Updated 2018 HGB Modeling Results

Using a 2006 Base Year

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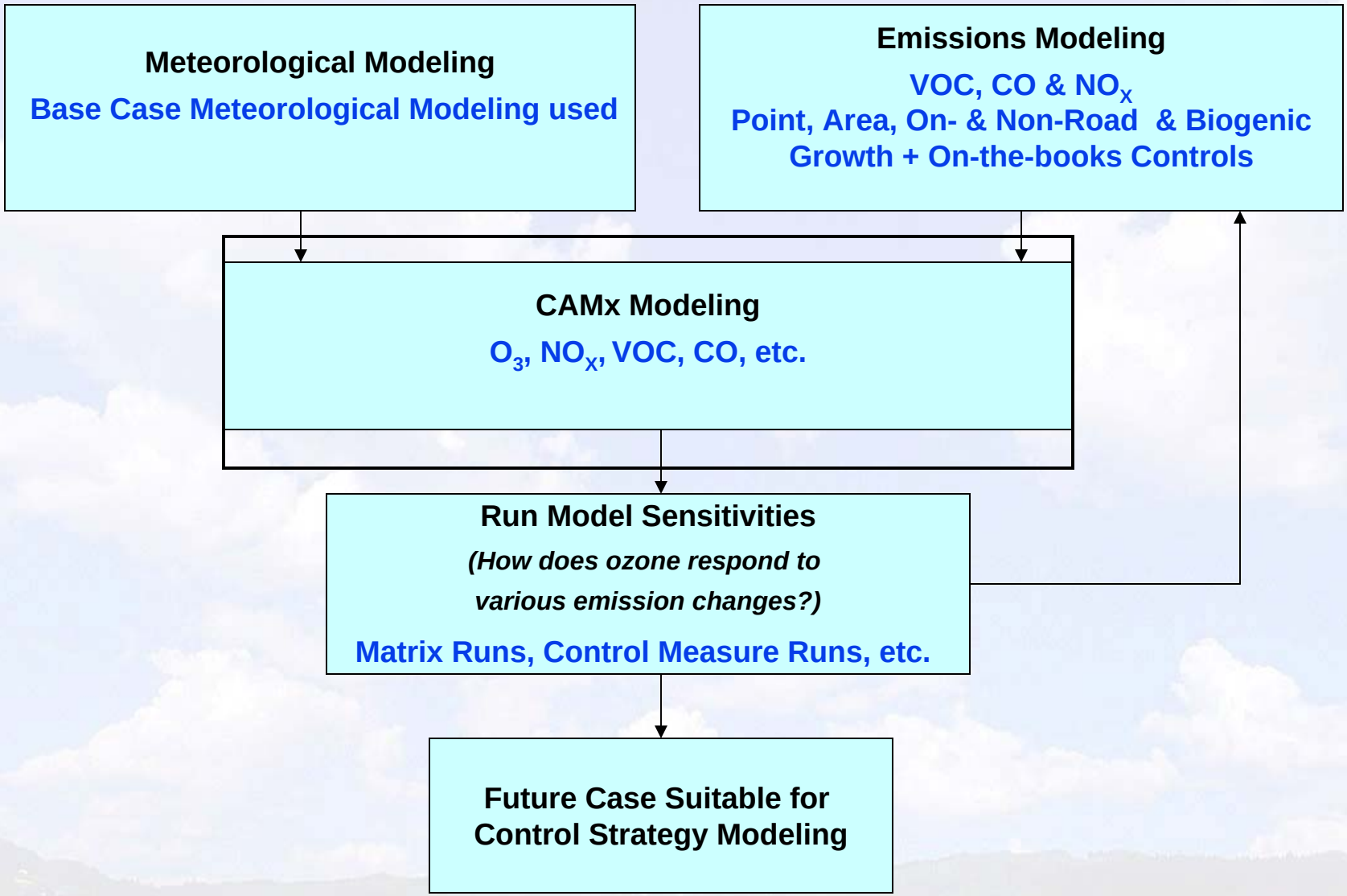
CAMx Ozone Modeling in SIP Development

The Big Picture

Base Case	Day-specific meteorology and emissions; replicate what actually happened
Baseline Case	Day-specific meteorology and Typical emissions; used in RRF to predict future design values
Future Base Case	Apply future growth + on-the-books controls to estimate future ozone
Control Strategy Testing	Determine control strategies that will effectively reduce ozone
SIP	Document modeling procedures

CAMx Ozone Modeling in SIP Development

Future Case – Future Baseline Emissions



2006 Baseline Modeling Emissions

- Point Sources
  - ARD sources (e.g., EGUs) used 2006 third quarter emissions
  - Non-ARD sources
    - For the region beyond Texas, used 2002 CENRAP/RPO inventory grown to 2006 with EGAS
    - For the region within Texas, used 2006 STARS OSD emissions, except
      - Tank landing losses used average of 2006 episodic emissions
      - PSCFv3 EI-Reconciliation of HRVOC emissions
- On-Road Mobile Sources
  - For the region beyond Texas, used EPA's NMIM generating generic 2006 summer weekday emissions adjusted with TTI developed day-type ratios
  - For Texas outside HGB and BPA, used TTI developed county-level, roadway-class, 2006 summer day-types emissions
  - For HGB and BPA, used TTI developed link-based, hourly, 2006 summer day-types emissions

2006 Baseline Modeling Emissions

- Non-Road and Off-Road Sources
  - For the region beyond Texas, used EPA's NMIM for non-road categories generating generic 2006 summer weekday emissions and used 2002 NEI for off-road categories grown to 2006 with EGAS
  - For regions within Texas, used TexN for non-road categories generating generic 2006 summer weekday emissions and used 2005 TexAER for off-road categories with Texas specific REMI-EGAS growth factors to 2006, except marine emissions in HGB which were taken from the Starcrest report, and aircraft/airport emissions in HGB and DFW, which were provided by AQP (Note: the 2006 baseline aircraft/airport emissions for HGB were provided via AQP through a stakeholders process and these emissions are airport-specific)
- Area Sources
  - For the region beyond Texas, used 2002 CENRAP/RPO inventory grown to 2006 with EGAS
  - For the region within Texas, used 2005 TexAER with Texas specific REMI-EGAS growth factors to 2006
- Biogenic Sources
  - used GloBEIS with region-specific land-use land-cover data and episode-specific solar radiation from GOES satellite imagery (note: the episode-specific biogenic emissions are used in both the 2006 baseline and the 2018 future case modeling)

2018 Future Point Source Modeling Emissions

- For the region outside Texas, used CENRAP/RPO regional haze 2018 modeling emissions for NEGUs, while the EGUs were modeled at their CAIR2 allocations (i.e., no trading)
- For the attainment region of Texas,
  - Used CAIR2 levels for existing EGUs, and growth of new EGUs was limited to the 9.5% set-aside
  - Used the larger of the TIPI or REMI EGAS factors to grow 2006 NEGU emissions to 2018 and included controls from recent DFW and BPA SIPs (e.g., East Texas Combustion Rule)
- For the DFW and BPA nonattainment areas,
  - Used CAIR2 levels for existing EGUs, and growth of new EGUs was limited to the 9.5% set-aside
  - Used larger of the TIPI/REMI EGAS factors or ERCs/DERCs to grow 2006 NEGU emissions to 2018 and included Chapter 117 ESADs
- For the HGB nonattainment area,
  - Used MECT for applicable EGUs and NEGUs
  - Used HECT for applicable NEGUs
  - Used larger of the TIPI/REMI EGAS factors or ERCs/DERCs to grow 2006 non-applicable MECT or HECT NEGU emissions to 2018
  - Used PSCFv3 EI-Reconciliation of HRVOC emissions with 59% reduction in Harris County

2018 Future On-Road Modeling Emissions

- For the region beyond Texas, used EPA's NMIM generating generic summer weekday 2018 emissions adjusted with TTI developed day-type ratios
- For Texas out side HGB and BPA, used TTI developed county-level, roadway-class, 2018 summer day-types emissions
- For HGB and BPA, used TTI developed link-based, hourly, 2018 summer day-types emissions

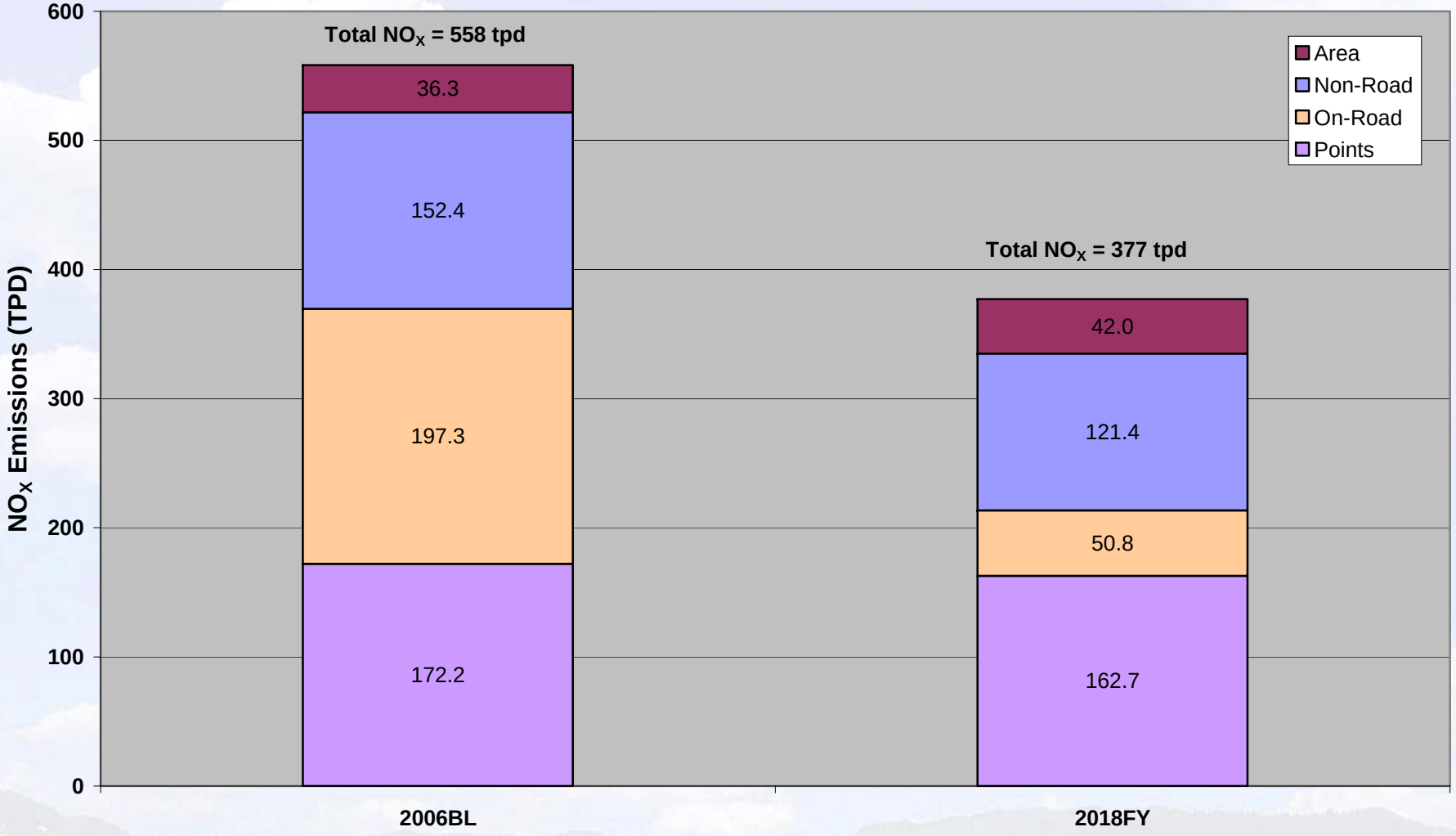
2018 Future Non- and Off-Road Modeling Emissions

- For the region outside Texas, used EPA's NMIM for non-road categories generating generic 2018 summer weekday emissions and used 2002 NEI for off-road categories grown to 2018 with EGAS with national controls on locomotives and marine vessels
- For regions within Texas, used TexN for non-road categories generating generic 2018 summer weekday emissions and used 2005 TexAER grown to 2018 with Texas specific REMI EGAS for off-road categories, except
  - For marine vessels in HGB and BPA, used emission trends provided by the HGB and BPA Port Authorities and 2007 and 2000 emission projections, respectively, provided from the Starcrest report
  - For aircraft/airports in HGB and DFW, used 2018 emission estimates from AQP (Note: the 2018 baseline aircraft/airport emissions for HGB were provided via AQP through a stakeholders process and these emissions are airport-specific)

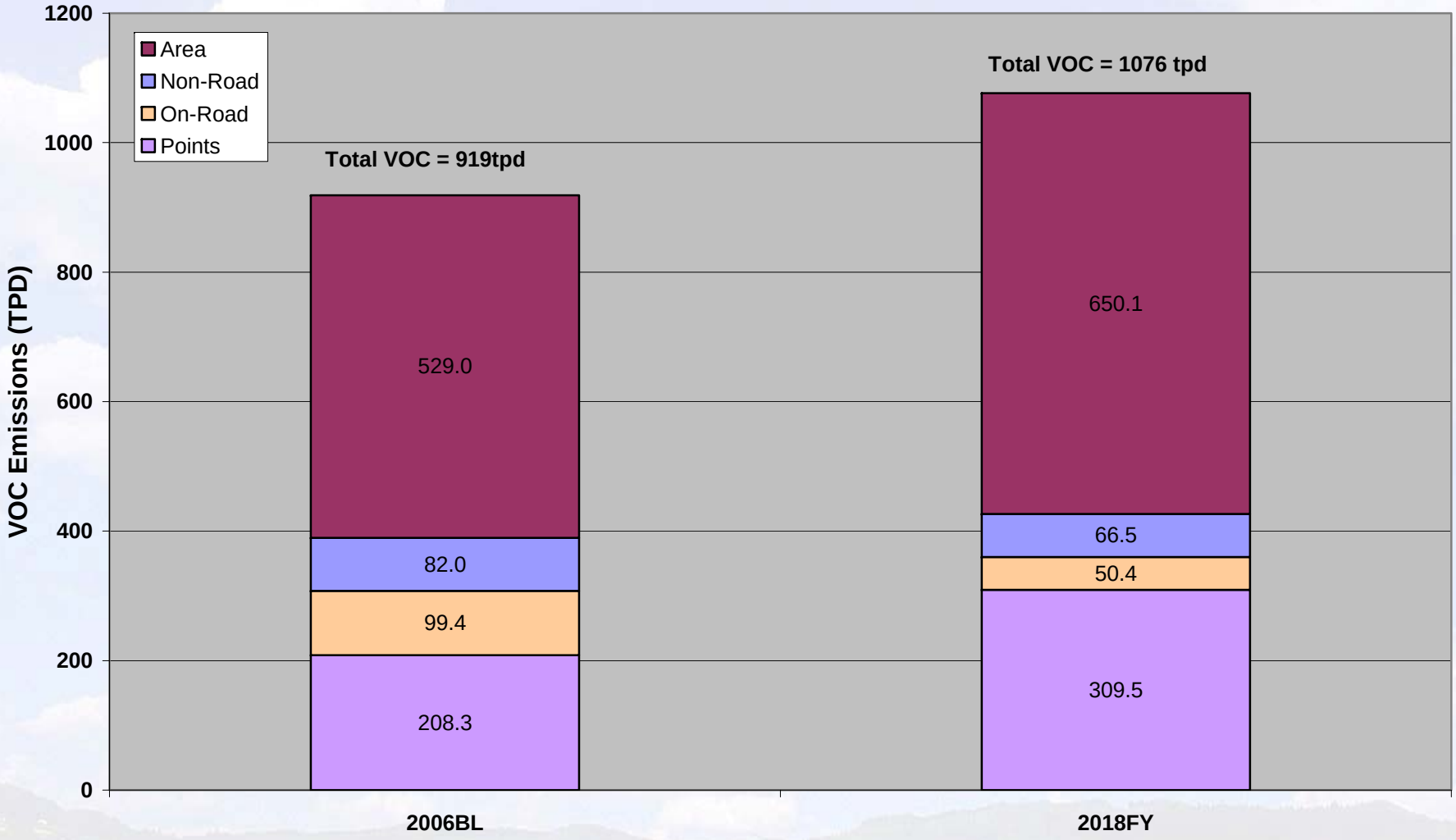
2018 Future Area Source Modeling Emissions

- For the region outside Texas, used CENRAP/RPO regional haze 2018 area source modeling emissions
- For the region within Texas, used 2005 TexAER grown to 2018 with Texas specific REMI-EGAS factors

2006 Baseline and 2018 Future Anthropogenic NO_X Modeling Emissions HGB Eight-County Area



2006 Baseline and 2018 Future Anthropogenic VOC Modeling Emissions HGB Eight-County Area

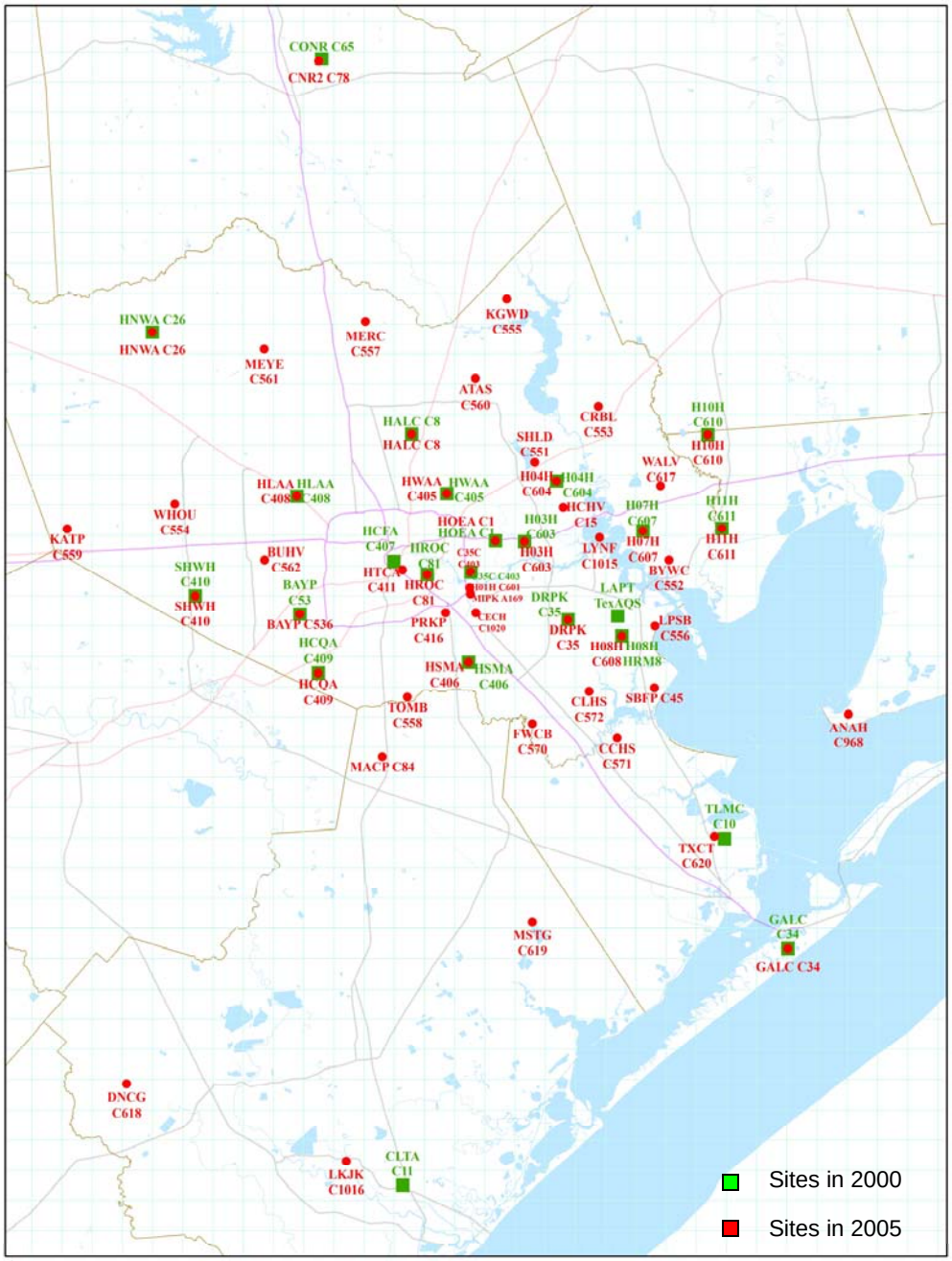


Met Modeling for 2006 Baseline and 2018 Future

Met modeling, same as for base case, includes:

- Observational nudging using radar profiler data in the 4 km domain
- New UT-CSR land-use/land-cover (LU/LC) data for surface characteristics
- New hourly- and spatially-varying sea surface temperatures algorithm (U of H)
- Grell cumulus parameterization scheme in the 4 km domain

HGB Ozone Monitoring Sites



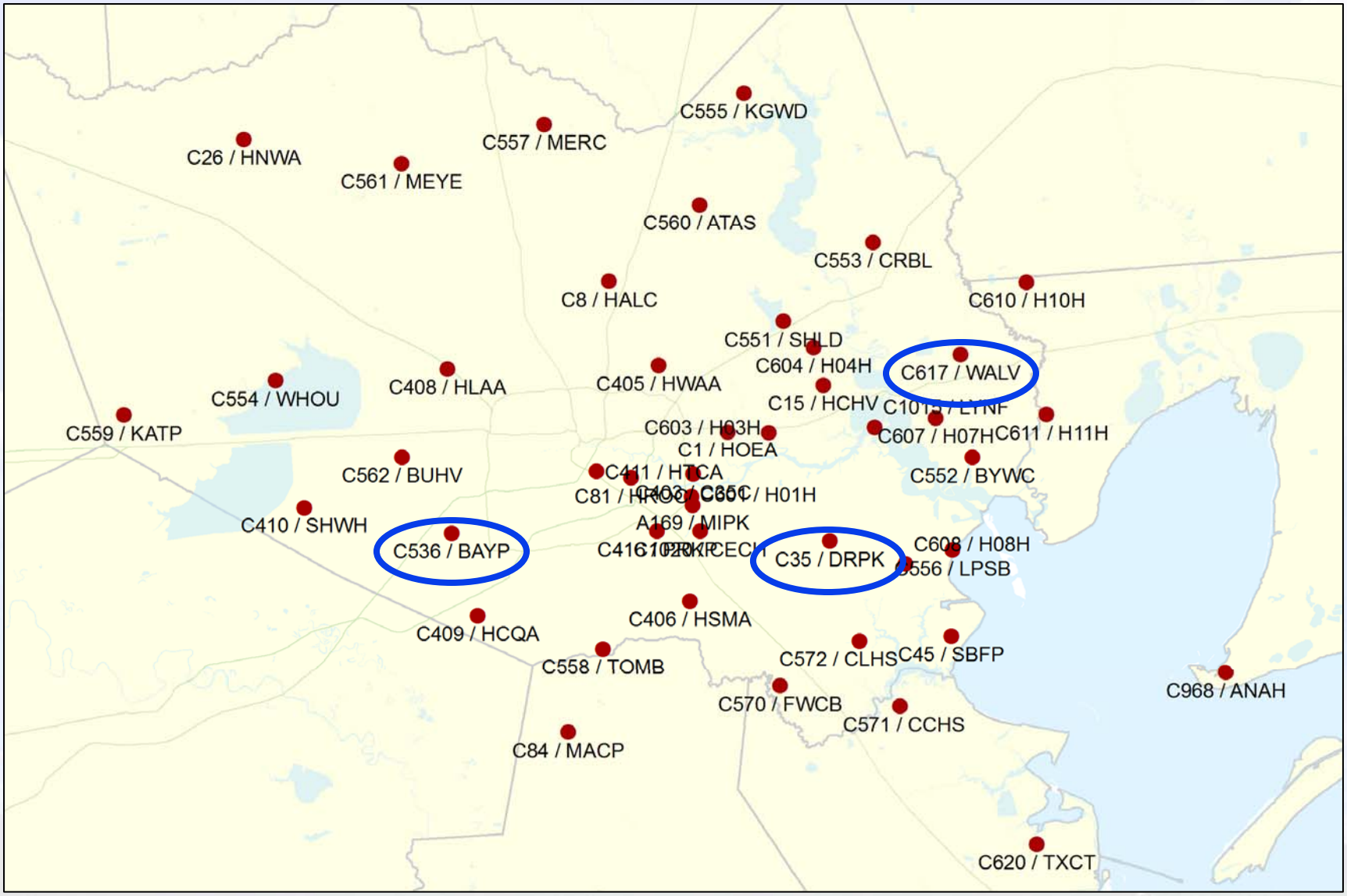
Site Code	Selected Site Name
BAYP	Bayland Park, Harris Co., TX
C35C	Clinton, Harris Co., TX
CNR2	Conroe Relocated, Montgomery Co., TX
DRPK	Deer Park, Harris Co., TX
GALC*	Galveston, Galveston Co., TX
H03H*	HRM-3, Haden Road, Harris Co., TX
H08H*	HRM Site 8, La Porte, Harris Co., TX
H10H*	HRM-10, Mt Belvieu, Chambers Co., TX
H11H*	HRM-11, , Chambers Co., TX
HALC	Aldine, Houston, Harris Co., TX
HCHV	Channelview, Houston, Harris Co., TX
HCQA	Croquet, Houston, Harris Co., TX
HNWA	NW Harris, Tomball, Harris Co., TX
HOEA	Houston East, Houston, Harris Co., TX
HROC	Houston Regional Office, Harris Co., TX
HSMA	Swiss and Monroe,, Harris Co., TX
HTCA	Texas Avenue, Houston, Harris Co., TX
HWAA	North Wayside, Houston, Harris Co., TX
LYNF	Lynchburg Ferry, Harris Co., TX
MACP	Manvel Croix Park, Brazoria Co., TX
MSTG*	Mustang Bayou, Brazoria Co., TX
SBFP	Seabrook Friendship Park, Harris Co., TX
SHWH	Westhollow, Houston, Harris Co., TX
TXCT*	Texas City, Galveston Co., TX
WALV*	Wallisville Road, Harris Co., TX

* Non-Regulatory Sites

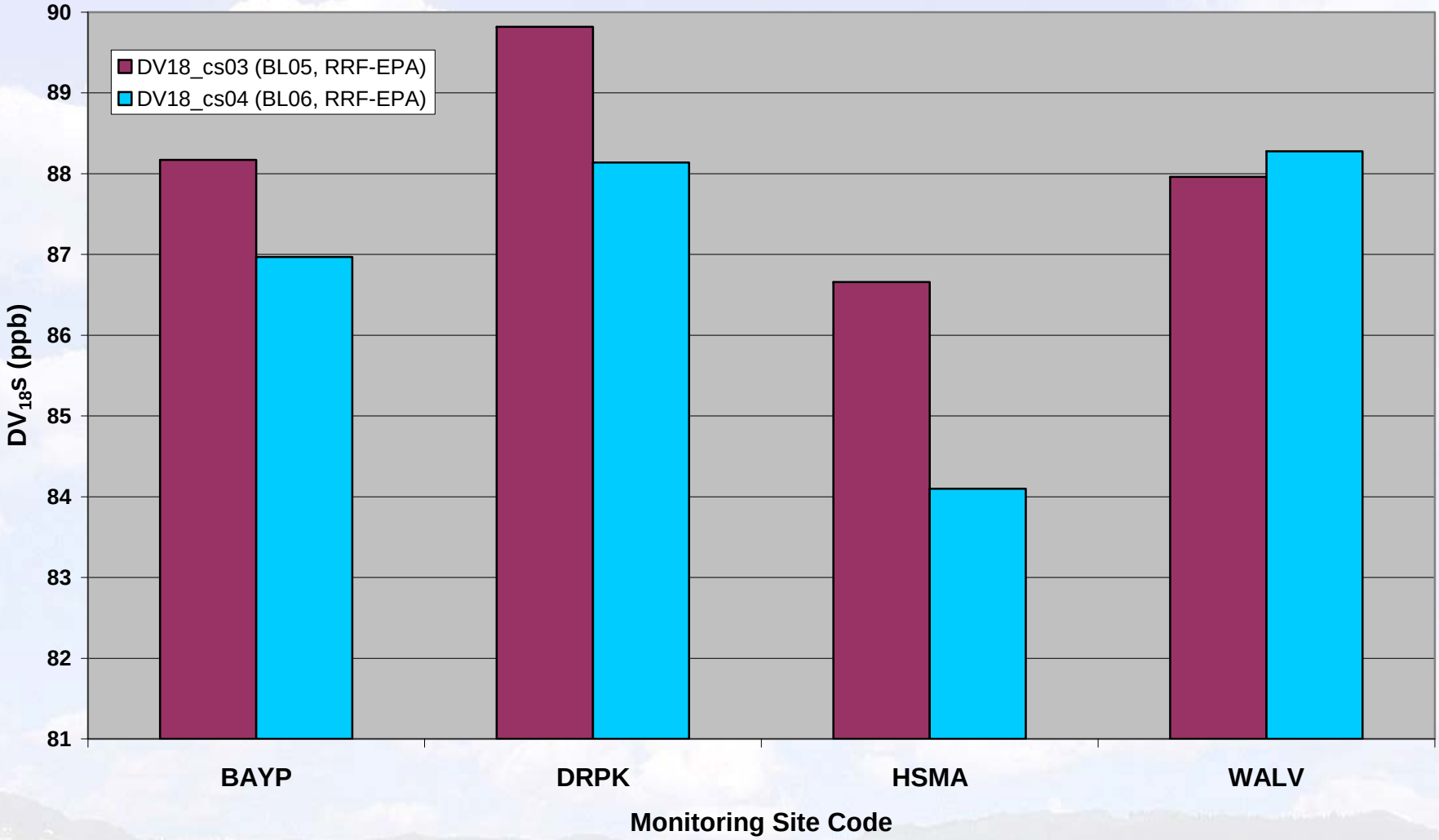
Updated 2018 Future Modeling Results

Site Code	2006 Baseline Design Value (ppb)	RRF: EPA Method	DV_{18}: EPA Method
BAYP	96.7	0.8994	87.0
C35C	79.0	0.9590	75.8
CNR2	83.0	0.8773	72.8
DNCG	80.3	0.8941	71.8
DRPK	92.0	0.9580	88.1
GALC	83.0	0.9553	79.3
H03H	84.0	0.9590	80.6
HALC	85.0	0.9199	78.2
HCHV	82.7	0.9577	79.2
HCQA	87.0	0.8994	78.3
HLAA	77.7	0.8885	69.0
HNWA	89.0	0.8691	77.4
HOEA	80.3	0.9588	77.0
HROC	79.7	0.9602	76.5
HSMA	90.3	0.9344	84.4
HTCA	79.3	0.9422	74.7
HWAA	76.3	0.9380	71.6
LKJK	77.0	0.9028	69.5
LYNF	81.7	0.9604	78.5
MACP	90.7	0.8999	81.6
MSTG	84.7	0.9168	77.6
SBFP	85.3	0.9450	80.6
SHWH	92.3	0.8586	79.2
TXCT	84.3	0.9461	79.8
WALV	92.0	0.9595	88.3

Regulatory Monitoring Sites with DV_{18}s $\geq$ 85 ppb



Comparison of 2018 Eight-Hour Ozone Design Values



Caveats to the 2018 Modeling using a 2006 Baseline

- CAIR phase 2 allocations were used in estimating 2018 future EGU emissions. Although the CAIR program has been remanded and its exact future form is uncertain, EPA supports the use of CAIR assumptions for SIP modeling;
- For 2018 NEGU emission projections, the larger of the ERCs plus DERCs or the TIPI/REMI-EGAS growth factors were used in the DFW, BPA and HGB nonattainment areas, which provides a conservative estimate for growth;
- The meteorological inputs are based on MM5 modeling with the Grell cumulus parameterization scheme applied in the 4 km domain to mitigate cloud/rain issues; and
- A portion of the reconciled HRVOC emissions (59%) within Harris County were assumed to be controlled by HECT in 2018.

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