4.0 The 2008 and 2009 Projected Inventories

Part II of EPA's rule to implement the 8-hour NAAQS requires the Washington, DC-MD-VA ozone nonattainment region to achieve a 15 percent reduction by 2008 using reductions in either VOC or NOx emissions or with any combination of the two.[1] Also an inventory for the attainment year 2009 is required for the region. The reduction must be calculated from the anthropogenic emissions levels reported in the 2002 Base-Year Inventory after those levels have been adjusted to reflect the expected growth in emissions between 2002 and 2008. The 2002 Base-Year Inventory is described in Chapter 3. This chapter presents the 2008 and 2009 Projection Inventories, the estimation of the levels of emissions to be expected in those years before the consideration of emission controls.

The 2008 and 2009 projected inventories are derived by applying the appropriate growth factors to the 2002 Base-Year Emissions Inventory. EPA guidance describes four typical indicators of growth. In order of priority, these are product output, value added, earnings, and employment. Surrogate indicators of activity, for example population growth, are also acceptable methods.

Round 7.0 Cooperative Forecasting results (population, household and employment projections), which are prepared and officially adopted by the Metropolitan Washington Council of Governments (COG), were used to project emissions from area sources. Projections for onroad emissions were developed using MOBILE6.2 (January 2003) model and the Travel Demand Model ver. 2.1d #50 developed by the National Capitol Region Transportation Planning Board. The travel demand modeling process also used Round 7.0 Cooperative Forecasts. The COG Board of Directors approved these forecasts on October 12, 2005.

EPA's nonroad model, NONROAD2005, was used for developing both 2008 and 2009 nonroad inventories. The Economic Growth Analysis System (EGAS) model was used by all three jurisdictions to project growth in point source emissions.

4.1 Growth Projection Methodology

The following sections describe the method followed to determine the projected inventories for 2008 and 2009.

4.1.1 Growth Projection Methodology for Point Sources: EGAS

The growth in point source emissions is projected using EGAS version 5.0. Point source emissions for 2002 are provided from the state data sources and the model is run with the following options selected: projections are run by Source Classification Code; the Bureau of Labor Statistics national economic forecast; and the baseline regional economic forecast. Point source emission projection using EGAS are contained in Appendix (?).

[1] EPA 40 CFR Parts 51, 52 & 90, *Federal Register*. Vol.70, No. 228, Nov. 29, 2005, pp.71612-71705.

4.1.2 Growth Projection Methodology: Area Sources

Base-year area source emissions for 2002 were calculated using 2002 population, household, and employment data. The 2002 data was derived by interpolating linearly 2002 and 2005 data. Thus, growth factors for the periods of 2002 to 2008 and 2002 to 2009 were derived by dividing Round 7.0 population, household, and employment forecasts for the analysis year by actual 2002 population, household, and employment values for the region. Categories related to transport and storage of gasoline were grown using projected vehicle miles traveled (VMT) for analyses years. Area projection inventories are contained in Appendix (?). The growth factors used for the 2008 and 2009 projection years are presented in Tables 4-1 and 4-2. The growth factors were applied to emissions categories by specific jurisdictions.

Table 4-1
2002-2008 Growth Factors

Jurisdiction	Employment[1]	Population[1]	Household[1]	VMT[2]
District of Columbia	1.032	1.038	1.041	1.033
Calvert County	1.238	1.126	1.127	1.151
Charles County	1.264	1.127	1.142	1.140
Frederick County	1.259	1.140	1.143	1.146
Montgomery County	1.088	1.084	1.082	1.048
Prince George's County	1.090	1.047	1.067	1.045
City of Alexandria	1.150	1.071	1.086	1.045
Arlington County	1.113	1.068	1.086	1.019
Fairfax County	1.109	1.098	1.101	1.146
Fairfax City	1.052	1.058	1.057	1.146
Falls Church City	1.145	1.109	1.132	1.146
Loudoun County	1.367	1.444	1.447	1.292
Prince William County	1.201	1.263	1.267	1.163
Manassas City	1.055	1.058	1.079	1.163
Manassas Park City	1.383	1.249	1.279	1.163

[1] Growth factors based on COG Final Round 7.0 Cooperative Forecasts.
[2] Growth factors based on VMT estimates provided by COG Department of Transportation Planning.

Table 4-2
2002-2009 Growth Factors

Jurisdiction	Employment[1]	Population[1]	Household[1]	VMT[2]
District of Columbia	1.043	1.049	1.051	1.038
Calvert County	1.266	1.147	1.147	1.161
Charles County	1.291	1.141	1.160	1.159
Frederick County	1.297	1.162	1.165	1.175
Montgomery County	1.106	1.097	1.095	1.057
Prince George's County	1.108	1.052	1.076	1.062
City of Alexandria	1.166	1.083	1.101	1.083
Arlington County	1.137	1.082	1.102	1.023
Fairfax County	1.138	1.117	1.120	1.074
Fairfax City	1.066	1.071	1.067	1.074
Falls Church City	1.094	1.141	1.172	1.074
Loudoun County	1.427	1.515	1.517	1.331
Prince William County	1.235	1.304	1.312	1.189
Manassas City	1.067	1.064	1.089	1.189
Manassas Park City	1.489	1.286	1.322	1.189

[1] Growth factors based on COG Final Round 7.0 Cooperative Forecasts.
[2] Growth factors based on VMT estimates provided by COG Department of Transportation Planning.

The 2008 and 2009 emissions for area sources are calculated by multiplying the 2002 base-year area emissions by the above growth factors for the appropriate year for each jurisdiction. Each area source category was matched to an appropriate growth surrogate based on the activity used to generate the base-year emission estimates. Surrogates were chosen as follows:

Surface Coating – depending on whether emission factors were based on employment or population, surrogate chosen varied with individual sub-categories. For example, automobile refinishing category was grown using employment as the emission factor was based on it, but population was chosen for growing traffic markings as its emission factor was based on population.

Commercial/Consumer Solvent Use - population was chosen as the growth surrogate since 2002 emissions are based on per capita emission factors.

Residential Fuel Combustion - household was chosen as the growth surrogate.

Industrial/Commercial/Institutional Fuel Combustion - population was chosen as the growth surrogate except for the commercial/institutional coal combustion category, where no growth was assumed.

Vehicle Fueling (Stage II) and Underground Tank Breathing - all gasoline marketing categories were based on vehicle miles traveled (VMT) data since VMT is an appropriate surrogate for gasoline sales. Emission factors for these categories are based on gasoline sales.

Open Burning - population was chosen as the growth surrogate as yard wastes, land debris, etc. increase with population.

Structural Fires, Motor Vehicle Fires – population was chosen as the growth surrogate.

Publicly Owned Treatment Works (POTW) – households was chosen as the growth surrogate.

Dry Cleaning - employment was chosen as the surrogate.

Graphic Arts - population was used to estimate growth since emissions are based on per capita emission factors.

Surface Cleaning - employment growth was used as the surrogate.

Tank Truck Unloading –growth in VMT was applied to this category since base-year emissions are calculated using gasoline sales.

Municipal Landfills - Base-year emissions are estimated using data on total refuse deposited. Population was chosen as a surrogate since deposited waste is from the general population rather than industrial facilities.

Asphalt Paving - population was chosen as the surrogate since base-year emissions are calculated using per capita emission factors.

Bakeries, Breweries - population was chosen as the surrogate.

Soil/Groundwater Remediation - zero growth was applied to this category. The number of remediations during the ozone season, used to generate base-year emissions, does not directly correlate to population, households, or employment growth.

General Aviation and Air Taxi Emissions - Emissions from commercial aircraft operations at Dulles and National Airports were provided by the Washington Metropolitan Airports Authority (MWAA). Emissions were calculated using FAA-approved activity data and the Emissions Dispersion Modeling system (EDMS) model.

Aircraft Refueling Emissions - emissions from refueling of aircrafts was projected based on population.

Portable Fuel Container Emissions - emissions from residential sector were grown based on household and those from commercial sector based on employment.

Railroad Locomotives - employment growth was used as the surrogate.

Commercial Cooking - employment growth was used as the surrogate.

Composting – zero growth was applied to this category.

Forest Fires, Slash Burning, Prescribed Burning – zero growth was applied to this category.

Accidental Oil Spills - zero growth was applied to this category.

Incineration– zero growth was applied to this category.

Pesticide Application - zero growth was applied to this category.

4.1.3 Growth Projection Methodology: Nonroad Sources

The 2008 and 2009 nonroad source inventories were created through the use of EPA's NONROAD2005.1.0 model (dt. 06/12/2006), except for locomotives, marine diesel vessels, and aircrafts. The base year 2002 nonroad source inventory was created using NONROAD2005.0.0 model (dt. 12/02/2005). Since the time it was first issued on 12/02/2005, this model version underwent several corrections. Base year nonroad inventory was created using the version current as of 3/21/2006.
The two model versions (NONROAD2005.0.0 and NONROAD2005.1.0) differ only in the options provided in their graphic user interfaces (GUI) and not in emission factors, base year equipment population, activity, load factor, average lifetime, scrappage function, growth estimates, and geographic and temporal allocation for any nonroad equipment and engine. Therefore, emissions produced by the two versions for a particular county, month, season, or year are the same.

Nonroad model runs were made for the metropolitan Washington region for an average ozone season day. First the model was run for the entire summer season (June-August) and then total emissions calculated this way was divided by the total number of days (92) in the season to get an average ozone season day emissions. Since ozone season extends

from May through September, monthly fuel data obtained from states were averaged for this period to get fuel parameters reflecting the ozone season period. These ozone season averaged fuel parameters were then used in the above mentioned ozone season runs for each state.
Methodology to prepare inputs for the ozone season day is provided below.

Temperature:
Temperature data were acquired from the National Climatic Data Center (NCDC). Hourly average temperature data were collected for Dulles (IAD) and Reagan National (DCA) stations for the top ten 8-hour maximum ozone days between 2002-2004. Then the two hourly datasets were averaged together to get one hourly dataset. Then minimum, maximum, and average temperatures were computed from this hourly temperature dataset.

Fuel inputs:
Month specific data for fuel RVP and oxygen weight percent were provided by the state air agencies. These data were averaged for the period May through September to get ozone season average inputs. Model defaults were used for gas, diesel, marine diesel, and CNG/LPG sulfur percent. Zero % Stage II controls were assumed for the model runs.

Model inputs (temperature, fuel, and other parameters) for both 2008 and 2009 are listed below for each jurisdiction:

NONROAD Model - Common Inputs

Parameters	**Values**
Min. Temperature	69.8
Max. Temperature	92.5
Avg. Temperature	81.4
Gas Sulfur (%)	0.003
Diesel Sulfur (%)	0.0348
Marine Diesel Sulfur (%)	0.0408
CNG/LPG Sulfur (%)	0.003
Oxygen Weight (%)	2.1
Stage II Control (%)	0

NONROAD Model – State-Specific Inputs

State	**RVP**
District of Columbia	6.8
Maryland	6.9
Virginia	6.7

Since the nonroad model does not generate emissions for aircraft, APU, locomotives, and commercial diesel marine vessels, these were either projected from the base year emissions using the co-operative forecast 7.0 (dt. October 12, 2005) or acquired from MWAA. Below are the details for projecting emissions for the above mentioned individual nonroad categories.

Aircraft emissions (military, commercial, general aviation, air taxi)
Metropolitan Washington Airports Authority (MWAA) provided all types of airport emissions for Dulles and Reagan National airports, which are documented in *Air Pollution Emission Inventories for Washington Dulles International Airport and Ronald Reagan Washington National Airport for Calendar Years 2002, 2008, 2009*[2] (see Appendix B4 of the base year 2002 inventory document). Since Dulles airport is spread across Fairfax and Loudoun counties, MWAA emission from Dulles airport were divide equally between Fairfax and Loudoun counties. Emissions from Reagan National airport were put into Arlington county.

Military aircraft emissions for Maryland for future years were provided by MDE. No growth was assumed for Virginia military aircraft emissions.

General aviation and air taxi emissions for Maryland were provided by MDE. For Virginia, these emissions were grown from the base year using population as the surrogate.

Auxiliary power units emissions
These emissions were only available for Dulles (Fairfax & Loudoun) and Reagan National (Arlington) airports and were provided by MWAA.

Ground support equipment emissions
NONROAD2005.1.0 model generated these emissions for Arlington, Loudoun, Manassas city, Fredrick, Montgomery, and Prince Georges' counties. However, emissions for Arlington, Fairfax, and Loudoun counties were taken from the MWAA document referred above. MWAA GSE emissions were generated using the EDMS model, which calculated emissions based on actual aircraft operations and used data from a recent survey performed in February 2004 on GSE fleet, fuel types, and operating times. Nonroad model calculated emissions based on GSE population only and therefore emissions generated this way was considered less accurate than the one generated by the EDMS model. MWAA also provided emissions from mobile lounges for Dulles airport separately, which were combined with GSE emissions. Since Dulles airport is spread across Fairfax and Loudoun counties, MWAA GSE emission from Dulles airport were

[2] Metropolitan Washington Airports Authority, *Air Pollution Emission Inventories for Washington Dulles International Airport and Ronald Reagan Washington National Airport for Calendar Years 2002, 2008, 2009*, prepared by URS Corporation, Washington, D.C. March 2006.

divide equally between Fairfax and Loudoun counties. MWAA GSE Emissions from Reagan National airport were put into Arlington county.

Commercial Diesel Marine Vessels
Base year emissions from commercial diesel marine vessels were provided by MDE and were grown to future years using employment as the surrogate.

Railroad
Railroad or locomotive emissions were provided by all three states and were grown using employment as the surrogate.

4.1.4 Growth Projection Methodology: Onroad Sources

The 2008 and 2009 mobile source inventories were created through the use of transportation and emissions modeling techniques. This involved use of the MOBILE6.2.03 emissions factor model and the Version 2.1d #50 Travel Demand Model with 2008 and 2009 planned highway network. Full documentation of the development of the 2008 and 2009 mobile inventories is included in Appendix (?). Appropriate population, household, and employment growth are input through the Round 7.0 Cooperative Forecasting techniques.

4.1.5 Biogenic Emission Projections

Biogenic emission inventories for 2009 are the same as those used for the 2002 base year for Washington, DC-VA-MD ozone nonattainment region. Year specific biogenic inventories for 2009 were not estimated. 2002 base year emissions were estimated by EPA using BEIS3.12 model. No 2008 biogenic inventories were prepared as they are not used to determine rate of progress.

4.2 Offset Provisions and Point Source Growth

The Act requires that emission growth from major stationary sources in nonattainment areas be offset by reductions that would not otherwise be achieved by other mandated controls. The offset requirement applies to all new major stationary sources and existing major stationary sources that have undergone major modifications. Increases in emissions from existing sources resulting from increases in capacity utilization are not subject to the offset requirement. For the purposes of the offset requirement, major stationary sources include all stationary sources exceeding an applicable size cutoff. The Washington, DC region is designated as moderate nonattainment for the 8-hour ozone standard. Under the current moderate designation, the NSR thresholds are 50 tpy VOC and 100 tpy NOx.

The New Source Review permit regulations in Virginia are structured so that the pertinent requirements such as major source threshold and offset ratio are self-implementing depending upon changes to the nonattainment area classification. The

NSR threshold will remain at 25 tpy for both VOC and NOx for Maryland and the District.

4.3 Actual vs. Allowable Emissions in Development of the 2008 and 2009 Projected Emissions Inventories

For the purposes of calculating 2008 and 2009 projection emissions inventories, EPA guidance specifically outlines the circumstances under which emissions projections are to be based on actual or allowable emissions. For sources or source categories that are subject to a pre-1990 regulation and the state does not anticipate subjecting the source to additional regulation, emissions projections should be based on actual emissions levels. Actual emissions levels should also be used to project for sources or source categories that were unregulated as of 1990. For sources that are expected to be subject to post-1990 regulation, projections should be based on new allowable emissions.

To simplify comparisons between the base-year and the projected year, EPA guidance states that comparison should be made only between like emissions: actual to actual, or allowable to allowable, not actual to allowable. Therefore, all base-year and all projection-year emissions estimates are based on actual emissions.

The term "actual emissions" means the average rate, in tons per year, at which a source discharged a pollutant during a two year period, which preceded the date or other specified date, and which is representative of normal source operation. Actual emissions are calculated using the source's operating hours, production rates, and types of material processed, stored, or combusted during the selected time period.

"Allowable emissions" are defined as the maximum emissions a source or installation is capable of discharging after consideration of any physical, operations, or emissions limitations required by state regulations or by federally enforceable conditions, which restrict operations and which are included in an applicable air quality permit to construct or permit to operate, secretarial order, plan for compliance, consent agreement, court order, or applicable federal requirement.

4.4 Projection Inventory Results

Chapter 6 of this SIP describes the control measures that have been or will be implemented by 2008 and 2009 that will reduce emissions. Most control measures are required by federal or state regulations. Local governments and state agencies have voluntarily committed to other measures, as described in Section 6.6. Projected controlled inventories for 2008 and 2009 assume a number of control measures to be in place by these years.

Tables 4-3 through 4-6 present the projected controlled emissions for the 2008 rate-of-progress and 2009 attainment years resulting from implementation of the control measures. Below is a list of the measures implemented by the year 2002 in the

Washington region. Chapter 6 presents detailed information on the measures and the projected reductions from each.

Point

Non-CTG VOC RACT to 50 tpy
NOx OTC Phase II Budget Rules (DC only)
Expanded Non-CTG VOC RACT and State Point Source Regulations to 25 tons/yr
NOx SIP Call (MD)

Area

Stage II Vapor Recovery Nozzles
Phase II Gasoline Volatility Controls
Reformulated Surface Coatings
Reformulated Consumer Products – National Rule
Reformulated Industrial Cleaning Solvents – National Rule
National Standards for Locomotive Engines
Surface Cleaning/Degreasing for Machinery/Automotive Repair
Landfill Regulations
Seasonal Open Burning Restrictions
Stage I Expansion (Tank Truck Unloading)
Graphic Arts Controls
Auto body Refinishing

Nonroad

1994 EPA Non-Road Diesel Engines Rule
1995 EPA Non-Road Small Gasoline Engines Rule, Phase 1 and Phase 2 (handheld and non handheld)
1996 EPA Emissions standards for spark ignition marine engines2002 EPA Emissions standards for large spark ignition engines
Reformulated Gasoline (off-road)

Onroad

High-Tech Inspection/Maintenance
Reformulated Gasoline (on-road)
Federal "Tier I" Vehicle Standards and New Car Evaporative Standards
National Low Emission Vehicle Program

Below is a list of the measures implemented phased-in between 2002 and 2009 in the Washington region:

Point

Clean Air Interstate Rule (CAIR) (VA and DC)
Maryland Clean Power Rule/Healthy Air Act (MD)

Area

Additional phase in of reductions from National Locomotives Rule
OTC Mobile Equipment Repair and Refinishing (VA and DC)
OTC AIM Coatings Rule
OTC Solvent Cleaning, VA and DC
OTC Consumer Products
OTC Portable Fuel Container
On-Board Refueling/vapor recovery for LD Trucks (2004)

Nonroad

2004 Nonroad Heavy Duty Diesel Rule (negligible benefits by 2009)
Additional phase in of Pre-2003 technology rules

Onroad

Heavy-Duty Diesel Engine Rule (2004)
Heavy-Duty Diesel Engine Rule (2007)
Tier 2 Motor Vehicle Emission Standards
I&M Program with Final Cutpoints
Chip Reflash [?]

4.5 2008 Controlled Emissions for Rate-of-Progress

The projection of 2008 controlled emissions is simply the 2008 uncontrolled emissions minus the emission reductions achieved from the federal control measures and the rate-of-progress control measures implemented by states for the 8-hour ozone plan. This information is presented in Tables 4-3 through 4-6. Point source controlled inventories are contained in Appendix (?), while area and non-road controlled inventories are in Appendix (?). Details on mobile source controlled inventories can be found in Appendices (?) and (?).

Table 4-3
2008 Projected Controlled VOC Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	5.34	8.40	0.24	13.98
Area	85.47	88.96	17.40	191.83
Non-road	47.51	37.71	7.06	92.28
Mobile	33.86	29.65	7.47	70.98
Total	172.18	164.72	32.17	369.07

* Small discrepancies may result due to rounding
** Regional total includes a reduction of [xxx] tpd from 6.6 Voluntary Measures Bundle.

Table 4-4
2008 Projected Controlled NOx Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	176.91	48.94	3.11	228.96
Area	7.11	17.58	2.24	26.93
Non-road	30.13	37.65	9.09	76.87
Mobile	77.85	67.20	15.25	160.3
Total	292	171.37	29.69	493.06

* Small discrepancies may result due to rounding
** Regional total includes a reduction of [xxx] tpd from 6.6 Voluntary Measures Bundle

4.6 2009 Controlled Emissions for Attainment

The projection of 2009 controlled emissions is simply the 2009 uncontrolled emissions minus the emission reductions achieved from the federal control measures and the rate-of-progress control measures implemented by states for the 8-hour ozone plan.

Table 4-5
2009 Projected Controlled VOC Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	5.33	8.72	0.24	14.29
Area	85.46	89.46	17.57	192.49
Non-road	45.47	36.18	6.80	88.45
Mobile	31.64	28.15	6.88	66.67
Total	167.9	162.51	31.49	361.9

* Small discrepancies may result due to rounding
** Regional total includes a reduction of [xxx] tpd from 6.6 Voluntary Measures Bundle.

Table 4-6
2009 Projected Controlled NOx Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	72.18	49.08	1.99	123.25
Area	7.17	17.96	2.26	27.39
Non-road	29.28	36.99	8.79	75.06
Mobile	70.94	61.44	14.16	146.54
Total	179.57	165.47	27.2	372.24

* Small discrepancies may result due to rounding
** Regional total includes a reduction of [xxx] tpd from 6.6 Voluntary Measures Bundle.