Photochemical Modeling Surrogate Files

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Level III: Secondary Data
Revision: 0

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Prepared by:

Alamo Area Council of Governments

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APPROVAL SHEET

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During the course of the project, any revision to the QAPP will be circulated to everyone on the distribution list. Paper copies need not be provided to individuals if equivalent electronic information systems can be used.

1   PROJECT DESCRIPTION AND OBJECTIVES

AACOG has prepared this Level III Quality Assurance Project Plan (QAPP) for the Texas Commission on Environmental Quality (TCEQ) following EPA guidelines. The nature of the technical analysis and tasks to be conducted as part of this project are consistent with quality assurance (QA) <u>Category III – National Risk Management Research Laboratory (NRMRL) QAPP requirements for secondary data projects</u>. This QAPP is in effect for the duration of this project, January 11, 2016 through December 15, 2017.

1.1   Purpose of Study

The Clean Air Act (CAA) is the comprehensive federal law that regulates airborne emissions across the United States.[1] This law authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. Of the many air pollutants commonly found throughout the country, EPA has recognized six "criteria" pollutants that can injure health, harm the environment, and/or cause property damage. Air quality monitors measure concentrations of these pollutants throughout the country.

Of the six criteria pollutants, the one that poses the greatest challenge to the San Antonio-New Braunfels Metropolitan Statistical Area (MSA) is ground-level ozone. Ozone monitors in the MSA have recorded violations of the 70 ppb 2015 ozone standard. Ozone is produced when volatile organic compounds (VOC) and nitrogen oxides (NO_X) react in the presence of sunlight, especially during the summer time.[2] These ozone precursors can be generated by natural processes, but the majority of chemicals that form ground-level ozone originate from anthropogenic sources.

To conduct analyses that determine the emission reductions required to bring the area into compliance with the standards, local and state air quality planners need an accurate temporal and spatial account of emissions and their sources in the region. Understanding the spatial location of emission sources that create ozone precursor pollutants increases the accuracy of photochemical modeling analysis and control strategy development to reduce ground-level ozone. This assessment provides key information to update existing data on the location of area and non-road emissions.

1.2   Project Objectives

AACOG will develop improved surrogates for local sources using GIS tools to spatially allocate area and non-road emissions. The project will focus on significant area and non-road emission sources.

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[1] EPA. November 17, 2015. "Summary of Clean Air Act." Available online: http://www2.epa.gov/laws-regulations/summary-clean-air-act. Accessed: 11/19/2015.
[2] EPA. September 23, 2011. "Ground-level Ozone." Available online: http://www3.epa.gov/airquality/ozonepollution/. Accessed: 11/19/2015.

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

### 2.1 Responsibilities of Project Participants

This study will be conducted by the Alamo Area Council of Governments (AACOG) under Contract (Grant) # 582-16-60180, PGA # 582-16-60849-01 and provided to the Texas Commission on Environmental Quality (TCEQ). AACOG staff working on this project and their specific responsibilities are listed below. "The project manager is ultimately responsible for assessing whether the performance and acceptance criteria for the intended modeling use were met and works iteratively with the intended users of the results."[3]

Table 2-1: AACOG's Project Team Participants and Their Responsibilities

Participant	Project Responsibility
Steven Smeltzer	Project manager and expert on developing emission inventories and using ArcGIS to geo-code emissions. He will ensure the project implementation follows all contract requirements and that project quality standards are met on all deliverables. He will assist in interactions with TCEQ as required.
Brenda Williams	Expert on developing emission inventory and will be responsible for implementing project review and quality assurance.
Parviz Nazem	Expert on developing emission inventory and will be responsible for collecting data.
Maricela Diaz-Wells	Expert on developing emission inventory and will be responsible for collecting data.
Lyle Hufstetler	Expert on developing emission inventory and using GIS software. He will be responsible for collecting data and geo-coding emission sources.

In addition, TCEQ staff will participate in the review of the technical documentation generated during this project.

2.2 Project Organization Chart

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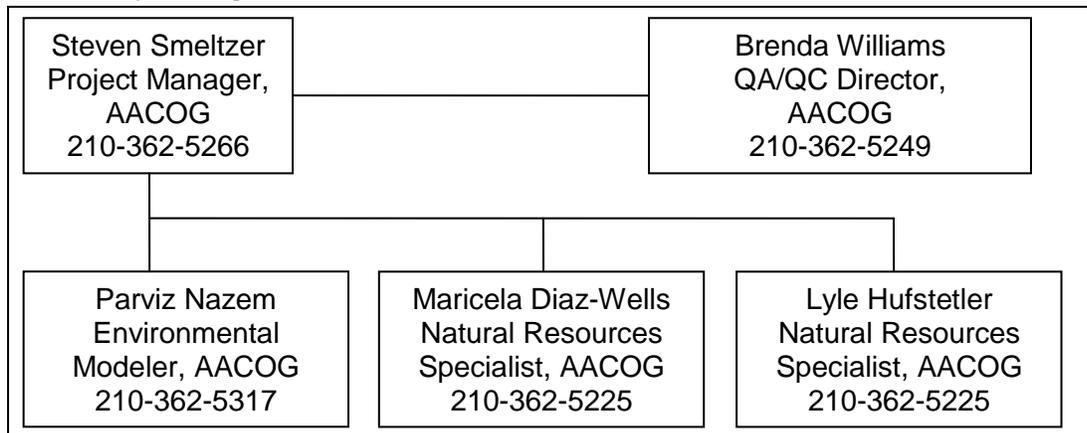
[3] EPA. December 2002. "Guidance for Quality Assurance Project Plans for Modeling EPA QA/G-5M." EPA/240/R-02/007. Available online: http://www2.epa.gov/sites/production/files/2015-06/documents/g5m-final.pdf. Accessed 11/19/2015.

2.3   Project Schedule

The table below shows the overall schedule for completion of this project.

Table 2-2: Summary of Project Schedule and Milestones

Work Element	Deliverable Date
Deliverable 3.1.1: QAPP	
Drafts submitted to TCEQ for review and approval	January 11, 2015
Deliverable 3.1.2: Final Report	
Draft Report and draft EPS3 GRDEM Spatial Allocation file	November 15, 2017
Final Report and final EPS3 GRDEM Spatial Allocation file	December 15, 2017

3   SCIENTIFIC APPROACH

3.1   Data Needed

To allocate significant area and non-road emission sources, data needs to be collected from a wide variety of sources. The spatial allocation of the following emissions sources will be included in the final results.

- Construction Equipment
- Quarry and Mining Equipment
- Landfill Equipment
- Agricultural Equipment
- Truck Idling
- Commercial Equipment
- Industrial Equipment

3.2   Sources of Data to be Used

3.2.1   Construction Equipment

To allocate construction equipment emissions accurately in the photochemical model, surrogate files will be created by subsector based on type and purpose of equipment used. Local departments of transportation, utility companies, government agencies, and private companies will be contacted to collect data on size and location of construction projects. Residential building permits, commercial building permits, and demolition permits will also be collected to create a spatial surrogate file. Spatial surrogates for diesel construction equipment emissions will be based on the sources listed in Table 3-1.

Based on employment data from the Texas Workforce Commission, construction equipment emissions from brick and stone, concrete, and scrap recycling operations will be spatially allocated by the number of employees by North American Industry Classification System (NAICS) in each sub-sector, while construction equipment used for manufacturing will be allocated based on the number of employees to manufacturing facilities with more than nine employees. Manufacturing companies with less than 10 employees generally do not use heavy construction equipment. Emissions from heavy highway construction and TxDOT equipment subsectors will be spatially allocated based on dollar amounts for TxDOT[4] and the Alamo Area MPO[5] highway projects built between Jan. 2012 – Dec. 2015. Similarly, city/county road construction, county-owned equipment, and municipally-owned equipment will be geo-coded based on 2012 to 2015 road projects built by Bexar County[6] [7] and City of San Antonio (COSA)[8].

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[4] TxDOT, June 16, 2015. "FY 2016 Statewide Project Letting Dates". Available online: http://www.txdot.gov/inside-txdot/division/general-services/letting/letting-schedule.html. Accessed 12/14/2015.

[5] Alamo Area Metropolitan Planning Organization, October 16, 2015. "Transportation Improvement Program (TIP)". San Antonio, Texas. Available online: http://www.alamoareampo.org/Plans/TIP/index.html. Accessed 12/14/2015.

[6] Bexar County, 2015. "Road and Bridge Capital Projects". San Antonio, Texas. Available online: http://inf.bexar.org/infraCitizen.asp?Sect=_CIP. Accessed 12/14/2015.

[7] Bexar County, 2015. "Bexar County Flood Country". San Antonio, Texas. Available online: http://www.bexarfloodcontrol.org/category/projects/. Accessed 12/14/2015.

[8] City of San Antonio, 2015. "Transportation and Capital Improvements". San Antonio, Texas. Available online: http://www.sanantonio.gov/TCI/Projects.aspx. Accessed 12/15/2015.

Table 3-1: Spatial Allocation Surrogates for Construction Equipment

TexN Model Diesel Construction Equipment (DCE) Subsector	Numeric Code	Spatial Allocation Methodology	
		Bexar County	The rest of the counties in the AACOG region
Agricultural Activities	1	Crop Acres (Corn, Peanuts, Wheat, Sorghum, Cotton, Oats)	Crop Acres (Corn, Peanuts, Wheat, Sorghum, Cotton, Oats)
Boring and Drilling Equipment	2	EPA Default and Quarry Locations	EPA Default and Quarry Locations
Brick and Stone Operations	3	Brick, Stone, and Related Construction Employment	Brick, Stone, and Related Construction Employment
City/County Road Construction	4	COSA and Bexar County Road Dollar Value	EPA Default
Commercial Construction	5	COSA/Bexar County Building and Demolition Permits	EPA Default
Concrete Operations	6	Block, Brick, Pipe, and Other Concrete Manufacturing	Block, Brick, Pipe, and Other Concrete Manufacturing
County-Owned Equipment	7	Bexar County Road Dollar Value	EPA Default
Cranes	8	EPA Default and Quarry Locations	EPA Default and Quarry Locations
Heavy Highway Construction	9	TxDOT and MPO Highway Construction Dollar Value	TxDOT Highway Construction Dollar Value
Landscaping Activities	11	EPA Default	EPA Default
Manufacturing Operations	12	Manufacturing Employees (only companies > 9 employees)	Manufacturing Employees (only companies > 9 employees)
Municipal-Owned Equipment	13	COSA Road Dollar Value	EPA Default
Transportation/Sales/Services	14	EPA Default	EPA Default
Residential Construction	15	COSA and Bexar County Residential Building Permits	EPA Default
Rough Terrain Forklifts	16	EPA Default	EPA Default
Scrap Recycling Operations	17	Scrap and Waste Materials Employment	Scrap and Waste Materials Employment
Skid Steer Loaders	18	EPA Default	EPA Default
Special Trades Construction	19	EPA Default	EPA Default
Trenchers	20	EPA Default	EPA Default
TxDOT Equipment	21	TxDOT Construction Dollar Value	TxDOT Construction Dollar Value
Utility Construction	22	CPS and SAWS Construction Dollar Value	EPA Default
Tractors, Misc., and < 25 hp	25	EPA Default	EPA Default

Construction equipment emissions from agricultural activities will be allocated to crop acreage in the AACOG region.[9] Utility construction emissions will be allocated to the locations of San Antonio Water System (SAWS) and CPS Energy projects over $50,000. Other DCE categories, including landscaping activities, transportation/sales/services, rough terrain forklifts, skid steer loaders, special trades, and trenchers, will be spatially allocated based on EPA's default methodology using urban area locations from TxDOT GIS files provided by Texas Natural Resources Information System[10].

Previous studies have found that when updates to the spatial allocation of construction equipment were used in the photochemical model, there was a significant impact on ozone formation. In a previous study using the September 1999 photochemical model, ozone predictions for the San Antonio ozone monitors were between a maximum increase of 0.44 ppb and a maximum decrease of 0.16 ppb for the peak 8-hour ozone average when the spatial allocation of construction equipment was updated.[11]

3.2.2 Quarry and Mining Equipment
A surrogate file for quarry equipment emissions will be created based on the location of quarries identified through TCEQ Permits[12], Mineral Locations Database[13], Find the Best directory[14], and aerial photographs.

3.2.3 Landfill Equipment
Surrogate files for geo-coding emissions from landfill equipment will be based on the location of landfills identified through aerial photographs.

3.2.4 Agricultural Equipment
Data from the Natural Agricultural Statistics Service will be used to create surrogate files for agricultural equipment emissions.[15] The estimated acreage in each 4 km photochemical modeling grid square will be based on the following crops:

- Corn
- Pasture/Hay
- Peanuts
- Wheat
- Sorghum
- Cotton
- Oats

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[9] National Agricultural Statistics Service, 2014. "CropScape – Cropland Data Layer". United States Department of Agriculture. Available online: http://nassgeodata.gmu.edu/CropScape/. Accessed 12/15/2015.

[10] Texas Natural Resources Information System (TNRIS), 2015. "TxDOT Urban Files". Available online: http://www.tnris.org/get-data?quicktabs_2=1#boundary. Accessed 12/15/2015.

[11] Steven Smeltzer, June, 2008. "Improving Spatial Allocation of Construction Equipment Emissions". Paper presented at EPA's 17th Annual International Emission Inventory Conference: Inventory Evolution - Portal to Improved Air Quality in Portland, Oregon - June 2 - 5, 2008. Available online: http://www.epa.gov/ttnchie1/conference/ei17/session11/smeltzer.pdf. Accessed 12/15/2015.

[12] TCEQ. Permit Database". Austin Texas. Available online: https://webmail.tceq.state.tx.us/gw/webpub. Accessed 12/15/2015.

[13] MineralMundi. "Mineral Locations Database". United States Geological Survey Mineral Resources Program. Available online: http://www.mineralmundi.com/texas.htm. Accessed 12/15/2015.

[14] Find the Best, 2015. "Texas Active Mines". Available online: http://active-mines.findthebest.com/directory/d/Texas. Accessed 12/15/2015.

[15] National Agricultural Statistics Service, 2014. "CropScape – Cropland Data Layer". United States Department of Agriculture. Available online: http://nassgeodata.gmu.edu/CropScape/. Accessed 12/15/2015.

Maps of crop acreages will be checked with satellite imagery to ensure locations are accurately listed in the data files.

3.2.5   Truck Idling

To create spatial surrogates for long-term truck extended idling (or hoteling) the following locations need to be identified: truck stops, rest stops, and picnic areas. Extensive research will be conducted in an effort to identify and locate all such facilities in the 13-county AACOG region. Information will be collected to develop a geographic dataset of local truck stops, gas stations, restaurants, and travel plazas that have parking facilities for long term idling of heavy-duty trucks. Truck stop data will be collected from TxDOT, Yahoo yellow pages, the trucking industry web pages, facility managers, TTI research, and the ERG reports. According to the ERG, "there is no single comprehensive list of truck stops available for Texas"[16]. However, AACOG developed a list of known truck stops in the San Antonio-New Braunfels MSA as part of a 2011 study of truck idling activities. Table 3-2 provides a list of the truck stops identified in the study, their addresses, and the number of parking spaces at each facility.[17] Regional aerial images will be used to verify the accuracy of location information and determine the number of available parking spaces.

An official Texas Travel Map[18] will be used to verify regional picnic area locations. All the rest stops and picnic areas that will be included, with the number of estimated parking spaces, are provided in Table 3-3.[19]

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[16] Eastern Research Group, Inc., Cambridge Systematics, Inc., and Alliance Transportation Group, Inc., August 31, 2004. "Heavy-Duty Vehicle Idle Activity and Emissions Characterization Study, Final Report". Sponsored by TCEQ. Austin, Texas. p 3-1. Available online: http://www.tceq.state.tx.us/assets/public/implementation/air/am/contracts/reports/mob/HDDV_Idle_Activity_and_EI_Phase2-tti.pdf. Accessed 10/15/2015.

[17] AACOG, Oct. 31, 2011. "Heavy-Duty Vehicle Idle Activity and Emissions, San Antonio-New Braunfels MSA". Prepared for TCEQ. San Antonio, Texas. p. 2-3. http://aacog.com/DocumentCenter/View/6543. Accessed 12/29/2015.

[18] TxDOT Expressway, 2015. "Safety Rest Area Maps". Austin, Texas. Available online: http://www.txdot.gov/driver/travel/rest-areas-map.html. Accessed 12/15/2015.

[19] AACOG, Oct. 31, 2011. "Heavy-Duty Vehicle Idle Activity and Emissions, San Antonio-New Braunfels MSA". Prepared for TCEQ. San Antonio, Texas. p. 2-5. http://aacog.com/DocumentCenter/View/6543. Accessed 12/29/2015.

Table 3-2: Truck Stops in the San Antonio-New Braunfels MSA

Truck Stop	Address	Exit	County	Parking Spaces
Kuntry Korner Steak & Eggs	IH 37 / Jim Brite Rd, Pleasanton	104	Atascosa	45
ZS Super Stop	IH 37 / FM 97, Pleasanton	109	Atascosa	24
EZ Mart	15537 IH 37, Elmendorf	125	Bexar	25
Tex Best Travel Center	20290 IH 37, Elmendorf	125	Bexar	30
Valero Ram Travel Center	IH 37, Elmendorf	130	Bexar	12
Texas Best Fuel Stop (Exxon)	14650 IH 35, Von Ormy	140	Bexar	15
Valero AAA Travel Center	14555 IH 35, Von Ormy	140	Bexar	70
Shell Time Wise Landmark	13437 IH 35, Von Ormy	141	Bexar	24
Love's Country Store	11361 IH 35, S Von Ormy	145	Bexar	108
Valero	IH 35, S Von Ormy	145	Bexar	50
Shell Truck Stop	11607 N IH 35, San Antonio	169	Bexar	45
PICO	25284 IH 10, San Antonio	550	Bexar	15
Petro Travel Plaza	1112 Ackerman Rd, San Antonio	582	Bexar	320
Pilot Travel Center	5619 IH 10 E, San Antonio	582	Bexar	50
Flying J Travel Plaza	1815 Foster Rd., San Antonio	583	Bexar	283
TA Travel Center	6170 IH 10 E, San Antonio	583	Bexar	258
Shell Truck Stop	8755 IH 10 E, Converse	585	Bexar	60
Alamo Travel Center	13183 IH 10, Converse	591	Bexar	40
Texaco	IH 10, Converse	593	Bexar	30
Trainer Hale Truck Stop	14462 IH 10, Converse	593	Bexar	25
Pilot Travel Center	4142 Loop 337, New Braunfels	184	Comal	80
Tex Best Travel Center	2735 N IH 35, New Braunfels	191	Comal	28
TA Truck Stop	4817 IH 35, New Braunfels	193	Comal	250
Sunmart No 167	6150 W IH 10, Seguin	601	Guadalupe	40
Jud's Food and Fuel - Shell	IH10/Hwy 123, Seguin	610	Guadalupe	40
Chevron	IH 10, Comfort	523	Kendall	20
Exxon Valley Mart	US 90, Hondo	533	Medina	10
Total				1,997

Table 3-3: Rest Areas and Picnic Areas in the San Antonio Region

Type	Location	Mile Marker	County	Parking Spaces*
Rest Areas	Northbound - IH 35	180	Comal	18
	Southbound - IH 35	180	Comal	18
	Eastbound - IH 10	619	Guadalupe	26
	Westbound - IH 10	619	Guadalupe	32
	Northbound - IH 35	130	Medina	17
	Southbound - IH 35	130	Medina	20
	Eastbound - US 90	518	Medina	15
	Westbound - US 90	518	Medina	13
Picnic Areas	Northbound - IH 37	112	Atascosa	28
	Southbound - IH 37	111	Atascosa	28
	Eastbound - IH 10	529	Kendall	17
	Westbound - IH 10	531	Kendall	25
	US 90	548	Medina	6

3.2.6 Commercial Equipment

Based on data from the Texas Workforce Commission, surrogate files for commercial equipment emissions will be based on commercial employment.

3.2.7 Industrial Equipment

The industrial employment database from the Texas Workforce Commission will be used to create surrogate files for industrial equipment.

3.2.8 Spatial Surrogate Files used for Photochemical Modeling Projected Emission Inventories

The data used to develop the emission inventory spatial surrogate files will be collected over multiple years to ensure the most accurate spatial distribution. The same spatial distribution will be used in future projection years because future activities would occur in the same general areas of the San Antonio-New Braunfels MSA. The activity data collected over multi years will be more accurate than default EPA spatial surrogate allocations. If new truck stops, landfills, and quarries are identified in future years, they will be included in the future year surrogate files. It is expected that the future year surrogate files will be used for a 2020 or a 2023 photochemical modeling projection year.

3.3 EPS Surrogate Files

The Emissions Processor Version 3 (EPS3) is used to temporally speciate, and spatially allocate emissions that will be input into the photochemical model. The GRDEM module of EPS3 "spatially allocates emissions based on source location, or gridded spatial surrogate indicators; generates a CAMx-ready surface emissions file."[20] "GRDEM uses five input files: the USERIN file, an EMBR emissions file, the file cross referencing SCC (ASC) codes and surrogate spatial allocation codes, a file containing the distribution of the surrogate data in the modeling grid, and an optional file containing definitions of transportation links."[21] As part of this project, the file cross referencing SCC (ASC) codes and surrogate spatial allocation codes will be updated for significant area and non-road emission categories.

"The SCC(ASC)/spatial surrogate cross-reference table that allows the user to tailor the distribution of emissions for a particular region. In this file each SCC(ASC) code is assigned a spatial surrogate code, which is used to distribute the total county emissions into the appropriate model grid cells. The surrogate codes represent the column of county fraction data in the spatial allocation file."[22] Figure 3-1 shows an example of gridded surrogates cross reference file read by GRDEM.[23]

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[20] ENVIRON International Corporation. "User's Guide Emissions Processor Version 3". Novato, CA. p. 2-1. Available online: ftp://amdaftp.tceq.texas.gov/pub/HGB8H2/ei/EPS3_manual/EPS3UG_UserGuide_200908.pdf. Accessed 12/01/2015.

[21] *Ibid*., p. 3-109.

[22] *Ibid*., p. 3-110.

[23] *Ibid*., p. 3-112.

Figure 3-1: Example of gridded surrogates cross reference file read by GRDEM.

```
# This is an example of only primary surrogate codes
#
00000       IND    2102002000 Industrial Bituminous/Subbituminous Coal
00000       IND    2102004000 Industrial Distillate Oil
00000       IND    2102005000 Industrial Residual Oil
00000       IND    2102006000 Industrial Natural Gas
00000       IND    2102006001 Natural Gas All Boilers
00000       IND    2102007000 Industrial Liquefied Petroleum Gas
 .
 .
00000       RUR    2260001000 Recreational Vehicle
```

"The file cross referencing SCC (ASC) codes file contains the SCC(ASC)/spatial surrogate cross-reference table that allows the user to tailor the distribution of emissions for a particular region. In this file each SCC(ASC) code is assigned a spatial surrogate code, which is used to distribute the total county emissions into the appropriate model grid cells. The surrogate codes represent the column of county fraction data in the spatial allocation file. This is accomplished with a header record in the gridded surrogate data file that indicates the 'name', or code, to be used for each column."[24] As part of this process, "the spatial allocation surrogate file must be pre-sorted by FIPS".[25] An example of spatial allocation surrogate file read by GRDEM is provided in Figure 3-2.[26]

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[24] *Ibid.*, p. 3-110.
[25] *Ibid.*, p. 3-114.
[26] *Ibid.*, p. 3-115.

Figure 3-2: Example of spatial allocation surrogate file read by GRDEM.

```
# file developed 20 Aug 2008 at ENVIRON
# columns/codes represent the following
# TCA - total county area
# TPP - total population
# UPP - urban population
# RPP - rural population
# THU - urban housing
# TRU - rural housing
#
  -252000 -1728000 1296000 -180000 0 12000.000 12000.000
# the surrogate codes are specified here
CODES TCA TPP UPP RPP THU TRU
# spatial allocation data starts here
01001     1200000.0 -720000.0     0  0.010609  0.031712  0.000000  0.050727  0.033086  0.0000
01001     1200000.0 -708000.0     0  0.025946  0.089234  0.000000  0.142743  0.097310  0.0000
01001     1212000.0 -744000.0     0  0.007318  0.000431  0.000000  0.000690  0.000482  0.0000
01001     1212000.0 -732000.0     0  0.046129  0.107611  0.000000  0.172139  0.109099  0.0000
01001     1212000.0 -720000.0     0  0.091955  0.093768  0.000000  0.149995  0.097105  0.0000
01001     1212000.0 -708000.0     0  0.078770  0.006486  0.000000  0.010375  0.006386  0.0000
01001     1224000.0 -744000.0     0  0.001886  0.000111  0.000000  0.000178  0.000124  0.0000
01001     1224000.0 -732000.0     0  0.059059  0.003711  0.000000  0.005937  0.004105  0.0000
01001     1224000.0 -720000.0     0  0.093876  0.015149  0.000000  0.024232  0.015040  0.0000
01001     1224000.0 -708000.0     0  0.093452  0.016113  0.000000  0.025774  0.015584  0.0000
01001     1224000.0 -696000.0     0  0.038873  0.006954  0.000000  0.011124  0.006645  0.0000
01001     1236000.0 -732000.0     0  0.046042  0.006843  0.000369  0.010726  0.006894  0.0000
01001     1236000.0 -720000.0     0  0.093871  0.027776  0.007033  0.040215  0.026804  0.0000
```

4 QUALITY METRICS

The quality requirements for the data used in this study and the procedures for determining the quality of the data are described in this section. Ten percent of the data used in this study will be audited. After each section is completed, the QA/QC manager will check the data that inputs into formulas and will check all documentation on methodologies. All formulas will be recalculated by the QA/QC manager to make sure the results can be replicated and are accurate. The QA/QC manager will work closely with the project manager to update the calculations, spatial allocation, EPS surrogate files, and documentation. The results of the audit process will be provided in the draft and final report submitted to TCEQ.

4.1 Data
The data used to create the spatial allocation of emissions must be reasonably consistent with other studies and be sufficiently complete to be expected to adequately represent the spatial allocation. In addition, collected data will be assessed for missing information and outliers through communications with Texas Department of Transportation, local building permit departments, Texas Workforce Commission, United States Department of Agriculture, Mine Safety and Health Administration, United States Geological Survey Mineral Resources Program, local utilities, other organizations, other agencies, and aerial imagery.

4.2 Quality Control
Quality control (QC) is a system of routine technical activities implemented by inventory development personnel to measure and control the quality of the inventory as it is being developed. The QC system is designed to:

- "Provide routine and consistent checks and documentation points in the inventory development process to verify data integrity, correctness, and completeness;
- Identify and reduce errors and omissions;
- Maximize consistency within the inventory preparation and documentation process; and
- Facilitate internal and external inventory review processes.

QC activities include technical reviews, accuracy checks, and the use of approved standardized procedures for calculations. These activities should be included in inventory development planning, data collection and analysis, spatial allocation, and reporting."[27]

Equations, data sources, and methodology will be checked throughout the development of the surrogate files. "Simple QA procedures, such as checking calculations and data input, can and should be implemented early and often in the process. More comprehensive procedures should target:

- Critical points in the process;
- Critical components of the surrogate data; and
- Areas or activities where problems are anticipated"[28]

Special emphases will be put on critical components, such as location of construction projects, building permits, truck stop parking spot counts, employment locations, and location of

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[27] Eastern Research Group, Inc, Jan. 1997. "Introduction: The Value of QA/QC'. Quality Assurance Committee Emission Inventory Improvement Program, U.S. Environmental Protection Agency. p. 1.2-1. Available online: http://www.epa.gov/ttn/chief/eiip/techreport/volume06/vi01.pdf. Accessed 06/04/2012.
[28] *Ibid.*, p. 1.2-2.

agricultural crops, for quality checks. Ten percent of calculations will be independently replicated to ensure accuracy. The project manager will ensure that all of the QA checks performed are compiled, and maintained in the project archives.

When errors and omissions are identified, they will be corrected and all documentation will be updated with the corrections. All calculation methodologies will be documented and described in detail so external officials and other interested parties can replicate the results. For every area and non-road emission source, documentation will be consistent and contain data sources, spatial allocation methodology, formulas, and results.

Pertinent information and supporting statistics used for developing spatial allocations will be analyzed to ensure that the information and statistics are reasonable (i.e., avoiding extremely low or high values that are indicative of errors). Data that are found to be questionable will be examined in greater detail to determine what errors might be present and what adjustments might be needed. If data are revised, the procedures and assumptions used will be thoroughly documented. The Project Manager will review and approve all data adjustments.

AACOG will use a senior peer reviewer not directly involved in conducting the project to review all methods and results of the work. The senior peer reviewer will be involved in the initial planning stages of this project to ensure the planned approaches are technically sound, and will also provide quality checks and review on all final products prior to submittal to TCEQ to ensure the project procedures were properly implemented. When the spatial allocation is completed, documentation and spreadsheets will be sent to TCEQ and other interested parties for review.

5 DATA ANALYSIS, INTERPRETATION AND MANAGEMENT

5.1 Data Reporting Requirements

Primary data for the spatial allocation of area and non-road emissions that are assembled for this study will be reported electronically and documented in the project final report. Any data that are assembled for this study, ARC shape files, GRDEM surrogate files, and spreadsheets, will also be delivered electronically and documented in the final report. Data that are documented elsewhere, such the location of construction projects, crops, truck stops, employment, will be documented in the final report by reference to the original data source. Records will be maintained that include sufficient information to reconstruct each spatial allocation calculation.

5.2 Data Management Procedures

Hard copy data received during the course of the project will be cataloged into the file index and made available for copying or checkout. Electronic data files will be stored in a specific project directory on AACOG's fileserver network drives. Original data files will be kept in a separate folder and will not be altered or changed. Project staff will make copies of any data files needed and perform their work with the copy. All project staff will have access to these files and all files on the network drive undergo automatic backup each. After the final product is completed and approved by TCEQ, all project data will be archived on CD-ROM for storage.

6   DATA REPORTING

6.1   Project Deliverables

The project final delivery will include a report documenting the spatial surrogate files and the information necessary to update TCEQ's EPS GRDEM surrogate files. All relevant QA/QC findings will be included in the final report. The report will describe the steps taken and any background that is relevant to the project. The report shall provide the report in Microsoft Office Word and Adobe Acrobat Reader (*.pdf) formats. The final report will include the following components:

(1) An executive summary and abstract,
(2) An introduction that discusses background and objectives,
(3) A discussion of the pertinent accomplishments, shortfalls, and limitations of the work completed, and
(4) Recommendations, if any, for what should be considered next as a new study.

The final report will provide a comprehensive overview of activities undertaken and data collected and analyzed during the study. The final report will highlight major activities and key findings, provide pertinent analysis, describe encountered problems and associated corrective actions, and detail relevant statistics including data, parameter, or model completeness, accuracy and precision.

Modeling files will be in EPS3 GRDEM surrogate file format based on the grid system consistent with EPA's Regional Planning Organizations (RPO) Lambert Conformal Conic map projection with the following parameters:

- First True Latitude (Alpha):   33°N
- Second True Latitude (Beta):   45°N
- Central Longitude (Gamma):   97°W
- Projection Origin: 97°W, 40°N
- Spheroid: Perfect Sphere, Radius: 6,370 km

All future TCEQ photochemical model emissions processing work will be based on the grid system listed above.