

# RDE GTR Development

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US EPA

SEOUL, KOREA

OCTOBER 29<sup>TH</sup>, 2019



# Outline

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- Do EPA Test Routes Meet RDE4 Route Requirements?
- Do EPA Tested Vehicles Comply with RDE4 Requirements?
- Ideas to Improve Upon Current Test Procedures
- Summary

# Do EPA Test Routes Meet RDE4 Route Requirement?

	Vehicle A		Vehicle B		Vehicle C	Vehicle D						Vehicle E				Vehicle F		Vehicle G						
<b>RPA</b>	P	P	P	P	P	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
<b>V x Accel</b>	F	P	P	P	P	P	P	P	P	P	P	F	F	F	F	P	P	F	P	F	F	P	P	P
<b>CO2 MAW</b>	P	F	P	P	F	P	P	P	F	F	F	P	P	P	P	P	P	F	F	F	F	P	F	F
<b>Test Duration</b>	F	P	F	P	F	F	F	F	F	F	F	F	P	F	F	F	F	F	P	F	F	F	F	P
<b>U/R/M Split</b>	F	P	F	P	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F

- Routes used by EPA's NVFEL were not designed to comply with RDE4 route requirements
- Each route was designed to replicate a specific type of driving rather than covering the full spectrum of vehicle operation in one route
- Routes can be arranged such that RDE4 route validity is completely met

# Do EPA Tested Vehicles Pass RDE4

Vehicle	Vehicle A		Vehicle B		Vehicle C	Vehicle D						Vehicle E				Vehicle F		Vehicle G					
Bin Label	T2 Bin 4											T3 Bin 160				T3 Bin 125		T2 Bin 4					
Standards	40											160				125		40					
FTP Composite	9	9	11	11	17	17	17	17	17	17	17	31	31	31	31	8	8	6	6	6	6	6	6
RDE Total	9	7	31	50	20	24	19	24	22	25	32	163	148	90	195	51	69	22	19	20	19	12	25
RDE Urban	6	5	43	54	17	40	31	40	29	96	37	424	267	196	291	123	120	39	32	32	37	16	38

Yellow	>Standard
Red	>1.43*Standard

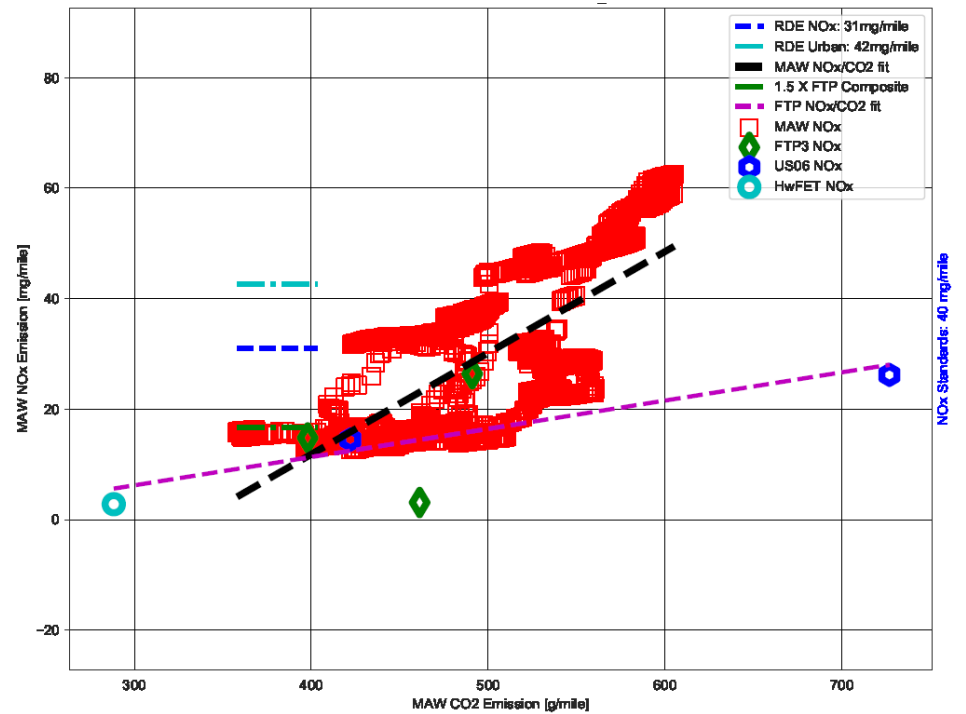
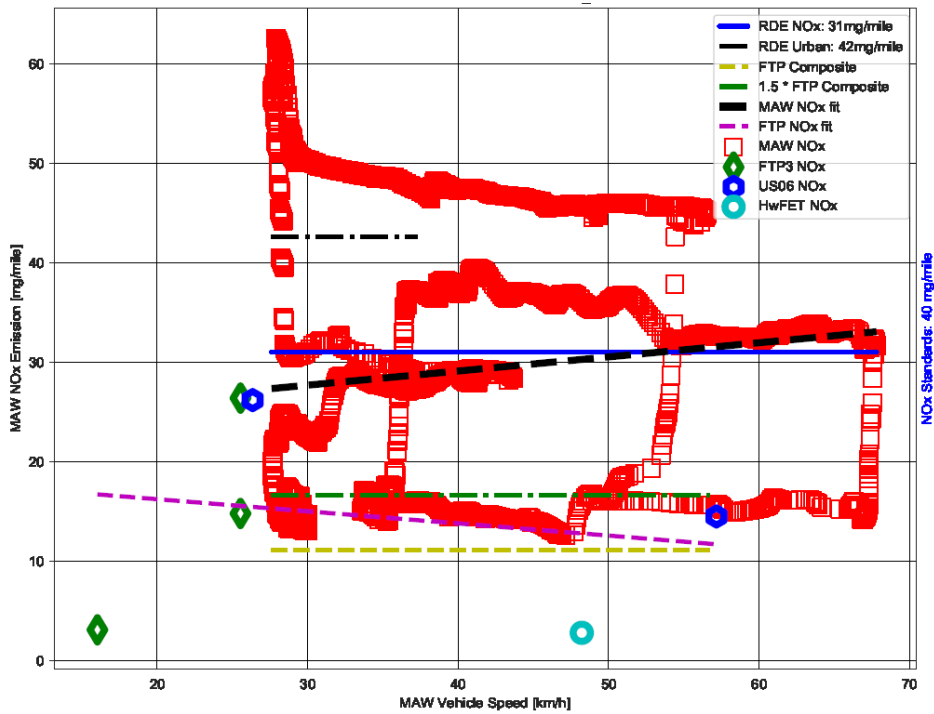
- Besides vehicle D, emissions were consistent across drive routes
- Even though routes do not comply with RDE4 requirements the clean vehicles seem to be clean regardless of how they are driven

# Ideas to Improve Upon Current Test Procedures

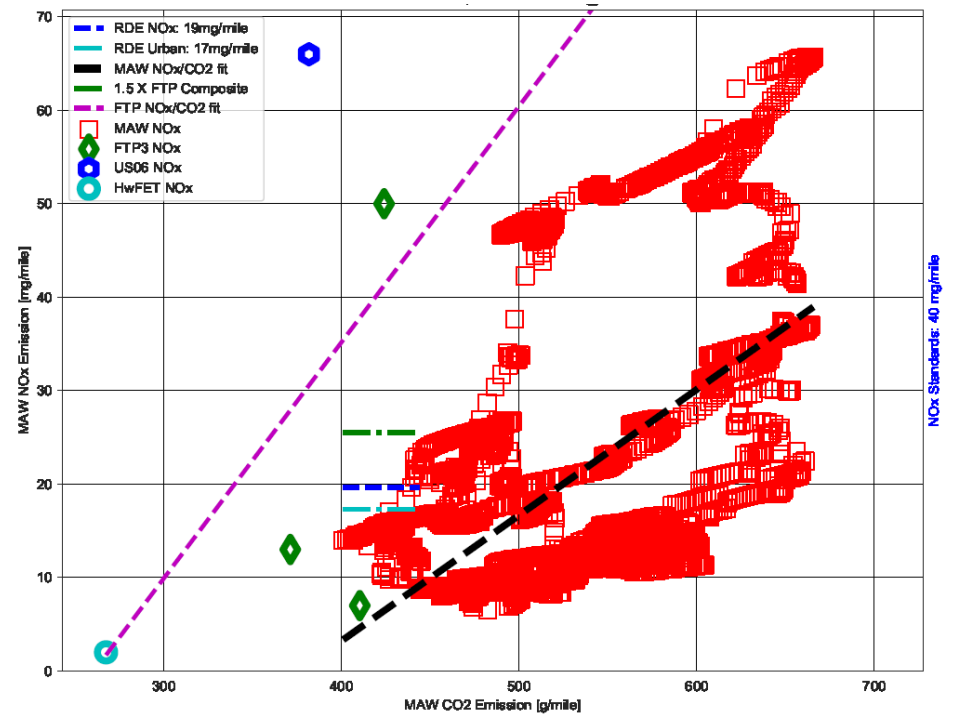
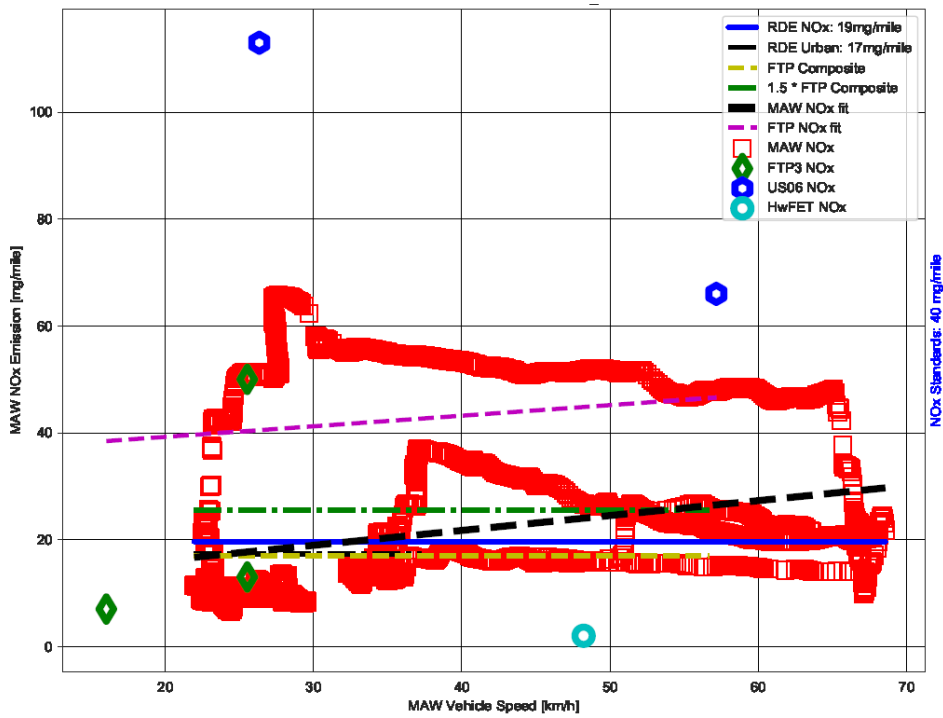
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- Are main concern with the European RDE procedure is with the constraints on the routes that can be used for a valid test
- One possible way to handle this is by dividing test data into segments so that the appropriate standard can apply for each segment
- To date we have looked at using window average speed and window CO<sub>2</sub> (g/km) to divided up in-use test data
  - For the United State the standards could be based on FTP, HWY and US06 emission levels

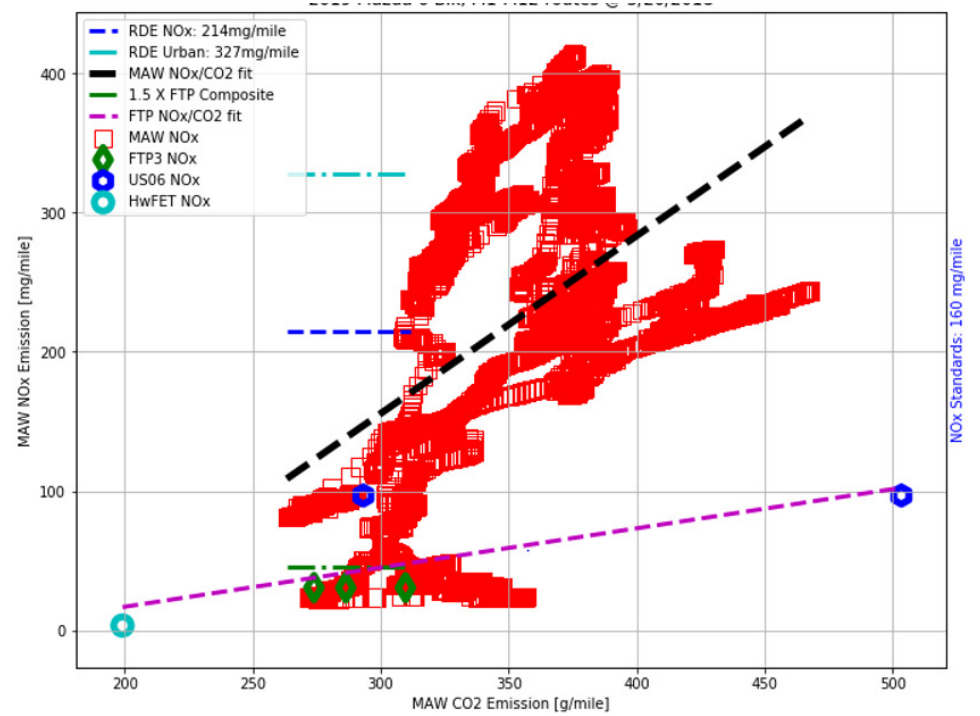
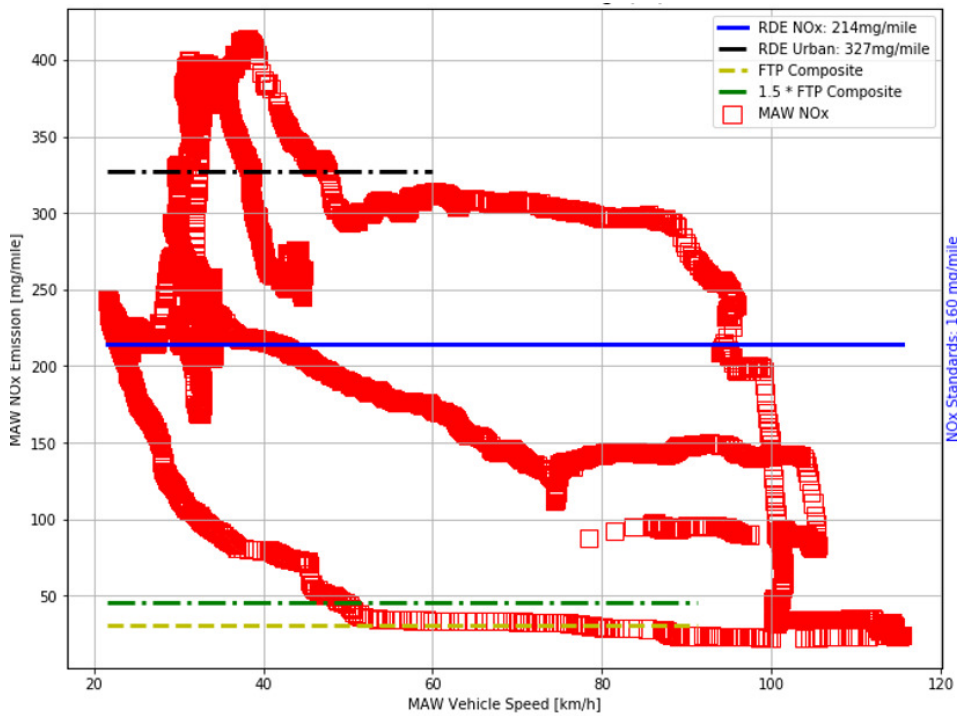
# Vehicle B



# Vehicle C

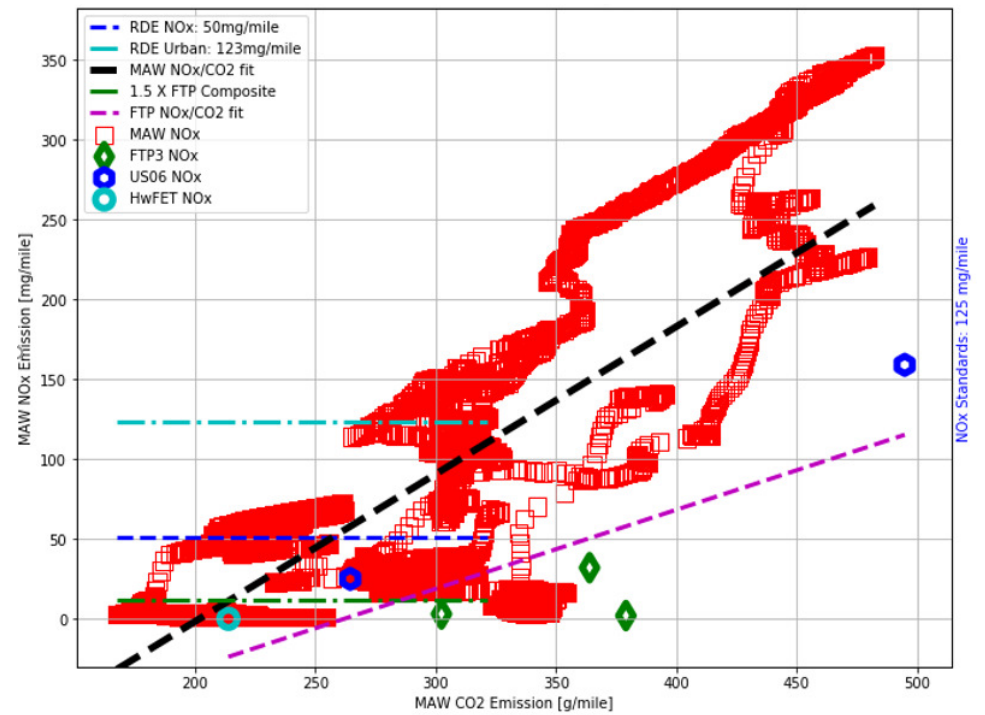
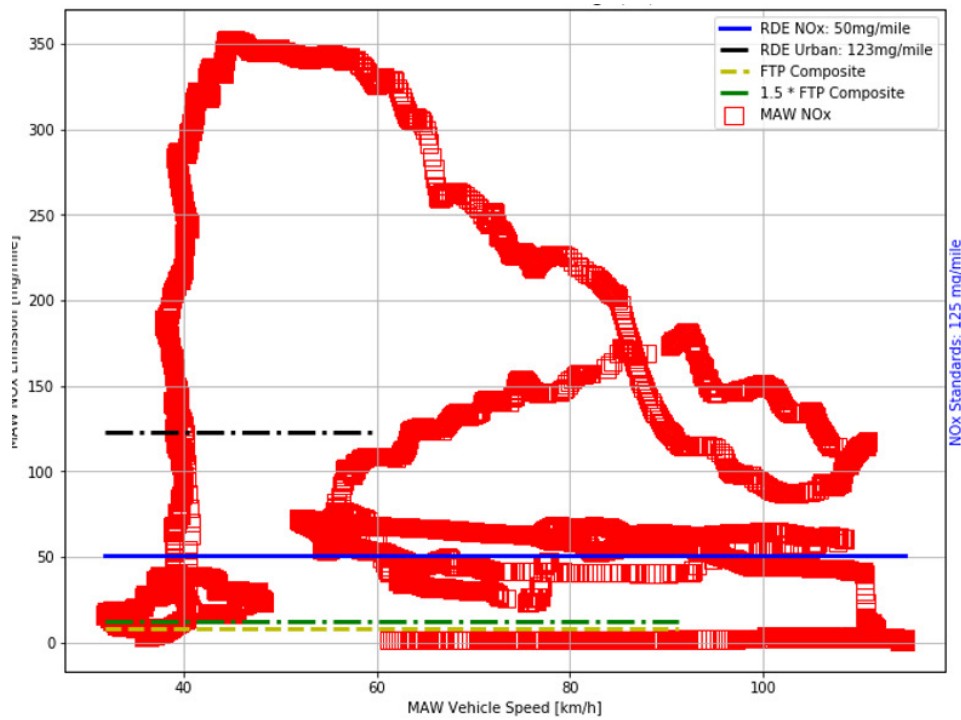


# Vehicle E





# Vehicle F



# Summary

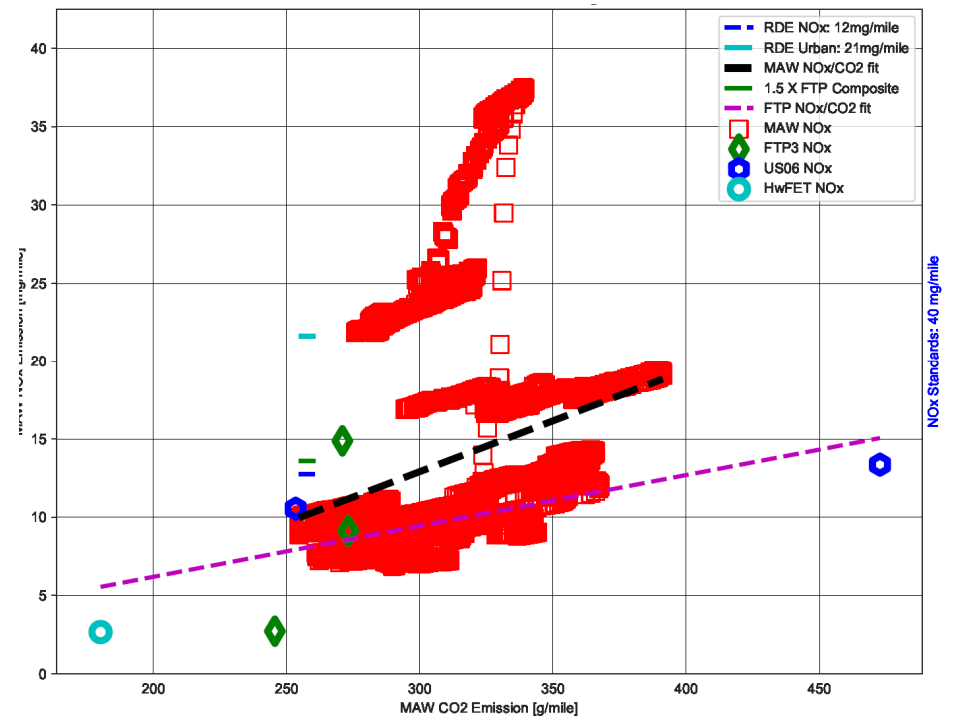
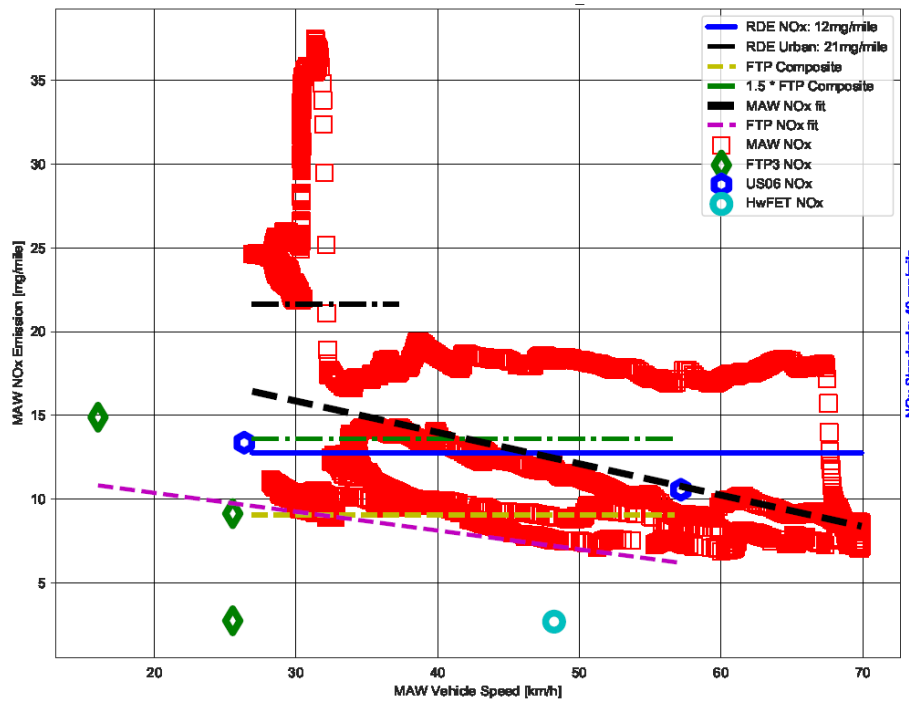
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- RDE4 procedure constrains in-use routes can be used for test procedure
- EPA routes can be arrange in a way to pass RDE4 route requirements
- At least one vehicle that EPA has tested would fail RDE4
- RDE emissions are route and environmental conditions dependent
- Looking into ways to not require defined route, but still have appropriate standards for different driving conditions
- Cold start operation may need to be binned separately

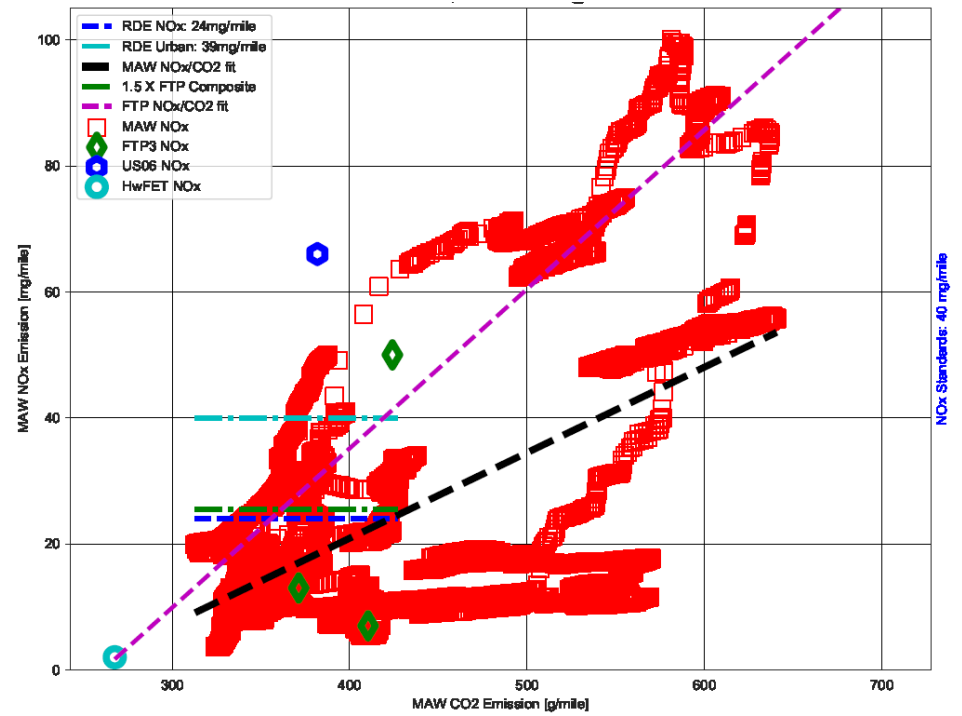
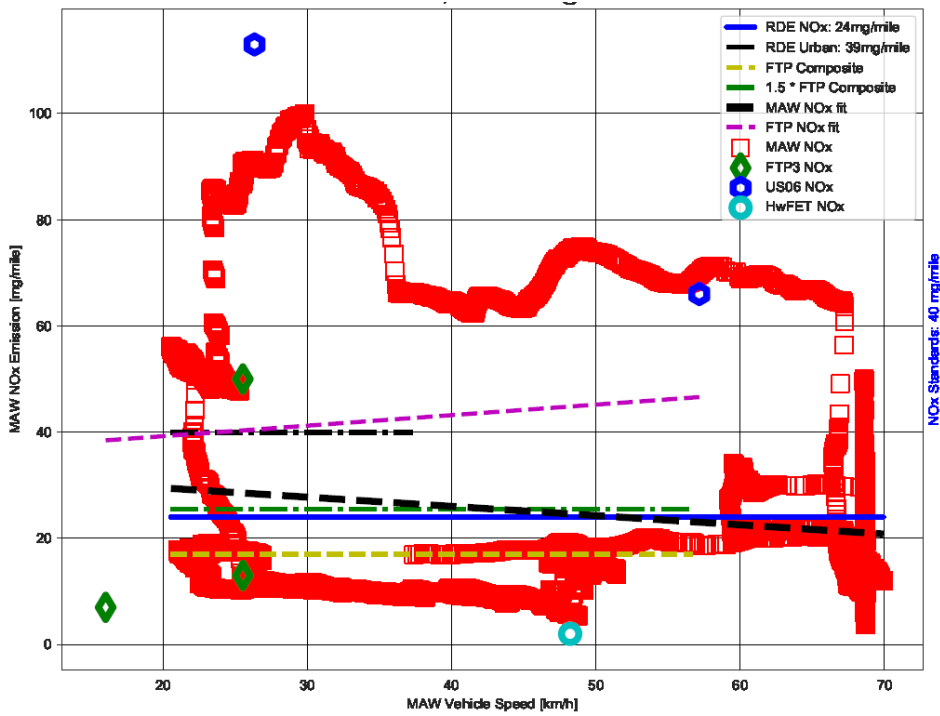
# Appendix

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# Vehicle A



# Vehicle D



# Vehicle G

