Texas Transportation Institute

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DRAFT FOR REVIEW

TWG Air Quality Planning Technical Analysis-

Analysis Methodology Overview for

Donut and Isolated Rural

Nonattainment Areas

TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM
COLLEGE STATION, TEXAS

Prepared for the Texas Department of Transportation

August 2011

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Task 2.1, FY 2011

Transportation Air Quality Policy Analysis

Prepared for

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Prepared by

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Table of Contents

List of Figures

List of Tables

Introduction

Transportation conformity requires the preparation of estimates of on-road mobile source emissions. Such estimates require corresponding estimates of vehicle miles of travel (VMT) by vehicle classification, age, and speed. For most urbanized areas in Texas with metropolitan planning organizations (MPO), travel demand forecasting (TDF) models have been developed and are maintained to support transportation planning. Two outputs of these models are VMT and speeds. For rural Texas areas or areas with population concentrations below the MPO level (which therefore do not have TDF models), Highway Performance Monitoring System (HPMS) data are typically used as the basis for estimating future traffic and VMT.

This report provides an overview of methods used in Texas and elsewhere, specifically for isolated rural counties and what are called "donut" areas. Donut areas are adjacent to urbanized areas for which TDF models exist. For example, for a single county MPO whose TDF model covers the one county, a county adjacent to the MPO county would be considered a donut area. The report concludes with an assessment of how to apply these methods to future new nonattainment counties that are either isolated rural counties or donut areas.

Overview of Transportation Conformity

Transportation conformity, first introduced as part of the Clean Air Act (CAA) of 1977, is a planning process used to ensure that transportation agencies integrate air quality goals into transportation planning and transportation investments. Areas that do not meet established air quality standards are classified as nonattainment areas. Requirements are established in a State Implementation Plan (SIP) to bring such areas into attainment. Each metropolitan area transportation plan and each federally (and in Texas, state) funded project in a nonattainment area must comply with the air quality requirements. This test is called a conformity determination.

Thus, only transportation activities consistent with federal air quality goals are given federal approval and funding, based on conformity determination. Certain emissions limits, or "budgets," are defined by a SIP developed by the state air quality agency, and budgets are approved by the U.S. Environmental Protection Agency (EPA).

The purpose of a SIP is to define what emissions control measures will be implemented and enforced. Control measures are strategies and actions that will be undertaken to reduce emissions and either meet air quality standards or maintain conformity status.

On a regional basis, conformity determination is used to show that projected emissions associated with a long-range transportation plan (LRTP) or transportation improvement program (TIP) fall within the budget. Transportation projects approved or funded by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) are subject to conformity requirements, as are projects considered to be regionally significant.

Regional emissions analysis, including projection of future emissions, is used as part of the conformity process. Emissions models are used to determine emissions totals, and rely on inputs such as vehicle travel and fleet characteristics. Regional emissions are typically estimated based on anticipated highway and transit usage included in LRTPs and TIPs. Conformity also requires demonstration that Transportation Control Measures (TCMs) included in the SIP will be implemented in a timely manner.[1]

Only nonattainment and maintenance areas must prove conformity. Such areas do not currently meet or did not previously meet, respectively, the EPA National Ambient Air Quality Standards (NAAQS). Conformity determinations must be made within a year of an area being designated as nonattainment, and must at least be made every three years. Conformity determinations also must be made when long-term plans or TIPs are updated. Projects must come from plans or TIPs with conformity approved by the FHWA or FTA.1 Such projects would be acceptable since conformity is intended to ensure that transportation plans, programs, and projects should not create new standard violations, increase the frequency or severity of violations, or delay attainment of NAAQS.[2]

Typically, an MPO must make a conformity determination on plans and TIPS, and then must obtain FHWA or FTA approval. However, for projects in isolated rural areas, either the state's department of transportation (DOT) or project sponsor is typically responsible for conformity determination, which must also be approved by the FHWA or FTA to receive approval or funding. Interagency cooperation and consultation is often needed, and may include the FHWA, FTA, EPA, the state DOT, MPOs, and state or regional air quality agencies.1

If a conformity determination cannot be made, the use of federal funding is significantly restricted, which would delay all aspects of projects that receive federal funding. Certain exempt projects such as mass transit projects and safety projects can still receive federal funding. If such a conformity lapse occurred due to a missed deadline, the lapse may be fairly easy to resolve. If estimated emissions exceed the emissions budget, the projects in the transportation plan may be changed so the emissions budget can be attained, or additional control strategies may need to be established to compensate for exceeding the budget. Alternatively, the emissions budget may be revised, which may be a more difficult and time-consuming process.1

Introduction to Donut and Isolated Rural Areas

Typically, nonattainment or maintenance areas correspond to urban areas, which are more likely to have significant traffic contributing to air pollution. Such areas are typically included in an MPO, which would be responsible for conformity determination.

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[1] Federal Highway Administration. *Transportation Conformity: A Basic Guide for State & Local Officials.* FHWA, U.S. Department of Transportation, April 2005.

[2] North Carolina Department of Transportation. *Air Quality and Transportation Conformity in North Carolina.* http://www.ncdot.org/doh/preconstruct/tpb/PDF/AQ_ConformityOverview.pdf, accessed December 2010.

Donut Areas

However, air pollution concerns may extend beyond the boundaries of an MPO urbanized area or may even occur in isolated rural areas. A geographic area located within a nonattainment or maintenance region that includes at least part of a metropolitan area, but not located within a metropolitan planning area, has been termed a donut area. Donut areas are not to be confused with isolated rural areas, which would not be in a nonattainment or maintenance area that also includes a metropolitan area.

Vehicle emissions for all nonattainment or maintenance areas are needed to develop emissions budgets and the SIP. [3] However, both donut areas and rural areas typically lack the necessary data to directly determine vehicular emissions. For example, data on future VMT, speeds, and vehicle characteristics may be limited. In addition, such areas may not have a TDF model or be able to project future travel inputs.[4]

The FHWA recommends that MPOs contained in a nonattainment or maintenance area that includes a donut area should work cooperatively with the state DOT to include vehicle emissions from the donut area in regional emissions analysis.3 The regional emissions analysis used for conformity determination of an MPO's plan and TIP must include projects in the donut area for such projects to show conformity. Out of 24 current nonattainment or maintenance areas with donut areas, the FHWA found that in five areas the MPO was primarily responsible for regional emissions analysis for the donut area. Those MPOs were located in Atlanta, Chicago, Portland, Utah County, and Washington, D.C., and typically have a large enough staff to perform such analysis due to the size of the MPO. The state DOT takes the lead in the other 19 areas.3

The Dallas-Fort Worth region briefly had a donut area when its nonattainment area was last expanded from four to nine counties in 2004, but the MPO, the North Central Texas Council of Governments (NCTCOG), soon expanded its TDF model coverage to all counties in the region, including all nonattainment area counties. In the brief interim period, NCTCOG and the consultation partners agreed on a HPMS-based method for estimating emissions in the donut area.

Isolated Rural Nonattainment Areas

The FHWA sponsored a survey of isolated rural nonattainment and maintenance areas. It found that only a small percentage of carbon monoxide (CO) or ozone problem areas were

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[3] Federal Highway Administration. Nonattainment and maintenance areas with "donut" area(s). *Transportation Conformity Practices in Complex Areas*. FHWA, U.S. Department of Transportation, September 16, 2010. http://www.fhwa.dot.gov/environment/air_quality/conformity/policy_and_guidance/group3.cfm, accessed December 2010.

[4] ICF Consulting. *Sample Methodologies for Regional Emissions Analysis in Small Urban and Rural Areas*. Prepared for the Federal Highway Administration, U.S. Department of Transportation. Fairfax, Virginia, October 18, 2004, http://www.fhwa.dot.gov/environment/air_quality/conformity/research/methodologies.pdf, accessed July 2011.

isolated rural areas.[5] On the other hand, slightly more than a third of the particulate matter of 10 microns or less (PM_{10}) nonattainment areas were isolated rural areas. However, in almost every case, less than 5 percent of the PM_{10} pollution was attributed to on-road mobile sources.

Based on survey responses, agencies in isolated rural areas generally lack staff with expertise in air quality or transportation planning. Local transportation data is somewhat limited in such areas. In addition, 11 of 18 respondents reported that the rural isolated nonattainment areas had not had any relevant projects in the past five years. Thus, such areas may forgo conformity analysis until such a project is actually considered, although such an occurrence could lead to delays.

Texas currently has no isolated rural nonattainment areas. The Big Bend area (Brewster County) is the only isolated rural area in Texas that might fall into nonattainment if the ozone standard is again lowered.[6]

Conformity Approaches for Donut and Isolated Areas

Donut Areas

Mobile source emissions inventories are based on EPA emissions models. The latest version is the MOVES model, which replaces the MOBILE6.2 model. The EPA guidance for the models recommends the use of local transportation data rather than the included national defaults, and also requires the input of data such as total annual vehicular miles of travel.[7] In Texas, TTI uses HPMS data and a "virtual link" technique to estimate emissions in areas that are not in air quality nonattainment.[8]

The HPMS is a recommended tool for use in estimated vehicle travel in areas outside those for which MPOs have TDF models. Procedures may be developed locally within a county if permitted through interagency consultation (typically the FHWA, EPA, state DOT, and state environmental agency), with primary responsibility falling to the state.[9] In addition, the HPMS provides travel estimates for higher functional systems only—thus, state and local methods are needed to estimate travel on rural minor collectors and local roads also as permitted through

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[5] Dye Management Group, Inc. *Transportation/Air Quality Issues in Rural Areas*. Prepared for the Federal Highway Administration, U.S. Department of Transportation. Bellevue, Washington, April 2003.

[6] Mario Loyola and Kathleen Hartnet White, EPA "Putting a Lid on Texas' Economic Growth," Texas Public Policy Foundation, November 22, 2010, http://www.texaspolicy.com/commentaries_single.php?report_id=3396, accessed July 2011.

[7] U.S. Environmental Protection Agency. Technical Guidance on the Use of MOBILE6.2 for Emissions Inventory Preparation. Publication EPA420-R-04-13. Office of Transportation and Air Quality, August 2004.

[8] Perkinson, D.G. IAC-A Air Quality/Conformity – Task 15 – Procedures/Virtual Link Emissions Estimation and VMT Forecasting Procedure Review and Update. Texas Department of Transportation, June 16, 2009.

[9] Federal Highway Administration. Appendix G: Reporting travel data in air quality nonattainment and maintenance areas. *HPMS Field Manual*. FHWA, U.S. Department of Transportation, December 6, 2010. http://www.fhwa.dot.gov/ohim/hpmsmanl/appg.cfm, accessed January 2011.

interagency consultation. The HPMS Field Manual does include guidance on "developing a sample panel of highway sections that can be used to estimate travel for certain functional systems in the donut area of an NAAQS nonattainment or maintenance area."9 This sampling procedure requires up-to-date road functional classifications and accurate length and road section information.

Conformity determinations undertaken by an MPO must include projects located in the donut area.[10] Therefore, the donut area must be included in plans, TIPs, and regional emissions analysis. The conformity rule also specifies that cooperative planning and analysis should be undertaken by the MPO and the state DOT together as part of the conformity process. Through interagency consultation, an analysis option will be chosen. Table 1 shows the options specified by the FHWA.

Table 1: Analysis Options for Donut Area Projects Provided by the FHWA.

Regional Emissions Analysis Options for Donut Area Projects

Option (to be determined through the interagency consultation process)	Action
1. Include all donut area projects in the transportation plan/TIP	No further regional analysis of the projects is necessary because the donut area projects were included in the conformity analysis for the plan/TIP.
2. Include all donut area projects in original regional emissions analysis used to demonstrate plan/TIP conformity	Document that such projects were included in regional emissions analysis.
3. Perform applicable conformity tests based on hypothetical assumption that donut area project is added to plan/TIP and use analysis procedure for adding projects to the plan/TIP	Redo regional emissions analysis using latest planning assumptions and emissions models, which may have changed since the TIP was adopted.

One example of conformity analysis within donut areas occurs in the Atlanta area of Georgia, where "the Atlanta Regional Commission (ARC) has conducted transportation and air quality modeling for the existing 13-county nonattainment area, even though only 10 of the counties are ARC members."[11] This arrangement includes a working agreement between ARC

[10] Federal Highway Administration. Chapter 12: Donut and Clean Data Areas. *Transportation Conformity and Reference Guide*. FHWA, U.S. Department of Transportation, September 20, 2010. http://www.fhwa.dot.gov/environment/air_quality/conformity/reference/reference_guide/chap12.cfm, accessed December 2010.

[11] Makler, J. and A.M Howitt. Regulating Transportation in New Nonattainment Areas under the 8-Hour Ozone Standard. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1842, Transportation Research Board of the National Academies, Washington, D.C., 2003, pp. 39-46.

and the Georgia Department of Transportation (GDOT). It follows the same approach (TDF modeling expanded to cover donut area) described previously and used by NCTCOG for the Dallas-Fort Worth area.

The North Carolina Department of Transportation (NCDOT) takes the lead in that state's donut area conformity determination, although the process is similar to that undertaken by the MPO.2 The planning document for the donut area is the Statewide Transportation Improvement Program (STIP), which includes projects for the donut area and is adopted by NCDOT. If the donut area is not covered by a transportation demand model (TDM), NCDOT performs a "non-modeled area analysis."

Several other examples of donut areas exist. In Ohio, the Ohio Department of Transportation (ODOT) specifies the use of HPMS county-level VMT data by functional class, with the proportion of VMT for sub-county areas estimated using the centerline mileage found in a sub-county area-wide road inventory and using average volume by functional class.[12] Emissions projections are then estimated by applying the "percent of area" factor to estimated HPMS VMT forecasts. Finally, the "no greater than baseline" test is used to determine conformity.

In the Genesee-Finger Lakes Region of New York, the process was undertaken by the New York State Department of Transportation (NYSDOT), with some help from the Genesee Transportation Council (the MPO of that area).[13] Again, HPMS estimates of county-wide VMT were used, with seasonal adjustment factors 1.16 and 1.12 for rural interstates/ expressways and all other facilities, respectively. A straight line projection was used to obtain forecast values, based on values initially projected from historical regressions. The functional class shares from a previously reported HPMS-based daily VMT inventory for 2002 were used for the 2002 base year analysis. The modeled daily VMT was then subtracted from the TDF model forecast of the Genesee Transportation Council (GTC). The speeds specified in the New York SIP for non-urbanized areas were used for each functional class, as well as NYSDOT's MOBILE6.2 factor tables to estimate volatile organic compounds (VOC) and oxides of nitrogen (NO_x). Finally, estimated donut area "build" emissions were added to GTC's for the analysis years.

Several methodologies pertaining to analysis in donut areas are given in an ICF Consulting report for FHWA in 2004.4 Several methods are presented for estimating VMT from

[12] Mid-Ohio Regional Planning Commission. Air quality conformity determination documentation for the Franklin, Delaware, Licking, Fairfield, Madison, and Knox County ozone nonattainment area and the Franklin, Delaware, Licking, Fairfield, and Coshocton (FranklinTwp) County PM2.5 nonattainment area. *Central Ohio Air Quality Analysis.* MORPC, Columbus, Ohio, May 10, 2007. http://www.morpc.org/pdf/t_funding_TIPAppendix1.pdf, accessed December 2010.

[13] Genesee Transportation Council and the New York State Department of Transportation, Region 4. *Transportation Conformity Statement for the Long Range Transportation Plan for the Genesee- Finger Lakes Region: 2007-2027 Update and 2011-2014 Transportation Improvement Program.* GTC, NYSDOT, June 17, 2010. http://www.gtcmpo.org/Docs/Conformity/GTC_ConformityStatement_2010.pdf, accessed December 2010.

a TDF model when the donut area is not covered by the model. Similarly, there are two methods for estimating speed in donut areas not covered by the TDF model. Table 2 shows these and related methods that could be used in estimating on-road mobile source emissions in donut and isolated rural nonattainment areas.

Table 2: Potential Methodologies for Estimating Emissions for Donut and Isolated Rural Counties.

Desired Information	Potential Methodologies Proposed in ICF Report	
Estimating local road VMT	Use statewide estimates to calculate the proportion of local road to collector VMT and apply ratio	
	Use county-level estimates to develop statistical relationship between local road and collector VMT and apply formula	
	Estimate average daily traffic on local roadways from inventory of local roads	
Forecasting VMT without a TDF model	Linear projection of VMT based on estimated growth factor	
	Linear projection of total VMT by functional roadway class, based on regression analysis of historic VMT data	
	Linear projections of VMT by functional class, based on historic VMT, with adjustments for changes in functional class categories	
	Linear projection of interstate VMT from historic VMT, and population-based forecast for non-interstate VMT	
	Analysis of expected VMT growth on interstate corridors, and population-based forecast for non-interstate VMT	
	Regression forecasts by functional class (based on VMT, population, and employment) with growth factor employing a decay function	
Forecasting VMT with a TDF model	Adjustments to TDF model outputs so VMT results are consistent with estimates used to develop the SIP emissions budget	Adjustment factor to scale modeled VMT estimate to HPMS VMT estimate
		Adjustment to account for trip lengths that do not cover the entire model link length
		Detailed approach to incorporating external trips into a statewide TDF model
		Use of seasonal adjustment factor
	Methods to account for local road links that are within the model area but not \within the model network	Assume percent of modeled VMT
		Use HPMS estimate of VMT and apply VMT growth rate on analogous function classes from the model
		Off-model Geographic Information System (GIS) analysis using TAZ-level trip data and number of dwelling units
	Methods to estimate VMT for donut areas not covered by the TDF model	Develop projection of countywide VMT and subtract modeled VMT estimate
		Use traffic counts and other projections for higher-class roadways, and apply ratio from model to lower-class roadways
		Use a statewide model and subtract estimates from urban area model

Desired Information	Potential Methodologies Proposed in ICF Report	
Estimating speeds without a TDF model	Use observed speeds and/or speed limits	
	Use Highway Economic Requirements System (HERS) Model at a statewide level	
	Use Bureau of Public Roads (BPR) formula or variation	
	Use Texas Transportation Institute (TTI) method	
Estimating speeds with a TDF model	Adjustments to account for inaccuracies with TDF model outputs	Use TDF model outputs
		Use TDF model outputs with adjustments where model values are inconsistent with observed data
		Use formula and/or lookup tables to estimate speed based on modeled volume-to-capacity (v/c) ratio
	Methods to estimate speed in donut areas not covered by the TDF model	Use speeds from modeled area by functional class
		Use speeds from statewide model
VMT mix by vehicle type	Use MOBILE6 model default (based on national-level registration data and projected future changes)	
	Use available local data (vehicle registration data, traffic data, or combination) and assume constant mix	
	Use available local data for base year fleet mix and iteratively adjust to reflect expected changes	
Vehicle age distribution	Use MOBILE6 model default, which is based on national-level vehicle registration data	
	Use local vehicle registration data for in-use fleet	
Percent of VMT on freeway ramps	Use local data on percent of freeway traffic on ramps	
Inspection and maintenance (I/M) program implementation	Apply type of I/M program to area of analysis (standard approach)	
	Use local data sources to estimate proportion of traffic subject to I/M	

Isolated Rural or Small Urban Areas

Isolated rural or small urban areas typically do not have the use of a network-based TDF model. That makes it more difficult to accurately estimate travel data needed for emissions modeling (a TDF model is used in an emissions analysis to predict future travel inputs). Small areas also typically have limited data on VMT and speeds. In addition, "rural counties do not have the institutional capacity for transportation modeling or air quality planning, nor do they have a structure that provides a clear point of contact for state officials like an MPO does."[11] In North Carolina, a consortium of state and local agencies chose to address this problem by creating rural planning organizations (RPOs), which would serve as a liaison between local officials and state agencies. Technical services would be provided by state agencies, as an RPO would be too small to have such technical expertise.[11]

Another potential problem is that isolated rural areas typically do not have a transportation plan or TIP. Areas with populations less than 50,000 are exempt from FHWA requirements to develop such documents.[14] Thus, transportation projects for the area must be included in a STIP, and may also be included in a statewide transportation plan. In addition, regionally significant projects and federally funded projects must be included in a regional emissions analysis, and must satisfy emissions budgets. However, conformity determinations for these areas is only required when a new non-exempt FHWA or FTA project needs funding or approval. In addition, these isolated rural areas are allowed to choose which conformity test they use, with a choice between "the budget test, the interim emissions test(s), or air quality modeling used in the attainment demonstration or maintenance plan," while metropolitan areas must continuously demonstrate conformity to latest SIP budgets.[14, 15] Table 3 shows conformity requirements as provided by the FHWA.

[14] Federal Highway Administration. Chapter 13: Isolated rural area. *Transportation Conformity Reference Guide*. FHWA, U.S. Department of Transportation, March 6, 2010. http://www.fhwa.dot.gov/environment/air_quality/conformity/reference/reference_guide/chap13.cfm, accessed December 2010.

[15] Dancausse, E. Isolated rural areas. *U.S. EPA Conformity Training, Summer 2004*. North Carolina Division, Federal Highway Administration, 2004. www.daq.state.nc.us/planning/Isolated_Rural_Area.ppt, accessed December 2010.

Table 3: Conformity Requirements for Isolated Areas Provided by the FHWA.

Conformity Requirements for Isolated Rural Areas
(40 CFR §§§93.109(l) 93. 118, 93.119)

Type of Area	Period		
	No Emissions Budget	**Adequate Emissions Budget**	**After time frame of last adequate SIP**
• Moderate or above ozone area, • Moderate CO area with design value greater than 12.7 ppm, • Serious CO area	These areas are required to submit a control strategy SIP containing an emissions budget, which must then be used for conformity purposes. If no adequate or approved budget has been submitted, a regional emissions analysis must be performed that meets the following interim emissions tests: build less than no-build and less-than-baseline test. For 8-hour ozone and PM2.5 areas, the baseline year is 2002. For all other areas, the baseline year is 1990.	Regional emissions analysis meeting emissions budget test (as long as the budget has been found adequate by EPA).	Projects must satisfy one of the following: 1. Regional emissions analysis meeting emissions budget test; 2. Build less than no-build and less-than-baseline test including NOx in ozone areas. For 8-hour ozone and PM2.5 areas, the baseline year is 2002. For all other areas, the baseline year is 1990. or 3. Air quality model as used in last adequate SIP
• Rural transport ozone area • Marginal and below ozone area, including basic areas • Incomplete data ozone area • Moderate CO area with design value of 12.7 ppm or less • Unclassified CO area • PM10, PM2.5 or NO2 area	Regional emissions analysis meeting build no greater than no-build or no-greater-than-baseline tests. For 8-hour ozone and PM2.5 areas, the baseline year is 2002. For all other areas, the baseline year is 1990.	Regional emissions analysis meeting emissions budget test	Projects must satisfy one of the following: 1. Regional emissions analysis meeting emissions budget test; 2. Build no greater than no -build or no-greater-than -baseline test including NOx in ozone areas. For 8-hour ozone and PM2.5 areas, the baseline year is 2002. For all other areas, the baseline year is 1990,or 3. Air quality model as used in last adequate SIP

As stated, only new project approvals require conformity determination in isolated rural areas. However, these areas also have a one-year grace period for new air quality standards, so projects proposed during a grace period can be approved without conformity determination.[15]

One method for isolated areas to utilize when attempting to determine vehicular travel is the Easy Mobile Inventory Tool (EMIT), "designed to complete a locale-specific mobile source emissions inventory by incorporating a component for forecasting congested vehicle speeds and

VMT and a component for employing the MOBILE6.2 model."[16] There are four steps to this tool: entering basic MOBILE6.2 data (including fleet characteristics and vehicle activity), entering fuel options and state programs needed for MOBILE 6.2, entering monthly data for MOBILE 6.2, and entering HPMS data. The tool will then calculate emissions based on the entered data. Although intended for small areas, the tool can also be used for larger or urban areas if an easier user interface is desired.

In another report, part of the UC Davis-Caltrans Air Quality Project, the "less-than-base-year" emissions test is recommended for small isolated areas as the easiest approach for making project assessments.[17] With this method, a project will pass conformity if projected future emissions are less than the emissions estimated for the base year. A simple analysis procedure for this test is presented, with VMT projections based on the California motor vehicle emissions model and assumptions about changes in traffic flow. However, if these assumptions are not precise enough, the more detailed procedure should be used. Since it is intended for rural areas, this analysis procedure does not require the availability of a TDF model. In addition, the report outlines what should be included in a conformity analysis for a rural area, and lists data requirements in addition to procedures.

The example mentioned in this report was a project in Cherokee, South Carolina. The analysis for that project was actually conducted with FHWA consultation. The report also mentions that the alternative test would be the horizon-year, no-build scenario. However, the preferred method of conformity testing is based on emissions budgets, if they are available.

A report prepared by ICF Consulting in 2003 details conformity requirements for urban, donut, and rural areas.[18] The report also presents a then state-of-the practice look at the conformity process in rural areas in seven states, with a total of 32 isolated rural areas. However, not all isolated rural areas had been through a conformity analysis. In all interviewed states, the state DOT took the lead in the conformity analysis, although local governments contributed in three of the states. Table 4 shows the areas that underwent a conformity analysis and problems they encountered.

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[16] Claggett, M. and J. Houk. *An Emission Inventory Tool for Transportation Conformity Applications in Rural and Small Urban Areas*. Report 06-0742, 2006 TRB Annual Meeting, November 21, 2005.

[17] Van Houtte, J., D. Eisinger, and D. Neimeier. *Rural Area Conformity Guidance: Completing 8-Hour Ozone Project Assessments.* UC Davis-Caltrans Air Quality Project. Prepared for the California Department of Transportation, September 7, 2006. http://aqp.engr.ucdavis.edu/Documents/RuralConformityGuidance-Final-Report.pdf, accessed December 2010.

[18] ICF Consulting. *Rural Conformity: A Survey of Practice*. Prepared for the Standing Committee on Planning, American Association of State Highway and Transportation Officials, in association with Sarah J. Siwek & Associates. NCHRP 08-36, Task 28, National Cooperative Highway Research Program, Transportation Research Board, October 31, 2003. http://66.132.139.69/uploads/nchrp28.pdf, accessed December 2010.

Table 4: ICF Survey of the 2003 State-of-Practice.

Exhibit 6: Outcomes of Conformity Analyses

State	Conformity Analyses Conducted	Outcomes
Colorado	Aspen - Entrance to Aspen project on State Highway 82.	Initial project was not able to meet build-no build test. Conformity process influenced design of project: added busway/light-rail component. [However, project is on hold due to other issues].
Kentucky	Edmonson Paducah	Paducah – failed to determine conformity in 1998. Eventually was able to make a conformity determination in 2002 after revising its motor vehicle emissions budget in the SIP.
Maine	Rural conformity analyses are conducted on a routine basis as part of the STIP cycle.	No significant projects. Problem has been identifying projects to conduct build/no build test.
Ohio	Clinton Columbiana	No problems meeting conformity have been encountered.
Oregon	Lakeview Klamath Falls Grants Pass	Grants Pass – Experienced difficulty in demonstrating conformity; however, the project was delayed long enough that fleet turnover, as reflected in an upgraded MOBILE model, allowed the area to demonstrate conformity.[22]
Pennsyl-vania	Conformity analyses are conducted for the eleven isolated rural counties during each two-year STIP cycle. There have been two to five projects in isolated rural areas in over the past two STIP cycles.	No projects have been delayed, but project components have been modified in order to demonstrate conformity. Conformity demonstration was challenging with the build/no-build test but there have been no problems meeting conformity using the "less than 1990" test.
South Carolina	Cherokee County	Conformity analysis for project was initiated in 1995 but only completed in 2000, due to a variety of technical and procedural issues, not issues associated with meeting the emissions budget.

Most of the areas used HPMS to estimate VMT and defaults included in MOBILE to estimate emissions. However, there are certainly limitations to the use of MOBILE defaults in rural areas, and HPMS was designed as a statewide tool rather than for county-level analysis. Thus, use of these tools may result in inaccuracies for rural areas.

The most extensive report identified that addresses methodologies for small urban and rural areas was prepared by ICF Consulting for FHWA in 2004.4 The report is useful for providing an overview of available options for these areas when conducting regional emissions analysis. Methods and examples are given for areas both with and without a TDF model. Various methodologies are presented for estimating local road VMT, forecasting VMT without a TDF model, and forecasting VMT with a TDF model. In addition, this section presents different additions and adjustments that can be made to the TDF model outputs.

The next section presents methods of estimating speeds with and without a TDF model. This includes methodologies for estimating VMT and speeds in a donut area that is not covered by the TDF model. Methods for determining other factors are also presented, including VMT

mix, vehicle age distribution, percent of VMT on freeway ramps, and implementation of I/M programs. Each presented methodology is rated based on data availability, ease of application, technical robustness, and policy sensitivity. In addition, each method includes a description of the method, description of applicability, potential data sources, procedures, advantages, limitations, and an example of the use of this method in the real world.

As an example, one method for forecasting VMT without a TDF model is to use linear regressions of VMT by functional class, with minor changes "smoothed" by adjusting for changes in functional class categories. Figure 1 shows an example of how each method is graphically rated.

Method 3: Linear Projections of VMT by Functional Class, with Adjustments to Correct for Changes in Functional Class Categories

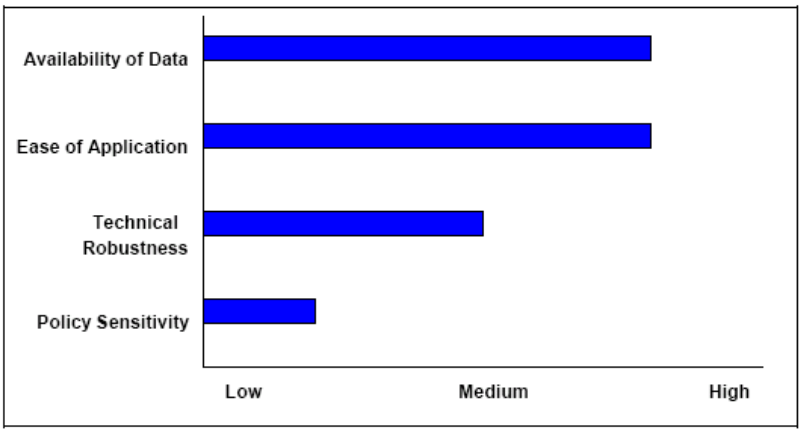

Figure 1: Example of Rating Methodologies in an ICF Publication.

The report states that the method is "most appropriate for an area that is expected to maintain a stable rate of growth in population, economic activity, and vehicle travel."4 The equations shown in Figure 2 are given as part of the procedure to adjust for changes in functional class categories.

$$VMT_{adjusted-historic-year} = VMT_{historic-year} \times \frac{FuctionalClassMiles_{current-year}}{FunctionalClassMiles_{historic-year}}$$

$$VMT_{corrected-historic-year} = VMT_{adjusted-historic-year} \times \frac{VMT(All-Roadways)_{unadjusted-historic-year}}{VMT(All-Roadways)_{adjusted-historic-year}}$$

Figure 2: Example Equations in an ICF Publication.

Three advantages and three disadvantages are listed for this methodology. For example, one advantage is that the rationale behind it and the data sources are generally accepted. On the other hand, one limitation is that it does not explicitly account for factors such as population growth, land use changes, and economic growth that could influence future VMT growth. The example location given for this methodology is for use in areas with no TDF model where the ODOT has used it to predict VMT.

Potential Donut and Isolated Areas in Texas

One of the pollutants regulated by the EPA is ground level ozone (O_3), which is created when sunlight causes a chemical reaction between NO_x and VOC.[19] This pollutant is a particular problem in the summer, as hotter weather contributes to creation of ozone. Atmospheric ozone is necessary in the stratosphere, where it protects earth from harmful ultraviolet (UV) rays from the sun. Thus, atmospheric ozone that occurs naturally between about 10 and 30 miles above the surface of the earth is considered "good" ozone. However, ground-level ozone is considered "bad" ozone, in that it contributes to smog, causes damage to plant life, and is harmful to human health, particularly respiratory health. In addition, ozone is not only an urban problem, as wind can move ozone hundreds of miles from the original source.

The EPA proposed a lowering of the 2008 primary 8-hour ozone standards on January 6, 2010, with a final decision to be reached by July 29, 2011.[20] The current primary 8-hour standard for ozone is 0.075 parts per million (ppm), and became effective May 27, 2008.[21] In other words, the average of the fourth-highest 8-hour ozone concentrations for three years must not exceed 0.075 ppm. The previous 8-hour standard (the 1997 standard) was 0.08 ppm, and the use of the 1-hour standard has been revoked. The proposed standard would lower the allowed

[19] Environmental Protection Agency. Basic information. *Ground-Level Ozone*. EPA, December 8, 2010. http://www.epa.gov/air/ozonepollution/basic.html, accessed December 2010.

[20] Texas Commission on Environmental Quality. *The EPA's 2010 Proposed Revisions to Air Quality Standards*. TCEQ, December 30, 2010. http://www.tceq.state.tx.us/implementation/air/aqps, accessed January 2011.

[21] U.S. Environmental Protection Agency. Ozone air quality standards. *Ground-Level Ozone.* EPA, January 8, 2010. http://www.epa.gov/air/ozonepollution/standards.html, accessed January 2010.

concentrations to between 0.06 and 0.07 ppm. In addition, a "separate seasonal secondary standard within the range of 7 to 15 ppm-hours using a cumulative peak-weighted index" is part of the proposal.[20] Primary standards are set at levels appropriate for protecting human health, while secondary standards are meant to protect aspects of public welfare, including visibility and vegetation. Figure 3 shows the current problem areas in Texas.

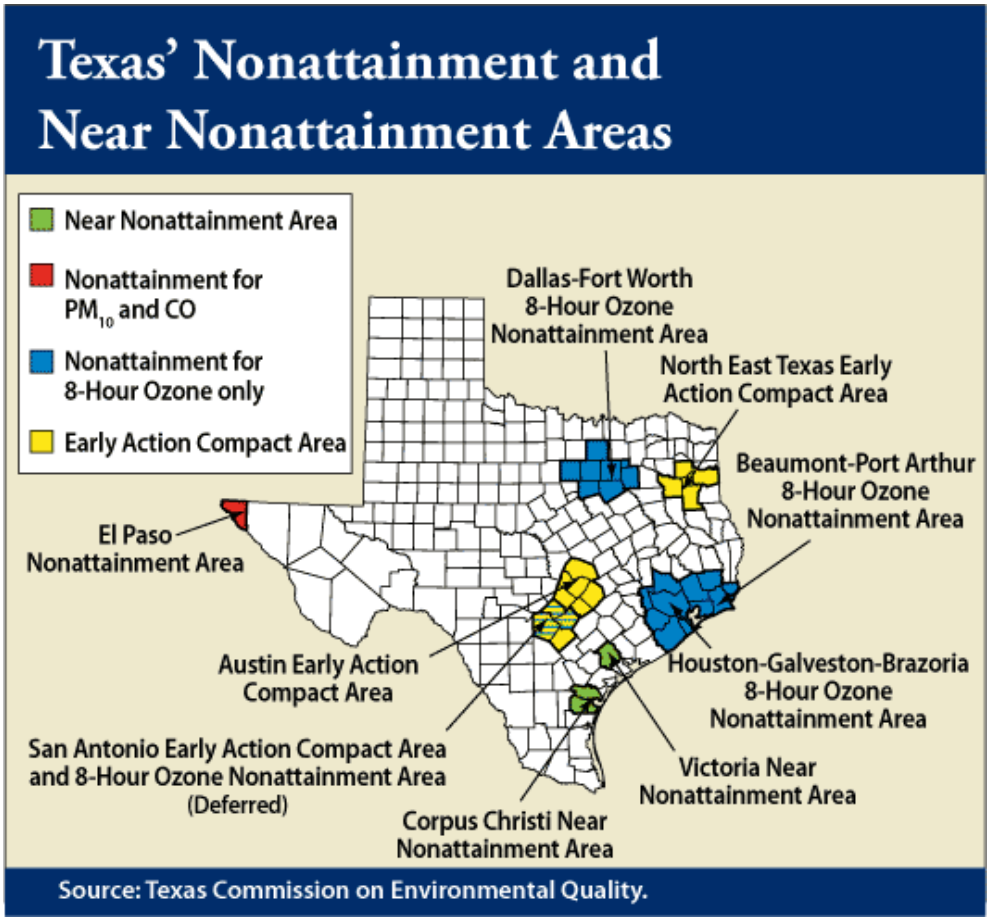

Figure 3: Nonattainment, Near-Nonattainment and Early Action Compact (EAC) Areas in Texas.

The lowering of current ozone standards could cause additional counties in Texas to be classified as nonattainment for ozone, and some of these counties may be donut or isolated rural nonattainment areas. A potential isolated rural nonattainment area is Brewster County in the western portion of Texas, which is the largest Texas county in terms of land size and the location of Big Bend National Park. However, the estimated 2009 population is only 9,481 people, or about 1.4 persons per square mile.[22] In addition, an about 6,500 of those people live in the

[22] U.S. Census Bureau. Brewster County, Texas. *State & County QuickFacts.* U.S. Census Bureau, August 16, 2010. http://quickfacts.census.gov/qfd/states/48/48043.html, accessed January 2011.

county seat of Alpine as of 2009, including approximately 50 city employees.[23] With such a small population, it is possible that the county would lack the necessary resources and manpower to undertake any sort of air quality analysis. Thus, the work would likely fall to the Texas Department of Transportation (TxDOT). In addition, determining where the ozone pollution originates would be important, since the population of the county itself typically contributes relatively few vehicle miles due to the small population size.

The revised ozone standards also have the potential to create several donut areas within Texas. One potential donut area is Harrison County in East Texas, which is part of the North East Texas EAC Area, as shown in Figure 3. The MPOs of both Tyler and Longview are included in this EAC area. In fact, part of the Longview MPO falls within Harrison County, as Figure 4 shows.

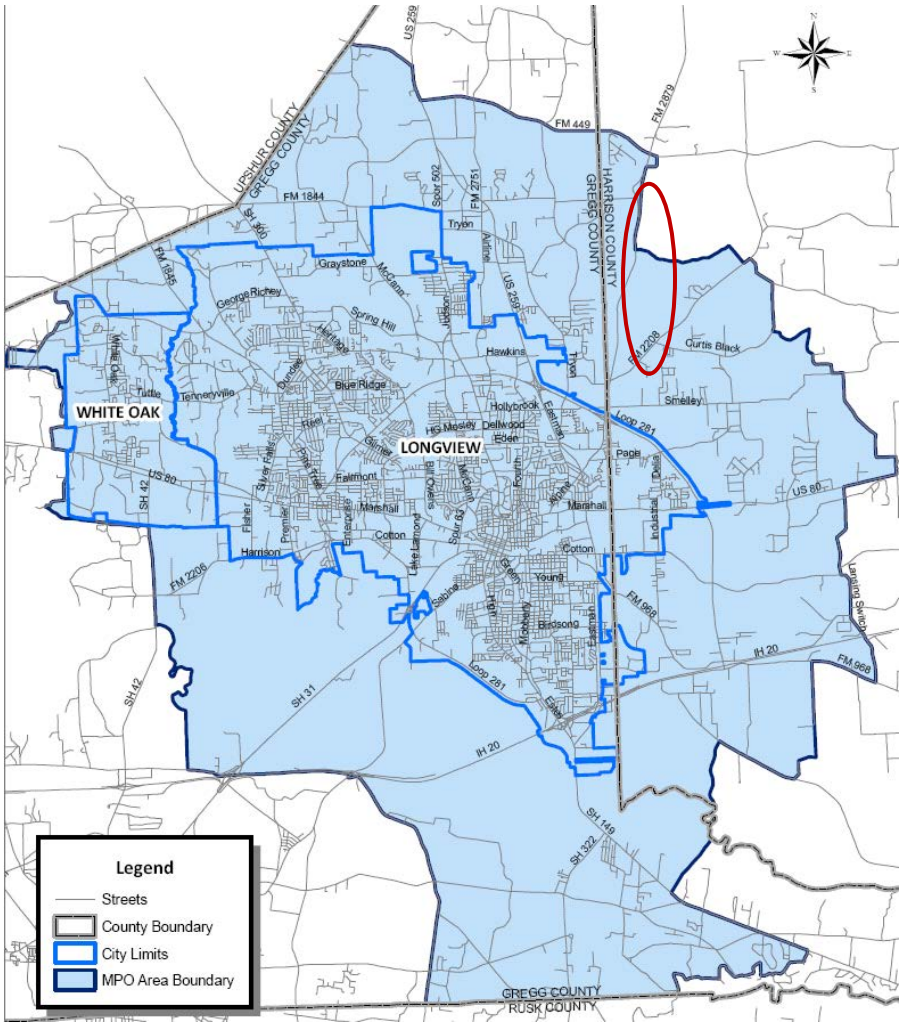

Figure 4: Longview MPO intersection with Harrison County.

[23] Advameg, Inc. *Alpine, Texas*. City-Data.com, 2003-2010. http://www.city-data.com/city/Alpine-Texas.html, accessed January 2011.

The area chose to develop an EAC agreement in November of 2002 to avoid a nonattainment designation.[24] Five counties are included in this area – Gregg, Harrison, Rusk, Smith, and Upshur. The decision was reached by the Northeast Texas Air Care (NETAC) Policy Committee. The Longview MPO supports NETAC in this process.[25] It is unclear whether Harrison County would be a donut area under new ozone standards, as it appears to already be part of an effort to develop an SIP and attain ozone standards. NETAC itself works with both the Texas Commission on Environmental Quality (TCEQ) and the EPA to address ozone pollution as an EAC.

Finally, a five-county airshed could be designated in Central Texas based on new ozone standards, which would include the counties of McLennan, Bell, Falls, Hill, and Limestone. McLennan County is part of the Waco MPO, and Bell is part of the Killeen-Temple MPO (KTMPO). Thus, the remaining three counties would possibly be considered donut areas. None of these counties currently perform a conformity analysis, as none are classified as nonattainment, near-nonattainment, or EAC (as shown in Figure 3). Both MPOs do have long-range transportation plans and TIPs.[26, 27] However, it is expected that TxDOT would be needed to contribute to the conformity process for the remaining counties.

The 2004 ICF report listed previously would be very useful for selecting methodologies to estimate inputs to emissions analysis.4 Practitioners can evaluate the best area of applicability of each method, and weight the benefits and limitations of each.

[24] East Texas Council of Governments. *The 8-Hour Ozone and Early Action Compact (EAC).* Northeast Texas Air Care, 2011. http://www.netac.org/289/Early-Action-Compact.htm, accessed January 2011.

[25] City of Longview. Air quality. *Metropolitan Planning Organization (MPO)* http://mpo.longviewtexas.gov/air-quality, accessed January 2011.

[26] City of Waco. Plans and programs. *Metropolitan Planning Organization*. 2009-2011. http://www.waco-texas.com/mpo/plans.asp, accessed January 2011.

[27] Killeen-Temple Metropolitan Planning Organization. *Project Planning*. 2010. http://www.ktmpo.org/index.php?option=com_content&view=article&id=4&Itemid=6, accessed January 2011.

Summary and Conclusions

This review of current practice describes the challenges and options for addressing on-road mobile source emissions estimation for donut areas and isolated rural nonattainment areas. The review describes and references different methods that can be used to estimate emissions in such areas.

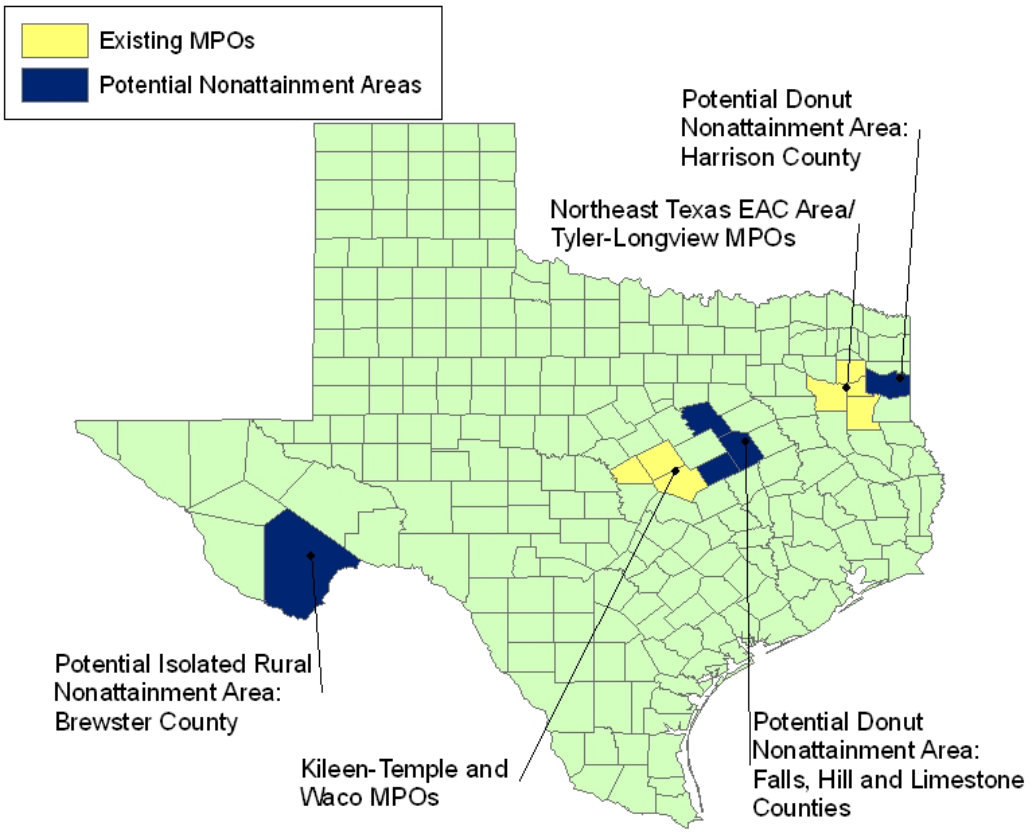

Figure 5: Summary of Potential Donut and Isolated Nonattainment Areas in Texas

At present Texas has neither donut nor isolated rural nonattainment areas. Figure 5 summarizes the potential donut or isolated rural nonattainment areas that may be created due to establishment of more stringent nonattainment standards, these include:

- A donut area (Harrison County), which could be designated in the future for ozone nonattainment in the Tyler-Longview area if standards are lowered.
- The central Texas counties of Falls, Hill, and Limestone lying outside the Waco and Killeen-Temple MPO urbanized areas, which could also become a donut area.

- Brewster County could also be designated as nonattainment for ozone in the future if ozone standards are lowered, due to ambient conditions in the Big Bend area.

As components of its statewide on-road mobile source emissions estimates, Texas has county-by-county estimates of emissions. In Texas, two methods are employed for travel projections needed for producing on-road mobile source emissions inventories. TDF models work best for urbanized areas where such models exist. The virtual link method can work for rural counties and counties with populations that do not meet MPO criteria. Both methods have been accepted by the interagency consultation partners.

Currently, for Texas' nonattainment areas, the emissions inputs are estimated using formal TDF model-based procedures and EPA's current mobile source emissions model. These are prepared by MPOs in some areas (Dallas-Fort Worth models both travel and emissions; Houston-Galveston-Brazoria, San Antonio, Austin, and El Paso model travel) and by TTI on behalf of TxDOT and TCEQ for the others. For counties that are not classified as nonattainment, the county emissions estimates are prepared by TTI using a virtual link technique and HPMS data.[28]

In the future, if areas without an existing TDF model are designated as nonattainment areas (either donut areas or isolated rural nonattainment areas), the following options may be considered for emissions estimation for conformity determinations, subject to agreement of interagency consultative partners and stakeholders:

- Continue to use the virtual link method and HPMS data for rural counties designated as nonattainment.
- Use a combination of the TDF model data and HPMS-based options for counties adjacent to MPO counties with areas partly covered by the TDF model.
- Consider expanding the TDF model limits in areas adjacent to MPO counties, especially if a county is expected to become at least partially urbanized during the horizon period. The TDF model limits could be expanded to cover at least the newly urbanizing portion of the county and might benefit from covering the entire county.

[28] Perkinson, D.G. IAC-A Air Quality/Conformity – Task 15 – Procedures/Virtual Link Emissions Estimation and VMT Forecasting Procedure Review and Update. Texas Department of Transportation, June 16, 2009.