Near-road NO_2 - Implementation Support

Nealson Watkins
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Near-road NO_2 Resources

- Near-road NO_2 Monitoring Technical Assistance Document (TAD)
- Pilot Study Report
- Pilot Study QAPP
- Webinars

- All available on AMTIC

  http://www.epa.gov/ttn/amtic/nearroad.html

Pilot Study and TAD partners:

- Broward County (FL) Pollution Prevention Remediation and Air Quality Division
- City of Albuquerque Environmental Health Department
- Hillsborough County (FL) Environmental Protection Division
- Idaho Department of Environmental Quality
- Maryland Department of the Environment
- NACAA Monitoring Steering Committee
- Florida Department of Transportation
- Texas Department of Transportation
- U.S. Department of Transportation Federal Highways Administration
- American Association of State Highway and Transportation Officials
- Sonoma Technology, Inc. (contract)

Near-road NO_2 TAD Objectives

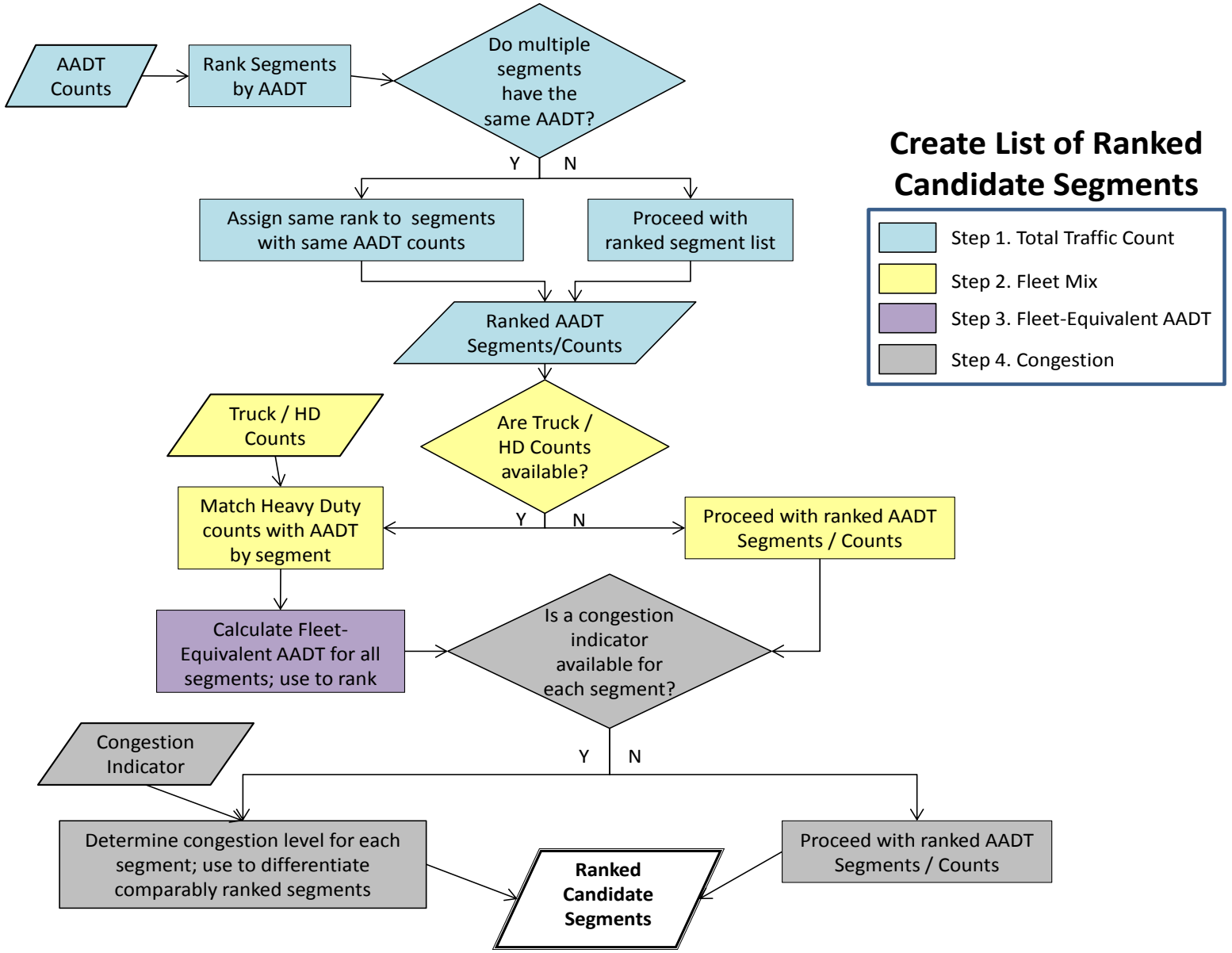
- The primary objective of the TAD:
  - Provide a set of technical approaches, and their rationale, for the near-road NO_2 site selection process by which state and local air monitoring agencies might implement near-road NO_2 monitoring stations in a manner that satisfies 40 CFR Part 58 requirements.

- A secondary objective:
  - Present information on other pollutants of interest in the near-road environment (definitions, reason of interest, and measurement methods).

Where does the near-road site go?

- Where maximum hourly NO_2 concentrations are expected to occur – considering:
  - Annual Average Daily Traffic (*traffic volume*)
  - Fleet mix (*ratio of diesel to gasoline fueled vehicles*)
  - Roadway Design (*lay of the road, grade, structure, etc*.)
  - Congestion patterns (*at-speed versus stop-and-go traffic*)
  - Terrain (*immediate and larger scale surrounding terrain*)
  - Meteorology (*climatologically based)*
  - ❖ *Population exposure is considered subsequent to these 6 factors.*

- Key passage from Appendix E: "…the monitor probe **shall be as near as practicable** to the outside nearest edge of the traffic lanes of the target road segment…"
  - No greater than 50 meters from edge of road



Candidate Road Segment Ranking Process: This flowchart presents the traffic data evaluation process to provide a prioritized list of candidate road segments (accounting for traffic volume [AADT], fleet mix, and congestion) for further evaluation as potential near-road NO_2 monitoring stations.

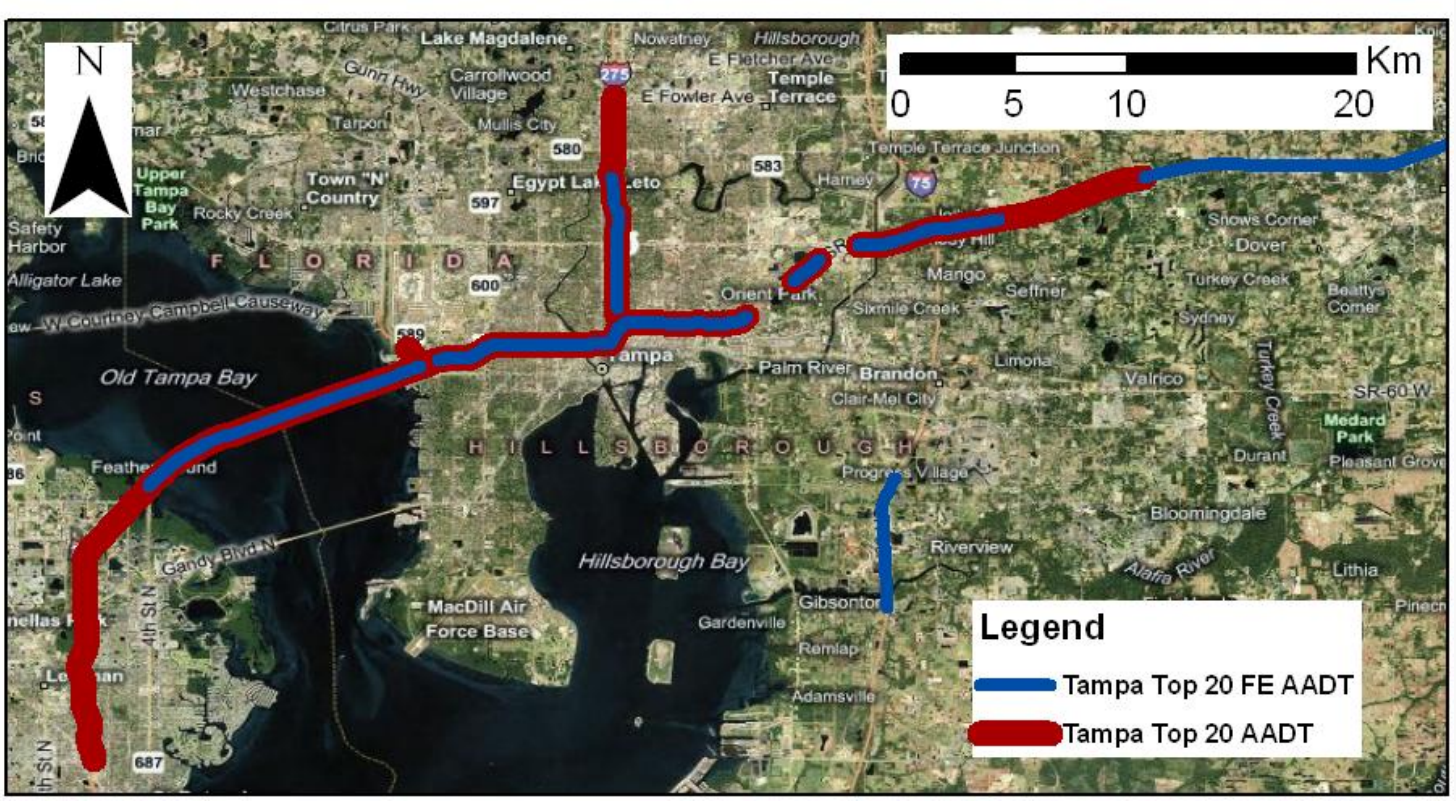
Example of a Prioritized List of Candidate Sites – Based on Traffic Analysis (Tampa CBSA)

Roadway	From	To	AADT	AADT Rank	Heavy Duty Vehicle AADT	Heavy Duty Vehicle AADT Rank	FE AADT	FE AADT Rank	(1999 LOS) (2005 LOS) 2007 LOS *2007 LOS* 2010 LOS
I-4	10320000/10320001	Bridge No-100658	164,000	6	12,251	10	274,259	1	(F)
I-275	Bridge No-100128	Bridge No-100110	192,000	1	8,467	27	268,203	2	(F)
I-4	US 301 / SR 43	I-75/SR 93A	136,500	15	14,073	5	263,157	3	F
I-4	Bridge No-100658	US 41/SR 599/50TH ST	151,000	13	12,050	11	259,450	4	(F)
I-4	I-75/SR 93A	Mango Rd	136,500	15	13,172	6	255,048	5	F
I-275	S600/U92/DALE MABRY	Bridge No-100128	170,500	3	8,713	25	248,917	6	(F)
I-4	Bridge No-100599	S566/THONOTOSASSA RD	110,000	25	15,279	3	247,511	7	F
I-4	Bridge No-100607	HILLS/POLK CO LINE	105,000	28	15,719	1	246,471	8	F
I-275	SLIGH AVE	Bridge No-100219	167,000	5	8,684	26	245,156	9	(F)
I-275	Bridge No-100138	10320000/10320001	169,000	4	8,298	29	243,682	10	(F)
I-275	Bridge No-100110	Bridge No-100138	169,000	4	8,298	29	243,682	10	(D)
I-275	FLORIBRASKA AVE	Bridge No-100203	160,500	8	9,229	21	243,561	11	(F)
I-275	CR587/WESTSHORE BLVD	Bridge No-100120	176,500	2	7,413	36	243,217	12	(F)
I-4	Bridge No-100605	Bridge No-100607	103,000	29	15,388	2	241,492	13	F
I-275	Bridge No-100120	S600/U92/DALE MABRY	163,000	7	7,824	32	233,416	14	(F)
I-4	MCINTOSH RD	Bridge No-100599	117,932	22	12,595	8	231,287	15	F
I-275	EAST END BR 150107	Bridge No-100115	147,000	14	9,026	22	228,234	16	(E)
I-275	4TH ST N	END BRIDGE 150107	147,000	14	9,026	22	228,234	16	D
I-4	S566/THONOTOSASSA RD	Bridge No-100605	98,000	30	14,396	4	227,564	17	F
I-275	SR 600 / HILLS AVE	SLIGH AVE	156,500	10	7,669	34	225,521	18	(F)
I-75	GIBSONTON DR	SR 43 / US 301	111,500	24	12,577	9	224,693	19	C
I-4	SR 574/ML KING BLVD	ORIENT RD	122,000	20	11,236	13	223,124	20	E
I-275	Bridge No-100203	SR 600 / HILLS AVE	153,500	11	7,736	33	223,124	20	(F)
I-4	Mango Rd	MCINTOSH RD	127,000	18	10,465	16	221,185	21	F
I-275	SR 580 / BUSCH BLVD	Bridge No-100231	151,500	12	7,105	39	215,445	22	(E)

Note that Fleet Equivalent AADT (FE AADT) is calculated by the air agency from AADT counts, Heavy Duty counts, and a HD to LD NOx emission ratio. The ratio can be national default (10), or specific for the CBSA if determinable.

AADT vs. FE AADT

- Shown below is a case example of the difference in focus and prioritization that FE AADT provides versus AADT alone for the Tampa, Florida CBSA



Physical Considerations

For the near-road site selection process, we must also consider:

- Roadway design
- Roadside features
- Terrain
- Meteorology

Physical Site Component	Impact on Site Selection	Desirable Attributes	Least Desirable Attributes	Potential Information Sources
Roadway design or configuration	Feasibility of monitor placements; affects pollutant transport and dispersion	At grade with surrounding terrain;	Deep cut-sections/significantly below grade; significantly above grade (fill or bridge); above grade (bridge)	Field reconnaissance; satellite imagery
Roadside Structures	Feasibility of monitor placement; affects pollutant transport and dispersion	No barriers present besides low (<2 m in height) safety features such as guardrails	Presence of sound walls, mature (high and thick) vegetation, obstructive buildings	Field reconnaissance; satellite imagery
Terrain	Affects pollutant dispersion, local atmospheric stability	Flat or gentle terrain, within a valley, or along road grade	Along mountain ridges or peaks, hillsides, or other naturally windswept areas	Field reconnaissance; digital elevation models and vegetation files; satellite imagery
Meteorology	Affects pollutant transport and dispersion	Relative downwind locations – winds from road to monitor	Strongly predominant upwind positions	Local data; NOAA/NWS; AQS

Siting Criteria

- Station should be as close as practicable to the road
- Vertical probe placement should be as close to breathing height as possible (~ 2m)
- Maintain proper spacing from other structures and land features

Near-Road NO2 Siting Criteria (per 40 CFR Part 58, Appendix E)	
Horizontal spacing 	Per 40 CFR Part 58 Appendix E: "As near as practicable to the outside nearest edge of the traffic lanes of the target road segment; but shall not be located at a distance greater than 50 meters, in the horizontal, from the outside nearest edge of the traffic lanes of the target road segment." ***The EPA recommends the target distance for near-road NO_2 monitor probes be within 20 meters of the target road whenever possible.**
Vertical spacing	Microscale near-road NO_2 monitoring sites are required to have sampler inlets between 2 and 7 meters above ground level. ***The EPA recommends the target height be as close to 2 meters (i.e. ground-level) as possible.**
Spacing from supporting structures	The probe must be at least 1 meter vertically or horizontally away from any supporting structure, walls, parapets, penthouses, etc., and away from dusty or dirty areas.
Spacing from obstructions	For near-road NO_2 monitoring stations, the monitor probe shall have an unobstructed air flow, where no obstacles exist at or above the height of the monitor probe, between the monitor probe and the outside nearest edge of the traffic lanes of the target road segment.

Site Logistics – Engaging Transportation Agencies

- The following information should be provided to share in advance of engaging transportation agencies regarding ROW access:
  - Air agencies own and are responsible for the monitoring equipment/site
  - The air monitoring site would be used/needed for the long term (permanent)
  - The physical dimensions of the monitoring site and shelter
  - The type of structure (shelter) that would be installed at the site - (Pictures are useful)
  - How often would air monitoring staff need to access the site – (typically weekly)
  - If there are no existing utilities at the candidate site location, the air agency will prepare the request for permit, and subsequently pay for the installation of required utilities
  - Air agencies would be financially responsible for the upkeep of the monitoring station
  - Air agencies would be responsible for any closure, removal, and relocation of the station, if necessary.

Site Logistics - Safety

- **Air agencies should make safety a top priority**
- Within the ROW, transportation agencies will be concerned about safety of travelling public and the monitoring staff and site
- Based on experience, monitoring sites can be placed very close to major roads in a safe manner through the use of safety devices and/or the consideration of ‘clear zones’ and other transportation agency safety concepts and recommendations.
- State and local air agencies will likely be able to install safety devices (i.e., guard rails, barriers, etc.) to protect the site and the public, in collaboration with their respective transportation agency
- Encourage not accessing the site from the highway, but find alternative access points through consultation with the transportation department and local land owners

Final Site Selection - Considerations

- When preparing all available data from which to make a selection, ensure that these considerations are taken into account:

- Population exposure (per rule) – Amongst otherwise similar top-ranked & available candidate sites (targeting peak NO_2 in the near-road environment), go with the site that represents relatively greater population exposure

- Avoid highly unique locations – Considering unique roadway designs or features (i.e., toll booths and tunnels) and larger nearby NO_X sources, it is advised that when possible, avoid near-road locations that are highly unique due to such characteristics or influences

Multi-pollutant Monitoring

- Unless required (e.g., NO_2 and CO for some locations) the multi-pollutant monitoring concepts presented are optional, but strongly encouraged

- What we think you should measure:
  - **NO_2** (FRM/FEM; consider photolytic method or others?)
  - **CO** (may be required; dependent on CBSA size)
  - Black Carbon
  - Meteorology (10 meter tower if possible; WS/WD/T/RH minimum)

Multi-pollutant Monitoring (cont.)

- What you should consider measuring:
  - Air toxics (at least BTEX)
  - Ultrafine PM (size distributed {$$$} or total counts {$$})
  - Traffic data (if not available nearby)
  - $PM_{2.5}$
  - PM_{coarse}
  - CO_2
  - OC & EC
  - Ozone

Near-road NO_2 TAD Wrap-up

- The TAD reflects input from state and local air agencies, associations, transportation agencies, in addition to multiple EPA offices: Regions, Office of Transportation Air Quality, Office of Research and Development, and OAQPS

- CASAC Ambient Monitoring and Methods Subcommittee consulted 2 times (September 2010 & September 2011)
  - http://yosemite.epa.gov/sab/sabproduct.nsf/8732AE5524171F75852579AD00716A85/$File/EPA-CASAC-12-003-unsigned.pdf

➢ Next version of TAD to be posted this month (May 2012)
  - No major differences between the May 2012 version and the December 2011 version – only editorial corrections and graphics improvements

What's next?

- People will be watching!
  - Where are the sites going and why?
  - What do the data look like?

- Annual Monitoring Plans
  - State and locals air agencies: talk to your Regional contacts
- EPA is pursing a rule change to address implementation timing