutional, Residential, Agricultural, and Transportation)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	AP-42 emission factors (Section 1.5, Table 1.5-1)	Local use statistics (ITCJ survey)	Employee data (industrial – total, commercial – total); population (residential, transportation); agricultural land use (agricultural)	Not reconciled with point sources (industrial).
Fuel Combustion – Wood	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	Projection of Mexico NEI	Mexico NEI	Population (GIS shapefile)	
Architectural Coating	VOC	Revised Mexico-specific per capita emission factors	Population (INEGI)	Population (GIS shapefile)	

Source Category	Pollutants	Methodology	Activity Data	Spatial Surrogate	Comments
		(SEMARNAT)			
Industrial Surface Coating	VOC	Revised Mexico-specific per employee emission factors (SEMARNAT)	Employment data by sector (INEGI)	Employee data (industrial sector)	Not reconciled with point sources.
Autobody Refinishing	VOC	Revised Mexico-specific per employee emission factors (SEMARNAT)	Employment data by sector (INEGI)	Employee data (industrial sector)	
Graphic Arts	VOC	Mexico-specific per capita emission factors (NEI)	Population (INEGI)	Population (GIS shapefile)	
Dry Cleaning	VOC	Revised Mexico-specific per employee emission factors (SEMARNAT)	Employment data by sector (INEGI)	Employee data (industrial sector)	Petroleum-based solvents only; no perchloroethylene.
Degreasing	VOC	Mexico-specific per employee emission factors (SEMARNAT)	Employment data by sector (INEGI)	Employee data (industrial sector)	Not reconciled with point sources.
Consumer Solvents	VOC	U.S. per capita emission factors (adjusted)	Population (INEGI)	Population (GIS shapefile)	Household and automotive factors modified to represent Mexican conditions.
Traffic Markings	VOC	Local applied quantities and VOC contents	Local use statistics (ITCJ survey)	Paved road network (GIS shapefile)	
Asphalt Application	VOC	Local applied quantities (ITCJ survey)	Local use statistics (ITCJ survey)	Paved road network (GIS shapefile)	No cutback asphalt usage reported. Reported quantity included both

Source Category	Pollutants	Methodology	Activity Data	Spatial Surrogate	Comments
					emulsified and hot-mix. For calculation purposes, all asphalt was assumed to be emulsified.
Petroleum Transport and Distribution	VOC	EIIP emission factors	Local fuel throughput (SEMARNAT)	Station locations (ITCJ survey)	
Agricultural Burning	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	ARB emission factors and fuel loading	Burned acreage (SAGARPA)	Agricultural land use data (GIS shapefile)	Only crop burned is wheat.
Agricultural Pesticides	VOC	EIIP emission factors	Harvested acreage, type and quantity of pesticides applied (SAGARPA)	Agricultural land use data (GIS shapefile)	Pesticides only applied to cotton.
Livestock	VOC, PM_{10}, $PM_{2.5}$	ARB emission factors	Number of livestock head (SAGARPA)	Dairy and slaughterhouse locations (SAGARPA)	Only livestock types were beef cattle and dairy cattle.
Structural Fires	NO_x, VOC, CO, PM_{10}, $PM_{2.5}$	EIIP emission factors	Number of structures burned (ITCJ survey)	Population (GIS shapefile)	
Vehicle Fires	NO_x, VOC, CO, PM_{10}, $PM_{2.5}$	EIIP emission factors	Number of vehicles burned (ITCJ survey)	Population (GIS shapefile)	
Border Crossing	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	MOBILE6-Mexico emission factors	Local traffic counts, idling times (BTS)	Border crossing locations	Only includes idling vehicles crossing from Juárez to El Paso.

Source Category	Pollutants	Methodology	Activity Data	Spatial Surrogate	Comments
Brick Kilns	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	Projection of Mexico NEI	Mexico NEI	Population (GIS shapefile)	
Charbroiling/Street Vendors	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	Projection of Mexico NEI	Mexico NEI	Population (GIS shapefile)	
Open Burning – Waste	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	Projection of Mexico NEI	Mexico NEI	Population (GIS shapefile)	
Landfills	VOC	AP-42 equations	Annual quantity of waste landfilled, opening year	Landfill location	
Wastewater Treatment Plant	VOC	U.S. EPA emission factor	Wastewater flow rates	Treatment plant location	
Bakeries	VOC	Mexico NEI emission factors	Population	Population (GIS shapefile)	

Appendix 3: Method for calculating international POE emissions

DESCRIPTION: Emissions from extended motor vehicle idling at border crossings.

POLLUTANTS: NOx, VOC, and CO

ACTIVITY DATA:
• Monthly average minimum and maximum temperatures (NCDC, 2008)
• Altitude of the border crossing ports (1100m)
• Number of vehicles at border crossing ports (MPO, Archive)
• Vehicle wait times at various border crossing ports can be obtained from US Customs and Border Protection (CBP). A novel approach to estimate vehicle wait time using Mexican radio reports is included in this protocol as well.

EMISSION FACTORS:
• As calculated by EPA MOVES and Mobile6-Mexico

ASSUMPTIONS:
• Average vehicle speed at border crossing ports is assumed to be 4 kilometers per hour (KPH)
• 97% of passenger vehicles considered light-duty gasoline vehicles (LDGV)
• 3% of passenger vehicles considered light-duty diesel vehicles (LDDV)
• Tractor-Trailer trucks and buses were grouped as heavy-duty diesel vehicles (HDDV)
• O3 season daily emissions = highest monthly emissions in the O3 season/number of days in that month

SAMPLE CALCULATIONS:
Estimate emissions from border crossings in Juárez, Chihuahua.
Emissions from border crossings in Juárez:
Emission factors for LDGV in the month of January: NOx = 3.01 g/km; HC = 25.4 g/km; and CO = 295.23 gm/km
Number of LDGV in January = LDGVPM (To be determined)
Average wait time for passenger vehicles = 60 minutes = 1.0 hr
NOx emissions = 3.01 g/km * LDGVPM * 4 km/hr * 1.0 hr = X Mg for January
VOC emissions = 25.4 g/km * LDGVPM * 4 km/hr * 1.0 hr = X Mg for January
CO emissions = 295.23 g/km * LDGVPM * 4 km/hr X 1.0 hr = X Mg for January
Emission factors for LDDV in the month of January: NOx = xx g/km; HC = xx g/km; and CO = xx g/km
Number of LDDV in January = LDDVPM (To be determined [LDDV*0.03])
Average wait time for passenger vehicles = 60 minutes = 1.0 hr
NOx emissions = 3.01 g/km * LDDVPM * 4 km/hr * 1.0 hr = X Mg for January
VOC emissions = 25.4 g/km * LDDVPM * 4 km/hr * 1.0 hr = X Mg for January
CO emissions = 295.23 g/km * LDDVPM * 4 km/hr X 1.0 hr = X Mg for January

Emission factors for HDDV in the month of January: NOx = 18.04 g/km; HC = 8.49 g/km; and CO = 43.76 g/km
Number of HDDV in January = HDDVPM
Average wait time for commercial vehicles = 60 minutes = 1.0 hr
NOx emissions = 18.04 g/km * HDDVPM X 4 km/hr * 1.0 hr = X- Mg for January
VOC emissions = 8.49 g/km * HDDVPM X 4 km/hr * 1.0 hr = X- Mg for January
CO emissions = 43.76 g/km * HDDVPM * 4 km/hr * 1.0 hr = 4.1 Mg for January
Total annual emissions at the Juarez border crossing = Σ (Emissions in each month)
Total annual NOx emissions at the Juarez border crossing = X-Mg = X-Tons
Total annual VOC emissions at the Juarez border crossing = X- Mg = X-Tons
Total annual CO emissions at the Juarez border crossing = X-Mg = X-Tons
Highest monthly emissions in the O3 season are for October (31 days)
Monthly NOx emissions in October = X-tons
Monthly VOC emissions in October = X-tons
Monthly CO emissions in October = X-tons
O3 season daily emissions for NOx = X-tons/31 days = X-tons/day = X-lbs/day
O3 season daily emissions for VOC = X-tons/31 days = X-tons/day = X-lbs/day
O3 season daily emissions for CO = X-tons/31 days = X-tons/day = X-lbs/day

ALTERNATE APPROACH: ESTIMATES OF VEHICLE WAIT TIME

It has been thought that a method of estimating emissions at the international ports of entry is through queuing information that is provided through the Mexican radio reports. EXA, one of the stations in Juarez, Mexico, reports every 20 minutes an estimated queuing time and a landmarker where the queue is positioned at. By providing a landmarker the number of vehicles that are queuing at that time can be obtained through acquiring the distance of the landmark and dividing that distance by the average space headway of 20 feet (El Paso MPO, 1995). Depending on the number of queues that number would be multiplied by the number of vehicles to obtain a total number for vehicles between the end of the queue and a splitting point. It is typical for a port of entry to have several booths. When a vehicles queue it is normal for the vehicles to split for example from three lanes to many lanes depending on the number booths open at the port of entry. Where the vehicle splits a different number of vehicles queuing is estimated at that point. Both the queue at the splitting point and from the landmarker are added to obtain the total number of vehicles queuing at the port of entry.

Although queuing times are provided by the radio reports, those queues are estimated without any knowledge of the number of booths open. A queuing time that is provided for a queue at a certain landmarker with for example 5 lanes open will wait longer than a queue that is open for 10 lanes open. Therefore the queuing time estimates provided by the radio reports are inaccurate. A proposed method to obtain a more accurate queuing time is by taking the number of vehicles at a certain time and then the number 20 minutes later provided by the reports.

For example if at certain time the queue was reported at a certain land marker the number of vehicles queuing could be estimated. Suppose that number is 440 vehicles. Assuming that 20 minutes later the radio reports the queue grows to 880 vehicles and there are 10 booths open. The difference is (880-440) 440 vehicles. If the average inspection time is one minute the number of vehicles that would be processed by the inspection booths during that lapse of time would be: 1 vehicle/ minute x 20 minutes x 10 booths = 200 vehicles

The number of vehicles that would arrive during the 20 minute period is (440-200) 240 vehicles. The number of vehicles arriving per minute is (240/20) 12 and the number of vehicles arriving per booth per minute is (12/10) 1.2. Having been provided the number of booths open, 10, and the inspection rate of one minute, this arrival rate can be input into a simulation program where a better estimate of the queuing time can be provided.

If the simulated queuing time is multiplied by the estimated average number of vehicles in queues and emissions factor provided by the EPA Mobile Vehicle Emissions Simulator (MOVES) it would be possible to obtain the emissions produced for a certain lapse of time. A possible issue is the accuracy and availability of the waiting time data provided by the radio reports. However, this could provide a better estimate than current methods.

Appendix 4: Method for calculating Ft. Bliss tactical operations emissions

SOURCE TYPE: Nonroad

SOURCE CATEGORY: Tactical Military Vehicles and Operations

DESCRIPTION: Estimate emissions from tactical military vehicles and operations at Ft. Bliss Military Reservation and McGregor Range Training Facility which contribute to ozone formation in El Paso

POLLUTANTS: NOx, VOC, and CO

ACTIVITY DATA:
• Monthly average minimum and maximum temperatures (NCDC, 2008)
• Altitude of McGregor Range Training Facility (MGRTF) (1500m)
• Estimated number and type of tactical vehicles operated by Ft. Bliss.
• Vehicle operational parameters at MGRTF provided by US Department of Defense (USDOD).
• Vehicle fuel consumption estimated from vehicle operational parameters.

EMISSION FACTORS:
Emissions factors are derived from diesel vehicles contained in EPA NONROAD and MOVES models.

ASSUMPTIONS:
• Tactical Operations at Ft. Bliss and MGRTF occur all year.
• Tractor-Trailer trucks are grouped as heavy-duty diesel vehicles (HDDV).
• 95% of all vehicles operate using diesel fuel; 5% of vehicles operate using gasoline.
• O3 season daily emissions = highest monthly emissions in the O3 season/number of days in that month

SAMPLE CALCULATIONS:
Estimate annual emissions from heavy-duty diesel vehicles
Assumed Emission Factors: NOx = 180.0 g/gal; HC = 9.5 g/gal; CO = 24.7 g/gal
Assumed Gallon of diesel fuel consumed = 1.0 E6 gallon
NOx emissions = 180.0 g/gal * 1.0 E6 gal = 180 E6 g = 198 ton
HC emissions = 9.5 g/gal * 1.0 E6 gal = 9.5 E6 g = 10.5 ton
CO emissions = 24.7 g/gal * 1.0 E6 gal = 24.5 E6 g = 27.2 ton

Appendix 5: Method of estimating emissions from locomotives

SOURCE TYPE: Nonroad

SOURCE CATEGORY: Locomotives

DESCRIPTION:
Emissions from locomotives

POLLUTANTS:
NOx, VOC, CO, and PM_{10}

EMISSION FACTORS:
Emission factors derived from EPA Emission Factors for Locomotives (EPA-420-F-09-025, 2009)
The conversion factor of HC to VOC: 0.94 (SMOKE2.5)

ACTIVITY DATA:
Gross Ton-miles (GTM) from line haul locomotives operating in El Paso in 2005 and 2008 (Union Pacific (UP) and Burlington-Northern Santa Fe (BNSF))
Number of switch locomotives operated in El Paso in 2005 and 2008 (UP and BNSF)

ASSUMPTIONS:
722 and 762 GTM per gallon of diesel fuel for UP and BNSF, respectively (TCEQ, 2003)
82,855 gallon of diesel fuel per year per switch engine (TCEQ, 2003)
The conversion factor of annual to ozone season daily emissions: 1/268.25 (TCEQ, 2003)
SAMPLE CALCULATIONS:
Estimate annual emissions from line haul locomotives in El Paso
Emission Factors: NOx = 180.0 g/gal; HC = 9.5 g/gal; CO = 24.7 g/gal
GTM = 1.5 E9 GMT, of which two thirds belong to UP and one third belong to BNSF.
Gallon of diesel fuel consumed = (1.0 E9 GMT)/(722 GMT/gallon) + (0.5 E9 GMT)/(762 GMT/gallon) = 2.0 E6 gallon
NOx emissions = 180.0 g/gal * 2.0 E6 gal = 360 E6 g = 396 ton
HC emissions = 9.5 g/gal * 2.0 E6 gal = 19.0 E6 g = 20.9 ton
CO emissions = 24.7 g/gal * 2.0 E6 gal = 49.4 E6 g = 54.4 ton

Estimate annual emissions from switch locomotives in El Paso
Emission Factors: NOx = 250.0 g/gal; HC = 15.0 g/gal; CO = 24.7 g/gal
Number of switch locomotives = 5
Gallon of diesel fuel consumed = 82,855 gallon/engine * 5 engines = 0.41 E6 gallon
NOx emissions = 250.0 g/gal * 0.41 E6 gal = 103 E6 g = 113 ton
HC emissions = 15.0 g/gal * 0.41 E6 gal = 6.15 E6 g = 6.77 ton
CO emissions = 24.7 g/gal * 0.41 E6 gal = 10.1 E6 g = 11.2 ton

Total annual NOx emissions in El Paso = 396 ton + 113 ton = 509 ton
Total annual VOC emissions in El Paso = (20.9 ton + 6.77 ton)*0.94 = 26.0 ton
Total annual CO emissions in El Paso = 54.4 ton + 11.2 ton = 65.6 ton
O3 season daily emissions for NOx = 509/268.25 = 1.90 ton/day
O3 season daily emissions for VOC = 26.0/268.25 = 0.10 ton/day
O3 season daily emissions for CO = 65.6/268.25 = 0.24 ton/day

Appendix 6: Method of estimating emissions from commercial aircraft, auxiliary power units, and ground support equipment

SOURCE TYPE: Nonroad

SOURCE CATEGORY: Commercial Aircraft

DESCRIPTION:
Emissions from commercial aircraft landing and taking off cycles (LTO), auxiliary power units, and ground support equipment

POLLUTANTS:
NOx, VOC, CO, $PM_{2.5}$ and PM_{10}

EMISSION FACTORS:
Emission factors from Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS) model

ACTIVITY DATA:
LTO from Bureau of Transportation Statistics (BTS) T-100 segment dataset

ASSUMPTIONS:
The aircraft make and model are known for commercial LTOs.

SAMPLE CALCULATIONS:
EDMS uses the following equation to estimate aircraft emissions:

$$E_{ijl} = \sum T_k \times NE_{jl} \times (FF_{jlk} / 1000) \times (EI_{ijlk}) \times LTO_{jl}$$

Where:

- E_{ijl} = Emission of pollutant i in pounds produced by the aircraft make j and model l
- T_k = Operating time in mode k (min)
- NE_{jl} = Number of engines associated with aircraft make j and model l
- FF_{jlk} = Fuel flow for individual engine used on aircraft make type j and model l operating in mode k (lbs/min)
- EI_{ijlk} = Emission index for pollutant i for each engine associated with aircraft make j and model l operating in mode k (lbs of pollutant /1,000 lbs of fuel)
- i = Pollutant (i.e., HC, VOC, CO, NO_x SO_2)
- j = Aircraft make (e.g. Boeing, McDonald Douglas, Airbus)
- l = Aircraft model (e.g., B-737 300 series)
- k = Mode (approach, taxi, climbout).

Emissions from APUs are estimated using the following equation in EDMS:

$$E_{ij} = T \times (FF_j/1{,}000) \times (EI_{ij})$$

Where:

- E_{ij} = Emission of pollutant i in pounds produced by the auxiliary power unit installed on aircraft type j for one LTO cycle
- T = Operating time per LTO cycle (min)
- FF_j = Fuel flow for each auxiliary power unit used on aircraft type j (lbs/min)
- EI_{ij} = Emission index for pollutant i for each auxiliary power unit used on aircraft type j (lbs of pollutant /1,000 lbs of fuel)
- i = Pollutant (i.e., VOC, HC, CO, NO_x SO_2)
- j = Aircraft type (e.g., B-737, MD-11)

Emissions from GSEs are estimated by applying activity data to an appropriate emission factor as noted in the following equation:

$$EE = A \times EF \times (1-CE/100)$$

Where:

- EE = Emission estimate (tons per year)
- A = Annual activity level
- EF = Emission factor (tons/activity)
- CE = Anticipated emission reduction (percentage)

Appendix 7: Method of estimating emissions from heavy duty truck extended idling

SOURCE TYPE: Onroad

SOURCE CATEGORY: Heavy Duty Trucks Extended Idling

DESCRIPTION:
Emissions from heavy duty truck extended idling (diesel long-haul combination truck)

POLLUTANTS:
NOx, VOC, CO, $PM_{2.5}$ and PM_{10}

EMISSION FACTORS:
Emission factors derived from the latest version of EPA MOVES (MOVES2010a at the time)

ACTIVITY DATA:
Monthly average temperature profile or minimum and maximum temperatures (NCDC)
Number of trucks hoteling at each truck stop and rest area

ASSUMPTIONS:
Average industry fleet emission factors

SAMPLE CALCULATIONS:
Emission Factors (per vehicle): NOx = 200.0 g/hour; VOC = 55.0 g/hour; CO = 91.0 g/hour. The temperature effect is neglected in this simple estimation.

Estimate extended idling emissions from heavy duty trucks 2230074 at 12 – 1 am on weekday in El Paso
Number of vehicles: 100
NOx emissions = 20,000 g
VOC emissions = 5,500 g
CO emissions = 9,100 g

MOVES default hourly distribution and weekday and weekend effects are assumed to calculate annual emissions. The assumption of MOVES defaults shall be revisited when detailed information is collected from field survey and quality assured for use.

Total annual NOx emissions in El Paso = 1.13E+08 g = 125 ton
Total annual VOC emissions in El Paso = 3.11E+07 g = 34.3 ton
Total annual CO emissions in El Paso = 5.15E+07 g = 56.7 ton

O3 season daily emissions are estimated by assuming more vehicles hoteling on an hourly basis, for example, 110 vehicles at 12 – 1 am:
O3 season daily emissions for NOx = 3.41 E+05 g
O3 season daily emissions for VOC = 9.38 E+04 g
O3 season daily emissions for CO = 1.55E+05 g

DRAFT FIELD SURVEY:
The observable data collected at truck stops and rest areas included:
- Site ID number
- Descriptive location (adjacent highway and mile marker)
- GPS points
- MOBILE6 or MOVES Functional Class of adjacent roadway
- Time of day and day of week of observation
- Number of parking spaces (count or estimate)
- Number of spaces occupied
- Total number of trucks idling
- Number of diesels
- Number of long-haul trucks
- Lot status (paved or unpaved)
- Meteorological Conditions (i.e. temperature and humidity, etc.)
- Is a truck stop electrification facility located at the site?
- How many trucks are using the truck stop electrification facility?
- Amenity characterization (truck stops only)
- Surveyor comments (e.g., problems with access, presence of IdleAire systems, reliability of interviews)

Appendix 8: Method of calculating emissions from dry cleaners

Three types of dry cleaning operations are found: coin operated, commercial, and industrial. Two of these dry cleaning types, coin-operated (SIC code 7215, NAICS code 812310) and commercial (SIC code 7216, NAICS code 812320) dry cleaners, are significant sources of emissions. Coin-operated dry cleaning units are self-service machines that are usually found in laundromats. Commercial dry cleaners are small businesses that offer cleaning services to the public. Some commercial sites may not be emission sources because they are only for drop-off and pick-up of clothes. Industrial launders (SIC 7218, NAICS code 812332) usually use soap and detergent when cleaning, but may also use large-capacity dry cleaning units that should be monitored for emissions. Industrial launders that use dry cleaning solvents are usually part of a business operation that generates soiled fabrics or are large businesses that provide uniform and rental services to its clients.

Methodology

There are a very small number of coin-operated and industrial dry cleaning facilities located within El Paso. Since there are few operations and industrial launders typically use soap and detergent, emissions from these two categories are minimal and not calculated. The methodology used in calculating emissions for commercial dry cleaning facilities is based on local survey. The methodology involves:

1) Conducting a mailed survey requesting the type of solvent used in the dry cleaning process, usage amounts, waste amounts, and activity data.
2) Data from the returned surveys helped formulate per employee emission factors, usage, waste, and activity data.
3) Conducting a second telephone survey requesting information about the type of solvent used and whether dry cleaning activities are performed at the location.
4) Allocating average amount and activity data to dry cleaning facilities contacted by phone that performed dry cleaning processes.
5) Spatially allocating emissions to 4km photochemical modeling grids with GIS software

For commercial dry cleaners the preferred methodology for calculating emissions involves sending out surveys to local commercial dry cleaning facilities and using the information gathered to develop local per employee emission factors. These factors are shown in Table A4-1(AACOG, year). The PERC emission factor is lower than the other solvent emission factors, despite its higher density, because dry cleaners tend to use less PERC per employee. One of the key factors that account for the lower usage is the higher price of PERC solvent compared to petroleum solvents leading to higher recovery and reuse rates of PERC from dry cleaning machines (Radian Corporation, 2006). Another factor in the lower usage amounts, are the stricter regulations by the EPA on PERC emissions, requiring such controls as upgrading equipment, limiting the number of dry cleaning machines, and contributing money to waste clean-up funds for contaminated dry cleaning sites.

Table A4-1: Dry Cleaning Emission Factors by Solvent

Type of Solvent	Density (TOG lbs/gal)	Emission Factor (lbs VOC/ employee/yr)
Petroleum (Stoddard Solvent)	6.8	632.6
PERC (Perchloroethylene)	13.47	55.4
DF-2000 (Exxon)	6.4	63.4
EcoSolv (Chevron-Phillips)	8.51	173.6
Dri-rite	8.55	508.6

After calculating the emission factor per employee for each solvent, a telephone survey of dry cleaners in the El Paso will be conducted.

Emissions were calculated by multiplying the per employee emission factor for each type of solvent by employment for each dry cleaning facilities that used that type of solvent. To determine daily emissions, average number of activity days per year was calculated from the survey results (275.41 days/year). The total emissions per year for each type of solvent were divided by the average number of activity days per year to obtain the emissions released per day.

Table

Table A4-2: Telephone Survey Results for Local Dry Cleaners

Activity data	Number of dry cleaners
No response	
Drop-off only	
Petroleum solvent	
PERC solvent	
DF-2000 solvent (Exxon)	
EcoSolv (Chevron-Phillips)	
Dri-rite solvent	
Water-based solvent (no emissions)	
Total	

Sample Calculation

Equation (1) - Emission factor per employee:

EF_A = [(SU_A – SW_A) x DEN_A / TE_A] x CON

Where,

EF_A = Emission factor for solvent A (lbs VOC/Emp./yr)
SU_A = Total amount of solvent A used (gal /yr)
SW_A = Total amount of solvent A waste (gal /yr)
DEN_A = Density of solvent A (lbs/gal), Table 4-30
TE_A = Total employment for all dry cleaners surveyed using solvent A
CON = Conversion factor to convert TOG to VOC (1.03)

Emission factor for petroleum:

EF_A = [(11,226.9 gal - 754.8 gal) x (6.8 lbs/gal.) / 116 Emp.] x 1.03
= 632.6 lbs VOC /Emp./yr

Equation (2) - Emissions released per solvent per year:

AE_A = (TE_A x EF_A) / 2,000 lbs/ton

Where,

AE_A = VOC emissions per solvent A (tons /yr)
TE_A = Total employment for dry cleaners using solvent A, Table 4-31
EF_A = Emission factor for solvent A (lbs VOC/Emp./yr), Equation (1) and Table 4-30

El Paso County emissions per year from petroleum solvent:

AE_A = (717.76 Emp. x 632.6 lbs VOC/Emp./yr) / 2,000 lbs/ton
= 227.03 tons VOC/ yr

Equation (3) - Emissions released per solvent per day:

DE_A = (AE_A / OSD)

Where,

DE_A = Daily emissions released per solvent A (tons VOC /day)
AE_A = Annual VOC emissions per solvent A (tons VOC /yr)
OSD = Average activity days per year for dry cleaning facilities from surveys – (275.41 days /yr)

El Paso County emissions per day from petroleum solvent:

DE_A = (227.03 tons VOC/ yr) / (275.41 days /yr)
= 0.82 tons VOC /day

Appendix 9: Spatial Analysis

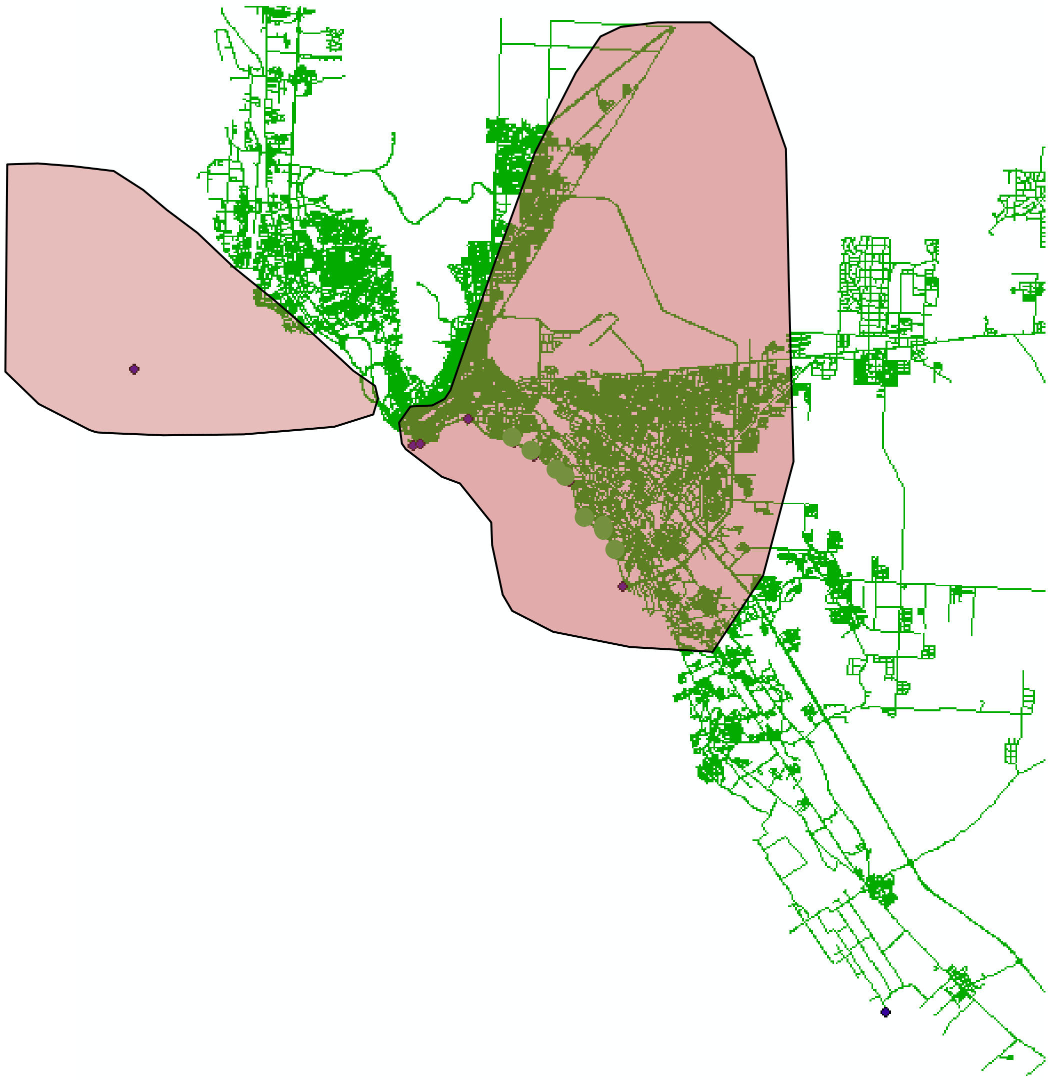

Figure A-1 Approximate high ozone area in El Paso overlapped with Ports of Entry

All ports of entry with the exception of the Tornillo-Guadalupe Port of Entry within the PDN area are subject to the areas of high ozone concentration and need to be examined in terms of emissions inventories. Ports of entry are considered one of the highest generators of air pollutions due to the emissions produced by idling passenger and commercial vehicles

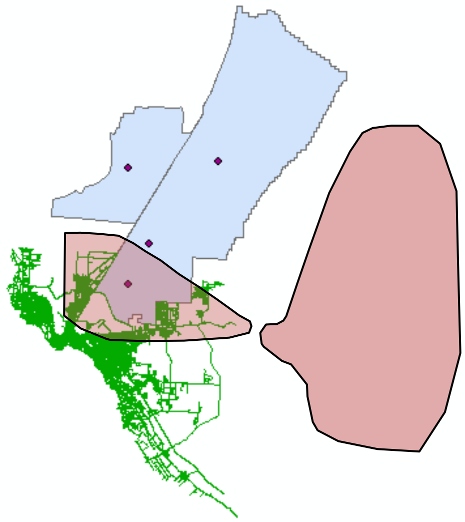

Figure A-2 Approximate high ozone area in El Paso overlapped with Fort Bliss Facilities

Due to Fort Bliss being a city within a city, its facilities in terms of mobile, point, area sources and tactical operations needs to be examined with regard to emissions inventories as it is in one of the highest concentrations of ozone. In addition, it is considered a city within a city. Since inception of the Base Relocation and Closure, developments have increased in Fort Bliss as well as the northeast areas of the PDN area.

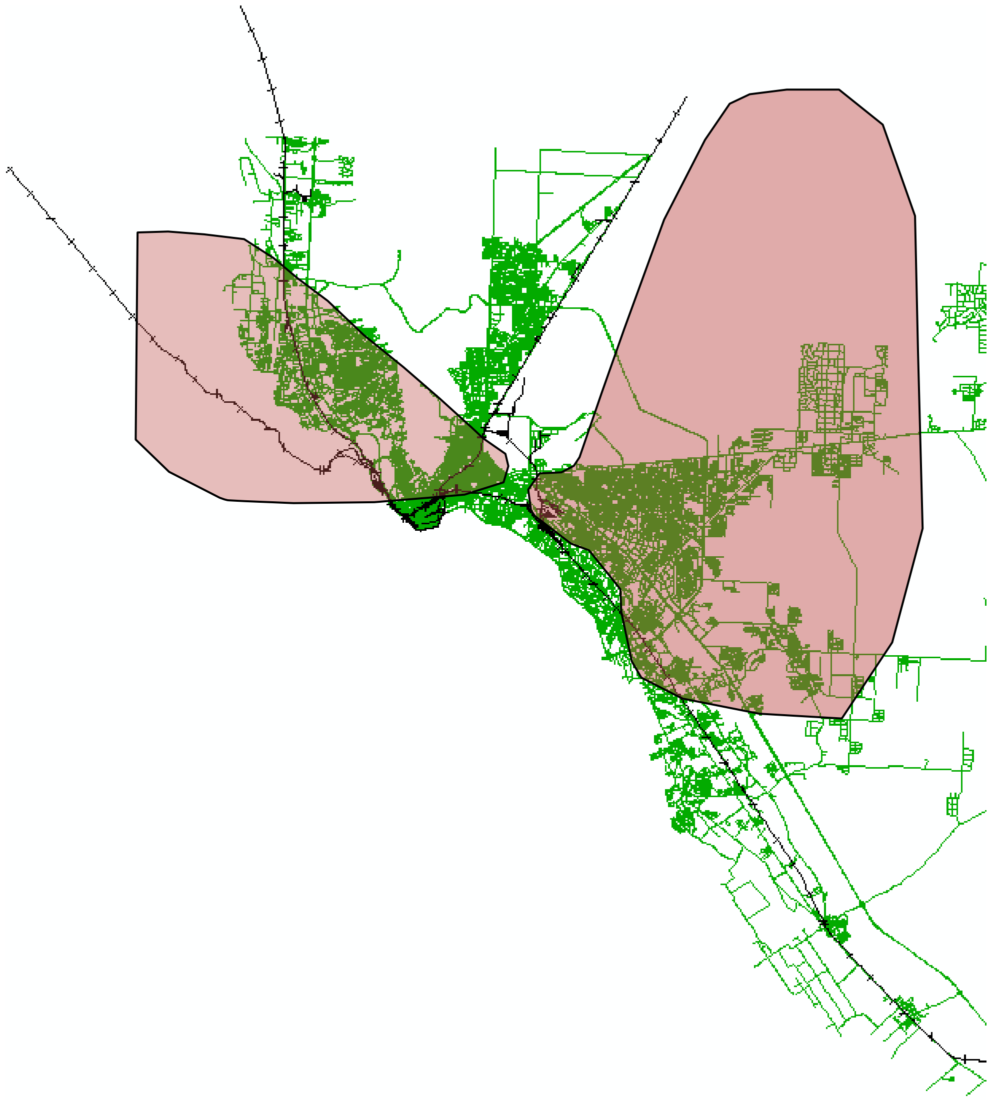

Figure A-3 Approximate high ozone area in El Paso overlapped with railroads

From the view of the figure above there appears that all railroad tracks and train stations are within the approximate area of higher ozone concentration. There will be a need to examine the effects of diesel combustion of the locomotives as well as the point sources that contribute to ozone production.

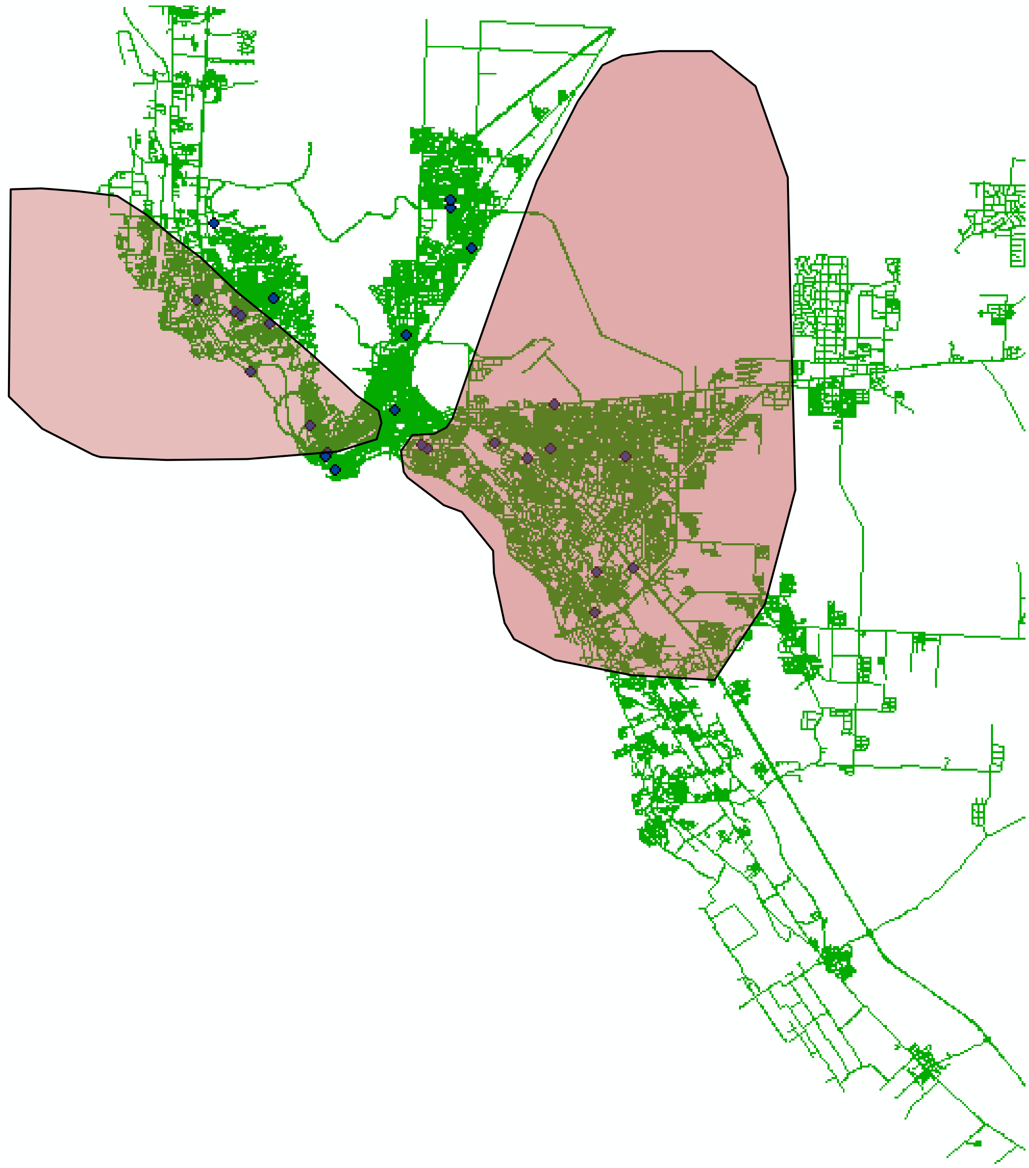

Figure A-4 Approximate high ozone area in El Paso overlapped with dry cleaner laundry facilities

Not all dry cleaner areas are within the ozone area. In the northwestern area there appears less of concentrations of ozone. The focus for dry cleaner areas that are within the ozone area are located on the eastside of the city as well as in downtown.