Background

The Clean Air Act requires transportation projects, programs, and plans conform to any federally-approved state plans established to achieve and/or maintain federal air quality standards in places designated as nonattainment or maintenance areas by the Environmental Protection Agency (EPA). Transportation projects in these areas cannot receive federal funding until "conformity" has been demonstrated. There are two levels of conformity; project-level and regional. Project-level conformity demonstrates that a transportation project will not create a location (or "hot spot") that exceeds the national ambient air quality standards (NAAQS) for a given criteria pollutant. Regional conformity demonstrates that the total emissions from a nonattainment/maintenance area's future transportation system, as described by a transportation improvement program (TIP) or long-range transportation plan (LRTP), are consistent with the goals for achieving air quality standards found in an area's state implementation plan (SIP).

The Nogales area is designated as nonattainment for two criteria pollutants, PM_{10} and $PM_{2.5}$. ADEQ worked with EPA to establish SIPs for the Nogales nonattainment area (NNA) specific to PM_{10} and $PM_{2.5}$. The most recent PM_{10} SIP was completed in August of 2012 and the most recent $PM_{2.5}$ SIP was adopted on September 6, 2013. Both SIPs were based on emissions estimates developed using the EPA's National Emissions Inventory (NEI) for 2008. EPA releases a new NEI every three years. The most current NEI is for the year 2014.

The Arizona Department of Transportation (ADOT), in association with the Federal Highway Administration (FHWA), proposes to improve State Route (SR) 189 from the Mariposa Port of Entry (POE) at the U.S.-Mexico border to the Mariposa Traffic Interchange (TI) at SR 189 and Interstate 19 (I-19) and east to Grand Avenue (milepost 0.6 to milepost 3.75) in the city of Nogales, Santa Cruz County, Arizona. Air quality conformity must be demonstrated and approved at both the project-level and regional level for this project. It was determined through consultation with EPA and FHWA that the project did not meet the definition of a Project of Air Quality Concern pursuant to 40 CFR 93.123 and a project-level analysis was therefore not required. However, a regional air quality conformity analysis (RCA) for the NNA that includes the project has not been completed. Given the NNA is a rural area without a metropolitan planning organization (MPO), the RCA for the NNA must be based on ADOT's statewide transportation improvement program (STIP) and statewide LRTP.

Introduction

RCAs address each pollutant for which an area has been designated nonattainment or maintenance and requires interagency consultation, regional emissions analyses, and a conformity test (budget test, build/no-build test, or no-greater-than baseline test as applicable). A budget test compares regional emission estimates to a "budget" or "budgets" established by the SIP or maintenance plan. An interim test (build/no-build test or no-greater-than baseline test) is conducted when emissions budgets have not been established for an area. They compare emissions estimates of a "build" condition (represented by the STIP and/or LRTP) to emissions estimates of a scenario where either no projects are built (i.e. no-build test) or to a NEI year (i.e. baseline test).

A PM_{10} emissions budget exists for the NNA. It was established by forecasting county-level PM_{10} emissions estimates developed for EPA's 2008 NEI to 2011. Thus, a budget test will be conducted for PM_{10}. The Budget for the NNA is 1,274.3 tons per year (tpy) and is made up of four source categories:

- Unpaved Road Dust (864.9 tpy)
- Paved Road Dust (121.4 tpy)
- Road Construction (267.0 tpy)
- On-road Mobile (21.0 tpy including exhaust, break, and tire wear)

A budget for $PM_{2.5}$ was not established due to a "clean data" determination on January 7, 2013 by the EPA. Therefore, an interim test will be used to demonstrate regional conformity for both $PM_{2.5}$ and nitrogen oxides (NOx), a contributor to ambient $PM_{2.5}$ concentrations. During the interagency consultation process with EPA, FHWA, ADEQ, and ADOT, both types of interim tests (build/no-build and no-greater-than) tests were discussed. After consultation, it was decided to use the no-greater-than baseline test to demonstrate regional conformity for both $PM_{2.5}$ and NOx as required by section 93.119(f)(9) of the conformity regulation. The baseline year applicable to the test is 2008 since it is the NEI year closest to the promulgation of the $PM_{2.5}$ standard violated by the NNA.

EPA approved the NNA's 2008 emissions inventory for both $PM_{2.5}$ and NOx on February 9, 2015. The applicable emissions estimates for the no-greater-than 2008 tests include:

- Unpaved Road Dust (154.9 tpy $PM_{2.5}$)
- Paved Road Dust (49.6 tpy $PM_{2.5}$)
- Road Construction (64.0 tpy $PM_{2.5}$)
- On-road Mobile (912.9 tpy NOx, 25.1 tpy $PM_{2.5}$ including exhaust, break, and tire wear)

Both tests will compare regional emissions estimates for the NNA based on a "build" condition represented by ADOT's current STIP and LRTP. All of ADOT's regionally significant and programmed transportation projects in the NNA will be included in estimates for the build condition.

For both tests, specific years must be analyzed. These include:

- 2017 (base year, first year of the current STIP)
- 2021 (last year of the current STIP)
- 2030 (required interim year)
- 2035 (current LRTP horizon year)

An emissions analysis is needed to support the RCA and must include annual road dust emissions (both paved and unpaved), road construction dust, and vehicle (or on-road mobile) emissions for PM_{10} only. No fugitive dust emissions sources are required for the $PM_{2.5}$ analysis unless either EPA or ADEQ concludes that they are significant to the NNA. To date, no such conclusion has been made by EPA, FHWA, or ADEQ. This document presents the methodology and assumptions proposed to complete a regional emissions analysis for the NNA and are the result of interagency consultation comments received through January 31, 2017.

Unpaved Road Dust

Both the PM_{10} and $PM_{2.5}$ SIPs for the NNA used the 2008 NEI for Santa Cruz County to estimate unpaved road dust emissions. The 2008 NEI used AP-42 emissions factors and estimates of unpaved roadway travel activity (VMT) obtained from ADOT, ADEQ, and FHWA. Since the NNA is only a portion of the county, emissions were apportioned to the NAA for SIP development using population.

For this emissions analysis, ADOT proposes using the PM_{10} unpaved road dust emissions estimates developed for Santa Cruz County as part of the 2014 NEI. The 2014 NEI utilized AP-42 emissions factor calculations and assumptions specific to each state. ADOT will review the available 2014 NEI documentation and assumptions used and verify that the assumptions and data used were conservative and/or reasonable for the RCA.

County-level PM_{10} emissions will be apportioned to the NNA using population estimates from the Arizona Department of Administration – Employment & Population Statistics, Office of Economic Opportunity for Rio Rico, the City of Nogales, and Santa Cruz County. The PM_{10} SIP previously established that 88.7% of the Rio Rico Southeast and 19.1% of the Southwest portions of the US Census Designated Places (CDPs) are within the NNA. Therefore, the NNA population is assumed to be the City of Nogales and corresponding portions of the Rio Rico community. The remainder of the NNA is assumed to be rural and minimally populated. ADOT will also use population growth forecasts to estimate emissions for each analysis year as was done for the SIP.

ADOT does not intend to include $PM_{2.5}$ emissions from unpaved road dust in the RCA. EPA did not make a formal finding that on-road mobile fugitive dust sources of $PM_{2.5}$ emissions were significant and ADOT has not received any formal requests to include these emissions in the RCA for $PM_{2.5}$.

Paved Road Dust

As with unpaved road dust, paved road dust emissions were estimated for the PM_{10} and $PM_{2.5}$ SIPs using 2008 NEI data for Santa Cruz County. NEI emissions estimates for paved road dust were based on paved roadway miles in the county and VMT data obtained from FHWA and/or ADOT. County-level emissions estimates were then apportioned to the NNA by population using the same methodology described for unpaved road dust.

ADOT proposes using the 2014 NEI to estimate PM_{10} paved road dust emissions. Emissions will be apportioned to the NNA based on population and will be forecast to each analysis year using population growth estimates for Santa Cruz County provided by the Arizona Department of Administration – Employment & Population Statistics, Office of Economic Opportunity.

ADOT will verify that the latest version of the AP-42 emissions factor equation was used for the 2014 NEI and that the assumptions used are appropriate and/or reasonably consistent with those used in the PM_{10} SIP. Paved road VMT used to estimate road dust emissions will also be evaluated for consistency with the VMT being used in MOVES to estimate on-road mobile emissions.

Again, because EPA did not make a formal finding that fugitive road dust sources of $PM_{2.5}$ emissions were significant to the NNA, ADOT will not be including $PM_{2.5}$ from paved road dust sources unless formally requested to do otherwise.

Road Construction Dust

The PM_{10} and $PM_{2.5}$ SIPs relied on the 2008 NEI road construction dust emissions estimates for Santa Cruz County to develop estimates for the NNA. The NEI used ADOT's overall roadway program value (in dollars) for six roadway types (urban interstates, rural interstates, urban arterials, rural arterials, urban collectors, and rural collectors) to estimate emissions for each county in the state. General conversion factors were used to convert dollars to lane-miles being constructed and then to acres of land under construction specific to roadway development. Acres disturbed for the state were then apportioned to each county using housing starts information.

PM_{10} emissions from road construction dust in the NNA will be estimated for both general roadway construction and specific roadway projects listed in the STIP or LRTP. $PM_{2.5}$ emissions from road construction were included in the 2014 NEI, but will not be included in the RCA because they have not been found to be significant by EPA.

To estimate general road construction dust emissions, ADOT will use the 2014 NEI and its assumptions. This methodology is the same one used to develop emissions estimates for the 2008 NEI and PM_{10} SIP. The 2014 NEI estimated the amount of land (in acres) disturbed at the state-level using state expenditure

data and unit cost estimates for each of the six roadway types. Total state-wide acres of construction were then estimated and apportioned to each county using building permit information. A ratio of the number of building starts in each county to the total number of building starts in Arizona was applied to the state-level acres disturbed estimate to develop the total number of acres disturbed by road construction in each county. An emissions factor of 0.42 tons PM_{10}/acre-month was applied to reflect the high level of cut and fill activity associated with road construction. Construction was assumed to occur over a 12-month time period. 2014 NEI estimates were then corrected to account for state-specific soil silt content values and average precipitation/evaporation values.

County-level emissions will be apportioned to the NNA using population data obtained from the Arizona Department of Administration – Employment & Population Statistics, Office of Economic Opportunity. Since ADOT will not have NNA specific housing start information to forecast emissions, ADOT will use population forecasts as a surrogate for each analysis year.

Construction dust for specific roadway projects identified in the STIP or LRTP will be calculated using estimates provided by ADOT on the number of acres disturbed for each project. EPA emissions factors will then be applied based on acres disturbed and project duration. At this time, the only project ADOT has programed for the NNA is the State Route (SR) 189, International Border to Grand Avenue (ADOT Project No.: 189 SC 000 H8045 01L).

On-Road Mobile

MOVES2010a, EPA's on-road mobile emissions model, was used to estimate county-wide on-road mobile emissions for both the PM_{10} and $PM_{2.5}$ SIPs. VMT and average roadway speed distribution data from the 2008 NEI were used to establish the PM_{10} motor vehicle emissions budget and the 2008 baseline emissions for $PM_{2.5}$ and NOx. Emissions estimates for the county were scaled to the NNA using population data.

To maintain consistency with the PM_{10} emissions budget and $PM_{2.5}$ SIP, ADOT proposes using the most recent version of EPA's MOVES model (MOVES2014a) with either updated data collected by ADOT or with data used for the 2014 NEI. The following is a list of MOVES required data elements and the data sources proposed for this emissions analysis:

Meteorology Data – It is assumed the inputs that were used for the PM_{10} and $PM_{2.5}$ SIPs are still valid. Forecasts will assume meteorology will not change over time.

Pollutants - PM_{10} (tailpipe, tire and break wear), $PM_{2.5}$ (tailpipe, tire and break wear), NO_x (tailpipe)

Vehicle Population – Current ADOT vehicle population data for Santa Cruz County will be provided for the analysis. The vehicle categories used by ADOT for reporting purposes will be mapped to the 13 types used by MOVES using a data converter spreadsheet tool created by ADOT. Vehicle population will be grown based on population forecasts obtained from the Arizona Department of Administration – Employment & Population Statistics, Office of Economic Opportunity.

Vehicle Age Distribution – Vehicle age distribution data for Santa Cruz County as of January 2017 will be obtained for the analysis and used to develop MOVES input files. County-level vehicle registration data were used for the 2008 NEI and to establish the PM_{10} budget in and the 2008 baselines for the $PM_{2.5}$ and NOx. Therefore, county-specific age distributions will be used for this emissions analysis. It is assumed vehicle age distributions in the county match those in the NNA and will remain the same for all forecast years.

Vehicle Type VMT – ADOT will compare two types of VMT estimates for the county and/or NNA and use the most conservative result to produce on-road emissions.

One estimate of 2017 VMT will come from ADOT's state-wide travel demand model. It is assumed ADOT's model network sufficiently represents the miles of paved roadway in the NNA and that ADOT's MOVES spreadsheet converter tool will provide VMT estimates apportioned to each MOVES vehicle type. VMT will be grown using rates derived from 2030 AADT VMT forecasts provided by ADOT's state-wide travel demand model.

Another estimate will come from VMT used for the 2014 NEI. Total annual VMT estimates by county and roadway class were reported by states for the 2014 NEI via FHWA's HPMS. VMT will be grown using rates derived from 2030 AADT VMT forecasts provided by ADOT's state-wide travel demand model.

Average Speed Distribution – MOVES uses specific drive cycles to calculate operating mode distributions. The operating mode distributions in turn determine the calculated emission rates. MOVES provides a default average speed distribution based on national data for use in areas where specific speed distribution data are either unavailable or unreliable. However, specific local speed distributions can be created using travel demand models or on-vehicle GPS speed data.

Two county-level average speed distributions will be developed for the RCA; an existing distribution and a "build" distribution. ADOT proposes using one of two existing speed distributions representing current conditions in the NNA, depending on the source of VMT data used. MOVES default average speed distributions were used for both SIP development and the 2014 NEI. Thus, MOVES default speed distributions will be used to calculate emissions from on-road mobiles sources assuming 2014 NEI VMT data. For emissions estimates developed using VMT taken from ADOT's state-wide travel demand model, average speed distributions from model outputs will be used. ADOT's MOVES spreadsheet converter tool provides average speed distributions when given output from the state-wide model.

Speed distributions representing the NNA build network will be developed using readily available travel time and traffic study information. Currently the only improvement project identified in the STIP or LRTP applicable to the NNA is the SR 189, International Border to Grand Avenue project. Therefore, project-specific information on travel speed improvements will be used to develop two average speed distribution files for use in the RCA. One file will be based on MOVES default distributions and another will be based on distributions developed from ADOT's travel demand model. Forecasts will assume average speed distribution will not change significantly in Santa Cruz County or the NNA over time.

Road Type Distribution – ADOT will develop two sets of road type distributions; one based on the $PM_{10}/PM_{2.5}$ SIPs and one based on ADOT's state-wide travel demand model data. Each set will be used with specific activity data. Road type data based on the $PM_{10}/PM_{2.5}$ SIPs will be used in conjunction with 2014 NEI activity data. Road type distributions based on ADOT's travel demand model network will be used with activity data from the model. Forecasts will assume road type distributions will not change significantly in the future unless a new roadway is identified in the STIP or LRTP.

Ramp Fraction – EPA default will be used. The default ramp fraction on both rural and urban interstates is 8% of VHT. Forecasts will assume the ramp fraction will not change significantly in the future.

Fuel – The most current EPA defaults for Santa Cruz County will be used in the emission's analysis. It is assumed EPA's default data for Santa Cruz County were used for the 2008 NEI and 2014 NEI. Additionally, it is assumed fuel properties will not significantly change in the future.

I/M Programs – No inspection/maintenance programs exist in Santa Cruz County or the NNA. This is assumed to continue into the future.

Vehicle Starts – EPA default.

Retrofit Data – None. These data are not required unless a vehicle retrofit program exists that needs to be modeled. No program exists in the NNA. This is assumed to continue into the future.

Hoteling - EPA default will be used. Hoteling is non-driving activity associated with long-haul combination trucks. There are four operating modes associated with hoteling; Extended Idle, Diesel Auxiliary Power (APU), Battery Power, and Engine-Off. Detailed, local data regarding hoteling hours and operating mode fractions does not exist for the NNA. Therefore EPA default data will be used to estimate emissions given current and future conditions.

SIP Control Measures

The EPA has not approved any PM_{10} or $PM_{2.5}$ transportation control measures for the NNA. Consequently, there is no need to address this requirement in the RCA. ADOT does not anticipate the need to calculate emissions reduction credits for road paving projects at this time. Should the RCA require emissions reduction credits associated with road paving projects, ADOT will submit a separate strategy, methodology, and set of assumptions for additional interagency consultation.