February 2007

Best Available Retrofit Technology (BART)

Modeling Protocol to Determine Sources Subject to BART in the State of Louisiana

Air Quality Assessment Division
Louisiana Department of Environmental Quality

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Acronyms

BART – Best Available Retrofit Technology

CAA – Clean Air Act

CAIR – Clean Air Interstate Rule

CALPUFF – California Puff Model - An air quality dispersion model

CALMET – A diagnostic 3-dimensional meteorological model that is a component of the modeling system CALPUFF.

CALPOST – A post processing component of the modeling system CALPUFF.

CAMx – Comprehensive Air Quality Model with Extensions

CEM – Continuous Emissions Monitoring

CENRAP – Central States Regional Air Planning Association

CMAQ – Community Multi-scale Air Quality

dv – Deciview whici is a Unit of the haze index

EGUs – Electrical Generating Units.

EPA – Environmental Protection Agency

FLMs – Federal Land Managers

IWAQM – Interagency Workgroup on Air Quality Modeling

LDEQ – Louisiana Department of Environmental Quality

NH_3 - Ammonia

"No-Obs" – no observational data

NO_X – Nitrogen oxides

NO_3 – Nitrate

NPS – National Park Service

Acronyms (cont)

NSR – New Source Review

O_3 – Ozone

PM – Particulate Matter

$PM_{2.5}$ – Refers to particulate matter that is 2.5 micrometers or smaller in size.

PM_{10} – Refers to particulate matter that is 10 micrometers or smaller in size.

POSTUTIL – Post processing program used to implement the ammonia-limiting method to address double-counting of available ammonia for NO_x to NO_3 chemical conversion.

PSD – Prevention of Significant Deterioration

RPO – Regional Planning Organizations

SIP – State Implementation Plan

SO_2 – Sulfur dioxide

SO_4 – Sulfate

VISTAS – Visibility Improvement State and Tribal Association of the Southeast

I. Introduction

On July 6, 2005, the U.S. Environmental Protection Agency published final amendments to its 1999 Regional Haze Rule in the Federal Register, including Appendix Y, the final guidance for Best Available Retrofit Technology determinations (70 FR 39104-39172). The BART rule requires the installation of BART on emission sources that fit specific criteria and "may reasonably be anticipated to cause or contribute" to visibility impairment in any Class I area. Air quality modeling is a means for determining which sources cause or contribute to visibility impairment. Louisiana's protocol for conducting this modeling for BART is provided herein. Sources may use the protocol to determine if BART-eligible units are subject to BART, and therefore must perform a BART analysis. If a source is subject to BART, the protocol can serve as a starting point to conduct the modeling required when making a BART analysis.

New BART guidance, both formal and informal, continues to become available from EPA and the Federal Land Managers that oversee visibility in Class I areas.

II. Background

Generally, Class I areas are national parks and wilderness areas in which visibility is more stringently protected under the Clean Air Act than any other areas in the United States. The Class I areas are shown in Appendix A.

The BART requirements are a part of the Regional Haze SIP that must be submitted to EPA by December 17, 2007. The Regional Haze SIP is a comprehensive plan of action to increase visibility in the Class I areas through the achievement of reasonable progress goals. The BART provisions do not cover all sources that may cause or contribute to visibility impairment in any Class I area, but focuses on reducing emissions from large sources that, due to age, were exempted from other control requirements in the Clean Air Act. According to the BART guidance, an emissions source is considered eligible for BART if it:

- Falls into one of 26 listed categories;
- Has the potential to emit at least 250 tons per year of any visibility-impairing pollutant (primarily NO_x, SO_2, or PM); and
- Existed on August 7, 1977, yet was not in operation before August 7, 1962.

According to EPA BART guidance, an individual source is considered to cause visibility impairment if it has a least a 1.0 deciview impact on the visibility in a Class I area. A source is considered to contribute to visibility impairment if it has at least a 0.5 dv impact. The guidance allows a state to exempt individual sources from the BART requirements if the sources do not cause or contribute to any impairment of visibility in a Class I area. Exemption is accomplished through air quality modeling. Although the BART guidance does not dictate how such an analysis must be conducted, it provides direction which was used to develop this modeling protocol.

The BART analysis process includes several other steps in addition to the modeling described in this protocol. These steps, none of which are addressed in this document, include detailed analysis of:

- Costs of compliance;
- Energy and non-air quality impacts;
- Existing pollution control technologies in use at the BART-eligible unit;
- Remaining useful life of the units and/or facility; and
- Improvements in visibility expected from the use of BART controls.

III. BART Air Quality Modeling Approach

One of the air quality modeling approaches in EPA's BART guidance is an individual source attribution approach. Specifically, this entails modeling source-specific BART-eligible units and comparing modeled impacts to the deciview threshold.

The modeling approach discussed here is specifically designed for conducting a source-specific subject-to-BART screening analysis. There may be differences between modeling for conducting BART analyses and modeling for conducting a visibility analysis for a New Source Review permit which may use similar emission sources and the same air dispersion model used here.

In preparing this modeling protocol, the LDEQ has attempted to maintain an approach consistent with the modeling in the Central States Regional Air Planning Association, one of the regional planning organizations.

EPA Region VI will review Louisiana's Regional Haze SIP which will include the BART requirements.

IV. Class I Areas to Assess

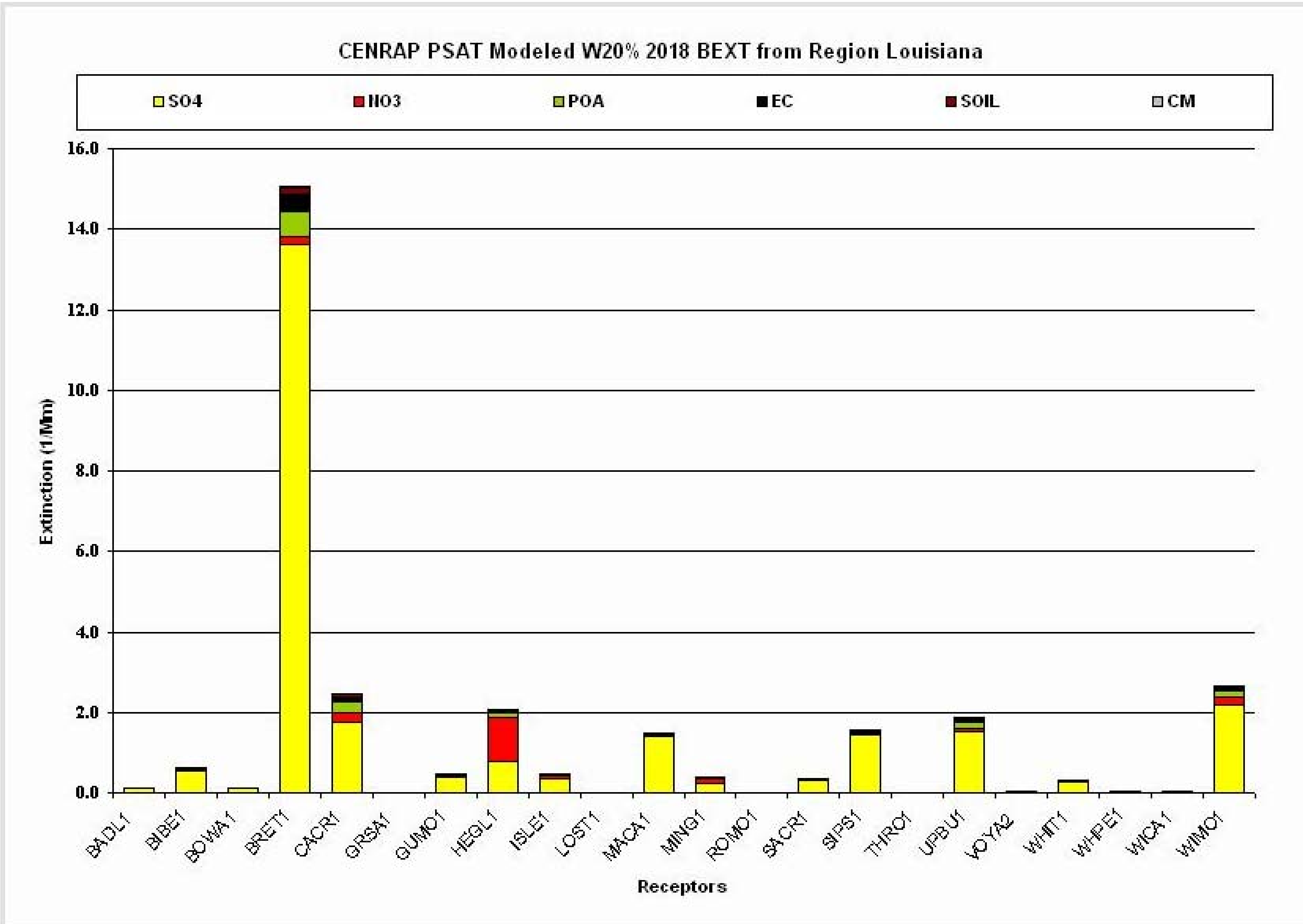
Table 1, *Class I Areas Evaluated for BART*, contains the list of Class I areas to be included in the modeling analysis in CENRAP. The list was developed for the subject-to-BART screening evaluation conducted by ENVIRON for CENRAP.

Table 1 - Class I Areas Evaluated for BART in the CENRAP South CALPUFF Domain

Class I Area	State	Visibility Monitoring Site Name
Bandelier Wilderness Area	NM	BAND1
Big Bend National Park	TX	BIBE1
Bosque del Apache Wilderness Area	NM	BOAP1
Breton Wilderness Area	LA	BRET1
Caney Creek Wilderness Area	AR	CACR1
Carlsbad Caverns National Park	NM	GUMO1
Great Sand Dunes Wilderness Area	CO	GRSA1
Guadalupe Mountains National Park	TX	GUMO1
Hercules-Glades Wilderness Area	MO	HEGL1
La Garita Wilderness Area	CO	WEMI1
Mesa Verde National Park	CO	MEVE1
Mingo Wilderness Area	MO	MING1
Pecos Wilderness Area	NM	WHPE1
Salt Creek Wildlife Refuges	NM	SACR1
San Pedro Parks Wilderness Area	NM	SAPE1
Upper Buffalo Wilderness Area	AR	UPBU1
Weminuche Wilderness Area	CO	WEMI1
Wheeler Peak Wilderness Area	NM	WHPE1
White Mountain Wilderness Area	NM	WHIT1
Wichita Mountains Wildlife Refuges	OK	WIMO1

Because of meteorological conditions, a Louisiana facility may impact a number of Class I areas. Based on CENRAP 2018 source apportionment modeling (results shown in Table 2 below), areas such as Caney Creek, Upper Buffalo, Wichita Mountains, and Breton may potentially be impacted.

Table 2



CENRAP PSAT Modeled W20% 2018 BEXT from Region Louisiana
SO4
NO3
POA
EC
SOIL
CM
Extinction (1/Mm)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
BADL1
BIBE1
BOWA1
BRET1
CACR1
GRSA1
GUMO1
HEGL1
ISLE1
LOST1
MACA1
MING1
ROMO1
SACR1
SIPS1
THRO1
UPBU1
VOYA2
WHIT1
WHPE1
WICA1
WIMO1
Receptors

V. Air Quality Model and Inputs

According to the final Regional Haze Rule's BART guidance, a source "can use CALPUFF 5.711a or other appropriate model to predict the visibility impacts from a single source at a Class I area." For purposes of the source-specific subject-to-BART screening analysis, the LDEQ recommends the use of CALPUFF. The LDEQ recognizes that CALPUFF has limited ability to simulate the complex atmospheric chemistry involved in the estimation of secondary particulate formation; however, for purposes of this source-specific subject-to-BART screening analysis, LDEQ recommends the use of CALPUFF for the following reasons:

1. The simplicity of the CALPUFF model. An increased level of effort would be required for conducting particulate apportionment in the regional scale, full-chemistry Eulerian model (CAMx or CMAQ) to acquire individual source contributions to Class I areas;
2. The limited scope of what this modeling is to determine; and
3. The additional modeling of BART controls by CENRAP using CAMx or CMAQ models that will be conducted as part of the Regional Haze SIP.

EPA's BART guidance recommends following the Phase 2 recommendations for long-range transport as they appear in EPA's Interagency Workgroup on Air Quality Modeling (GWAQM) guidance. The GWAQM guidance was developed to address air quality impacts at Class I areas as assessed through the Prevention of Significant Deterioration (PSD) program, where the source generally is located beyond 50 kilometer (km) of the Class I area. The GWAQM guidance does not specifically address the type of assessment that will occur with the BART analysis.

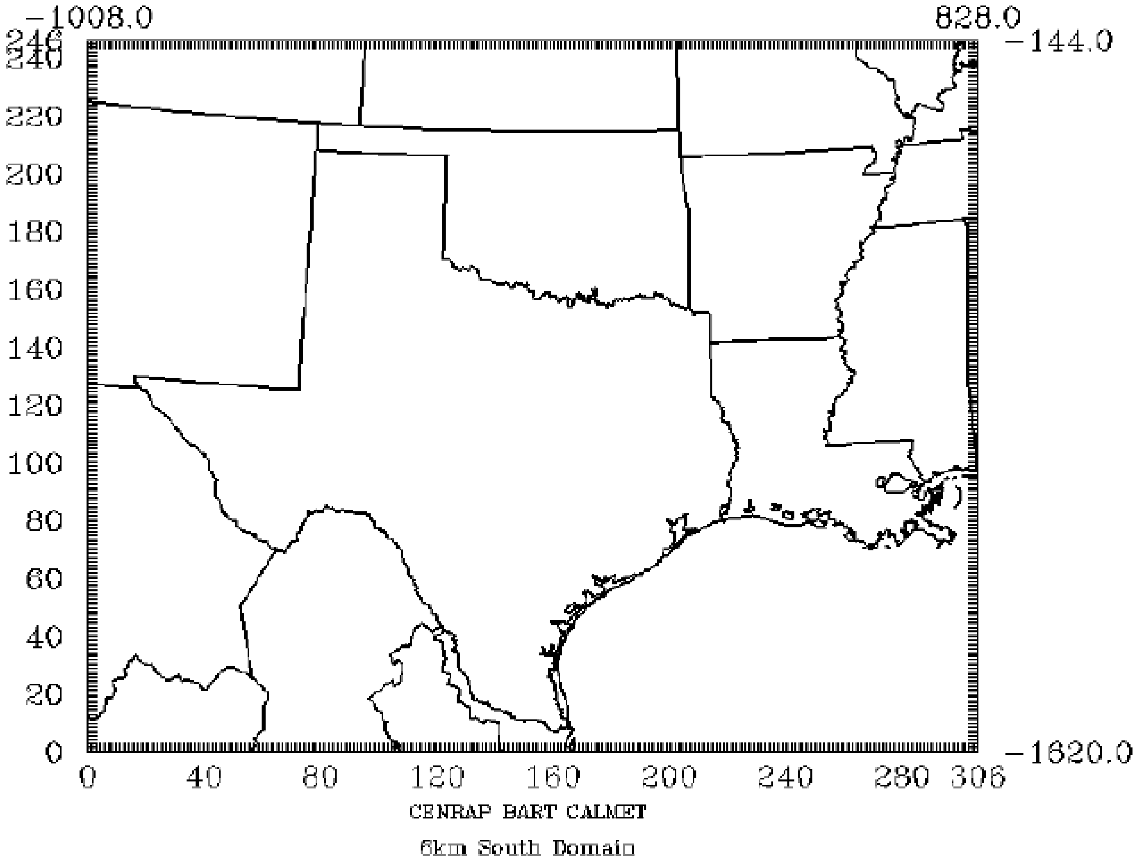
Given the uncertainties of transport and dispersion processes in CALPUFF for distances greater than 300 km, in a refined modeling analysis, consideration may be given to the CAMx model for determining visibility impacts at Class I areas located 300 km beyond the source. Below is a list of options for selecting a model to use. The first two apply to the source-specific subject-to-BART screening analysis, and the third is an option for a refined modeling analysis:

1. CALPUFF for Class I areas located within 300 km of the source;
2. CALPUFF for Class I areas located beyond 300 km of the source for a conservative screening analysis; and
3. CAMx for Class I areas located beyond 300 km of the source in a refined analysis.

A. Modeling Domain

The CALPUFF source-specific subject-to-BART screening modeling should be conducted with the CENRAP south 6 km grid. The extent of the proposed CALPUFF domain is shown in Figure 2, *6 km CENRAP South CALPUFF Domain*.

Figure 1 - 6 km CENRAP South CALPUFF Domain



CALPUFF should be applied for three (3) annual simulations spanning the years 2001 through 2003. The GWAQM guidance allows the use of fewer than five years of meteorological data if a meteorological model using four-dimensional data assimilation supplies the data. See the section on meteorology for more information.

B. CALPUFF System Implementation

There are three main components to the CALPUFF model:

1. Meteorological Data Modeling (CALMET);
2. Dispersion Modeling (CALPUFF); and
3. Post processing (CALPOST).

Versions of the modeling components that may be used in the source-specific subject-to-BART screening analysis are shown in Table 3 *CALPUFF Modeling Components*.

Table 3 - CALPUFF Modeling Components

Processor	Version	Level
TERREL	3.311	030709
CTGCOMP	2.42	030709
CTGPROC	2.42	030709
MAKEGEO	2.22	030709
CALMM5	2.4	050413
CALMET	5.53a	040716
CALPUFF	5.711a	040716
POSTUTIL	1.3	030402
CALPOST	5.51	030709

C. Meteorological data modeling (CALMET)

The 2001-2003 CENRAP-developed CALMET dataset found at ftp://ftp-cenrap.ldeq.org/ should be used in the source-specific subject-to-BART screening analysis.

Since observational data was not used in the CALMET outputs developed by CENRAP, the prognostic meteorological dataset from MM5 is not supplemented with surface or upper air observations during the CALMET processing. The use of observations is thought to counterbalance smoothing that may occur when using the coarse grid scale of the MM5 data. In their review of the draft CENRAP guidelines, both the EPA and FLMs commented that observations should be used in refined CALPUFF modeling. However, the LDEQ considers CALPUFF screening modeling to be conservative; therefore, the LDEQ will not require the use of observational data. Sources may use observational data if they wish to conduct a more refined modeling analysis.

In order to use the CENRAP-developed CALMET dataset, the parameter files for CALPUFF, POSTUTIL, and CALPOST may have to be edited to accommodate the size of the CENRAP-developed CALMET dataset modeling domain. Once the parameter files have been edited, the CALPUFF, POSTUTIL, and CALPOST model code will need to be re-compiled. There are specific versions in CALMET and CALPOST that have to be used together with the CALPUFF version 5.711a, CALMET version 5.53a and CALPOST Version 5.51. Detailed information on all CALMET settings to be used in the source-specific subject-to-BART screening analysis can be found in Appendix B.

D. Stack parameters

Stack parameters required for modeling BART-eligible units are: height of the stack opening from ground, inside stack diameter, exit gas flow rate, exit gas temperature, base elevation above sea level, and location coordinates of the stack. Since the modeling conducted for BART is concerned with long-range transport, not localized impacts, including the effects of building downwash in the source-specific subject-to-BART screening analysis is not necessary. To conduct a more refined modeling analysis, the effects of building downwash may be included.

E. Emissions

Emission rates for the BART analyses follow EPA's BART guidance. Specifically, the 24-hour average actual emission rate from the highest emitting day of the year under normal operations should be modeled. Identification of the maximum 24-hour actual emission rate should be made for each of the most recent three (3) years (2001-2003), according to the following prioritization:

1. Continuous Emissions Monitoring data;
2. Facility emissions tests;
3. Emissions factors;
4. Permit limits; or lastly,
5. Potential to emit.

The species that should be modeled and/or emitted in the source-specific subject-to-BART screening analysis are listed in Table 4 *Species Modeled in BART Screening Analysis*. Sources should include all species if the LDEQ CALPUFF screening showed any of their source groups to have impacts greater than 0.5 dv on visibility.

Clean Air Interstate Rule affected BART-eligible EGUs need only model particulate emissions, both PM-fine and PM-coarse. CAIR has been determined to be BART controls for the other species listed on Table 4t hat are emitted by EGUs.

Table 4 - Species Modeled in BART Screening Analysis

Species	Modeled	Emitted	Dry Deposited
SO_2	Yes	Yes	Computed-gas
SO_4	Yes	No	Computed-particle
NO_x	Yes	Yes	Computed-gas
HNO_3	Yes	No	Computed-gas
NO_3	Yes	No	Computed-particle
PM-fine	Yes	Yes	Computed-particle
PM-coarse	Yes	Yes	Computed-particle

Note: *In the case of a source where the PM profile for sulfate (SO_4), elemental carbon (EC), and secondary organic aerosols (SOA) are known, SO_4 should be modeled as a separate species in CALPUFF.*

Particle size parameters are entered in the CALPUFF input file for dry deposition of particles. There are default values for "aerosol" species (i.e., SO_4, NO_3, and $PM_{2.5}$). The default value for each of these species is 0.48 µm geometric mass mean diameter and 2.0 µm geometric standard deviation. Where the source is able to supply emissions of $PM_{2.5}$, the default values may be appropriate. However, many sources may not be able to supply $PM_{2.5}$ emissions and will supply what is available, PM_{10} emissions data. In this case, using the default values may underestimate deposition of particulates and overestimate the particulate contribution to visibility. For sources that are not able to supply $PM_{2.5}$ emissions, the source should speciate PM_{10} emissions to $PM_{2.5}$ and PM course by using $PM_{2.5}$/ PM_{10} emission factors, if available. If emission factors are not available, use either the worst-case assumption that all particulate is $PM_{2.5}$ or an emissions factor with full scientific documentation, provided by the source.

F. Dispersion modeling (CALPUFF)

The CALMET output is used as input to the CALPUFF model, which simulates the effects of the meteorological conditions on the transport and dispersion of pollutants from an individual source. In general, the default options are used in the CALPUFF model. The CALPUFF model has a puff-splitting option that splits puffs that become large over greater transport distances. The LDEQ recommends that the puff-splitting option not be used in the source-specific subject-to-BART screening analysis.

Detailed information on all CALPUFF settings to be used in the source-specific subject-to-BART screening analysis can be found in Appendix C.

Ozone and ammonia concentrations: Ozone (O_3) and ammonia (NH_3) can be input to CALPUFF as either hourly or monthly background values. Background ozone and ammonia concentrations are assumed to be temporally and spatially invariant and will be fixed between 40 and 3 ppb, respectively, across the entire domain for all months. At this time NH_3 values are not available in a model-ready form, but CENRAP is currently developing regional modeling outputs from which NH_3 concentrations may be derived.

Receptors: Receptors are locations where model results are calculated and provided in the CALPUFF output files. Receptor locations should be derived from the National Park Service (NPS) Class I area receptor database at www2.nature.nps.gov/air/maps/receptors/index.cfm. The discrete receptors are necessary for calculating visibility impacts in the selected Class I areas. The NPS provides receptors in all the Class I areas on a one (1) km basis. These receptors should be kept at the one (1) km spacing for the BART modeling.

Outputs: The CALPUFF modeling results will be displayed in units of micrograms per cubic meter ($\mu g/m^3$). In order to determine visibility impacts, the CALPUFF outputs must be post-processed.

G. Post-processing (CALPOST)

Hourly concentration outputs from CALPUFF are processed through POSTUTIL and CALPOST to determine visibility conditions. POSTUTIL takes the concentration file output from CALPUFF and recalculates the nitric acid and nitrate partition based on total available sulfate and ammonia. CALPOST uses the concentration file processed through POSTUTIL, along with relative humidity data, to perform visibility calculations. For the source-specific subject-to-BART screening analysis, the only modeling results of interest out of the CALPUFF modeling system are the visibility impacts. Please see Appendix D and E for detailed settings for POSTUTIL and CALPOST.

Light extinction: Light extinction must be computed in order to calculate visibility. CALPOST has seven (7) methods for computing light extinction. The BART screening analysis should use Method 6, which computes extinction from speciated particulate matter with monthly Class I area-specific relative humidity adjustment factors. Relative humidity is an important factor in determining light extinction (and therefore visibility), because sulfate and nitrate aerosols, which absorb moisture from the air, have greater extinction efficiencies with greater relative humidity. The BART screening analysis should apply relative humidity correction factors [*f*(RH)s] to sulfate and nitrate concentration outputs from CALPUFF; relative humidity correction factors may be obtained from EPA's "Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule (EPA, 2003). The *f*(RH) values for the Class I areas that should be assessed are provided in Table 5 *Monthly Averaged f(RH) Based on Centroid of the Class I Area*.

Table 5 - Monthly Averaged *f*(RH) Based on Centroid of the Class I Area

Class I Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bandelier	2.2	2.1	1.8	1.6	1.6	1.4	1.7	2.1	1.9	1.7	2.0	2.2
Big Bend	2.0	1.9	1.6	1.5	1.6	1.6	1.7	2.0	2.1	1.9	1.8	1.9
Bosque del Apache	2.1	1.9	1.6	1.4	1.4	1.3	1.8	2.0	1.9	1.6	1.8	2.2
Breton	3.7	3.5	3.7	3.6	3.8	4.0	4.3	4.3	4.2	3.7	3.7	3.7
Caney Creek	3.4	3.1	2.9	3.0	3.6	3.6	3.4	3.4	3.6	3.5	3.4	3.5
Carlsbad Caverns	2.1	2.0	1.6	1.5	1.6	1.6	1.8	2.1	2.2	1.8	1.9	2.1
Great Sand Dunes	2.4	2.3	2.0	1.9	1.9	1.8	1.9	2.3	2.2	1.9	2.4	2.4
Guadalupe Mountains	2.0	2.0	1.6	1.5	1.6	1.5	1.9	2.2	2.2	1.8	1.9	2.2
Hercules-Glades	3.2	2.9	2.7	2.7	3.3	3.3	3.3	3.3	3.4	3.1	3.1	3.3
La Garita	2.3	2.2	1.9	1.8	1.8	1.6	1.7	2.1	2.0	1.8	2.2	2.3
Mesa Verde	2.5	2.3	1.9	1.5	1.5	1.3	1.6	2.0	1.9	1.7	2.1	2.3
Mingo	3.3	3.0	2.8	2.6	3.0	3.2	3.3	3.5	3.5	3.1	3.1	3.3
Pecos	2.3	2.1	1.8	1.7	1.7	1.5	1.8	2.1	2.0	1.7	2.0	2.2
Salt Creek	2.1	1.9	1.5	1.5	1.7	1.6	1.8	2.0	2.1	1.8	1.8	2.1
San Pedro Parks	2.3	2.1	1.8	1.6	1.6	1.4	1.7	2.0	1.9	1.7	2.1	2.2
Upper Buffalo	3.3	3.0	2.7	2.8	3.4	3.4	3.4	3.4	3.6	3.3	3.2	3.3
Weminuche	2.4	2.2	1.9	1.7	1.7	1.5	1.6	2.0	1.9	1.7	2.1	2.3
Wheeler Park	2.3	2.2	1.9	1.8	1.8	1.6	1.8	2.2	2.1	1.8	2.2	2.3
White Mountain	2.1	1.9	1.6	1.5	1.5	1.4	1.8	2.0	2.0	1.7	1.8	2.1
Wichita Mountains	2.7	2.6	2.4	2.4	3.0	2.7	2.3	2.5	2.9	2.6	2.7	2.8

The $PM_{2.5}$ concentrations are considered part of the dry light extinction equation and do not have a humidity adjustment factor. The light extinction equation is the sum of the wet sulfate and nitrate and dry components $PM_{2.5}$ plus Rayleigh scattering, which is 10 inverse megameters (Mm^{-1}).

VI. Visibility Impacts

Perceived visibility in deciviews is derived from the light extinction coefficient. The visibility change related to background is calculated using the modeled and established natural visibility conditions. For the BART screening analysis, daily visibility will be expressed as a change in deciviews compared to natural visibility conditions.

The annual average natural levels of aerosol components at each Class I area are shown in Table 5, *Average Annual Natural Levels of Aerosol Components (μg/m^3)*. Natural conditions by component in this table are based on whether the Class I area is in the eastern or the western part of the United States. These data are in EPA's "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule" (EPA, 2003).

Table 6 - Average Annual Natural Levels of Aerosol Components (μg/m^3)

Class I Area	Region	SO_4	NO_3	OC	EC	Soil	Coarse Mass
Bandelier	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Big Bend	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Bosque del Apache	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Breton	EAST	0.23	0.10	1.40	0.02	0.50	3.00
Caney Creek	EAST	0.23	0.10	1.40	0.02	0.50	3.00
Carlsbad Caverns	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Great Sand Dunes	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Guadalupe Mountains	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Hercules-Glades	EAST	0.23	0.10	1.40	0.02	0.50	3.00
La Garita	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Mesa Verde	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Mingo	EAST	0.23	0.10	1.40	0.02	0.50	3.00
Pecos	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Salt Creek	WEST	0.12	0.10	0.47	0.02	0.50	3.00
San Pedro Parks	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Upper Buffalo	EAST	0.23	0.10	1.40	0.02	0.50	3.00
Weminuche	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Wheeler Peak	WEST	0.12	0.10	0.47	0.02	0.50	3.00
White Mountain	WEST	0.12	0.10	0.47	0.02	0.50	3.00
Wichita Mountains	WEST	0.12	0.10	0.47	0.02	0.50	3.00

In a cooperative agreement with FLMs and EPA Regions VI and VII, CENRAP guidance deviates from use of the 98th percentile impact. The CALMET datasets, as described in this protocol, were processed with the "No-Obs" options (i.e., surface and upper air observations were not used in the CALMET wind field interpolation). Exercising CALMET with No-Obs may lead, in some applications, to potentially less conservatism in the CALPUFF visibility results compared with the use of CALMET with observations. Aware of this situation, CENRAP has agreed to EPA's recommendation that the maximum visibility impact, rather than the 98th percentile value, should be used for screening analyses using the CENRAP-developed CALMET datasets. This approach should be used in the source-specific subject-to-BART screening analysis.

Sources with modeled maximum impacts below the 0.5 dv threshold are exempt from the remainder of the BART process. Sources with impacts at, or above, 0.5 dv can either perform refined CALPUFF modeling to show their visibility impact is in fact below the 0.5 dv threshold or continue with the BART process and perform a BART analysis. This analysis will likely include more refined CALPUFF modeling using observations coupled with the 98th percent impact, finer grid resolution, puff splitting, focused domain, etc.

VII. Change in Visibility Due to BART Controls

Once sources perform their BART analysis and BART emission limits are established, additional CALPUFF modeling should be conducted to establish visibility improvement at Class I areas with BART applied. The post-control CALPUFF simulation should be compared to the pre-control CALPUFF simulation by calculating the change in visibility over natural conditions between the pre-control and post-control simulations.

VIII. Reporting

Sources using LDEQ's source-specific subject-to-BART screening modeling protocol will not be required to provide a modeling protocol to the LDEQ, EPA, or FLMs; however, sources who do not follow the CENRAP guidelines or do not follow the LDEQ's source-specific subject-to-BART screening modeling protocol must provide a modeling protocol to the LDEQ for their approval and to EPA and FLMs for their review. Sources that need to perform refined modeling will be required to submit a modeling protocol to the LDEQ for approval. The protocols should be received by the LDEQ within two weeks of receiving the LDEQ notification letter. Refined modeling protocols must also be made available concurrently to EPA and FLMs for their review.

The report accompanying the source-specific subject-to-BART screening analysis should provide a clear description of the modeling procedures and the results of the analysis. An electronic archive that includes the full set of CALPUFF inputs and model output fields should also be included with the report. If the model code is re-compiled, the electronic archive should include all of the edited parameter files and a summary of the steps taken to re-compile the code, including the compiler used. All modeling should be submitted to DEQ no later than May 31.

References

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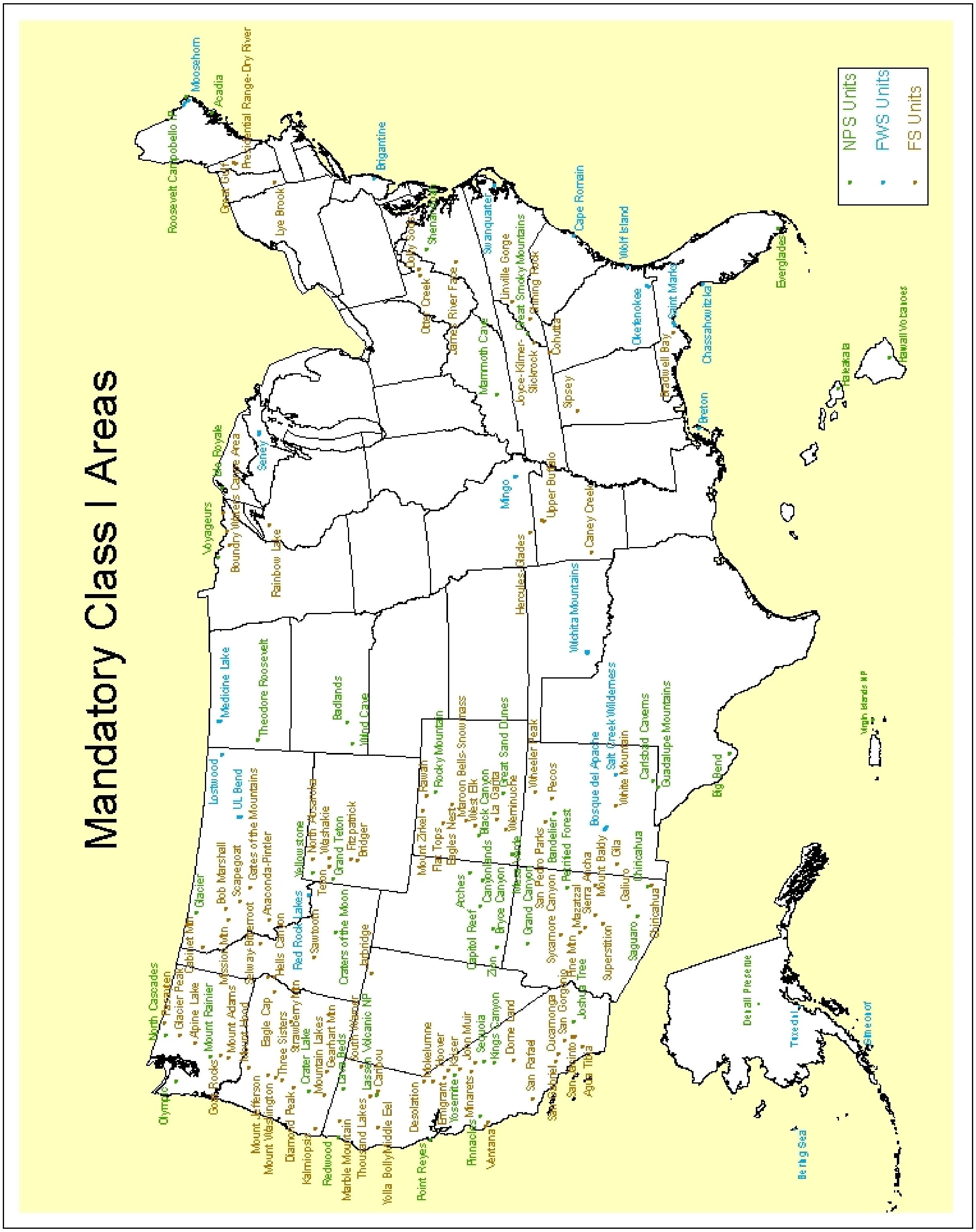
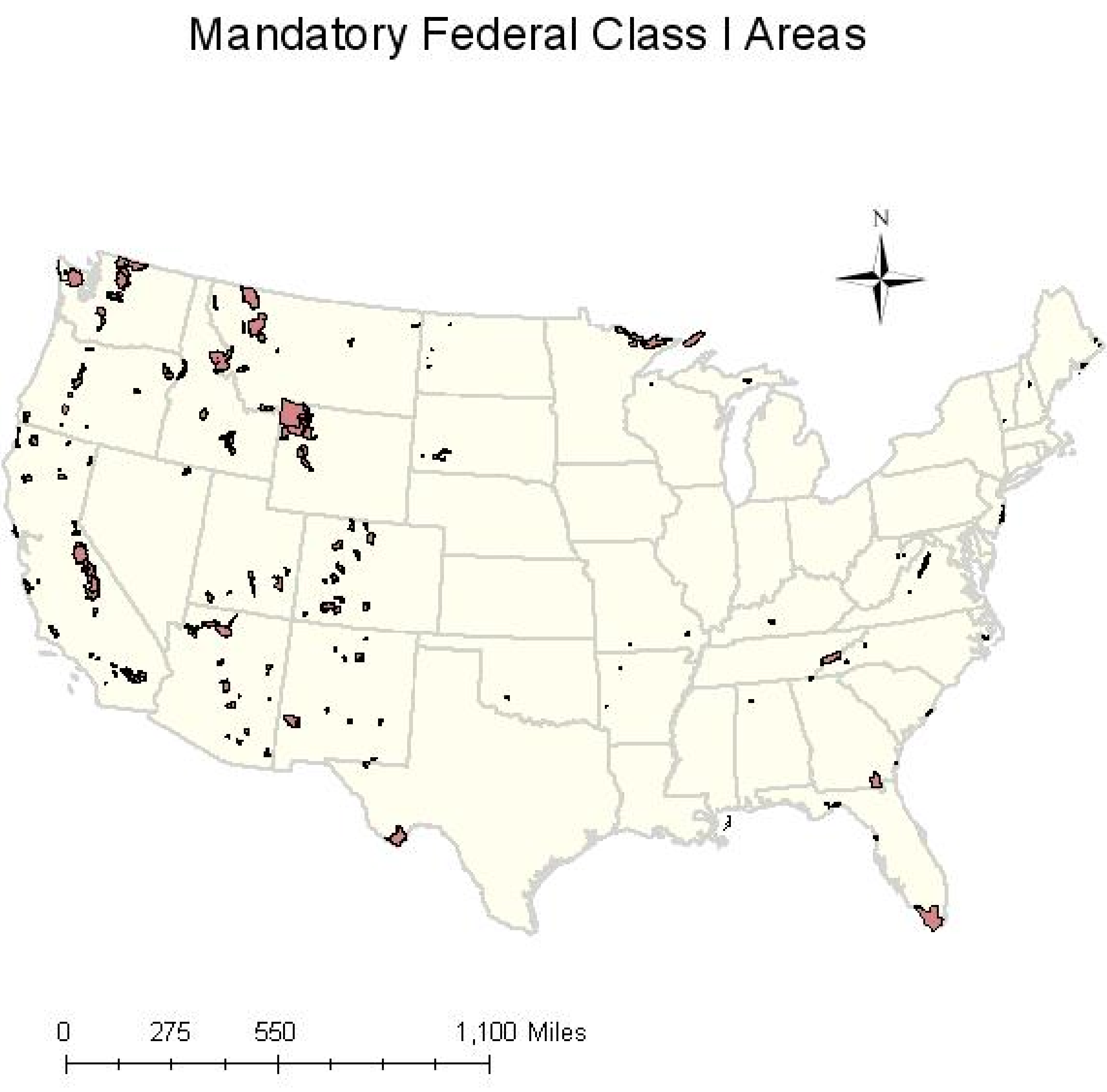
Appendix A – Federal Class I Areas
Map showing locations and names of areas



Appendix A – Federal Class I Areas
Map showing extent of areas



Appendix B – CALMET Control File Inputs

Table B-1 Input Groups in the CALMET Control File		
Input Group	**Description**	**Applicable to CENRAP BART**
0	Input and output file names	Yes
1	General run control parameters	Yes
2	Map Projection and Grid Control Parameters	Yes
3	Output Options	Yes
4	Meteorological Data Options	Yes
5	Windfield Options and Parameters	Yes
6	Mixing Height, Temperature and Precipitation Parameters	Yes
7	Surface Meteorological Station Parameters	Yes
8	Upper Air Meteorological Station Parameters	Yes
9	Precipitation Station Parameters	Yes

Table B-2 CALMET Model Input Group 0: Input and Output File Names			
Parameter	**Default**	**CENRAP**	**Comments**
Input	GEO.DAT	GEO.DAT	
Input	SURF.DAT	SURF.DAT	
Input	CLOUD.DAT	CLOUD.DAT	
Input	PRECIP.DAT	PRECIP.DAT	
Input	MM4.DAT	MM4.DAT	
Input	WT.DAT	WT.DAT	
Output	CALMET.LST	CALMET.LST	
Output	CALMET.DAT	CALMET.DAT	
Output	PACOUT.DAT	PACOUT.DAT	
NUSTA		0	Number of upper air stations
NOWSTA		0	Number of over water met stations
Input	UP1.DAT	UP1.DAT	
Input	UP2.DAT	UP2.DAT	
Input	UP3.DAT	UP3.DAT	
Input	SEA1.DAT	SEA1.DAT	
Input	DIAG.DAT	DIAG.DAT	
Input	PROG.DAT	PROG.DAT	
Output	TEST.PRT	TEST.PRT	
Output	TEST.OUT	TEST.OUT	
Output	TEST.KIN	TEST.KIN	
Output	TEST.FRD	TEST.FRD	
Output	TEST.SLP	TEST.SLP	

Table B-3. CALMET Model Input Group 1: General Run Control Parameters			
Parameter	**Default**	**CENRAP**	**Comments**
IBYR		2001	Starting year
IBMO		1	Starting month
IBDY		1	Starting day
IBHR		1	Starting hour
IBTZ		6	Base time zone
IRLG		8736	Length of run
IRTYPE	1	1	Run type (must = 1 to run CALPUFF)
LCALGRD	T	F	Compute CALGRID data fields
ITEST	2	2	Stop run after SETUP to do input QA

Table B-4. CALMET Model Input Group 2: Map Projection and Grid Control Parameters.			
Parameter	**Default**	**CENRAP**	**Comments**
PMAP	UTM	LCC	Map Projection
RLATO		40N	Latitude (dec. degrees) of projection origin
RLONO		97W	Longitude (dec. degrees) of projection origin
XLAT1		33N	Matching parallel(s) of latitude for projection
XLAT2		45N	Matching parallel(s) of latitude for projection
DATUM	WGS-G	WGS-G	
NX		300	Number of X grid cells in meteorological grid
NY		192	Number of Y grid cells in meteorological grid
DGRIDKM		6.0	Grid spacing, km
XORIGKM		-1008	Ref. Coordinate of SW corner of grid cell (1,1)
YORIGKM		0.0	Ref. Coordinate of SW corner of grid cell (1,1)
NZ		10	No. of vertical layers
ZFACE		0,20,40,80,160,320,640, 1200,2000,3000,4000	Cell face heights in arbitrary vertical grid, m

Table B-5. CALMET Model Input Group 3: Output Options.			
Parameter	**Default**	**CENRAP**	**Comments**
LSAVE	T	T	Disk output option
IFORMO	1	1	Type of unformatted output file
LPRINT	F	F	Print met fields
IPRINF	1	1	Print intervals
IUVOUT(NZ)	NZ*0	NZ*0	Specify layers of u,v wind components to print
IWOUT(NZ)	NZ*0	NZ*0	Specify layers of w wind component to print
ITOUT(NZ)	NZ*0	NZ*0	Specify levels of 3-D temperature field to print
LDB	F	F	Print input met data and variables.
NN1	1	1	First time step for debug data and variables
NN2	1	1	Last time step for debug data to be printed
IOUTD	0	0	Control variable for writing test/debug wind fields
NZPRN2	1	0	Number of levels starting at surface to print
IPR0	0	0	Print interpolated wind components
IPR1	0	0	Print terrain adjusted surface wind components
IPR2	0	0	Print initial divergence fields
IPR3	0	0	Print final wind speed and direction
IPR4	0	0	Print final divergence fields
IPR5	0	0	Print winds after kinematic effects
IPR6	0	0	Print winds after Froude number adjustment
IPR7	0	0	Print winds after slope flows are added
IPR8	0	0	Print final wind field components

Table B-6. CALMET Model Input Group 4: Meteorological Data Options.			
Parameter	Default	CENRAP	Comments
NOOBS	0	2	2=No surface, overwater, or upper air observations; use MM5 for surface, overwater and upper air data
NSSTA		0	Number of meteorological surface stations
NPSTA		0	Number of precipitation stations
ICLOUD		3	Gridded cloud fields
IFORMS	2	2	Formatted surface meteorological data file
IFORMP	2	2	Formatted surface precipitation data file
IFORMC	2	2	Formatted cloud data file

Table B-7. CALMET Model Input Group 5: Windfield Options and Parameters			
Parameter	Default	CENRAP	Comments
IWFCOD	1	1	Model selection variable
IFRADJ	1	1	Compute Froude number adjustment effects?
IKINE	0	0	Compute kinematic effects?
IOBR	0	0	Use O'Brien (1970) vertical velocity adjustment?
ISLSOPE	1	1	Compute slope flow effects?
IEXTRP	-4	-1	Extrapolate surface wind obs to upper levels?
ICALM	0	0	Extrapolate surface winds even if calm?
BIAS	NZ*0	0,0,0,0,0,0,0,0,0,0	Layer-dependent biases weighting aloft measurements
RMIN2	4	-1.0	Minimum vertical extrapolation distance
IPROG	0	14	14=Yes, use winds from MM5.DAT file as initial guess field [IWFCOD=1
ISTEPPG	1	1	MM5 output timestep
LVARY	F	T	Use varying radius of influence
RMAX1		30	Maximum radius of influence over land in sfc layer
RMAX2		30	Maximum radius of influence over land aloft
RMAX3		50	Maximum radius of influence over water
RMIN	0.1	0.1	Minimum radius of influence used anywhere
TERRAD		12	Terrain features radius of influence
R1		1	Weighting of first guess surface field
R2		1	Weighting of first guess aloft field
RPROG		0	MM5 windfield weighting parameter
DIVLIM	5 E -6	5 E -6	Minimum divergence criterion
NITER	50	50	Number of divergence minimization iterations
NSMMTH	2,4,4,4,4,4,4	2,4,4,4,4,4,4	Number of passes through smoothing filter in each layer of CALMET
NITR2	99	5,5,5,5,5,5,5,5,5,5	Maximum number of stations used in each layer for the interpolation of data to a grid point
CRITFN	1	1	Critical Froude number
ALPHA	0.1	0.1	Kinematic effects parameter
FEXTR2	NZ*0.0	NZ*0.0	Scaling factor for extrapolating sfc winds aloft
NBAR	0	0	Number of terrain barriers
IDIOTP1	0	0	Surface temperature computation switch
ISURFT		4	Number of sfc met stations to use for temp. calcs.
IDIOTP2	0	0	Domain-averaged lapse rate switch
IUPT	0	2	Upper air stations to use for lapse rate calculation

Parameter	Default	CENRAP	Comments
ZUPT	200	200	Depth through which lapse rate is calculated.
IDIOPT3	0	0	Domain-averaged wind component switch
IUPWND	-1	-1	Number of aloft stations to use for wind calc.
ZUPWND	1, 1000	1, 1000	Bottom and top of layer through which the domain-scale winds are computed
IDIOPT4	0	0	Observed surface wind component switch
IDIOPT5	0	0	Observed aloft wind component switch
LLBREZE	F	F	Use Lake Breeze Module
NBOX	0	0	Number of lake breeze regions
NLB		0	Number of stations in the region
METBXID(NLB)		0	Station ID's in the region

Table B-8. CALMET Model Input Group 6: Mixing Height, Temperature and Precipitation			
Parameter	**Default**	**CENRAP**	**Comments**
CONSTB	1.41	1.41	Neutral stability mixing height coefficient
CONSTE	0.15	0.15	Convective stability mixing height coefficient
CONSTN	2400	2400	Stable stability mixing height coefficient
CONSTW	0.16	0.16	Overwater mixing height coefficient
FCORIOL	1 E -4	1 E -4	Absolute value of Coriolis parameter
IAVEZI	1	1	Conduct spatial averageing? Yes = 1
MNMDAV	1	10	Maximum search radius in averaging process
HAFANG	30	30	Half-angle of upwind looking cone for averaging
ILEVZI	1	1	Layers of wind use in upwind averaging
DPTMIN	0.001	0.001	Minimum potential temperature lapse rate in the stable layer above the current convective mixing height
DZZI	200	200	Depth of layer above current conv., mixing height through which lapse rate is computed
ZIMIN	50	50	Minimum overland mixing height
ZIMAX	3000	3000	Maximum overland mixing height
ZIMINW	50	50	Minimum overwater mixing height
ZIMAXW	3000	3000	Maximum overwater mixing height
ITPROG	0	2	3D temperature from observations or from MM5?
IRAD	1	1	Type of interpolation; 1= 1/R
TRADKM	500	36	Temperature interpolation radius of influence
NUMTS	5	5	Max. number of stations for temp interpolation
IAVET	1	1	Spatially average temperatures? 1= yes
TGDEFB	-.0098	-.0098	Temp gradient below mixing height over water
TGDEFA	-.0045	-.0045	Temp gradient above mixing height over water
JWAT1		55	Beginning land use categories over water
JWAT2		55	Ending land use categories for water
NFLAGP	2	2	Precipitation interpolation flag; 2 = 1/R-squared
SIGMAP	100	50	Radius of influence for precipitation interpolation
CUTP	0.01	0.01	Minimum precipitation rate cutoff (mm/hr)

Appendix C – CALPUFF Control File Inputs

Variable	Description	Value	Default	Comments
INPUT GROUP 1: General run control parameters				
METRUN	Control parameter for running all periods in met. File (0=no; 1=yes)	0	Y	
IBYR	Starting year of the CALPUFF run	2002	n/a	2001 and 2003 are the other years modeled
IBMO	Starting month	1	n/a	
IBDY	Starting day	1	n/a	
IBHR	Starting hour	1	n/a	
XBTZ	Base time zone	6.0	n/a	Central Standard Time
IRLG	Length of the run (hours)	8760	n/a	2001=8760hrs, 2003=8748hrs only 12 hrs on 12/31
NSPEC	Total number of species modeled	7	5	
NSE	Number of species emitted	4	3	
METFM	Meteorological data format	1	Y	CALMET unformatted file
AVET	Averaging time (minutes)	60.0	Y	
PGTIME	Averaging time (minutes) for PG - σ_v	60.0	Y	
INPUT GROUP 2: Technical options				
MGAUSS	Control variable determining the vertical distribution used in the near field	1	Y	Gaussian
MCTADJ	Terrain adjustment method	3	Y	Partial plume path adjustment
MCTSG	CALPUFF sub-grid scale complex terrain module (CTSG) flag	0	Y	CTSG not modeled
MSLUG	Near-field puffs are modeled as elongated "slugs"?	0	Y	No
MTRANS	Transitional plume rise modeled?	1	Y	Transitional plume rise computed
MTIP	Stack tip downwash modeled?	1	Y	Yes
MBDW	Method used to simulate building downwash?	1	Y	ISC method
MSHEAR	Vertical wind shear above stack top modeled in plume rise?	0	Y	No
MSPLIT	Puff splitting allowed?	0	Y	No
MCHEM	Chemical mechanism flag	1	Y	Transformation rates computed internally (MESOPUFF II scheme)
MAQCHEM	Aqueous phase transformation flag	0	Y	Aqueous phase not modeled
MWET	Wet removal modeled?	1	Y	Yes
MDRY	Dry deposition modeled?	1	Y	Yes
MDISP	Method used to compute dispersion coefficients	3	Y	PG dispersion coefficients in RURAL & MP coefficients in urban areas
MTURBVW	Sigma-v/sigma-theta, sigma-w measurements used?	3	Y	Use both sigma-(v/theta) and sigma-w from PROFILE.DAT Note: not provided

Variable	Description	Value	Default	Comments
MDISP2	Backup method used to compute dispersion when measured turbulence data are missing	3	Y	PG dispersion coefficients in RURAL & MP coefficients in urban areas
MROUGH	PG sigma-y,z adj. for roughness?	0	Y	No
MPARTL	Partial plume penetration of elevated inversion?	1	Y	Yes
MTINV	Strength of temperature inversion	0	Y	No
MPDF	PDF used for dispersion under convective conditions?	0	Y	No
MSGTIBL	Sub-Grid TIBL module used for shoreline?	0	Y	No
MBCON	Boundary conditions (concentration) modeled?	0	Y	No
MFOG	Configure for FOG model output	0	Y	No
MREG	TEST options specified to see if they conform to regulatory values?	1	Y	Checks made
INPUT GROUP 3: Species list				
CSPEC	Species modeled	SO2 SO4 NOX HNO3 NO3 PM25 PM10	n/a	Modeled: All Emitted: SO2, NOx, PM25, PM10 Dry deposited: SO2(gas), SO4(particle), NOx(gas), HNO3(gas), NO3(particle), PM25(particle), PM10(particle)
INPUT GROUP 4: Map projection and grid control parameters				
PMAP	Map projection	LCC	N	Lambert conformal conic
FEAST	False Easting	0.0	Y	
FNORT	False Northing	0.0	Y	
RLATO	Latitude	40N	n/a	
RLONG	Longitude	97W	n/a	
XLAT1 XLAT2	Matching parallel(s) of latitude for projection	33N 45N	n/a n/a	
DATUM	Datum region for the coordinates	WGS-G	N	WGS-84 GRS 80 spheroid, global coverage (WGS84)
 NX NY NZ	Meteorological grid: No. X grid cells in meteorological grid No. Y grid cells in meteorological grid No. vertical layers in meteorological grid	 306 246 10	n/a	
DGRIDKM	Grid spacing (km)	6	n/a	

ZFACE	Cell face heights (m)	0, 20, 40,80, 160, 320, 640, 1200, 2000, 3000, 4000	n/a	
XORIGKM YORIGKM	Reference coordinates of SW corner of grid cell (1,1) (km)	-1008 -1620	n/a	
 IBCOMP JBCOMP IECOMP JECOMP	Computational grid: X index of LL corner Y index of LL corner X index of UR corner Y index of UR corner	 1 1 306 246	n/a	
LSAMP IBSAMP JBSAMP IESAMP JESAMP MESHDN	Logical flag indicating if gridded receptors are used X index of LL corner Y index of LL corner X index of UR corner Y index of UR corner Nesting factor of the sampling grid	F 1	- Y	Receptors are only in the Class I areas assessed
INPUT GROUP 5: Output options				
SPECIES	Species (or group) list for output options	1	n/a	Concentrations saved for SO2, SO4, NOx, HNO3, NO3, PM25, PM10
INPUT GROUP 6: Subgrid scale complex terrain (CTSG) inputs				
NHILL	Number of terrain features	0	Y	
NCTREC	Number of special complex terrain receptors	0	Y	
MHILL	Terrain and CTSG receptor data for CTSG hills input in CTDM format?	2	n/a	Hill data created by OPTHILL & input below in subgroup (6b); receptor data in subgroup (6c) note: no data provided
XHILL2M	Factor to convert horizontal dimensions to meters	1	Y	
ZHILL2M	Factor to convert vertical dimensions to meters	1	Y	
XCTDMKM	X-origin of CTDM system relative to CALPUFF coordinate system, in Km	0	n/a	
YCTDMKM	Y-origin of CTDM system relative to CALPUFF coordinate system, in Km	0	n/a	
INPUT GROUP 7: Chemical parameters for dry deposition of gases				
SPECIES DIFFUSVTY ALPHA STR REACTVTY MESO RES HENRYS C	Chemical parameters for dry deposition of gases	-	Y Y Y Y Y Y	SO2; NOx; HNO3 0.1509 0.1656 0.1628 1000 1 1 8 8 18 0 5 0 0.04 3.5 8.0*E-8

INPUT GROUP 8: Size parameters for dry deposition of particles				
SPECIES GEO. MASS MEAN DIA. GEO.STAND DEV.	Single species: mean and standard deviation used to compute deposition velocity for NINT size-ranges; averaged to obtain mean deposition velocity. Grouped species: size distribution specified, standard deviation as "0". Model uses deposition velocity for stated mean diameter.	-	n/a	SO4 NO3 PM25 PM10 0.48 0.48 0.48 0.48 2 2 2 2
INPUT GROUP 9: Miscellaneous dry deposition parameters				
RCUTR	Reference cuticle resistance	30	Y	
RGR	Reference ground resistance	10	Y	
REACTR	Reference pollutant reactivity	8	Y	
NINT	Number of particle-size intervals to evaluate effective particle deposition velocity	9	Y	
IVEG	Vegetation state in unirrigated areas	1	Y	
INPUT GROUP 10: Wet deposition parameters				
POLL LIQ PRECIP FRZ PRECIP	Scavenging coefficients	-	Y Y Y	SO2 SO4 NOx HNO3 NO3 3E-5 1E-4 0 6E-5 1E-4 0 3E-5 0 0 3E-5
INPUT GROUP 11: Chemistry parameters				
MOZ	Ozone data input option	0	N	
BCKO3	Monthly ozone concentrations	-	N	12*40
BCKNH3	Monthly ammonia concentrations	-	N	12*3
RNITE1	Nighttime SO2 loss rate	0.2	Y	
RNITE2	Nighttime NOx loss rate	2.0	Y	
RNITE3	Nighttime HNO3 formation rate	2.0	Y	
MH2O2	H2O2 data input option	1	Y	
BCKH2O2	Monthly H2O2 concentrations	-	Y	MQACHEM = 0; not used
BCKPMF OFRAC VCNX	Secondary Organic Aerosol options	-	-	MCHEM = 1; thus, not used
INPUT GROUP 12: Misc. Dispersion and computational parameters				
SYTDEP	Horizontal size of puff beyond which time-dependent dispersion equations (Heffter) are used.	550	Y	
MHFTSZ	Switch for using Heffter equation for sigma z as above	0	Y	
JSUP	Stability class used to determine plume growth rates for puffs above boundary layer	5	Y	
CONK1	Vertical dispersion constant for stable conditions	0.01	Y	
CONK2	Vertical dispersion constant for neutral/unstable conditions	0.1	Y	

TBD	Factor determining transition-point from Schulman-Scire to Huber-Snyder building downwash scheme	0.5	Y	No building downwash used
IURB1 IURB2	Range of land use categories for which urban dispersion is assumed	10 19	Y Y	METFM=1; not used
ILANDUIN	Land use category for modeling domain	-	-	METFM=1; not used
ZOIN	Roughness length (m) for modeling domain	-	-	METFM=1; not used
XLAIIN	Leaf area index for modeling domain	-	-	METFM=1; not used
ELEVIN	Elevation above sea level	-	-	METFM=1; not used
XLATIN	Latitude (degrees) for met location	-	-	METFM=1; not used
XLONIN	Longitude (degrees) for met location	-	-	METFM=1; not used
ANEMHT	Anemometer height (m)	-	-	METFM=1; not used
ISIGMAV	Form of lateral turbulence data in PROFILE.DAT	1	Y	Read sigma-v
IMIXCTDM	Choice of mixing heights	-	-	METFM=1; not used
XMXLEN	Maximum length of a slug	1	Y	
XSAMLEN	Maximum travel distance of a puff/slug during one sampling step	1	Y	
MXNEW	Maximum number of slugs/puffs released from one source during one time step	99	Y	
MXSAM	Maximum number of sampling steps for one puff/slug during one time step	99	Y	
NCOUNT	Number of iterations used when computing the transport wind for a sampling step that includes gradual rise	2	Y	
SYMIN	Minimum sigma y for a new puff/slug	1	Y	
SZMIN	Minimum sigma z for a new puff/slug	1	Y	
SVMIN SWMIN	Default minimum turbulence velocities sigma-v and sigma-w for each stability class	-	Y	A B C D E F .5 .5 .5 .5 .5 .5 .2 .12 .08 .06 .03 .016
CDIV	Divergence criterion for dw/dz across puff used to initiate adjustment for horizontal convergence	0, 0	Y	
WSCALM	Minimum wind speed allowed for non-calm conditions. Used as minimum speed returned when using power-law extrapolation toward surface	0.5	Y	
XMAXZI	Maximum mixing height (m)	4000	N	Top interface in CALMET simulation
XMINZI	Minimum mixing height (m)	20	N	

WSCAT	Default wind speed classes	-	Y	1 2 3 4 5 1.54 3.09 5.14 8.23 10.80
PLXO	Default wind speed profile power-law exponents for stabilities 1-6	-	Y ISC RURAL	A B C D E F .07 .07 .10 .15 .35 .55
PTGO	Default potential temperature gradient for stable classes E, F (deg K/m)	-	Y	0.020; 0.035
PPC	Default plume path coefficients for each stability class	-	Y	A B C D E F .5 .5 .5 .5 .35 .35
SL2PF	Slug-to-puff transitions criterion factor equal to sigma-y/length of slug	10	Y	
NSPLIT	Number of puffs that result every time a puff is split	3	Y	
IRESPLIT	Time of day when split puffs are eligible to be split once again; this is typically set once per day, around sunset before nocturnal shear develops	-	N	Hour 18 = 1
ZISPLIT	Split is allowed only if last hour's mixing height (m) exceeds a minimum value	100	Y	
ROLDMAX	Split is allowed only if ratio of last hour's mixing ht to the maximum mixing ht experienced by the puff is less than a maximum value	0.25	Y	
NSPLITH	Number of puffs that result every time a puff is split	5	Y	
SYSPLITH	Minimum sigma-y of puff before it may be split	1	Y	
SHSPLITH	Minimum puff elongation rate due to wind shear, before it may be split	2	Y	
CNSPLITH	Minimum concentration of each species in puff before it may be split	1E-7	Y	
EPSSLUG	Fractional convergence criterion for numerical SLUG sampling integration	1E-4	Y	
EPSAREA	Fractional convergence criterion for numerical AREA source integration	1E-6	Y	
DSRISE	Trajectory step-length (m) used for numerical rise integration	1	Y	
HTMINBC	Minimum height (m) to which BC puffs are mixed as they are emitted. Actual height is reset to the current mixing height at the release point if greater than this minimum	500	Y	

RSAMPBC	Search radius (in BC segment lengths) about a receptor for sampling nearest BC puff. BC puffs are emitted with a spacing of one segment length, so the search radius should be greater than 1	10	N	
MDEPBC	Near-surface depletion adjustment to concentration profile used when sampling BC puffs?	1	Y	Adjust concentration for depletion
INPUT GROUP 13: Point source parameters				
NPT1	Number of point sources with parameters	-	n/a	
IPTU	Units used for point source emissions	1	Y	
NSPT1	Number of source-species combinations with variable emissions scaling factors	0	Y	
NPT2	Number of point sources with variable emission parameters provided in external file	0	n/a	
INPUT GROUP 14: Area source parameters – Not used				
INPUT GROUP 15: Line source parameters – Not used				
INPUT GROUP 16: Volume source parameters – Not used				
INPUT GROUP 17: Non-gridded (discrete) receptor information				
NREC	Number of non-gridded receptors	0 3996	n/a	147 Bandelier 480 Big Bend 168 Bosque del Apache 40 Breton 80 Caney Creek 256 Carlsbad Caverns 195 Great Sand Dunes 127 Guadalupe Mountains 80 Hercules-Glades 187 La Garita 312 Mesa Verde 47 Mingo 321 Pecos 55 Salt Creek 247 San Pedro Parks 72 Upper Buffalo 744 Weminuche 109 Wheeler Peak 270 White Mountain 59 Wichita Mountains

Appendix D – POSTUTIL Control File Inputs

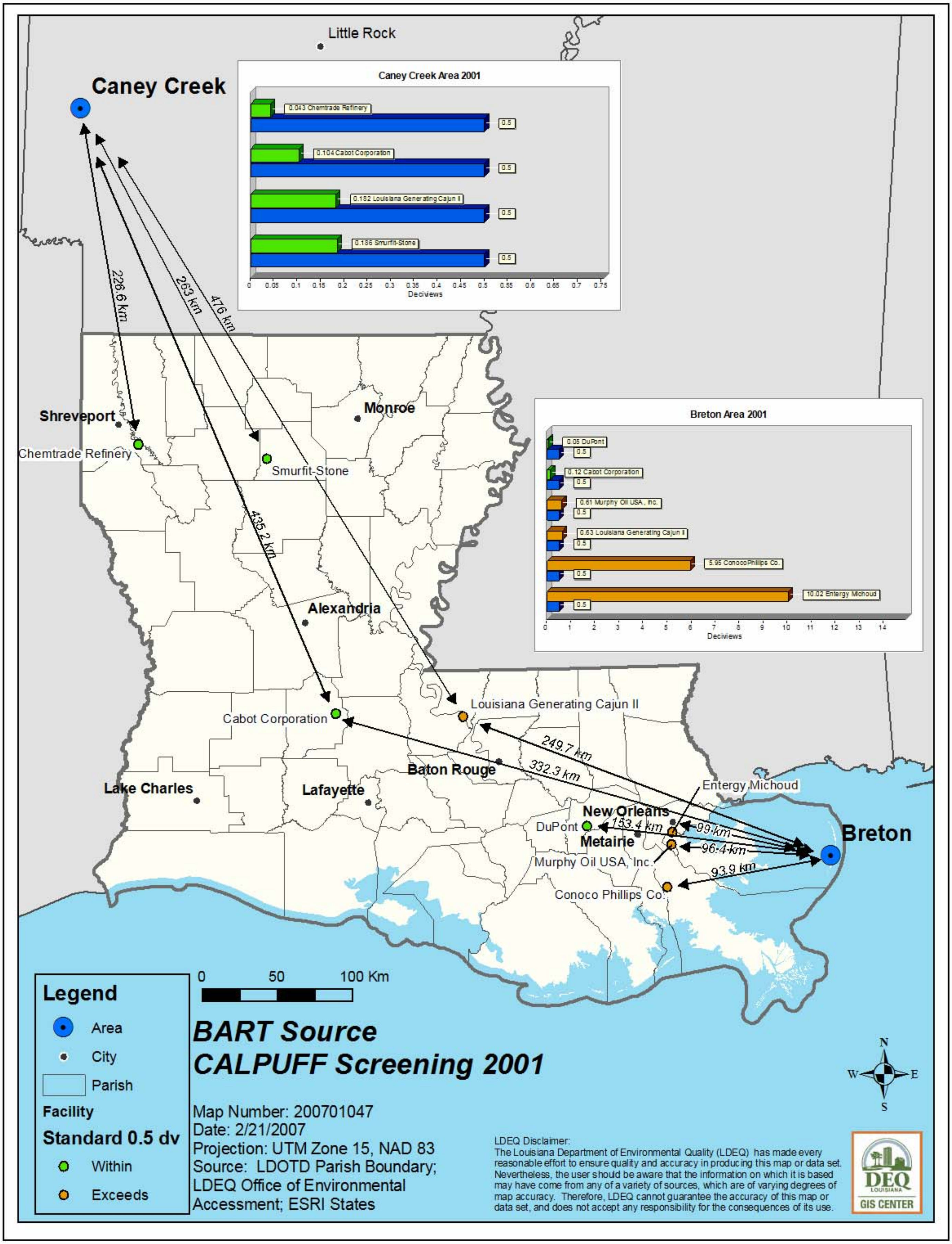
Variable	Description	Value	Default	Comments
INPUT GROUP 1: General run control parameters				
ISYR	Starting Year	2002	n/a	2001 and 2003 also modeled
ISMO	Starting month	1	n/a	
IDY	Starting day	1	n/a	
ISHR	Starting hour	1	n/a	
NPER	Number of periods to process	8760	n/a	2001=8760 hrs, 2003=8748hrs only 12 hrs on 12/31
NSPECINP	Number of species to process from CALPUFF runs	7	n/a	
NSPECOUT	Number of species to write to output file	7	n/a	
NSPECCMP	Number of species to compute from those modeled	0	n/a	
MDUPLCT	Stop run if duplicate species names found?	0	Y	
NSCALED	Number of CALPUFF data files that will be scaled	0	Y	
MNITRATE	Re-compute the HNO3/NO3 partition for concentrations?	1	N	Yes, for all sources combined
BCKNH3	Default ammonia concentrations used for HNO3/NO3 partition	-	N	12*3
INPUT GROUP 2: Species processing information				
ASPECI	NSPECINP species will be processed	-	n/a	SO2, SO4, NOx, HNO3, NO3, PM25, PM10
ASPECO	NSPECOUT species will be written	-	n/a	SO2, SO4, NOx, HNO3, NO3, PM25, PM10

Appendix E – CALPOST Control File Inputs

Variable	Description	Value	Default	Comments
INPUT GROUP 1: General run control parameters				
METRUN	Option to run all periods found in met files	0	Y	Run period explicitly defined
ISYR	Starting Year	2002	n/a	2001 and 2003 also modeled
ISMO	Starting month	1	n/a	
IDY	Starting day	1	n/a	
ISHR	Starting hour	1	n/a	
NHRS	Number of hours to process	8760	n/a	2001=8760hrs, 2003=8748hrs only 12 hrs on 12/31
NREP	Process every hour of data?	1	Y	Every hour processed
ASPEC	Species to process	VISIB	n/a	Visibility processing
ILAYER	Layer/deposition code	1	Y	CALPUFF concentrations
A, B	Scaling factors X(new) = X(old) *A + B	0, 0	Y	
LBACK	Add hourly background concentrations/fluxes?	F	Y	
MSOURCE	Option to process source contributions	0	Y	
LG LD	Gridded receptors processed? Discrete receptors processed?	F T	N/Y	Receptors located only in the Class I areas assessed
LCT	CTSG Complex terrain receptors processed?	F	Y	
LDRING	Report results by DISCRETE receptor RING?	F	Y	
NDRECP	Flag for all receptors after the last one assigned is set to "0"	-1	Y	
IBGRID JBGRID IEGRID JEGRID	Range of gridded receptors	-1 -1 -1 -1	Y	When LG = T Entire grid processed if all =-1
NGONOFF	Number of gridded receptor rows provided to identify specific gridded receptors to process	0	Y	
BTZONE	Base time zone for the CALPUFF simulation	6	n/a	
MFRH	Particle growth curve f(RH) for hygroscopic species	2	Y	FLAG (2000) f(RH) tabulation. Note: not used
RHMAX	Maximum relative humidity (%) used in particle growth curve	-	N	Not used
LVSO4 LVNO3 LVOC LVPMC LVPMF LVEC	Modeled species to be included in computing light extinction	T T F T T F	Y Y N Y Y N	
LVBK	Include BACKGROUND when ranking for TOP-N, TOP-50, and exceedence tables?	T	Y	

Variable	Description	Value	Default	Comments
SPECPMC SPECPMF	Species name used for particulates in MODEL.DAT file	PM10 PM25	N N	
EEPMC EEPMF	Modeled particulate species	0.6 1.0	Y Y	
EEPMCBK	Background particulate species	0.6	Y	
EESO4 EENO3 EEOC EESOIL EEEC	Other species	3.0 3.0 4.0 1.0 10	Y Y Y Y Y	
LAVER	Background extinction computation	F	Y	
MVISBK	Method used for background light extinction	6	N	Compute extinction from speciated PM measurements. FLAG RH adjustment factor applied to observed and modeled sulfate and nitrate
RHFAC	Extinction coefficients for hygroscopic species (modeled and background). Monthly RH adjustment factors	-	n/a	See Table 4 in main protocol document
BKSO4 BKNO3 BKPMC BKOC BKSOIL BKEC	Monthly concentrations of ammonium sulfate, ammonium nitrate, coarse particulates, organic carbon, soil and elemental carbon to compute background extinction coefficients	-	n/a	See Table 5 in main protocol document
BEXTRAY	Extinction due to Rayleigh scattering (1/Mm)	10	Y	
IPRTU	Units for all output	3	N	micrograms/cubic meter
L24HR	Averaging time reported	T	n/a	
LTOPN	Visibility: Top "N" table for each averaging time selected.	F	Y	
NTOP	Number of 'Top-N' values at each receptor selected (NTOP must be <=4)	4	Y	
MDVIS	Output file with visibility change at each receptor?	0	Y	Create file of DAILY (24 hour) delta-deciview. Grid model run.

Appendix F - Maps of impact from LDEQ screened facilities


Little Rock
Caney Creek
Caney Creek Area 2001
0.043 Chemtrade Refinery
0.5
0.104 Cabot Corporation
0.5
0.182 Louisiana Generating Cajun II
0.5
0.186 Smurfit-Stone
0.5
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75
Deciviews
226.6 km
263 km
476 km
435.2 km
Shreveport
Chemtrade Refinery
Smurfit-Stone
Monroe
Alexandria
Breton Area 2001
0.05 DuPont
0.5
0.12 Cabot Corporation
0.5
0.61 Murphy Oil USA, Inc.
0.5
0.63 Louisiana Generating Cajun II
0.5
5.95 ConocoPhillips Co.
0.5
10.02 Entergy Michoud
0.5
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Deciviews
Louisiana Generating Cajun II
Cabot Corporation
249.7 km
332.3 km
Baton Rouge
Lake Charles
Lafayette
Entergy Michoud
New Orleans
DuPont
153.4 km
99 km
Metairie
96.4 km
Murphy Oil USA, Inc.
93.9 km
Conoco Phillips Co.
Breton
0 50 100 Km
Legend
Area
City
Parish
Facility
Standard 0.5 dv
Within
Exceeds
BART Source
CALPUFF Screening 2001
Map Number: 200701047
Date: 2/21/2007
Projection: UTM Zone 15, NAD 83
Source: LDOTD Parish Boundary; LDEQ Office of Environmental Accessment; ESRI States
LDEQ Disclaimer:
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of map accuracy. Therefore, LDEQ cannot guarantee the accuracy of this map or data set, and does not accept any responsibility for the consequences of its use.
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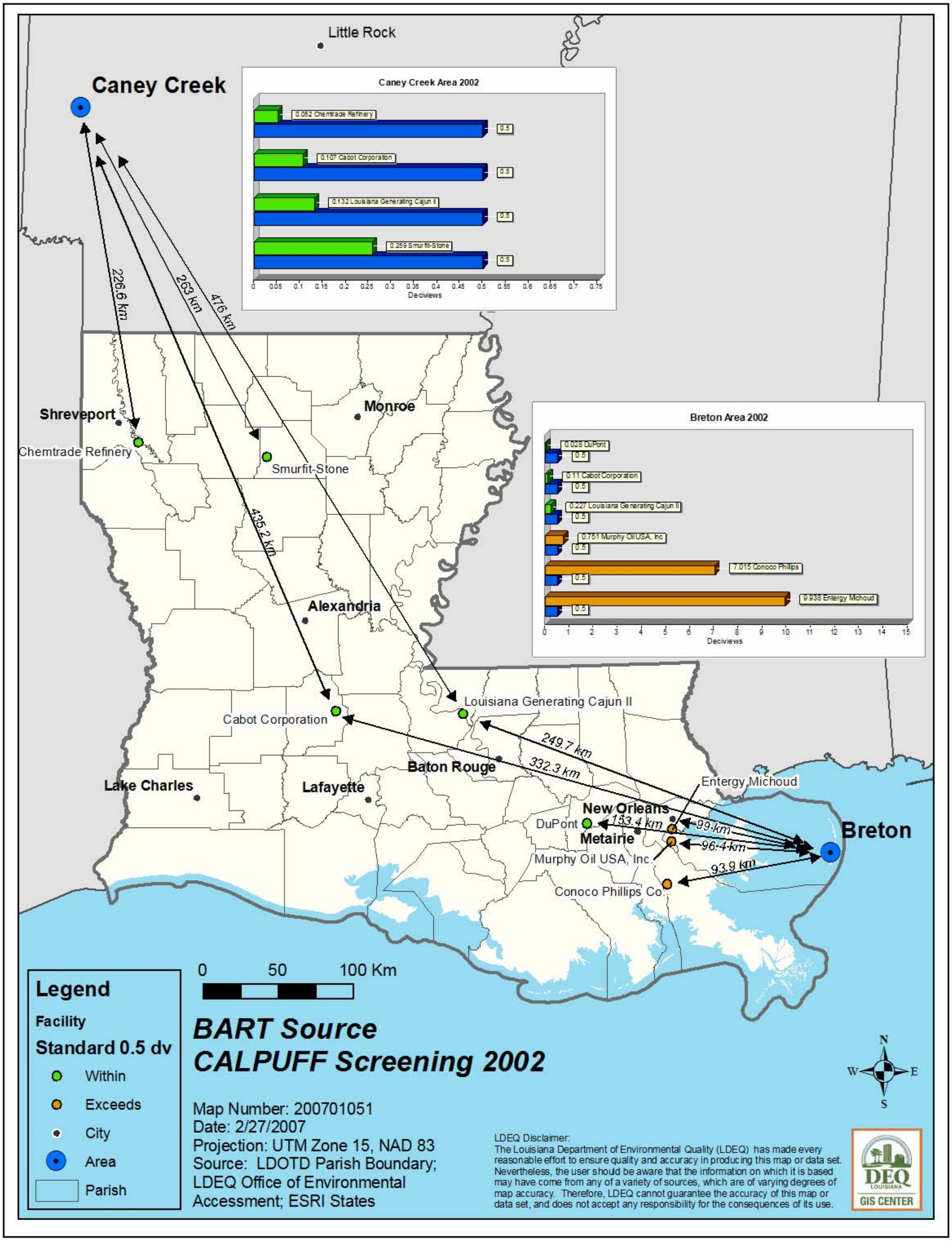

Little Rock
Caney Creek
Caney Creek Area 2002
0.052 Chemtrade Refinery
0.107 Cabot Corporation
0.132 Louisiana Generating Cajun II
0.259 Smurfit-Stone
0.5
Deciviews
226.6 km
263 km
476 km
435.2 km
Shreveport
Chemtrade Refinery
Monroe
Smurfit-Stone
Breton Area 2002
0.028 DuPont
0.11 Cabot Corporation
0.227 Louisiana Generating Cajun II
0.751 Murphy Oil USA, Inc
7.015 Conoco Phillips
9.938 Entergy Michoud
Deciviews
Alexandria
Louisiana Generating Cajun II
Cabot Corporation
249.7 km
332.3 km
Baton Rouge
Lake Charles
Lafayette
Entergy Michoud
New Orleans
DuPont
153.4 km
99 km
Metairie
96.4 km
Breton
Murphy Oil USA, Inc.
93.9 km
Conoco Phillips Co.
0 50 100 Km
Legend
Facility
Standard 0.5 dv
Within
Exceeds
City
Area
Parish
BART Source
CALPUFF Screening 2002
Map Number: 200701051
Date: 2/27/2007
Projection: UTM Zone 15, NAD 83
Source: LDOTD Parish Boundary; LDEQ Office of Environmental Accessment; ESRI States
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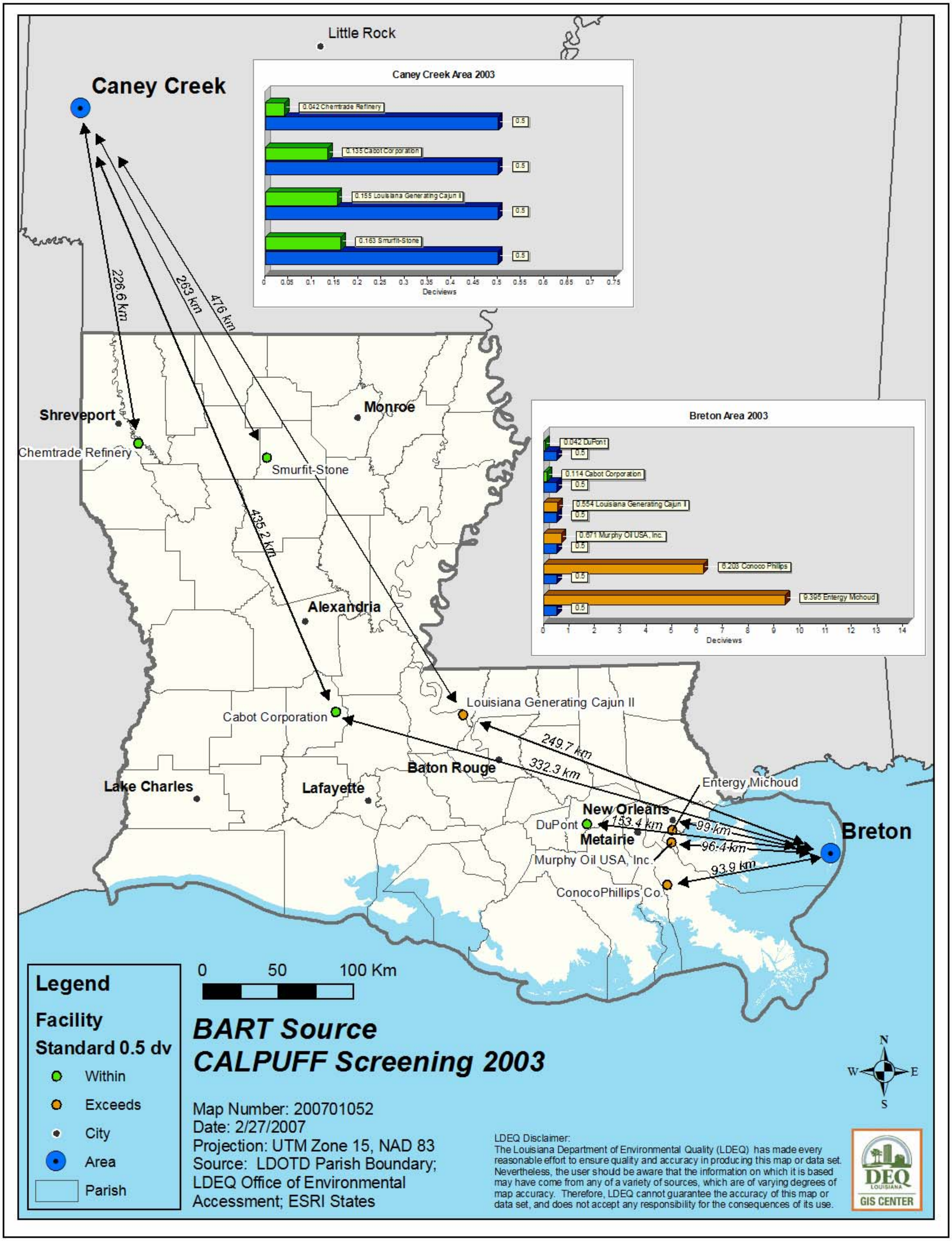

Little Rock
Caney Creek
Caney Creek Area 2003
0.042 Chemtrade Refinery
0.5
0.135 Cabot Corporation
0.5
0.155 Louisiana Generating Cajun II
0.5
0.163 Smurfit-Stone
0.5
Deciviews
226.6 km
263 km
476 km
435.2 km
Shreveport
Chemtrade Refinery
Monroe
Smurfit-Stone
Breton Area 2003
0.042 DuPont
0.114 Cabot Corporation
0.554 Louisiana Generating Cajun II
0.671 Murphy Oil USA, Inc.
6.203 Conoco Phillips
9.395 Entergy Michoud
Deciviews
Alexandria
Louisiana Generating Cajun II
Cabot Corporation
249.7 km
332.3 km
Baton Rouge
Entergy Michoud
Lake Charles
Lafayette
New Orleans
DuPont
153.4 km
99 km
Metairie
96.4 km
Breton
Murphy Oil USA, Inc.
93.9 km
ConocoPhillips Co.
0 50 100 Km
Legend
Facility
Standard 0.5 dv
Within
Exceeds
City
Area
Parish
BART Source
CALPUFF Screening 2003
Map Number: 200701052
Date: 2/27/2007
Projection: UTM Zone 15, NAD 83
Source: LDOTD Parish Boundary; LDEQ Office of Environmental Accessment; ESRI States
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DEQ Louisiana GIS Center