Stakeholder Group Modeling Results

ADEC

10/17/2018

Air Quality Modeling

- The CMAQ (community multiscale air quality) Model is a tool used to show attainment by modeling the representative emissions and meteorology.
- The model simulates meteorology, atmospheric chemical reactions and emissions in multiple layers and grid cells.
- Modeling a group of control measures allows the tool to represent the concentrations of PM 2.5 at the monitor locations and the entire non – attainment area.
- Monitor locations are used to verify the model and known concentrations, but an attainment demonstration has to be the entire area or all the grid cells in the model.

From the Moderate Area SIP

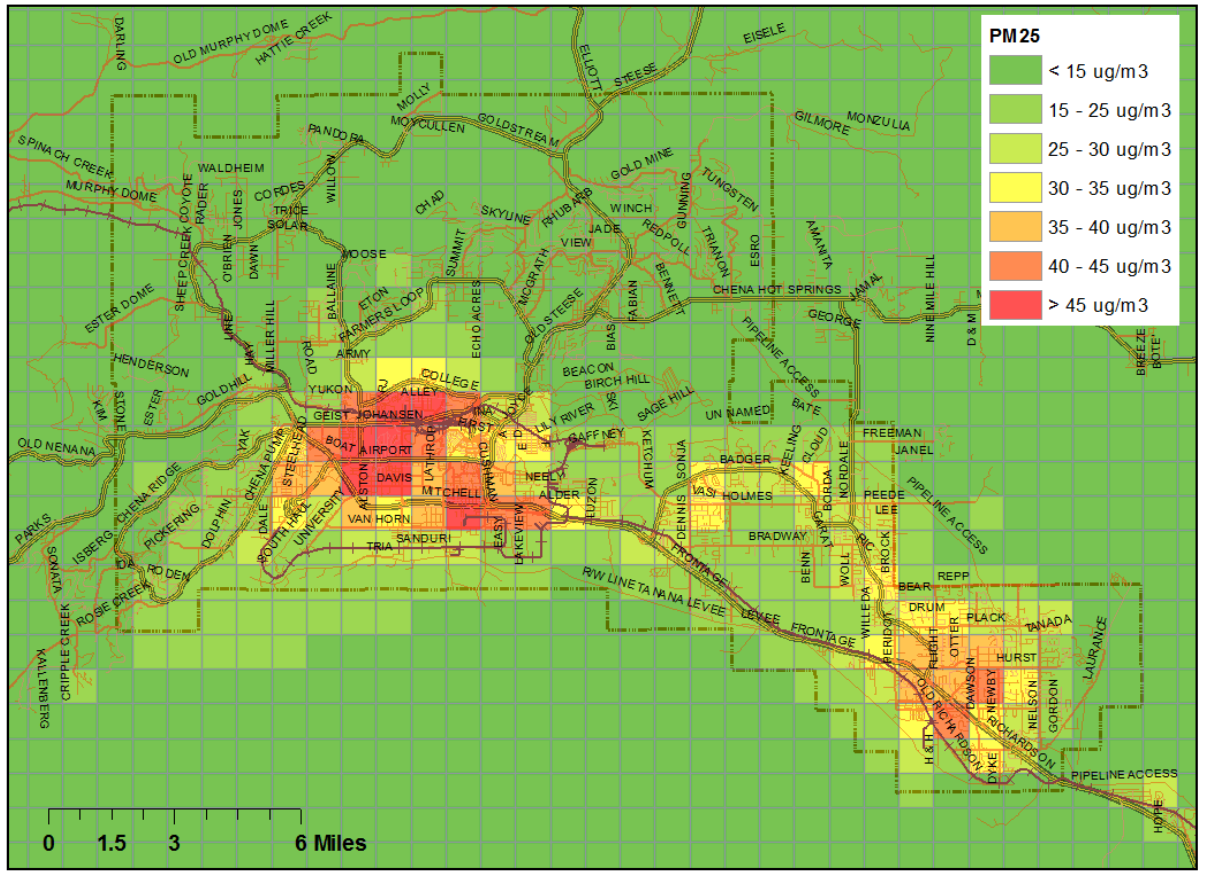


Figure 5.8-23. Unmonitored Area Analysis of 24-hour $PM_{2.5}$ for the 2015 Control Scenario

Serious Area SIP
Fairbanks PM 2.5 Monitored Data

Monitor Location	Average Monitored PM 2.5 ($\mu g/m^3$)
	2011-2015
Fairbanks State Office Building	38.9
Fairbanks NCORE	38.0
North Pole Fire Station	131.6

- Modeling uses a 5 year design value to be representative and include inter-annual variability.
- Moderate Area SIP 5 year design value was for years 2006-2010 for the State Office Building Monitor and the concentration was 44.7 $\mu g/m^3$.
- The decrease in the PM 2.5 is attributed to wood stove change outs, vehicle turnover and public education.
- There was a curtailment program started during the Moderate Area SIP that was voluntary, three stages and had some enforcement.

The Serious SIP modeling first step: 2013 Base Year

Monitor Location	Average Monitored PM 2.5	Modeled Base Year
	2011-2015	2013
Fairbanks State Office Building	38.9	38.93
Fairbanks NCORE	38.0	37.96
North Pole Fire Station	131.6	131.6

- **Starting point** for modeling and assessing measures for the Serious Area SIP.
- Base year is selected based on meteorology, available emissions and a representative year in the 5 year average.
- The Moderate Area SIP modeled base year was 2008.
- All emissions inventory are updated for all sectors using actual emissions. The same home heating demand model, surveys, WSCO and current curtailment programs are updated.

Next Step, establish a new baseline: 2019

Monitor Location	Average Monitored PM 2.5 (µg/m^3)	Modeled Base Year	Preliminary Modeled Baseline
	2011-2015	2013	2019
Fairbanks State Office Building	38.9	38.93	33.08
Fairbanks NCORE	38.0	37.96	32.19
North Pole Fire Station	131.6	131.6	112.15

- 2019 is the attainment year for the Serious Area SIP.
- Update the emissions inventory
- Moderate Area SIP controls:
  - Curtailment program (20% compliance)
  - Curtailment program was still three stages and the level was set at 55 µg/m^3
  - WSCO program
- Fleet turnover
- Oil price Wood-Oil use shifts

Next step, assess measures: Stakeholder Group Control Model Run

Monitor Location	Average Monitored PM 2.5 ($\mu g/m^3$)	Modeled Base Year	Preliminary Modeled Baseline	Stakeholder Group Model Run
	2011-2015	2013	2019	
Fairbanks State Office Building	38.9	38.93	33.08	24.88
Fairbanks NCORE	38.0	37.96	32.19	24.03
North Pole Fire Station	131.6	131.6	112.15	65.11

- Update the emission inventory
- Stakeholder selected measures
- Stronger curtailment program, 2 stages, 35 $\mu g/m^3$ level and enforcement.
- WSCO continuation
- Updated compliance rate

Stakeholder Group Model Run Conclusions

Monitor Location	Stakeholder Group Control Model Run
Fairbanks State Office Building	24.88
Fairbanks NCORE	24.03
North Pole Fire Station	65.11

- Significant progress was made toward attainment in North Pole, which is the regulatory violating monitor.
- Fairbanks area monitors are showing attainment concentrations and the next step is to look at maximum impact sites.
- Add additional control measures and model an extension year out to 2024.

Final Steps: Preliminary Unmonitored Area Analysis Modeling evaluation

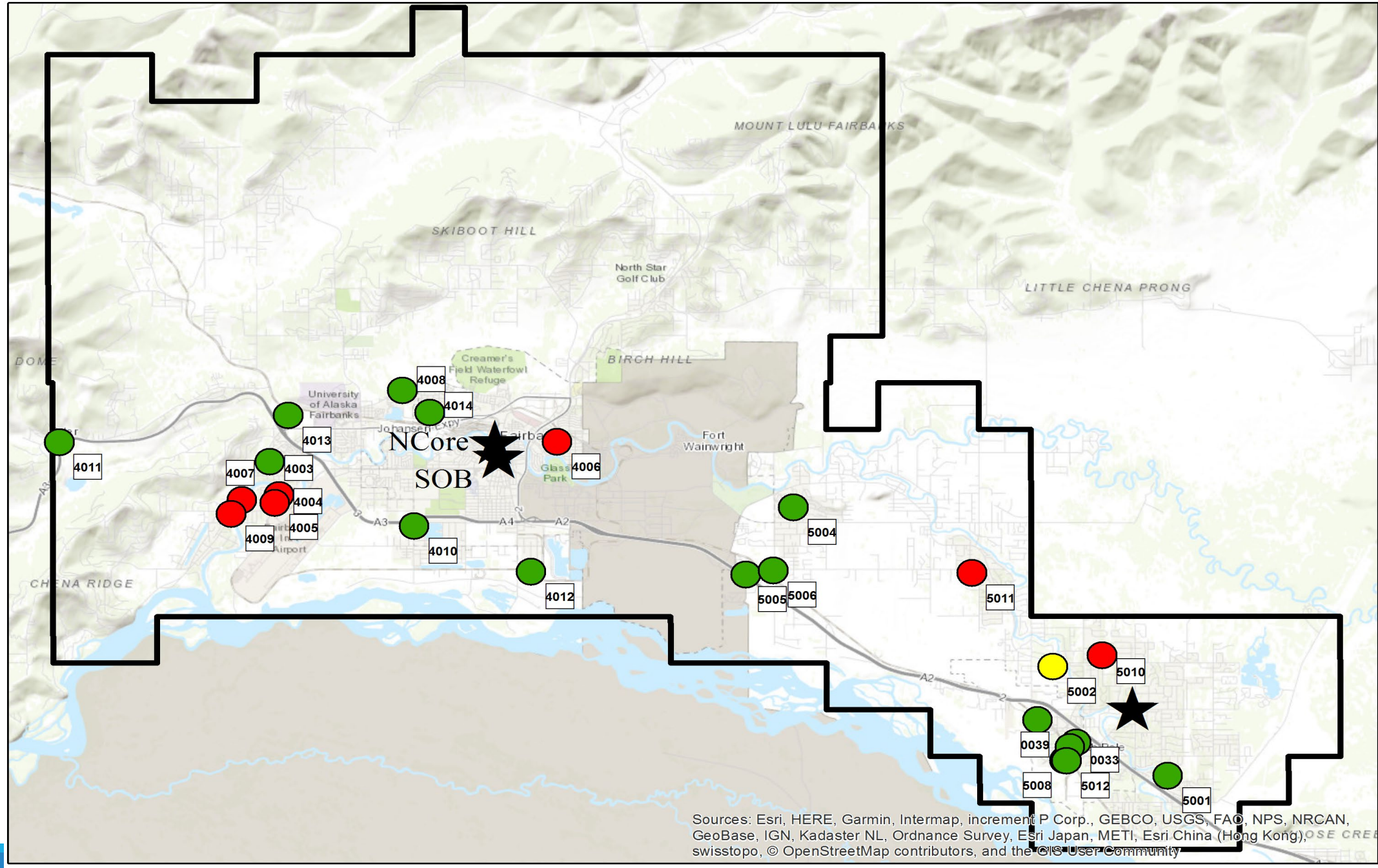
- When modeling an attainment demonstration, all grid cells in the model must show attainment or additional monitoring may be necessary.
- Depending on the results of the 2019 final control runs, including the stakeholder modeling runs, extension years maybe modeled out to 2024 and include additional controls such as MSM (most stringent measures) and/or a 5% reduction plans.
- For the Serious SIP, we are currently developing the relationship between the Special Purpose Monitors and comparing the concentrations to the regulatory monitors, and use this relationship to estimate modeled concentrations.

Thank you. Questions?

Short term monitoring sites

in relation to the 3 regulatory monitoring sites

2008-2016

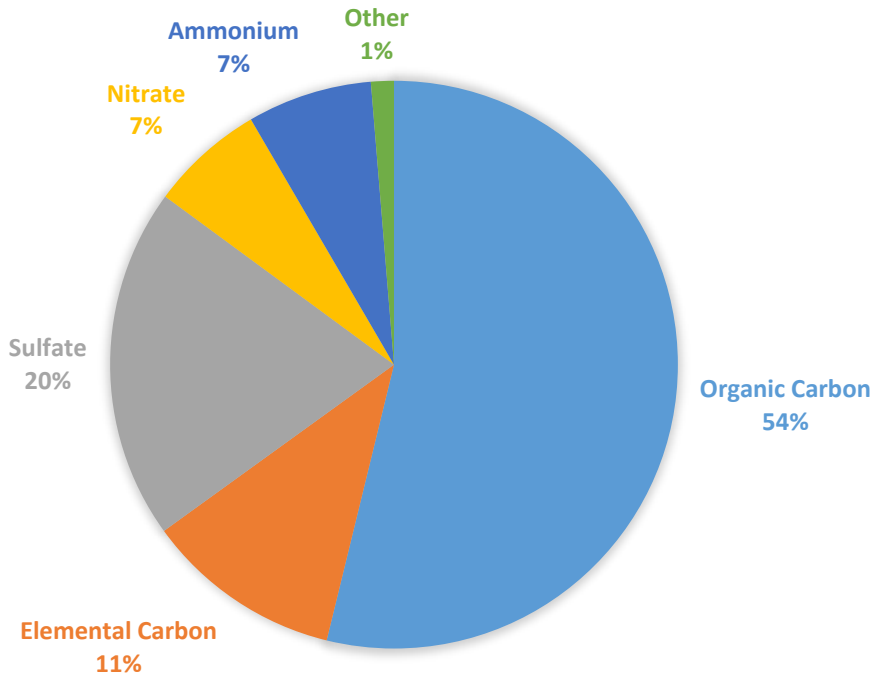


Fairbanks Non-attainment Area Design Value Summary

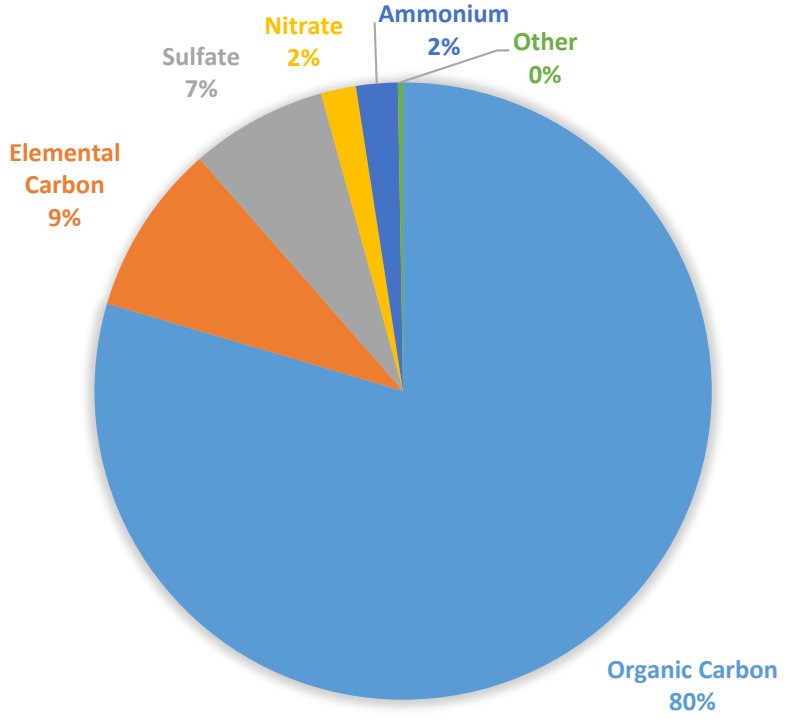
Monitor Site	Monitored 98th percentiles							Monitored 3 year Design Value					Modeled 5 year Design Value (except NPFS)	Preliminary Modeled 2019 Baseline
Year	2011	2012	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2011-2015 rolling average	2019
Fairbanks State Office Building	38	49.6	36.3	34.5	35.3	41.5	37.5	41	40	35	37	38	38.9	34.86
Fairbanks NCORE	33.1	50	36.2	31.6	36.7	32.4	34.9	40	39	35	34	35	38.0	33.93
North Pole Fire Station	NA	158.4	121.6	138.3	111.6	66.8	75.5	NA	139	124	106	85	131.6	122.8

Speciation Monitor Data from State Office Building and North Pole Fire Station

STATE OFFICE BUILDING AVERAGE WINTER HIGH PM 2.5 DAYS (38.9 UG/M3) FROM YEARS 2011-2015



NPFS WINTER AVERAGE HIGH PM 2.5 DAYS (131.6 UG/M3) FROM YEARS 2011-2015



Air quality Modeling Process

- Air quality models can estimate the concentrations of $PM_{2.5}$ within the nonattainment area as well as source contributions.
- These models combine meteorology, emissions inventories, and chemistry to determine source contributions.
- Air quality models account for both the location and height of the stack of a source when estimating contribution.
- Both the directly emitted $PM_{2.5}$ and precursor contributions are determined by the model.