National Capital Region Transportation Planning Board

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MEMORANDUM

March 29, 2006

To: Transportation Planning Board Technical Committee

From: Michael J. Clifford
               Systems Planning Applications Director

Subject: April 7, 2006 Technical Committee Meeting Item 9 Materials.

Since this agenda item ranges over three different air quality planning topics, I am writing this memo to provide an overview of the materials to be discussed (three attachments) and to place them into context for discussion.

The first attachment contains a wealth of information concerning the preliminary results of the 'VIN Decoder' program, which reads vehicle identification numbers to categorize each vehicle into Mobile6-specific vehicle types. The attached file is fairly large, even though we include only a powerpoint overview and some summaries using Virginia data as an illustration. This is our first year's application with the VIN decode process; results appear very promising for application in ongoing SIP and upcoming conformity work activities.

The second attachment presents draft results of the latest comparison of 'monthly vs. seasonal' approaches to the estimation of total yearly mobile source emissions. We briefed the Committee in February on the two approaches; as then, the two approaches offer very similar results, with a significant savings in computer time associated with the seasonal approach (here aggregated one step further into three 'seasons' to better address fuel program changes throughout the year).

The third attachment contains COG DEP's current schedule for development of the 8-hour ozone state implementation plan.

Staff will provide additional details on each of these items at the April 7th Technical Committee meeting.

Attachments (3)

METROPOLITAN WASHINGTON ◎ COUNCIL OF GOVERNMENTS

Local governments working together for a better metropolitan region

Memorandum

District of Columbia
Bowie
College Park
Frederick County
Gaithersburg
Greenbelt
Montgomery County
Prince George's County
Rockville
Takoma Park
Alexandria
Arlington County
Fairfax
Fairfax County
Falls Church
Loudoun County
Manassas
Manassas Park
Prince William County

Date: February 28, 2006

To: File

From: Michael Freeman

Subject: Evaluation of 2005 Vehicle Registration Data for Northern Virginia Jurisdictions of the Washington Area

Background

The Mobile 6.2 model that is used to develop emissions rates for mobile source emissions inventory for the State Implementation Plan (SIP) and transportation conformity analysis requires a number of vehicle-specific inputs. In the Washington non-attainment region emissions rates are developed for each jurisdiction in the non-attainment area. Two of the inputs are: vehicle registration data used to develop age distribution by vehicle type, and the percentage of diesel vehicles for each vehicle type. As part of the interagency consultation procedures in place, the transportation department and the environmental department have agreed to update these data sets once every three years. The region has been using 2002 registration data sets for all emissions analysis and we are in the process of using the 2005 raw registration data information to develop 2005 input files to the Mobile 6.2 model.

Vehicle registration data have been used to develop the two input files used in the Mobile 6.2 model; namely "xxx.rdt" (age distribution by vehicle type) and "xxx.dsf" (percentage of diesel vehicles for each vehicle type and for each model year). VDOT staff has transmitted to TPB staff 2005 raw registration data files as well as "xxx.rdt" and "xxx.dsf" files developed using their own methodology from the 2005 raw registration data. TPB staff has

used these raw data to produce a second set of "xxx.rdt" and "xxx.dsf" files using a method that includes vehicle identification number (VIN) decoding software. This memo will document TPB staff's findings and make recommendations for developing rdt and dsf files for future air quality planning studies.

Methodology

COG used the following outline to develop rdt and dsf files (depicted graphically in Attachment 1.0).:

1) Extract all unique VIN (deleting duplicates and purging expired registrations) by jurisdiction from the 2005 vehicle registration database (July 2005 snapshot) and decode with VINPOWER decoding software. The decoding software provided model year, Mobile 6.2 vehicle type, and other vehicle attributes. Attachment 1A summarizes the VIN control totals and decoded results. A summary of the number of decoded VIN by vehicle type and jurisdiction is provided in Attachment 1B.

2) Convert the decode results:

   a. Vehicle age distribution: This is the first of the two input files needed.

      i. *Vehicle type*: The VIN decoder software breaks down the registration data in to the Mobile 6.2 28 vehicle categories. However, the current version of Mobile 6.2 16 can only handle registration (xxx.rdt) files in 16 vehicle types and it uses the "xxx.dsf" files internally to break it into 28 categoires. Therefore, the decoded data are converted from the 28 (Mobile 6.2) types to 16 vehicle types by combining the diesel and gasoline vehicle types. Attachment 2 shows the method used for converting the 28 types to 16 types.

      ii. *Model Years*: Since the raw registration file reflects July 1, 2005 conditions, it includes model year 2005 and 2006 as the first year vehicles. The Mobile 6.2 guidance recommends combining the two model years into model year 'one'. In addition, Vinpower does not

decode VINs for vehicles that were manufactured prior to 1980 since the VINs did not meet International Standards Organization (ISO) standards prior to 1980. In order to solve this problem, we used the decoded results to directly assign vehicles to model years one through twenty-four, and used the year 24 profile to develop year 25 and older model years. The vehicle registration records were used to determine control totals by jurisdiction for: (A) Mobile 6 vehicle type years < than 25; (B) Mobile 6 vehicle types year = 25 or older. For Mobile 6 vehicle type year = 25, apply regional distribution for mobile year = 24 and normalize to match control total % from step (B). For Mobile years 1 through 24, use vin decode results to develop distributions by vehicle type and year. Then normalize years 1 through 24 of each row so that years 1 through 25 = 100%. Develop 16 (vehicle type) by 25 (Mobile 6 year) matrices by jurisdiction. This is the rdt file for input into Mobile 6.

b. Diesel percentages by vehicle type: This is the second input file needed in Mobile 6.2 model. For percentage of diesel vehicles by vehicle type and by year (xxx.dsf) file development, use the vehicle equivalency table and the VIN decode to calculate the number of diesel and gasoline vehicles for each of the 16 vehicle types. The ratio of diesel vehicles to the total number of vehicles is the dsf for each category. Since the VIN decoder will not decode for year 25, use the dsf calculated for year 24 for year 25, also.

Comparison with VDOT Data

The next step in the processes was to compare the data developed using the methodology described above with data developed by VDOT staff. The attached comparison charts were used to summarize the findings.

1)   Vehicle Age Distribution

a. For LDV and LDT1, LDT2, LDT3, LDT4 (less so than the others) vehicle types, the estimates from VDOT and the VIN Decodes are very close for each jurisdiction.

b. Generally "Heavy Duty" vehicle categories do not track as well as "Light Duty" vehicle categories among all jurisdictions.

c. For the motorcycle category, the VDOT method seems to put all vehicles older than 12 years into the 12th year category and no values are provided for years 13 through 25.

2) Percentage of Diesel Vehicles: For this comparison we aggregated all the northern Virginia data into one instead of breaking down by jurisdiction and compared them against Mobile 6 defaults. The reason behind this action was due to the fact that diesel vehicles by vehicle types were low in a number of jurisdictions and by aggregating we were able to increase the total number of vehicles for each vehicle type.

a   *LDV: Both the vin decodes and Mobile defaults have dsf values near zero for* years 1 to 20. For years 20 to 25, the mobile defaults increase to about 0.08, but the dsf values based on VIN decodes increase to about 0.25 for the same years.

b   *LDT1/LDT2:* The DSF values generated by the VIN decode method are near zero for a number of years as compared to the Mobile 6 default.

c   *LDT3/LDT4:* The VIN decoder identifies diesel vehicles in most of the years for these categories. For LDT3 both VIN decode and Mobile defaults have low values, typically less than 0.02. For LDT4, the Mobile default is also low, but the VIN decode values rise from about 0.1 in year 19 to 0.4 in year 24.

d. *HDV2B:* VIN decoder and Mobile defaults are fairly close with VIN decodes slightly higher in years 1 through 10 and mobile defaults slightly higher in years 11 through 24.

e. *HDV3/HDV4:* VIN decodes are lower than Mobile defaults for these categories, particularly in later years.

f. *HDV5/HDV6/HDV7:* VIN decodes are higher than Mobile defaults for these categories.

g. *HDV8A/HDV8B:* Both VIN decodes and Mobile defaults have dsf values at or near 1.0.

Recommendations

1) Age Distributions

- Use distributions developed by COG based on VIN decode results for each jurisdiction and 14 vehicle types. For school bus and transit bus use Mobile defaults for HDBT/HDBS because busses vehicle registration data reflects that busses are purchased infrequently in large numbers with big variations from year.

2) Diesel Fractions

- It is clear we need to use NOVA level aggregation for vehicle type diesel percentages. It is recommended we use VIN decode results for LDV, and all the HD vehicles. For the remaining types HDBT and HDBS it is recommended we use Mobile 6 defaults.
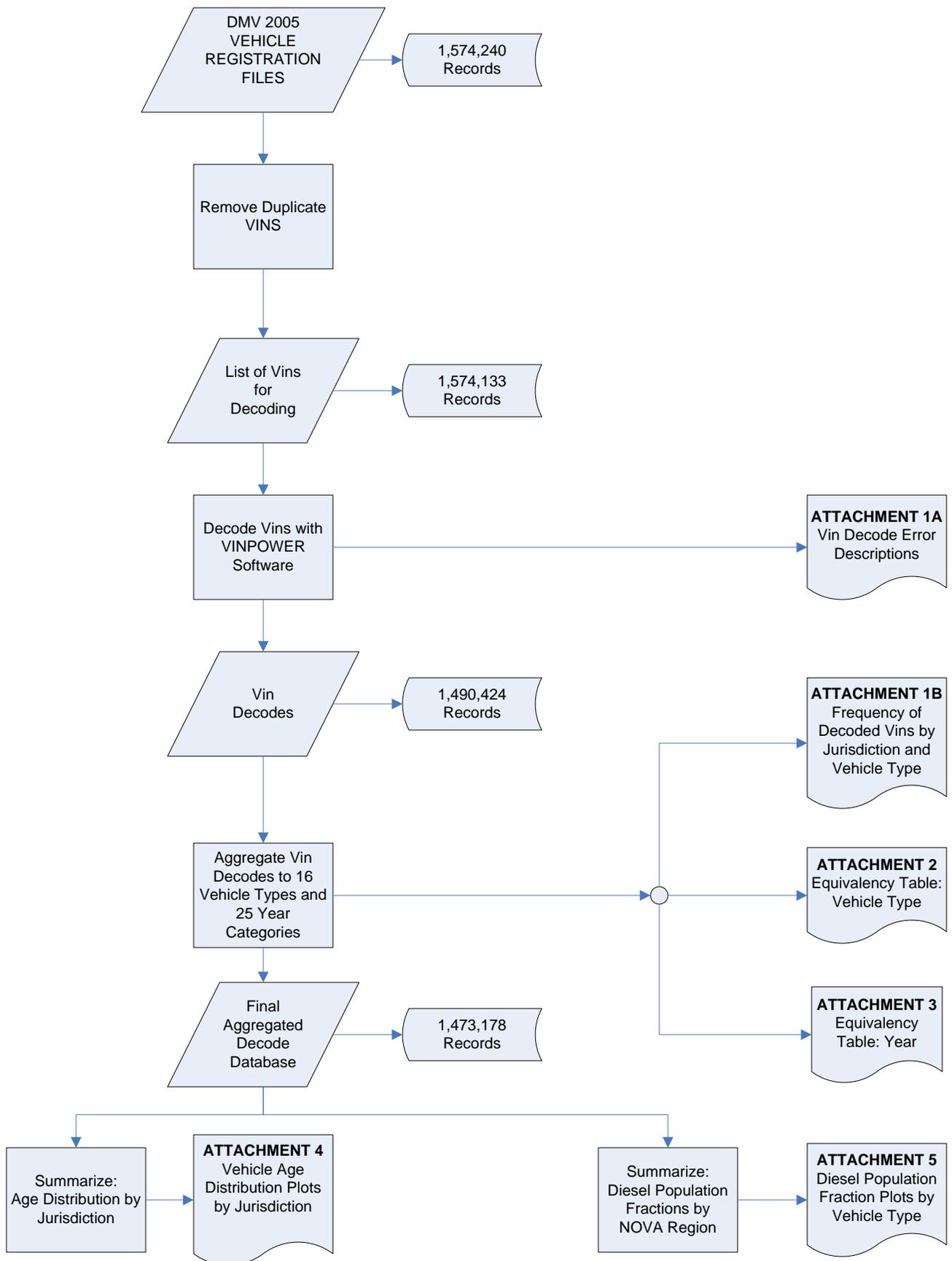
Summary Recommendation Table

Vehicle Type	Vin Generated		Mobile 6 Defaults	
	RDT **(By Jurisdiction)**	DSF (By NOVA Region)	RDT	DSF
LDV	X	X		
LDT1	X	X		
LDT2	X	X		
LDT3	X	X		
LDT4	X	X		
HDV2B	X	X		
HDV3	X	X		
HDV4	X	X		
HDV5	X	X		
HDV6	X	X		
HDV7	X	X		
HDV8A	X	X		
HDV8B	X	X		
HDBS			X	X
HDBT			X	X
MC	X	X		

LIST OF ATTACHMENTS

- **ATTACHMENT 1.0**: VIN DECODE PROCESS FLOWCHART

- **ATTACHMENT 1A**: 2005 VEHICLE REGISTRATION DATA VINPOWER DECODE RESULTS

- **ATTACHMENT 1B**: FREQUENCY OF DECODED VINS BY JURISDICTION AND VEHICLE TYPE

- **ATTACHMENT 2**: EQUIVALENCY TABLE: VEHICLE TYPE

- **ATTACHMENT 3**: EQUIVALENCY TABLE: YEAR

- **ATTACHMENT 4A**: COMPARISON OF VEHICLE AGE DISTRIBUTIONS, JURISDICTION = ALX

- **ATTACHMENT 4B**: COMPARISON OF VEHICLE AGE DISTRIBUTIONS, JURISDICTION = ARL

- **ATTACHMENT 4C**: COMPARISON OF VEHICLE AGE DISTRIBUTIONS, JURISDICTION = FFX

- **ATTACHMENT 4D**: COMPARISON OF VEHICLE AGE DISTRIBUTIONS, JURISDICTION = LDN

- **ATTACHMENT 4E**: COMPARISON OF VEHICLE AGE DISTRIBUTIONS, JURISDICTION = PW

- **ATTACHMENT 5**: DIESEL SALES FRACTIONS

ATTACHMENT 1.0
Vin Decode Process Flowchart

DMV 2005 VEHICLE REGISTRATION FILES

1,574,240 Records

Remove Duplicate VINS

List of Vins for Decoding

1,574,133 Records

Decode Vins with VINPOWER Software

ATTACHMENT 1A Vin Decode Error Descriptions

Vin Decodes

1,490,424 Records

ATTACHMENT 1B Frequency of Decoded Vins by Jurisdiction and Vehicle Type

Aggregate Vin Decodes to 16 Vehicle Types and 25 Year Categories

ATTACHMENT 2 Equivalency Table: Vehicle Type

Final Aggregated Decode Database

1,473,178 Records

ATTACHMENT 3 Equivalency Table: Year

Summarize: Age Distribution by Jurisdiction

ATTACHMENT 4 Vehicle Age Distribution Plots by Jurisdiction

Summarize: Diesel Population Fractions by NOVA Region

ATTACHMENT 5 Diesel Population Fraction Plots by Vehicle Type

ATTACHMENT 1B
FREQUENCY OF DECODED VINS BY JURISDICTION AND VEHICLE TYPE

Sum of Count	Jurisdiction					
Vehicle Type	ALX	ARL	FFX	LDN	PW	Grand Total
HDBS	238	139	1,767	447	512	3,103
HDBt	281	182	1,287	539	1,413	3,702
HDV2B	1,568	1,376	14,527	6,195	9,562	33,228
HDV3	274	264	2,928	1,404	2,447	7,317
HDV4	345	280	2,466	876	1,489	5,456
HDV5	84	55	744	362	541	1,786
HDV6	301	95	1,680	798	1,211	4,085
HDV7	145	70	963	448	669	2,295
HDV8A	193	156	1,696	946	1,322	4,313
HDV8B	26	17	334	252	330	959
LDT1	1,032	1,142	6,224	1,429	2,587	12,414
LDT2	29,450	28,581	201,269	56,439	85,170	400,909
LDT3	6,123	5,001	45,544	15,717	25,426	97,811
LDT4	1,494	1,210	13,188	4,965	7,369	28,226
LDV	84,759	83,001	437,485	92,847	145,737	843,829
MC	1,281	1,447	10,275	3,775	6,967	23,745
Grand Total	127,594	123,016	742,377	187,439	292,752	1,473,178

Sum of Count (%)	Jurisdiction					
Vehicle Type	ALX	ARL	FFX	LDN	PW	Grand Total
HDBS	0.02%	0.01%	0.12%	0.03%	0.03%	0.21%
HDBt	0.02%	0.01%	0.09%	0.04%	0.10%	0.25%
HDV2B	0.11%	0.09%	0.99%	0.42%	0.65%	2.26%
HDV3	0.02%	0.02%	0.20%	0.10%	0.17%	0.50%
HDV4	0.02%	0.02%	0.17%	0.06%	0.10%	0.37%
HDV5	0.01%	0.00%	0.05%	0.02%	0.04%	0.12%
HDV6	0.02%	0.01%	0.11%	0.05%	0.08%	0.28%
HDV7	0.01%	0.00%	0.07%	0.03%	0.05%	0.16%
HDV8A	0.01%	0.01%	0.12%	0.06%	0.09%	0.29%
HDV8B	0.00%	0.00%	0.02%	0.02%	0.02%	0.07%
LDT1	0.07%	0.08%	0.42%	0.10%	0.18%	0.84%
LDT2	2.00%	1.94%	13.66%	3.83%	5.78%	27.21%
LDT3	0.42%	0.34%	3.09%	1.07%	1.73%	6.64%
LDT4	0.10%	0.08%	0.90%	0.34%	0.50%	1.92%
LDV	5.75%	5.63%	29.70%	6.30%	9.89%	57.28%
MC	0.09%	0.10%	0.70%	0.26%	0.47%	1.61%
Grand Total	8.66%	8.35%	50.39%	12.72%	19.87%	100.00%

ATTACHMENT 2
EQUIVALENCY TABLE - VEHICLE TYPE

Mobile 6 Vehicle Type		COG Vehicle Type															TOTAL
		1 LDV	2 LDT1	3 LDT2	4 LDT3	5 LDT4	6 HDV2B	7 HDV3	8 HDV4	9 HDV5	10 HDV6	11 HDV7	12 HDV8A	13 HDV8B	14 HDBS	15 HDBT	16 MC	
1	LDGV	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00
2	LDGT1	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00
3	LDGT2	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00
4	LDGT3	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	1.00
5	LDGT4	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	1.00
6	HDGV2B	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	1.00
7	HDGV3	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	1.00
8	HDGV4	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	1.00
9	HDGV5	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	1.00
10	HDGV6	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	1.00
11	HDGV7	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	1.00
12	HDGV8A	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	1.00
13	HDGV8B	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	1.00
14	LDDV	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00
15	LDDT12	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00
16	HDDV2B	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	1.00
17	HDDV3	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	1.00
18	HDDV4	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	1.00
19	HDDV5	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	1.00
20	HDDV6	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	1.00
21	HDDV7	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	1.00
22	HDDV8A	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	1.00
23	HDDV8B	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	1.00
24	MC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	1.00
25	HDGB	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	0.50	-	1.00
26	HDDBT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.00
27	HDDBS	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	1.00
28	LDDT34	-	-	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	1.00

| Vehicle Model Year	Mobile 6 Year
2006, 2005	1
2004	2
2003	3
2002	4
2001	5
2000	6
1999	7
1998	8
1997	9
1996	10
1995	11
1994	12
1993	13
1992	14
1991	15
1990	16
1989	17
1988	18
1987	19
1986	20
1985	21
1984	22
1983	23
1982	24
<= 1981	25

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = LDV
Number of Decoded Vins = 437,485
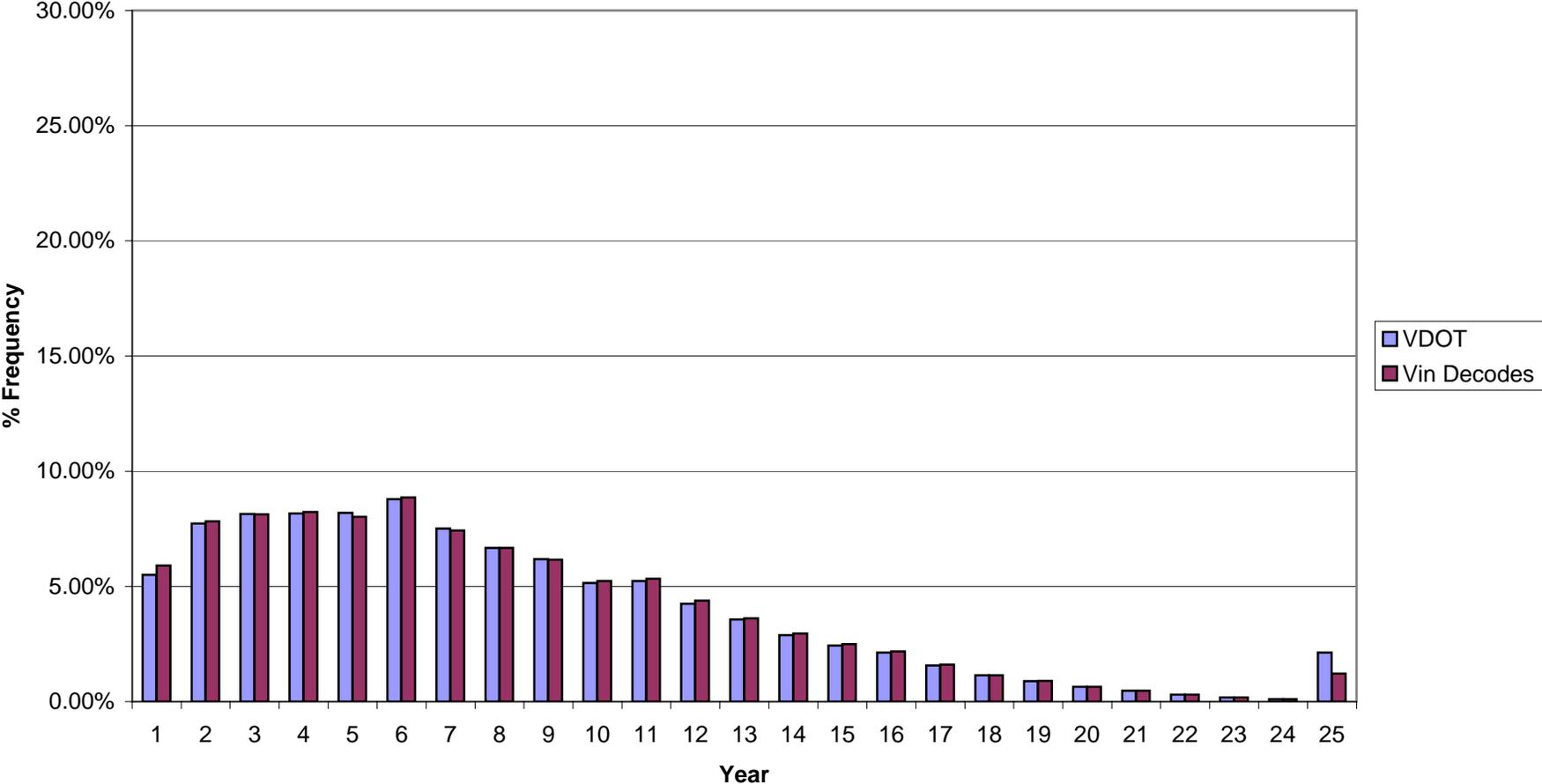
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = LDT1
Number of Decoded Vins = 6,224
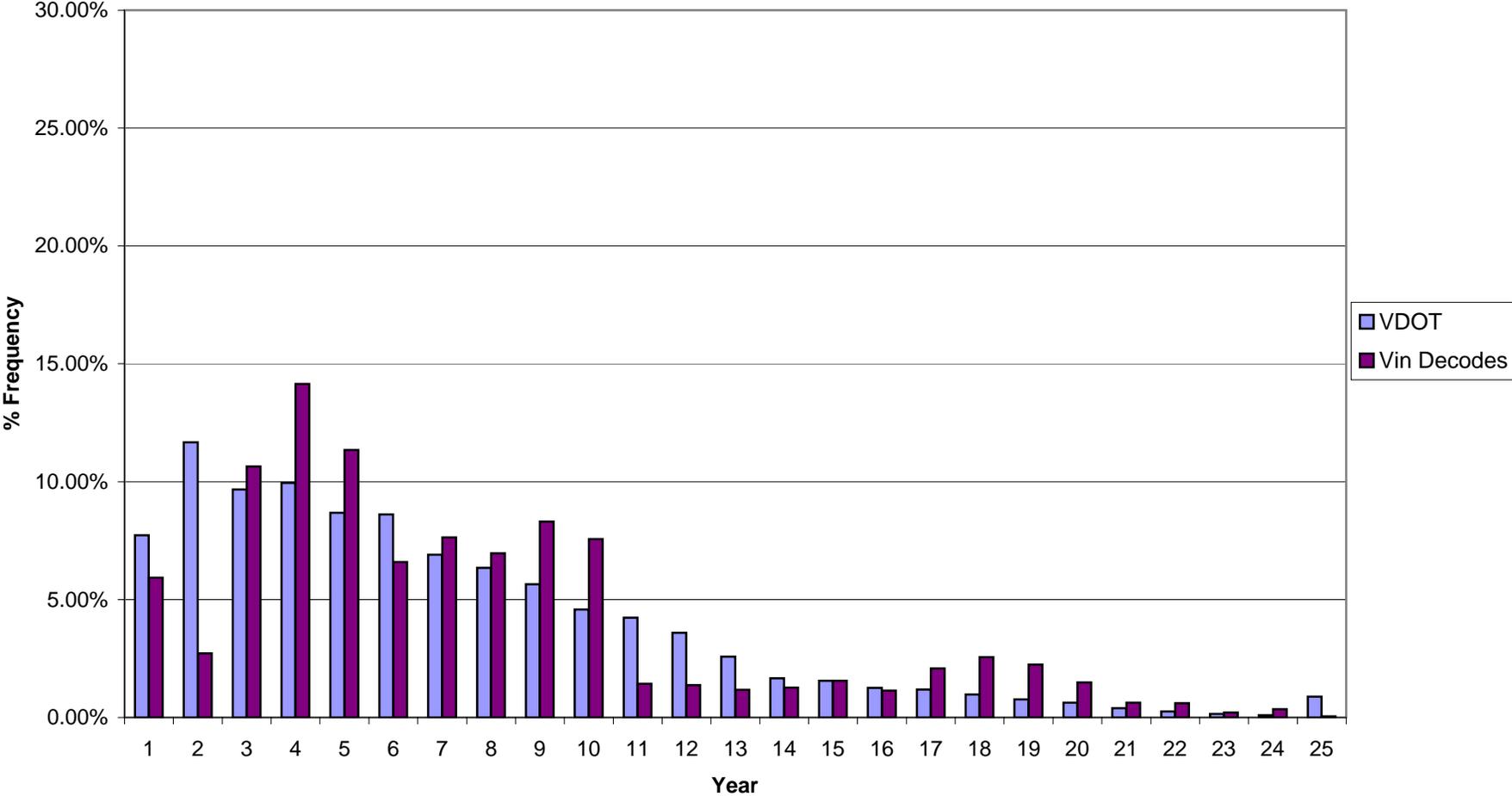
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
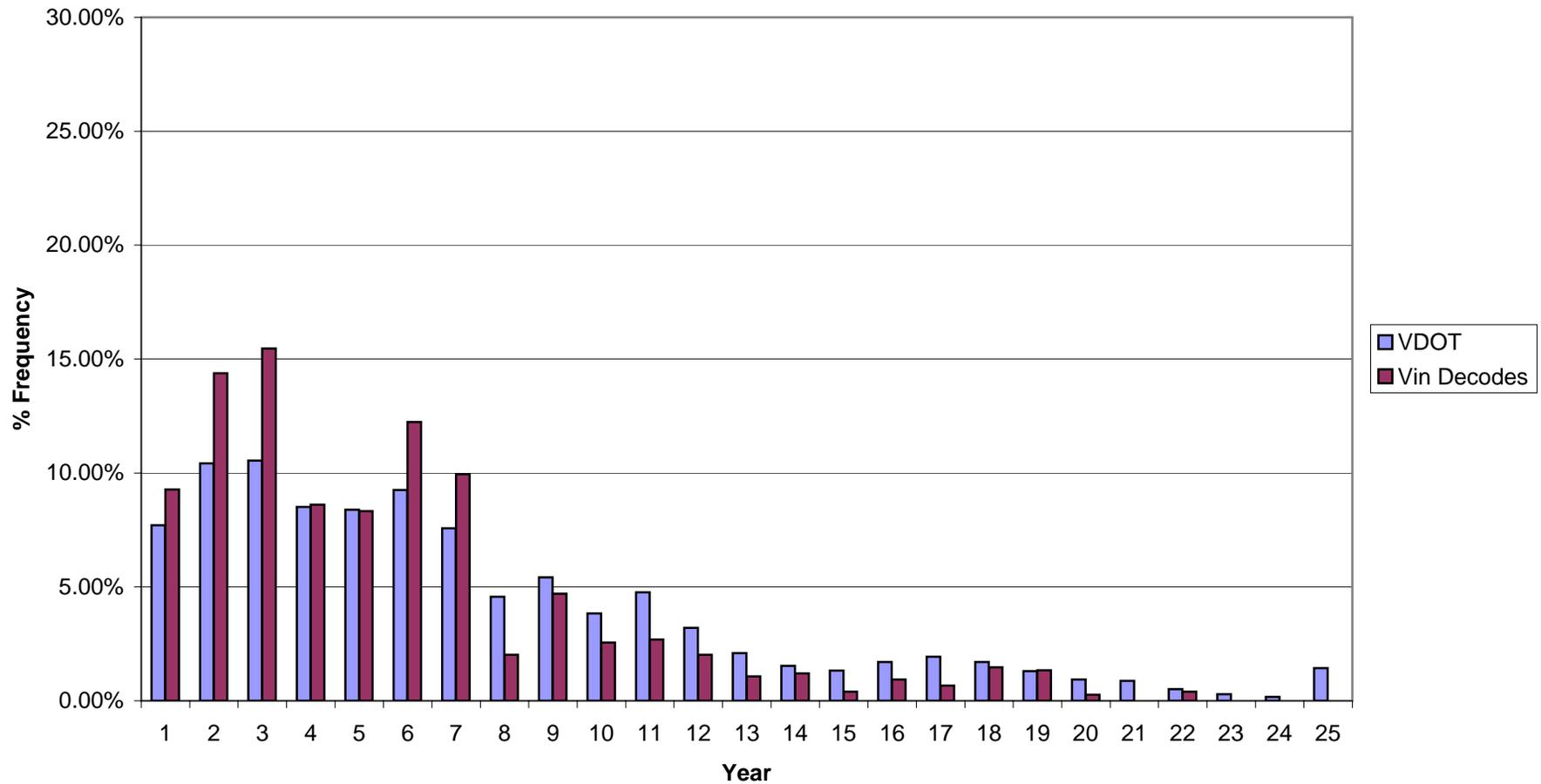**Vehicle Type = LDT2**
Number of Decoded Vins = 201,269
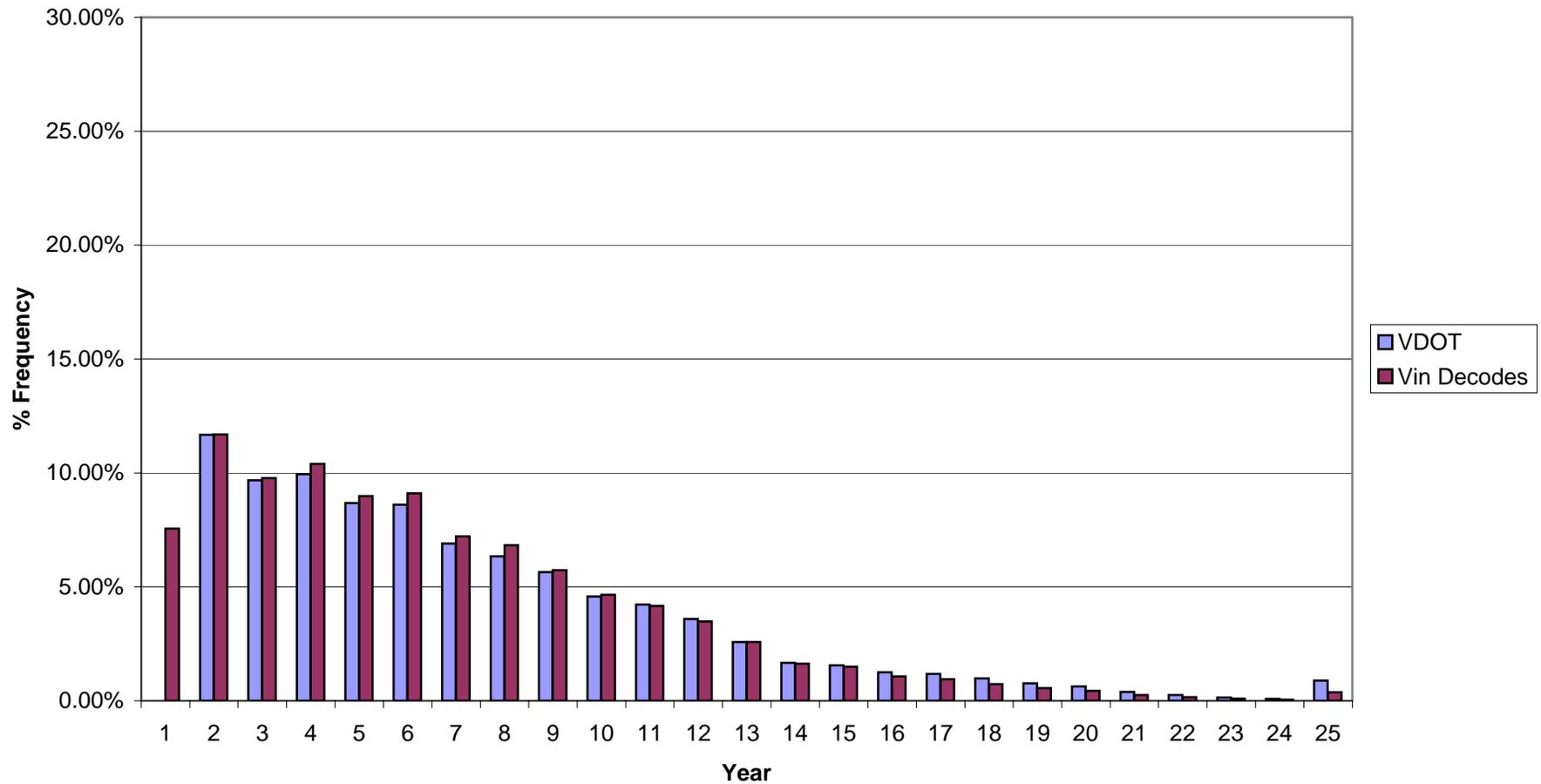
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = LDT3
Number of Decoded Vins = 45,544
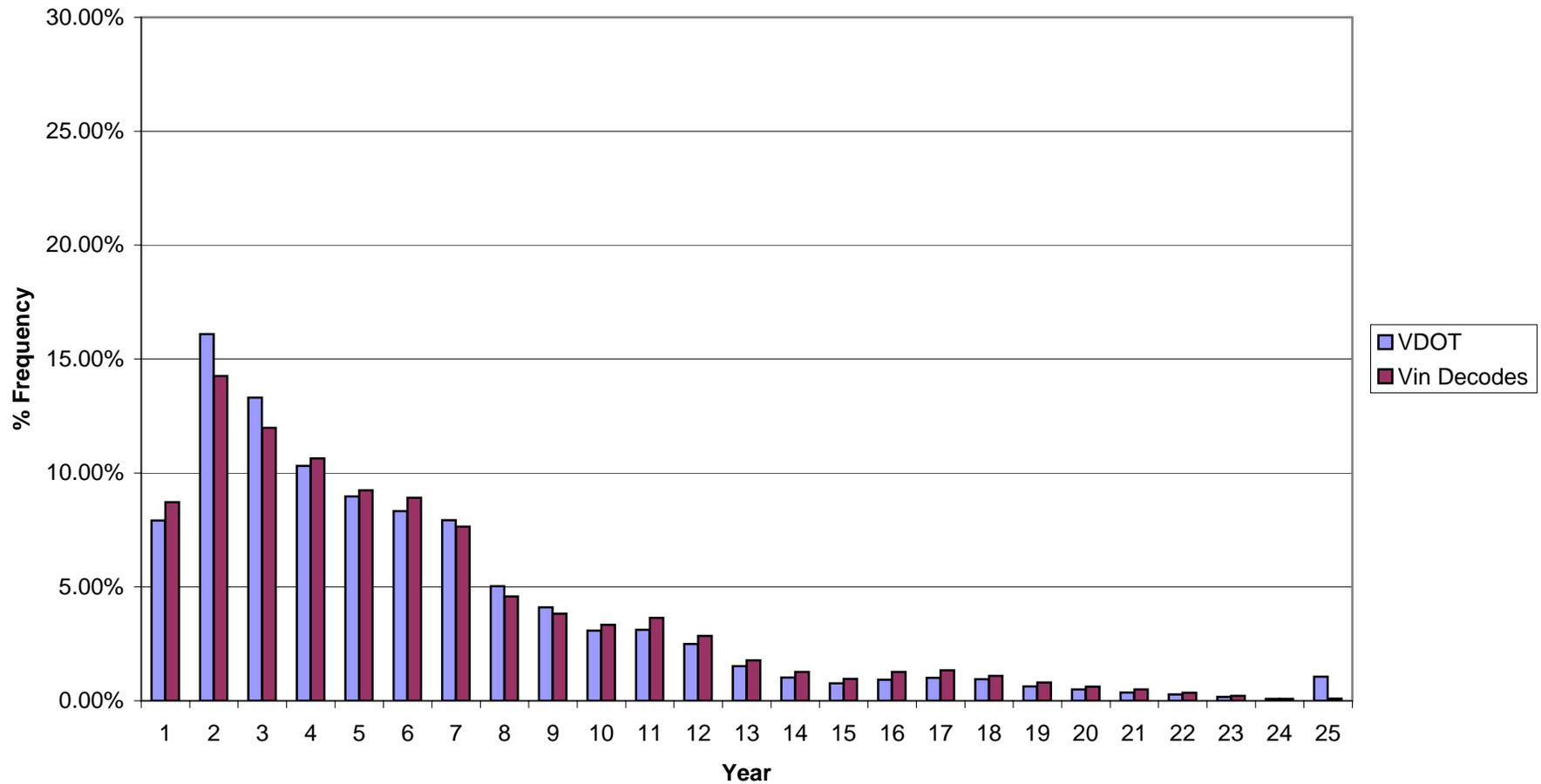
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
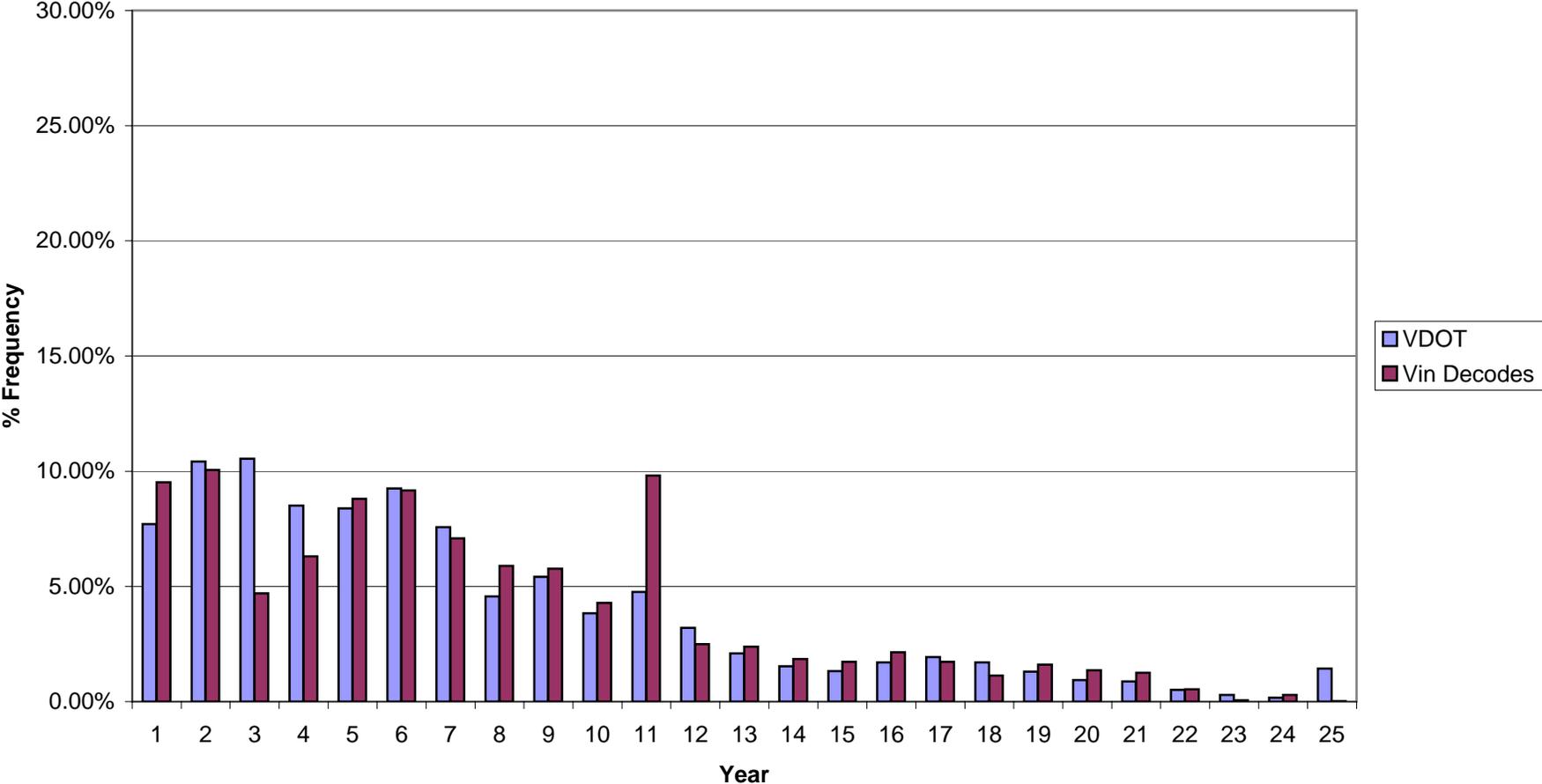**Developed from 2005 Vehicle Registration Data**
Jurisdiction = FFX
Vehicle Type = LDT4
Number of Decoded Vins = 13,188
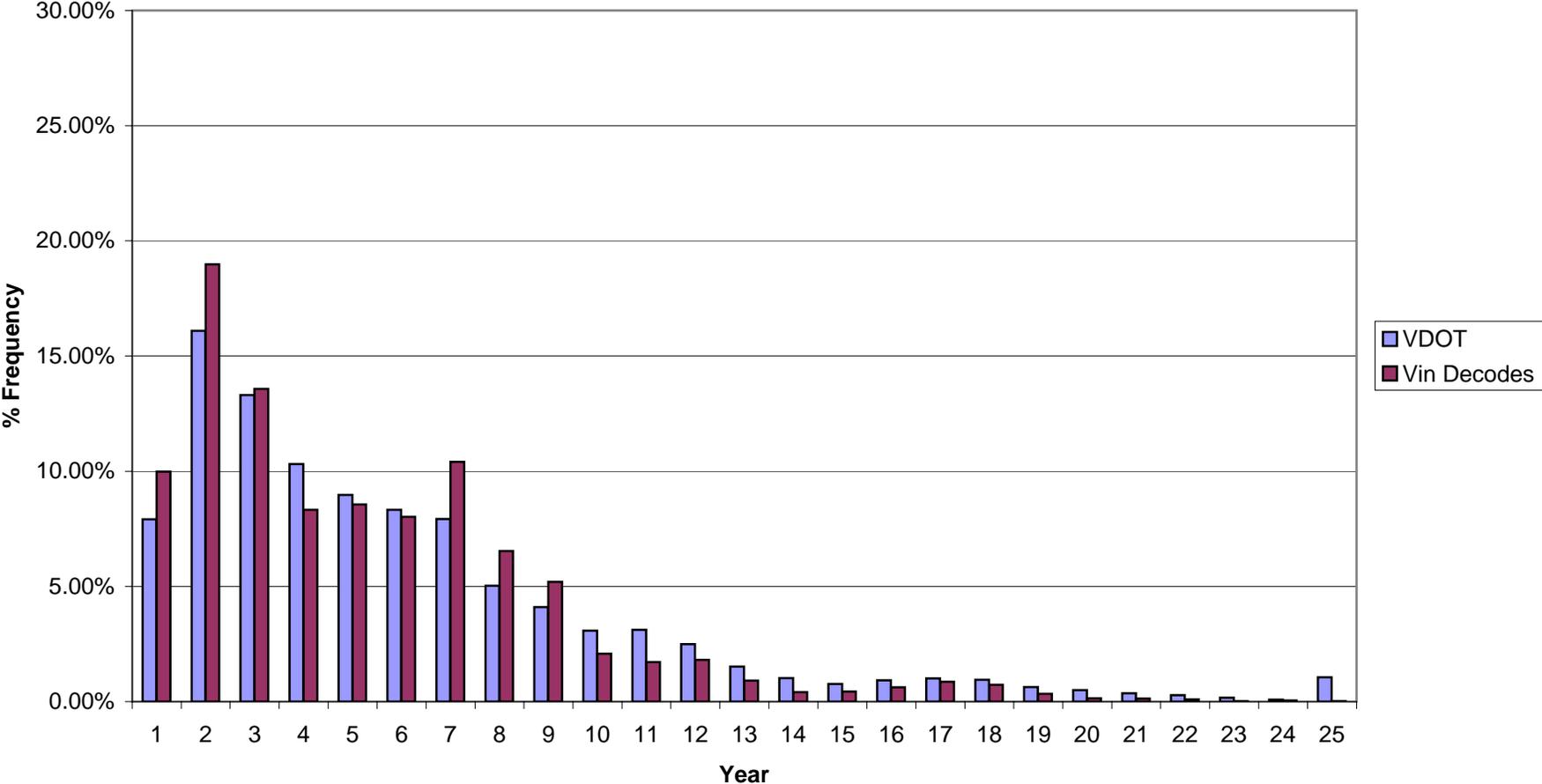
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
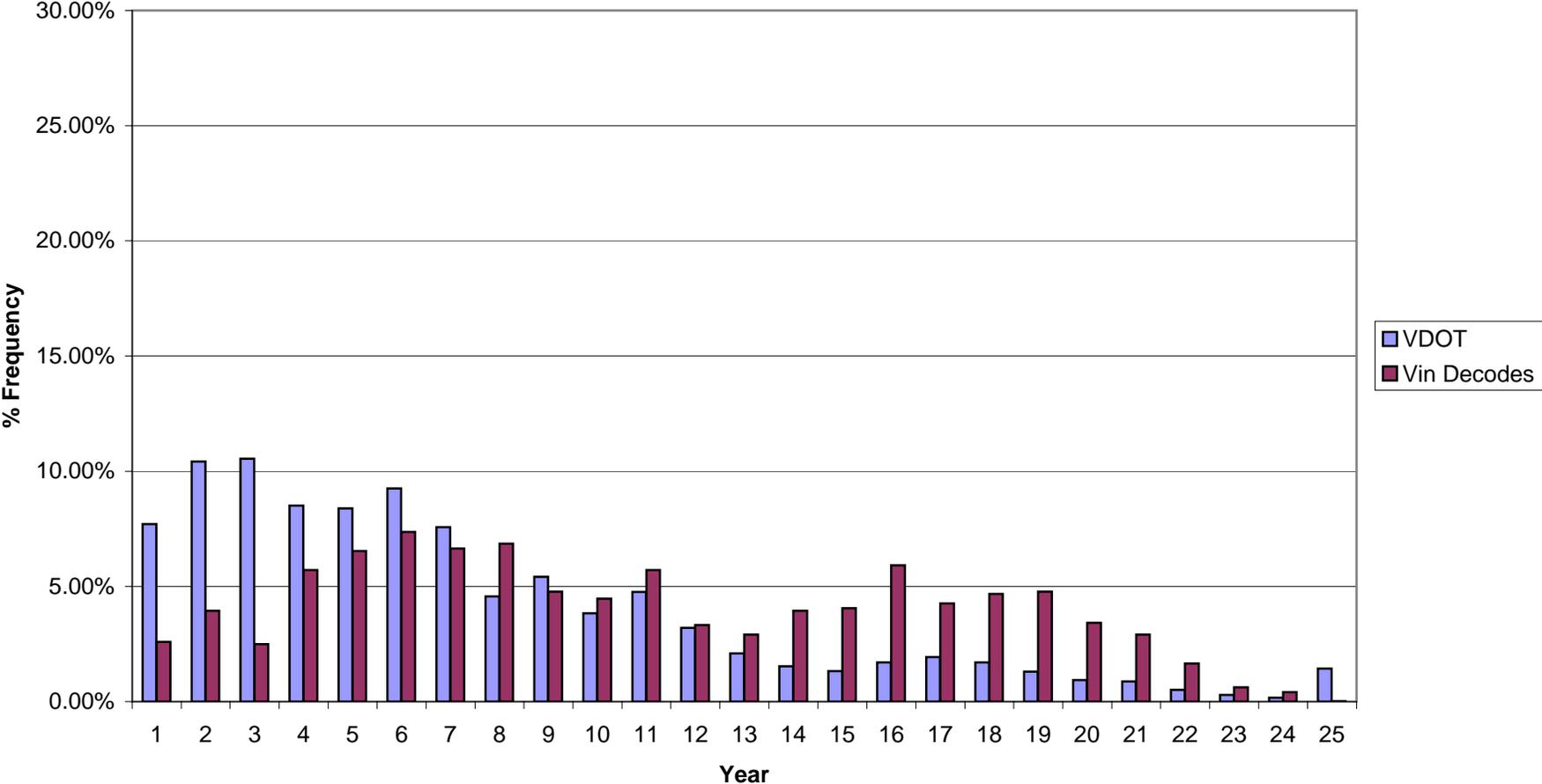**Vehicle Type = HDV2B**
Number of Decoded Vins = 14,527
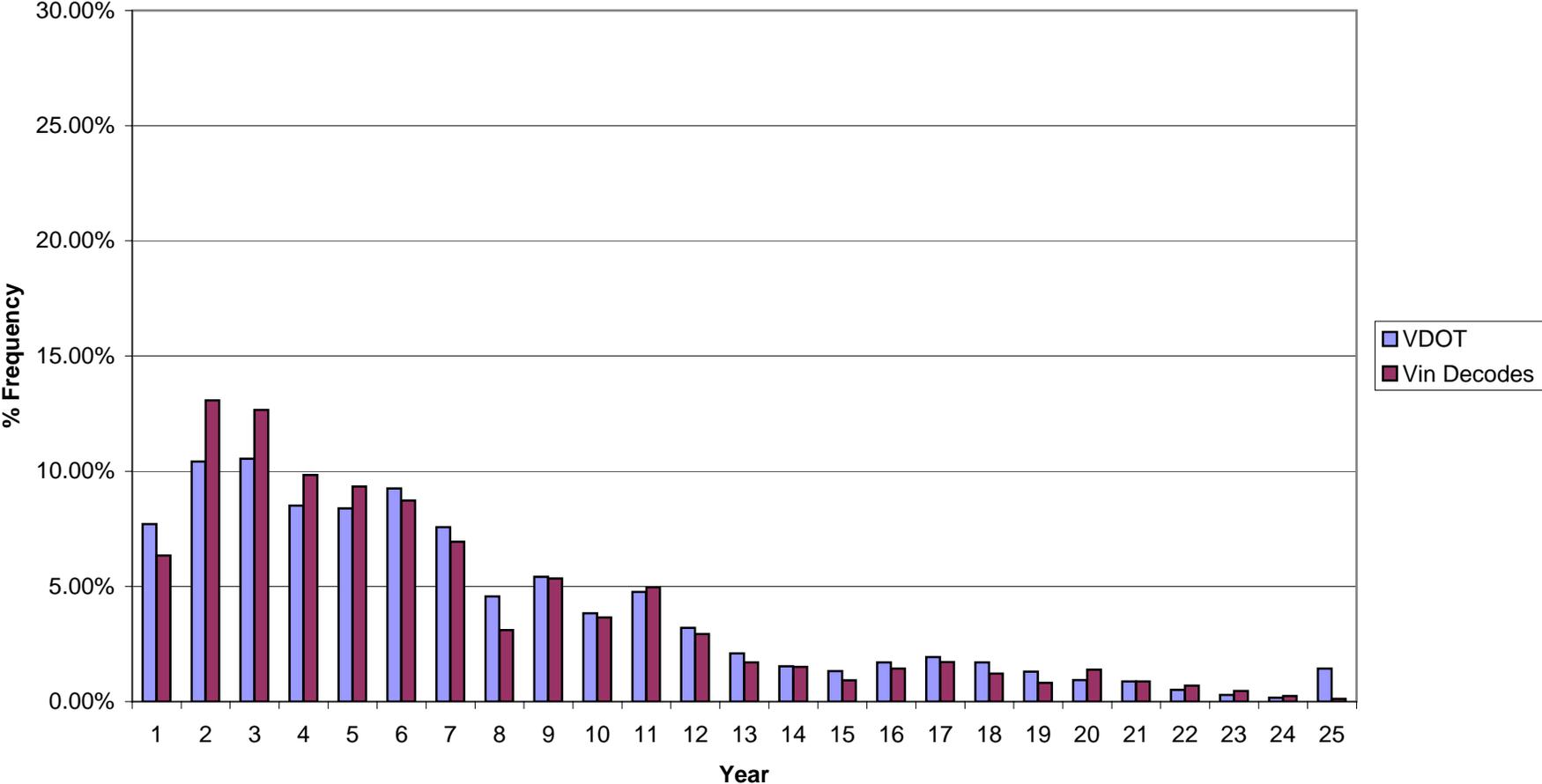
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = HDV3
Number of Decoded Vins = 2,928
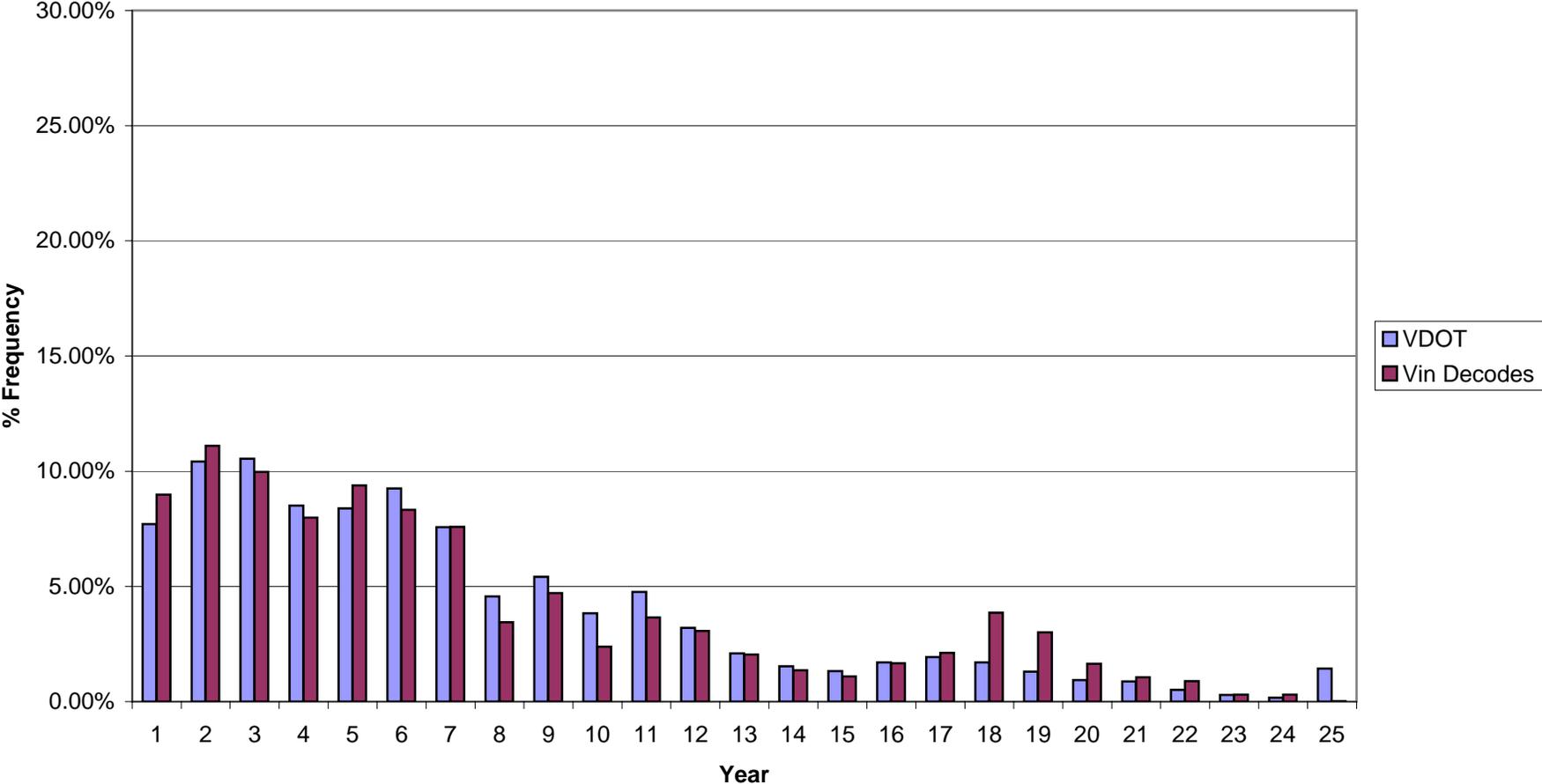
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = HDV4
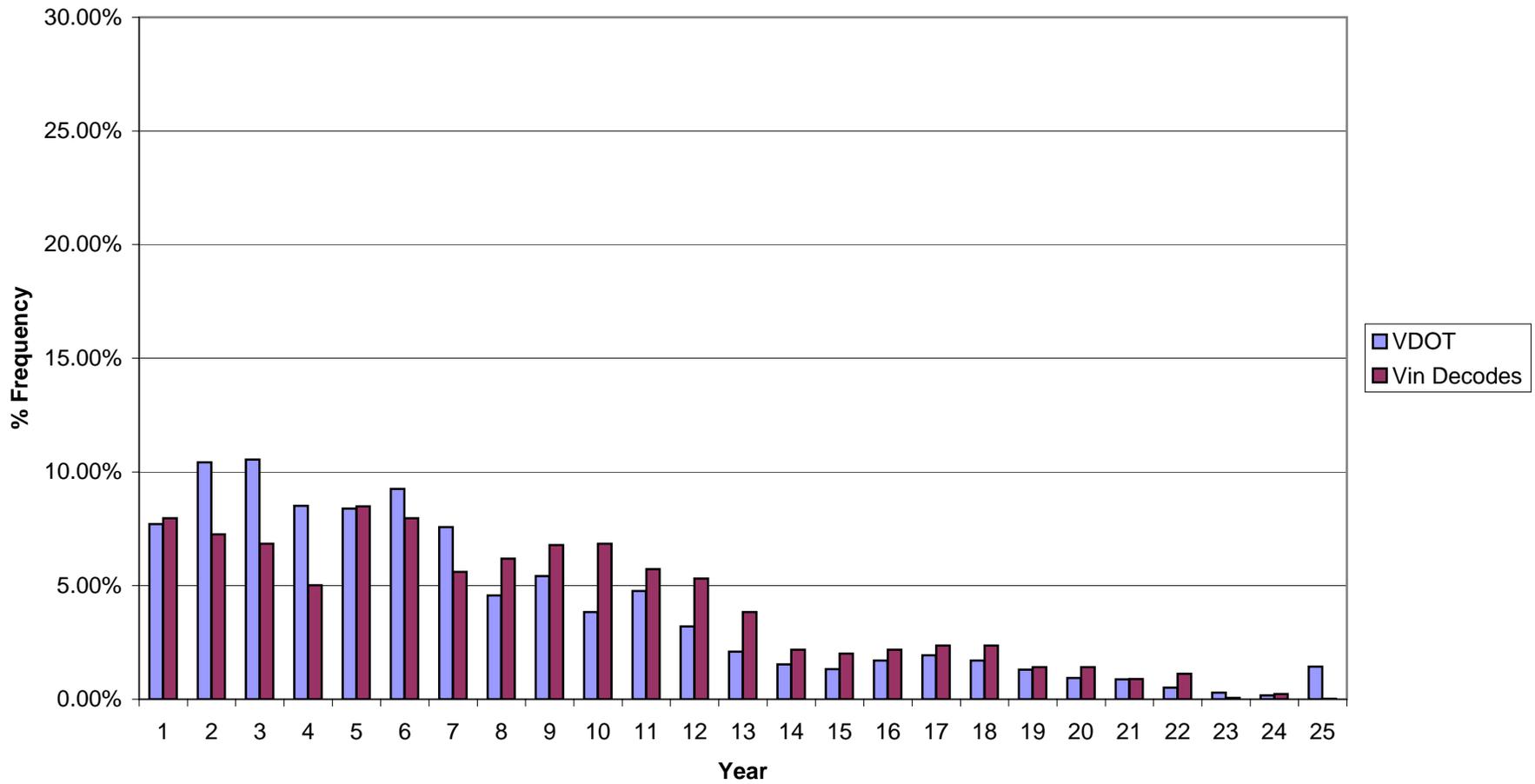**Number of Decoded Vins = 2,466**
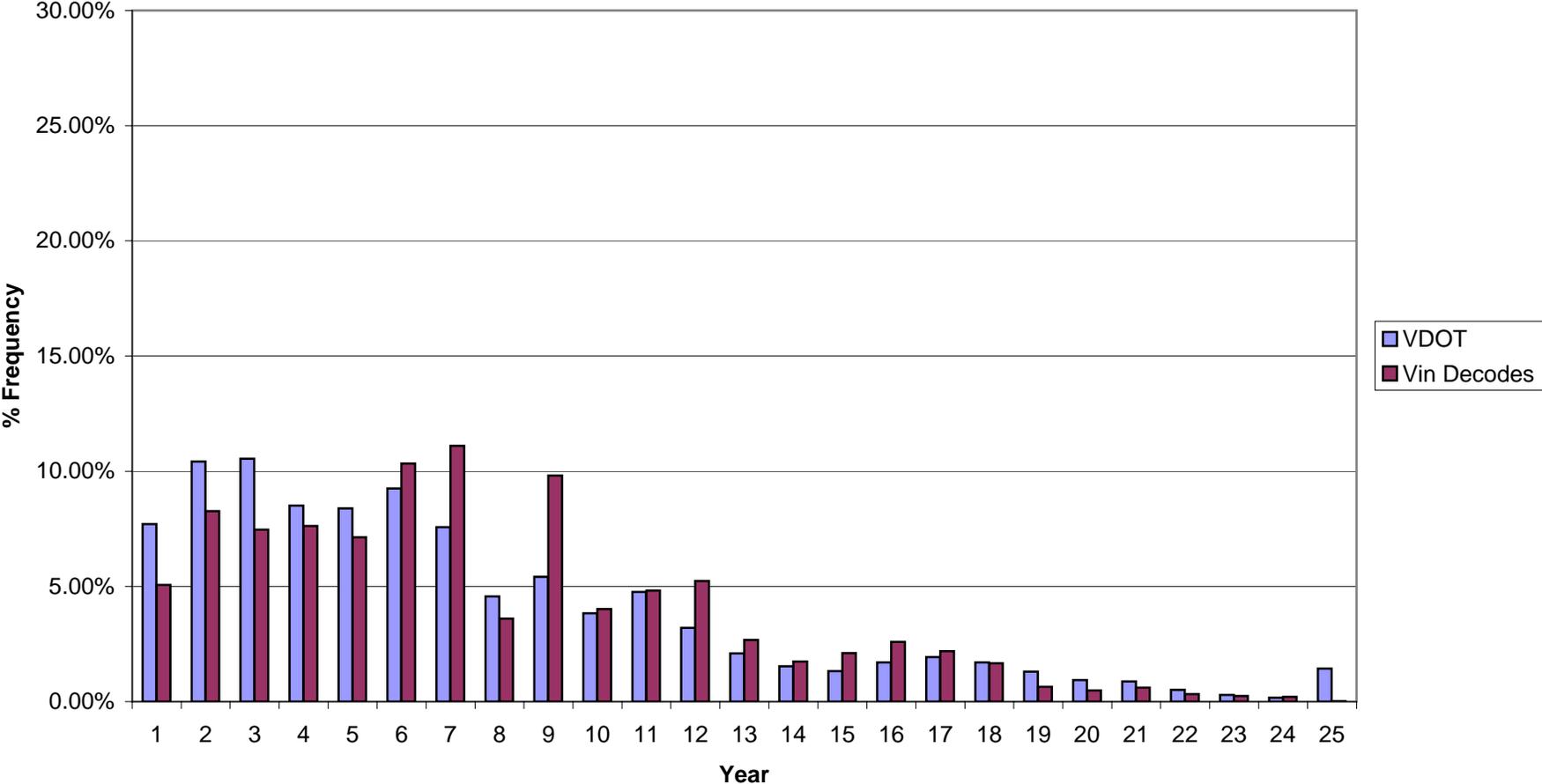
ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = HDV5
Number of Decoded Vins = 744

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = HDV6
Number of Decoded Vins = 1,680

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
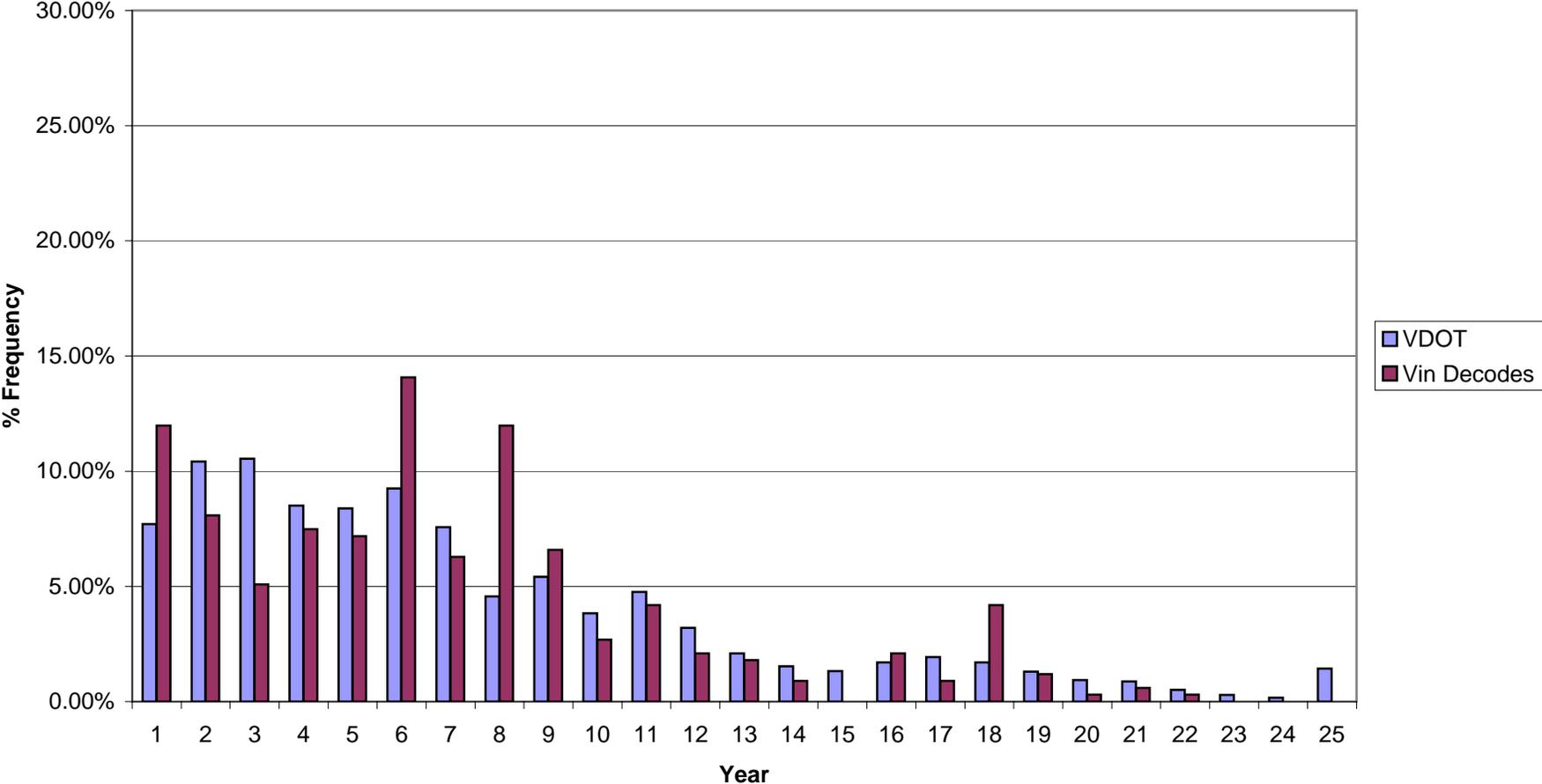**Developed from 2005 Vehicle Registration Data**
Jurisdiction = FFX
Vehicle Type = HDV7
Number of Decoded Vins = 963

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
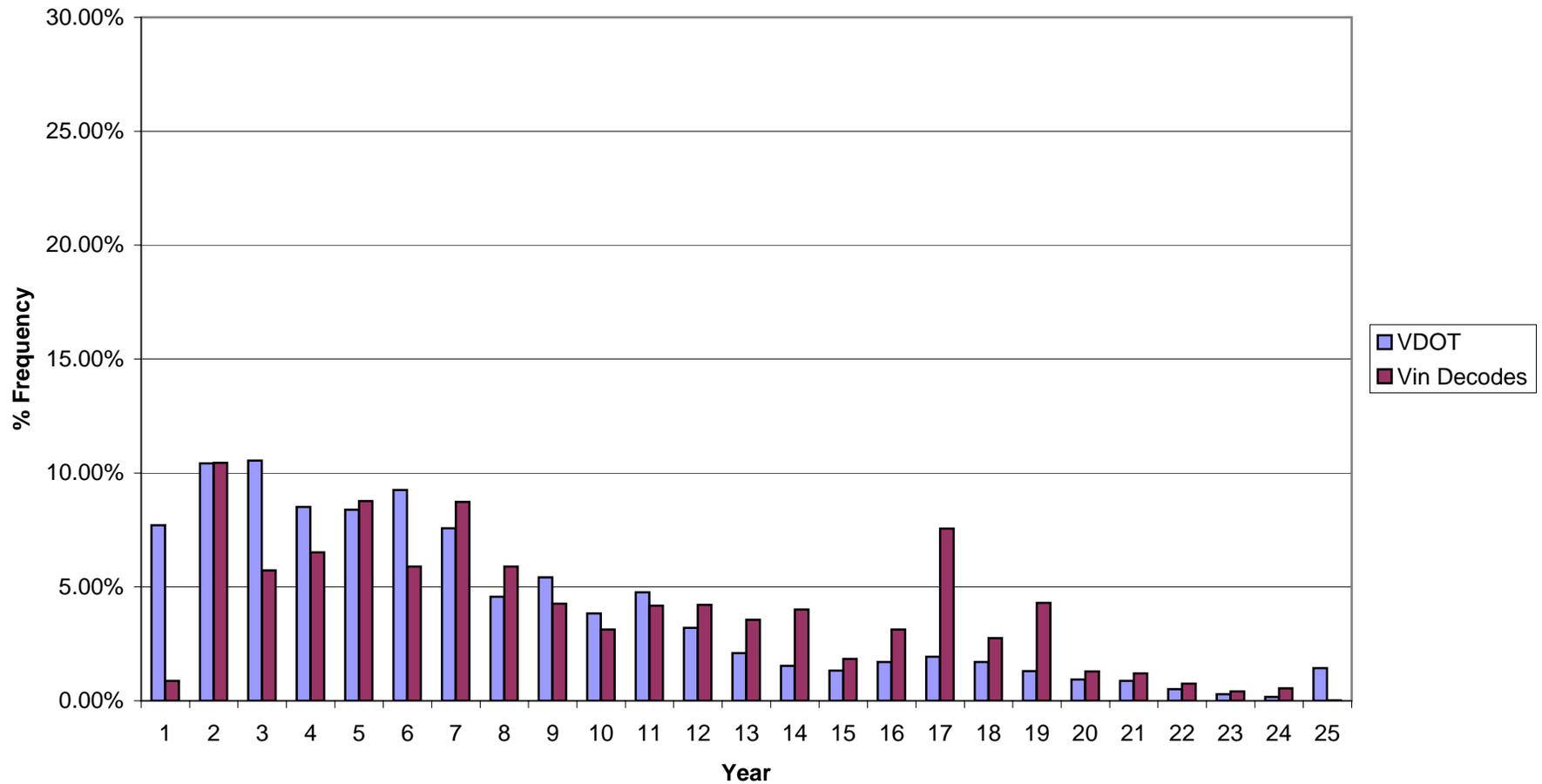**Vehicle Type = HDV8A**
Number of Decoded Vins = 1,696

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = HDV8B
Number of Decoded Vins = 334

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = HDBS
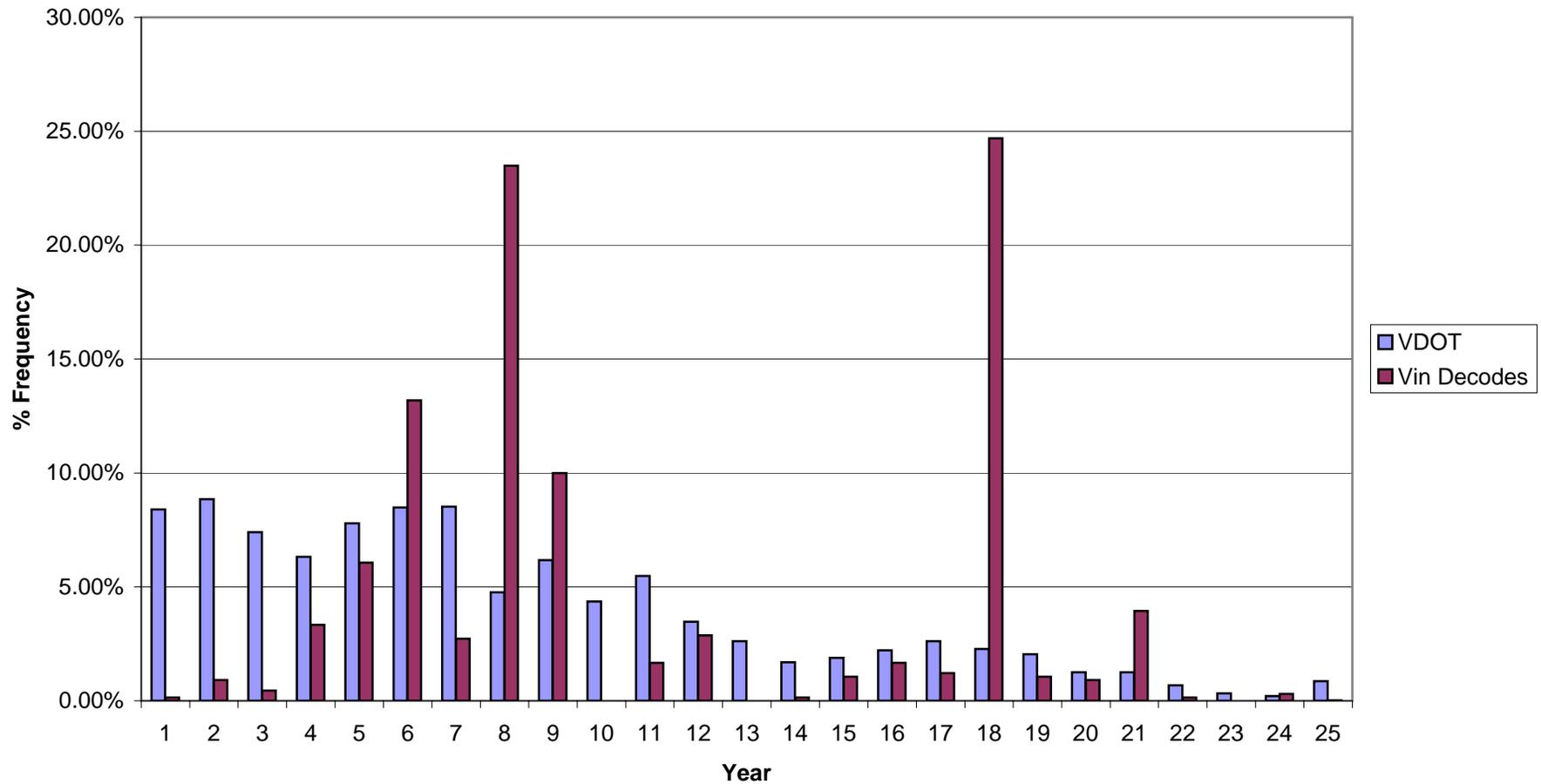**Number of Decoded Vins = 1,767**

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
Developed from 2005 Vehicle Registration Data
Jurisdiction = FFX
Vehicle Type = HDBT
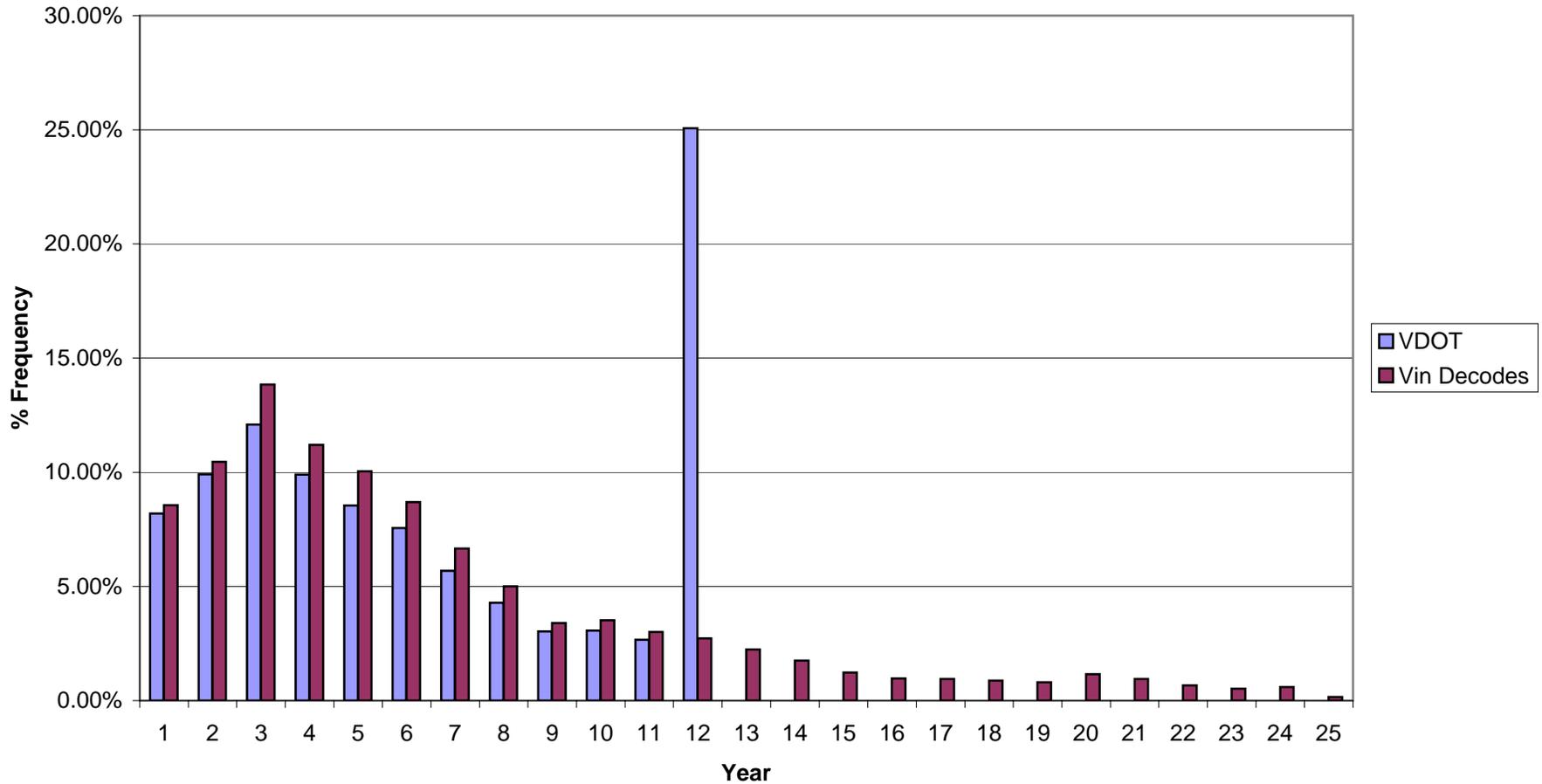**Number of Decoded Vins = 1,287**

ATTACHMENT 4C

Comparison of Vehicle Age Distributions (VDEQ / VDOT vs. Vin Decodes)
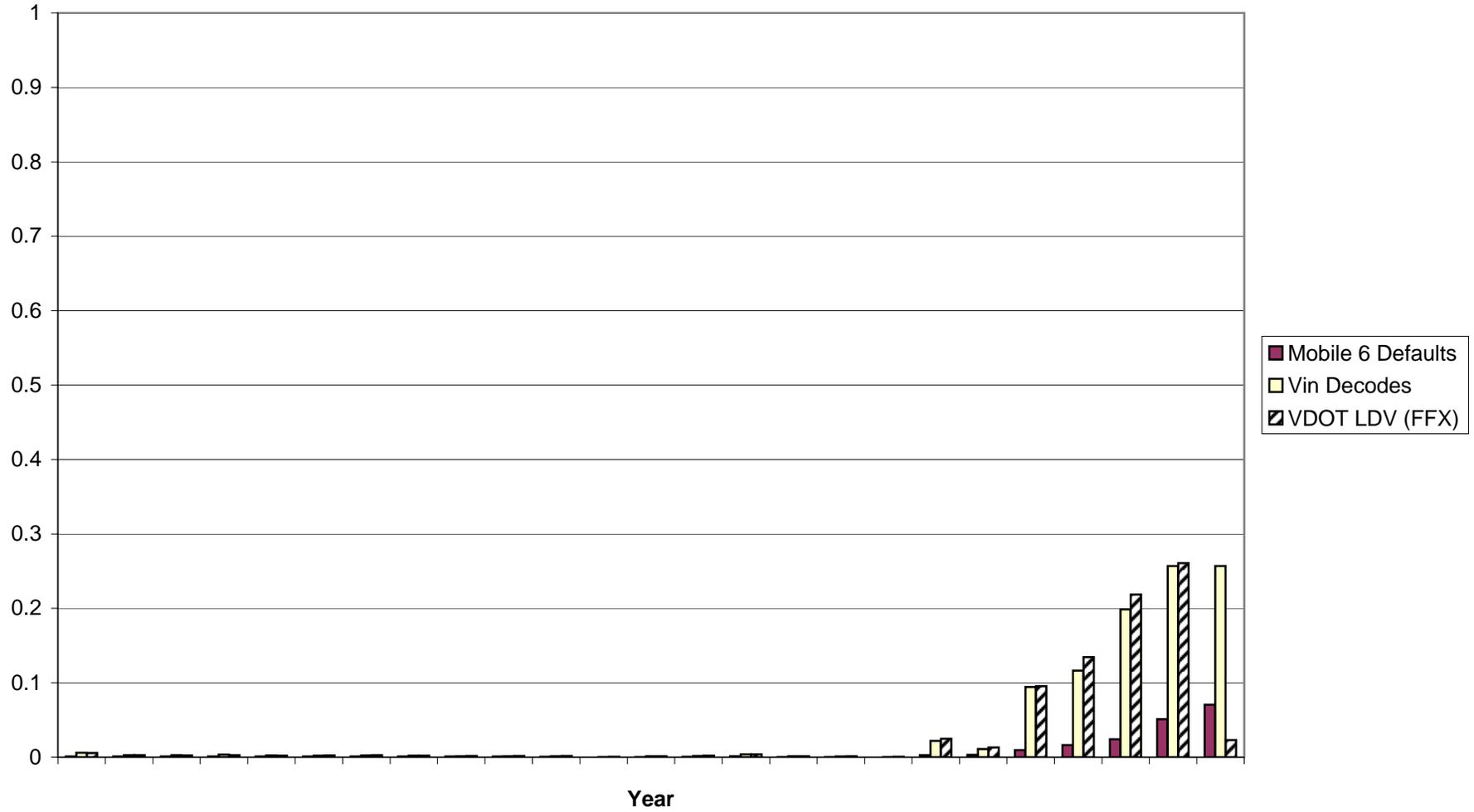**Developed from 2005 Vehicle Registration Data**
Jurisdiction = FFX
Vehicle Type = MC
Number of Decoded Vins = 10,275

ATTACHMENT 5

Diesel Sales Fractions
Northern Virgina Jurisdictions Combined (FFX only for VDOT Data)
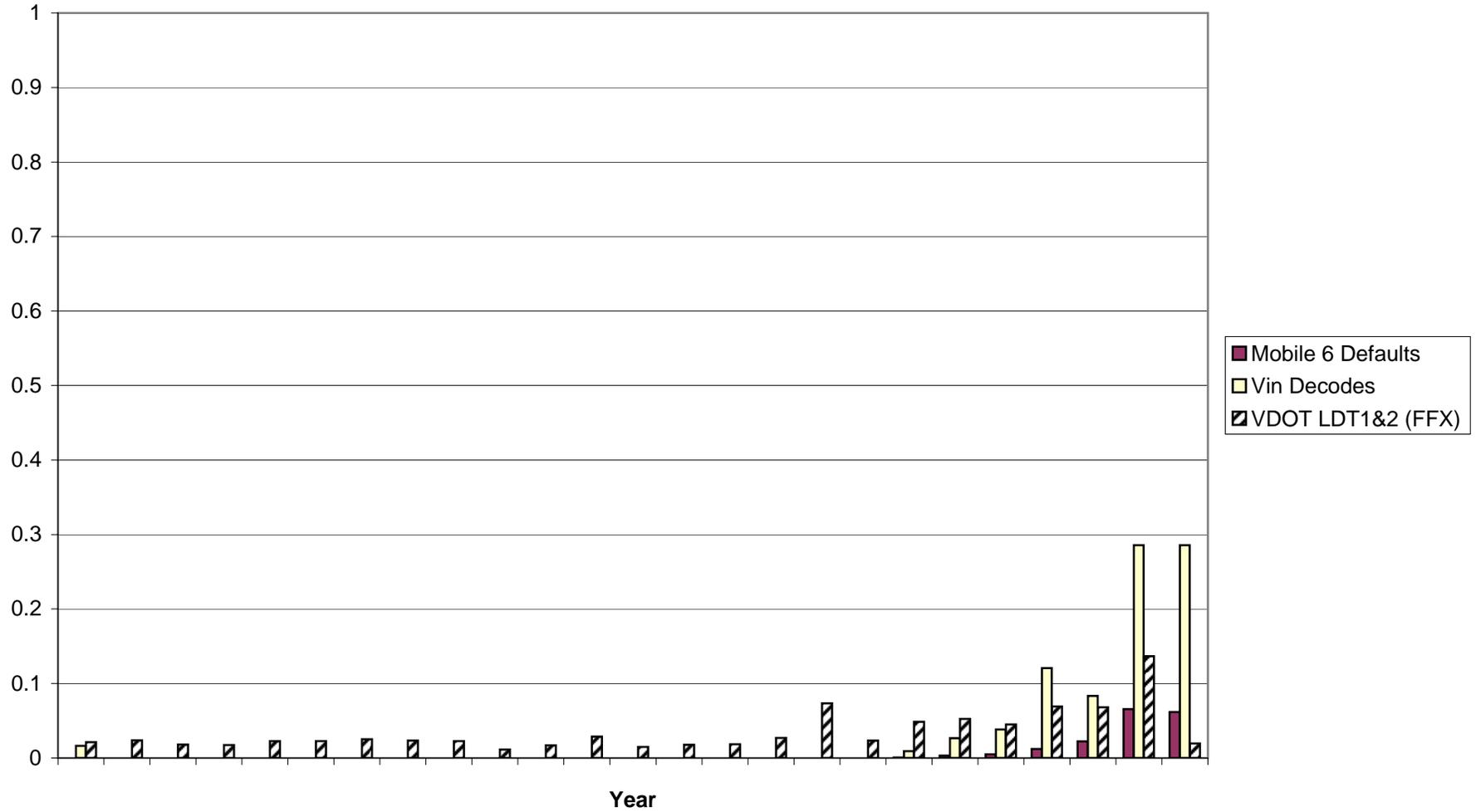**Vehicle Type = LDV**

ATTACHMENT 5

Diesel Sales Fractions
Northern Virgina Jurisdictions Combined (FFX only for VDOT Data)
Vehicle Type = LDT1

ATTACHMENT 5

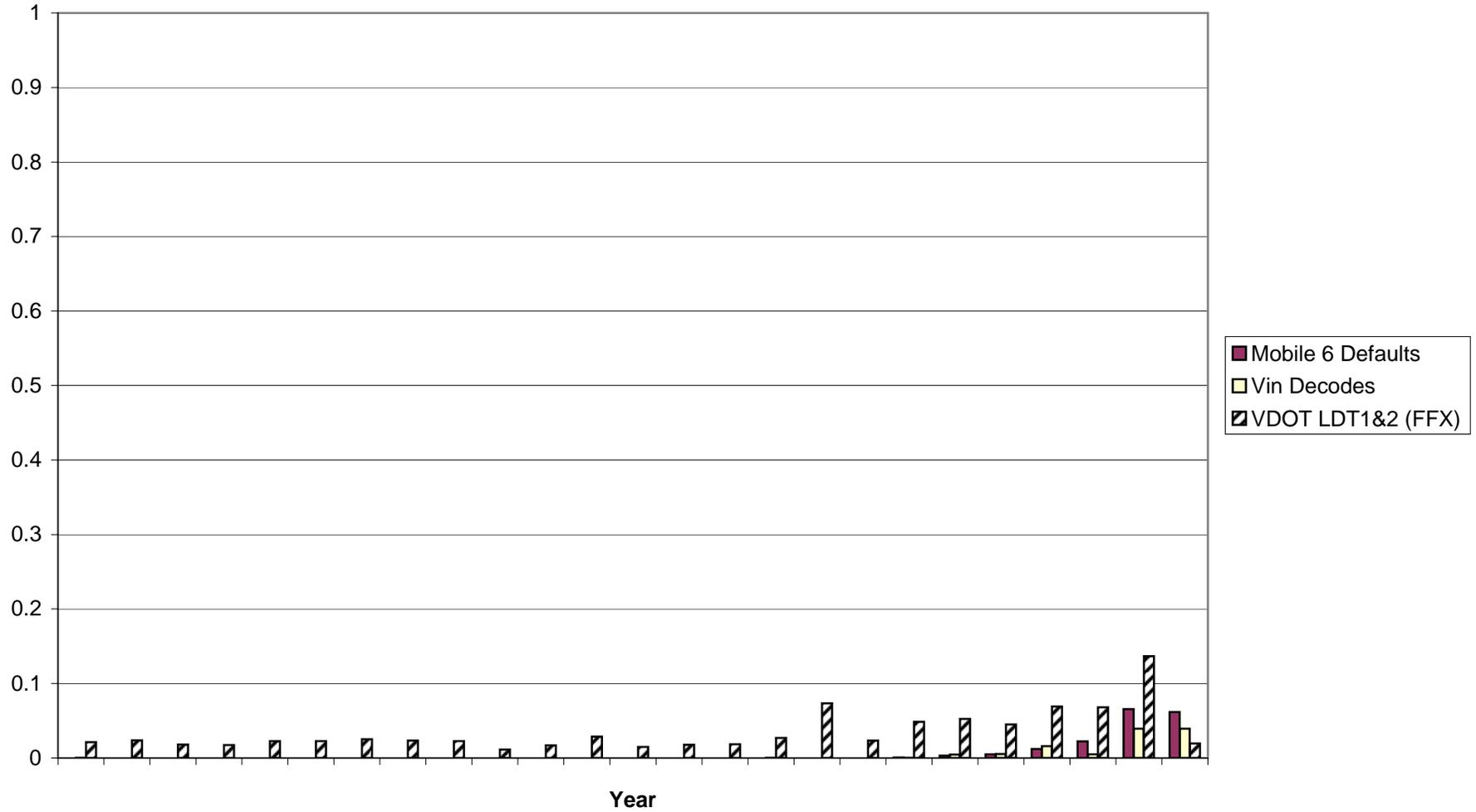**Diesel Sales Fractions**
Northern Virgina Jurisdictions Combined (FFX only for VDOT Data)
Vehicle Type = LDT2

ATTACHMENT 5

Vehicle Type | LDT3

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

Sum of DSF

Source
- Mobile 6 Defaults
- Vin Decodes

Year
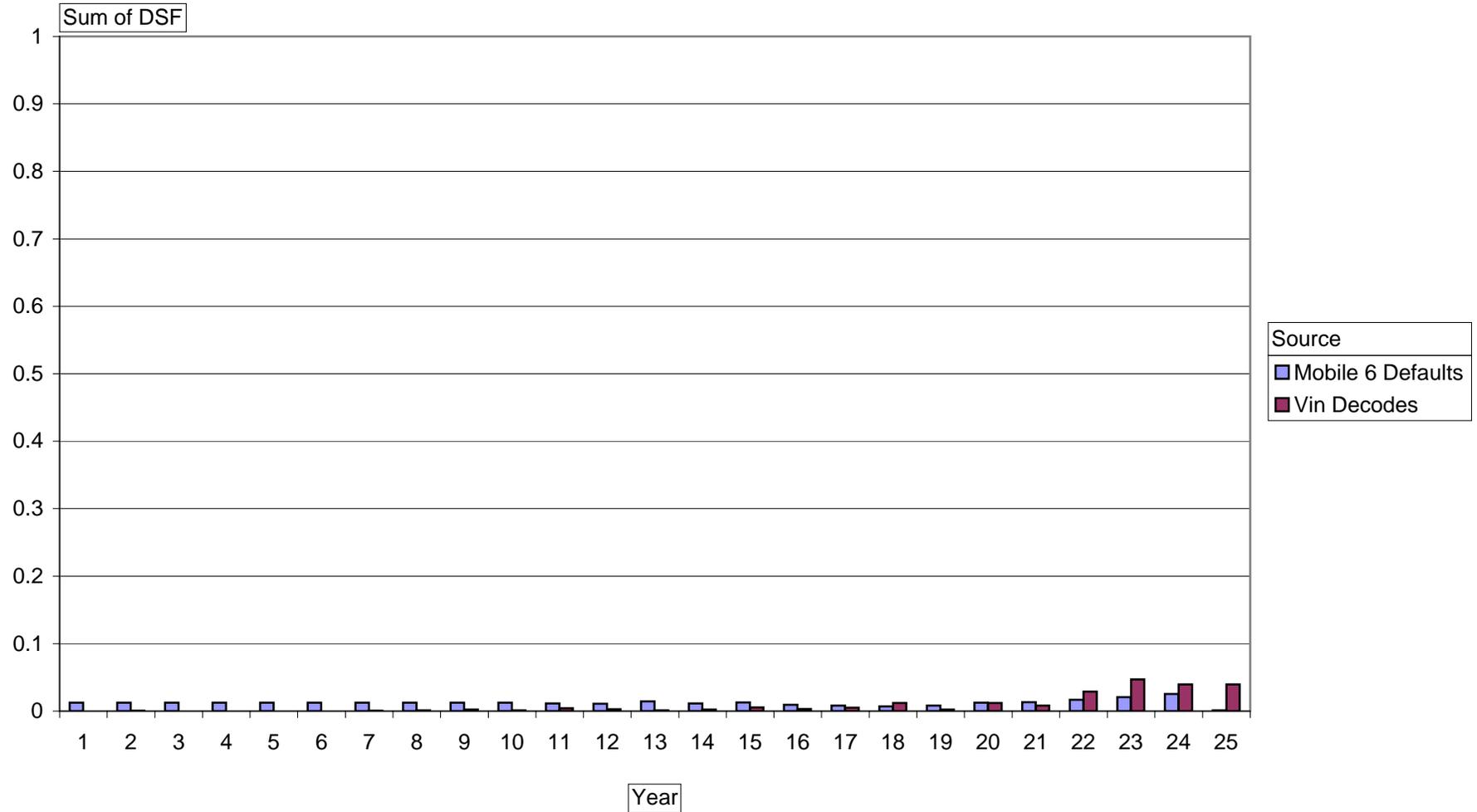
ATTACHMENT 5

Vehicle Type | LDT4

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

ATTACHMENT 5

Vehicle Type | HDV2B

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

ATTACHMENT 5

Vehicle Type | HDV3

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

ATTACHMENT 5

Vehicle Type | HDV4

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

ATTACHMENT 5

Vehicle Type | HDV5

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

ATTACHMENT 5

Vehicle Type | HDV6

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

ATTACHMENT 5

Vehicle Type | HDV7

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined

ATTACHMENT 5

Vehicle Type | HDV8A

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined
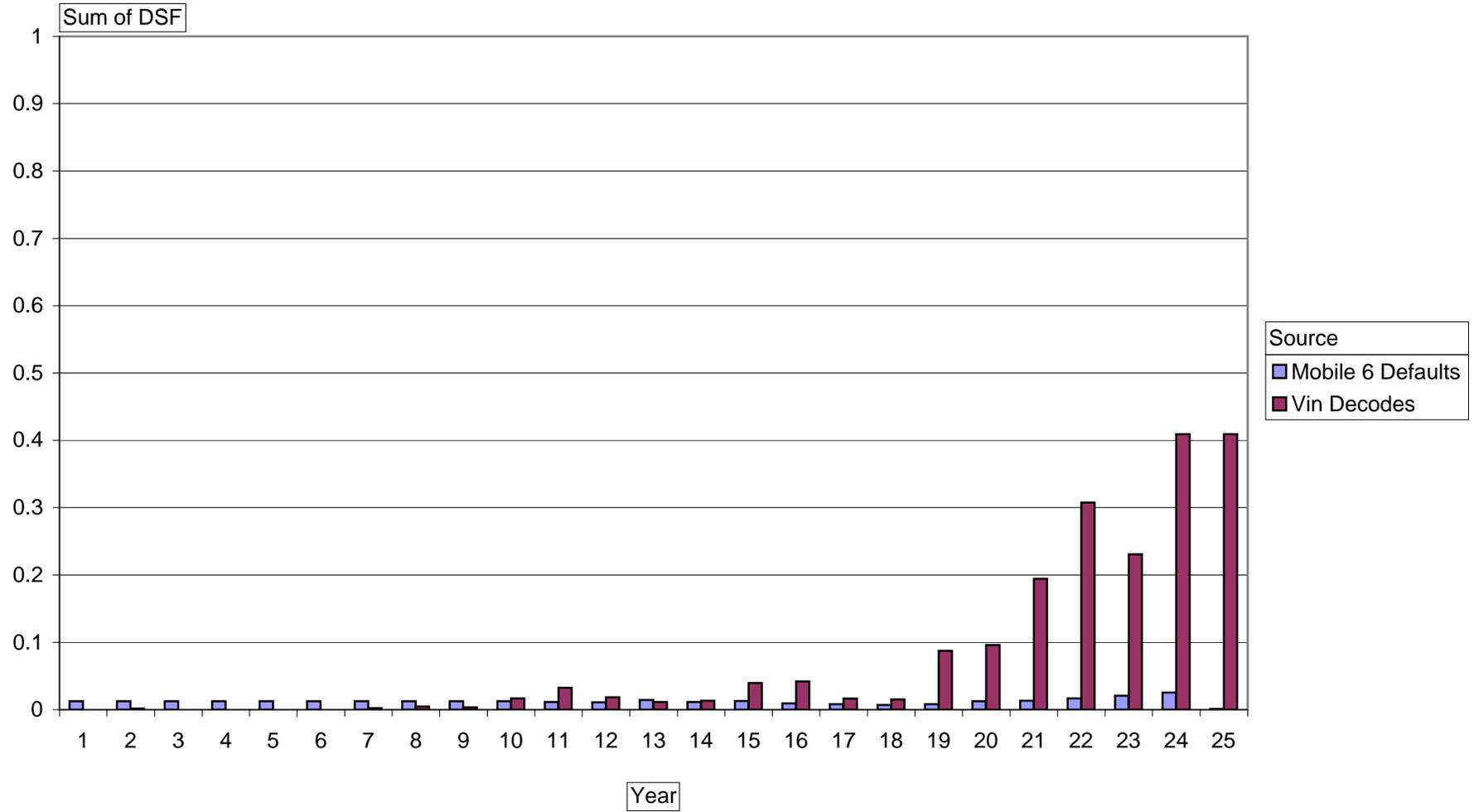
ATTACHMENT 5

Vehicle Type | HDBS
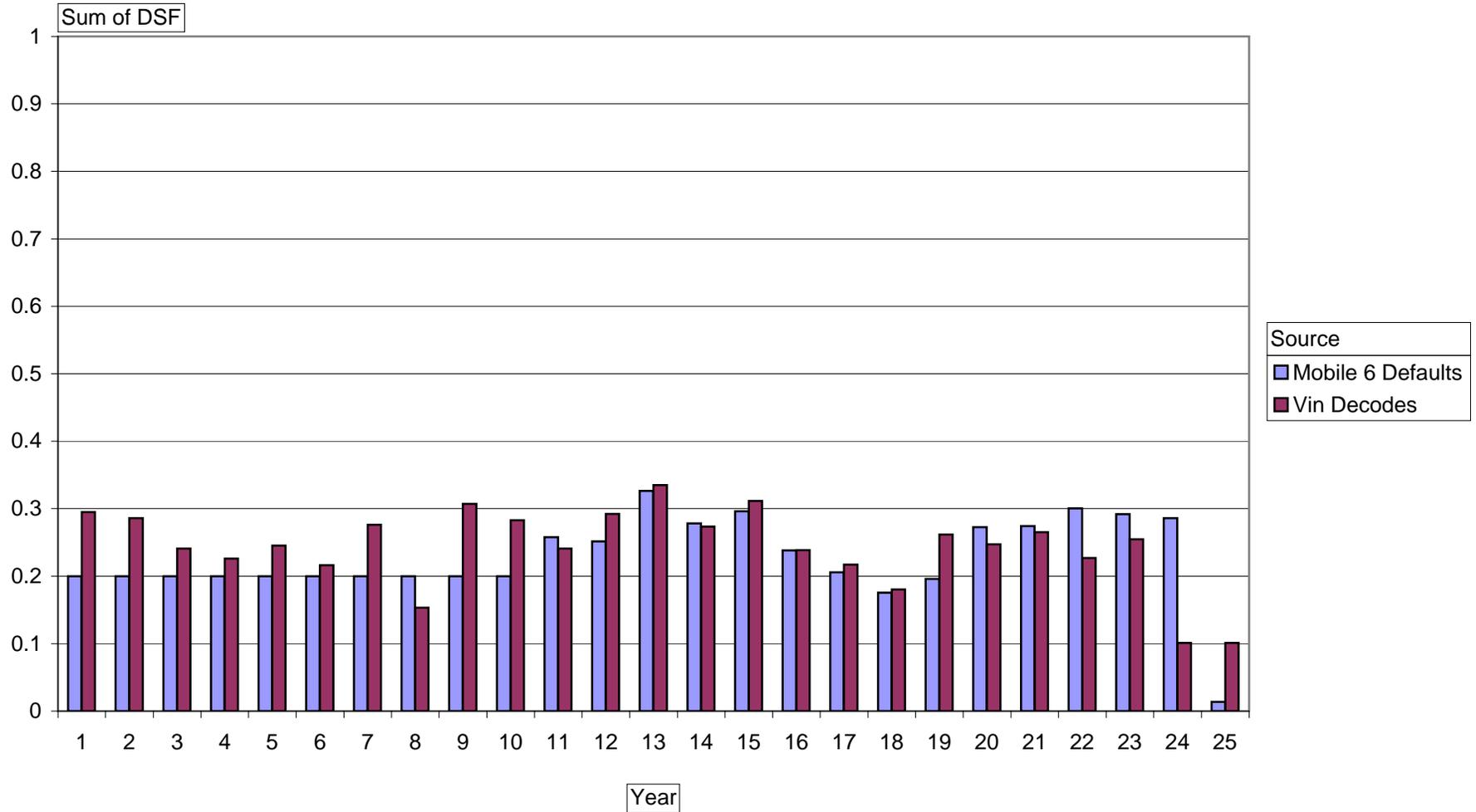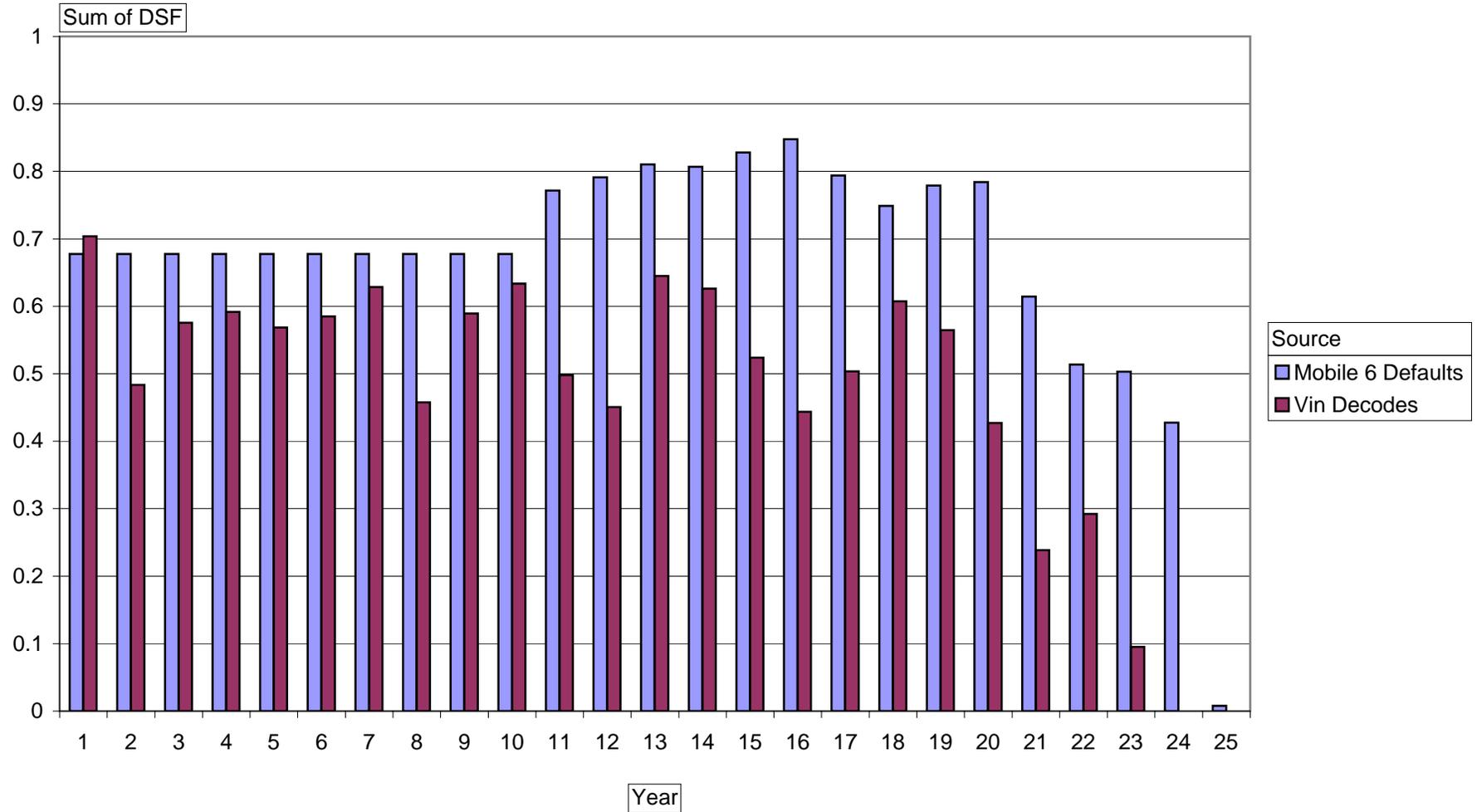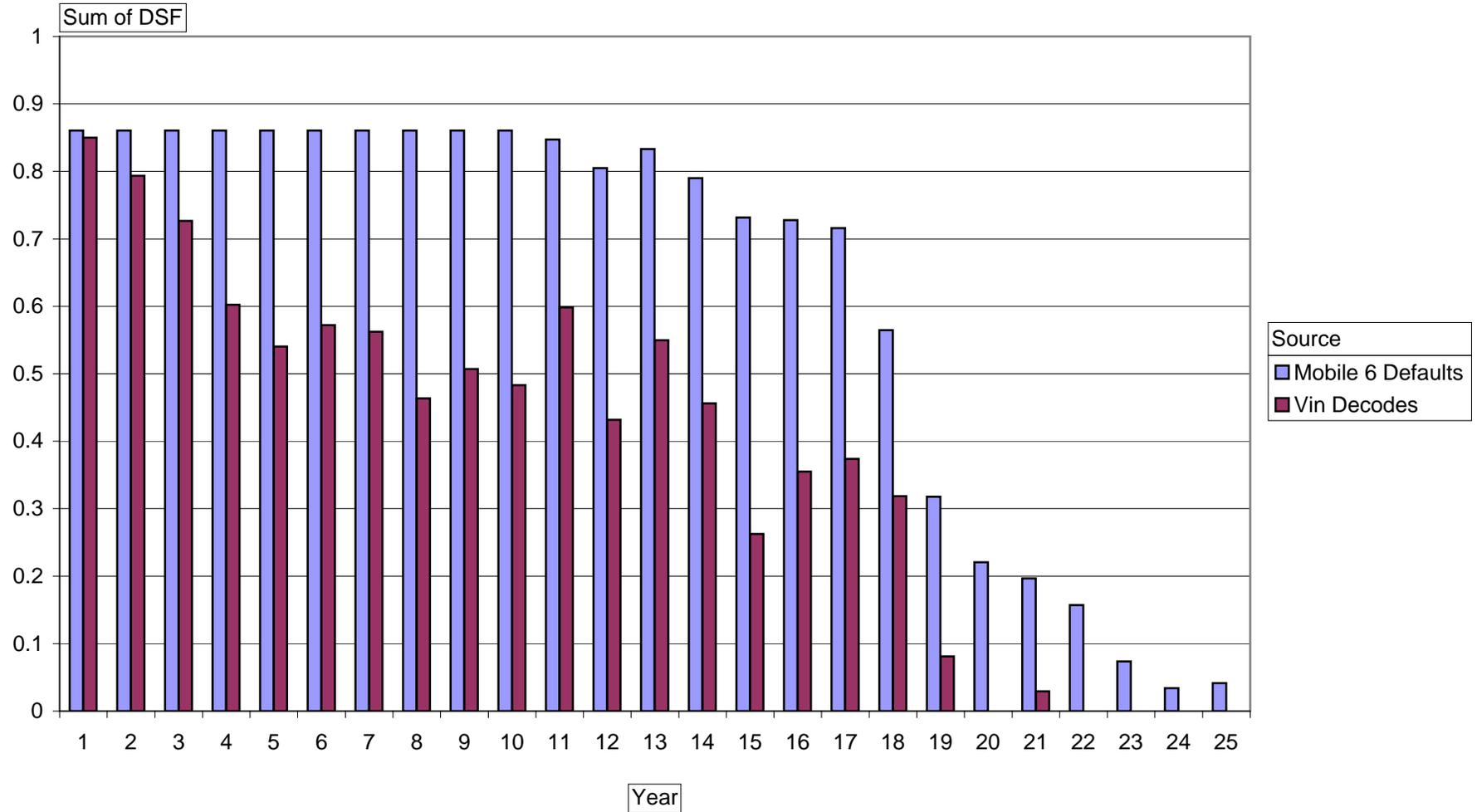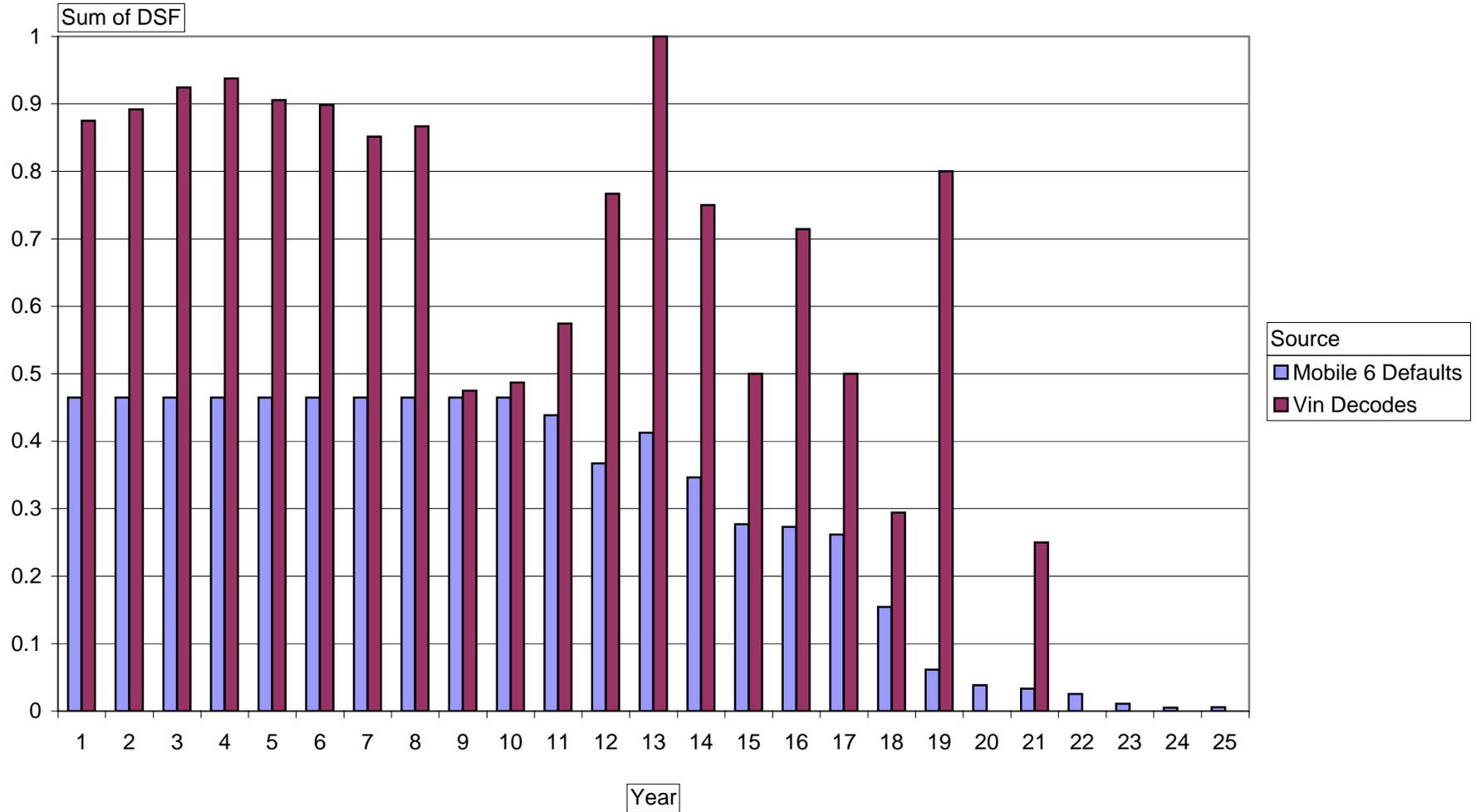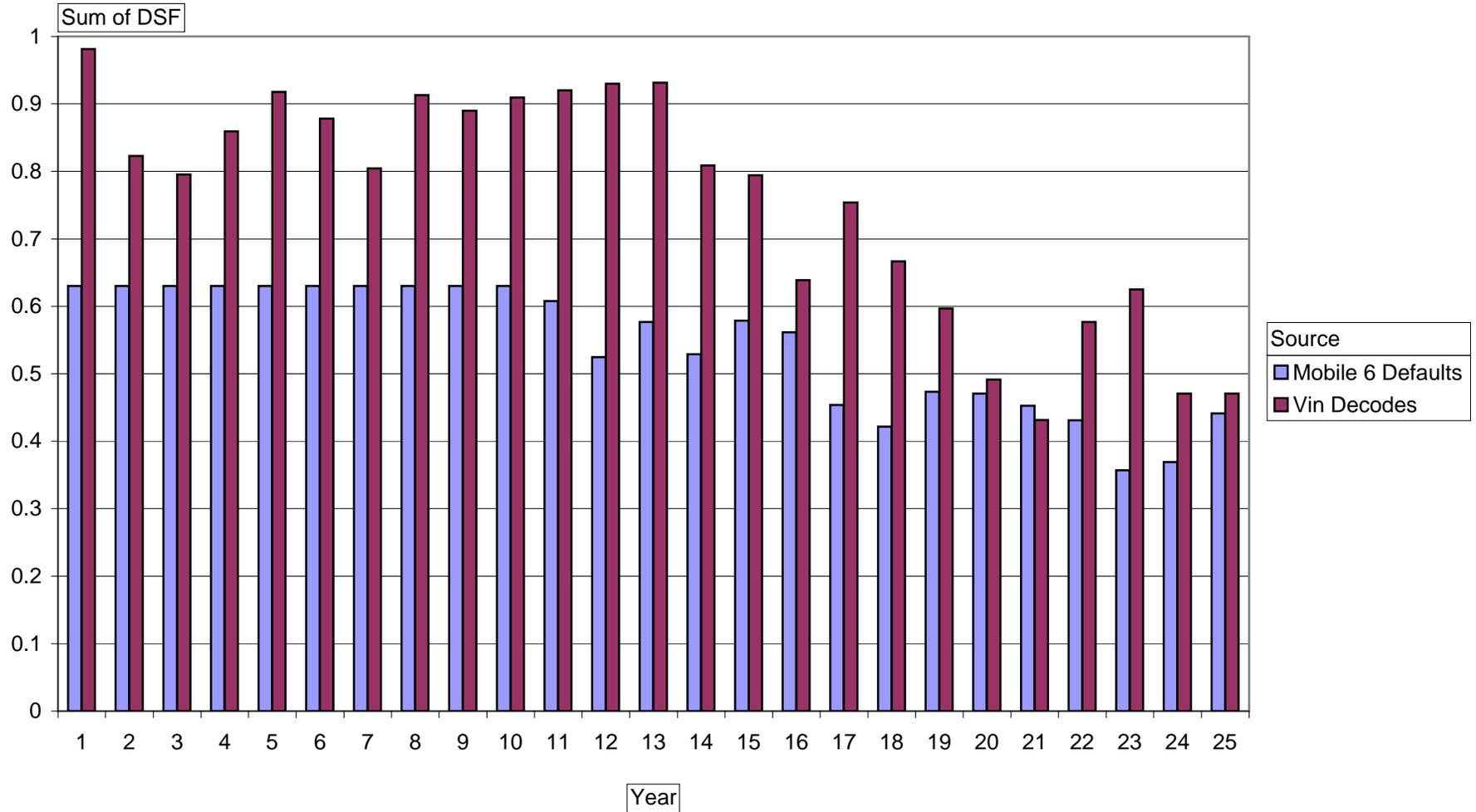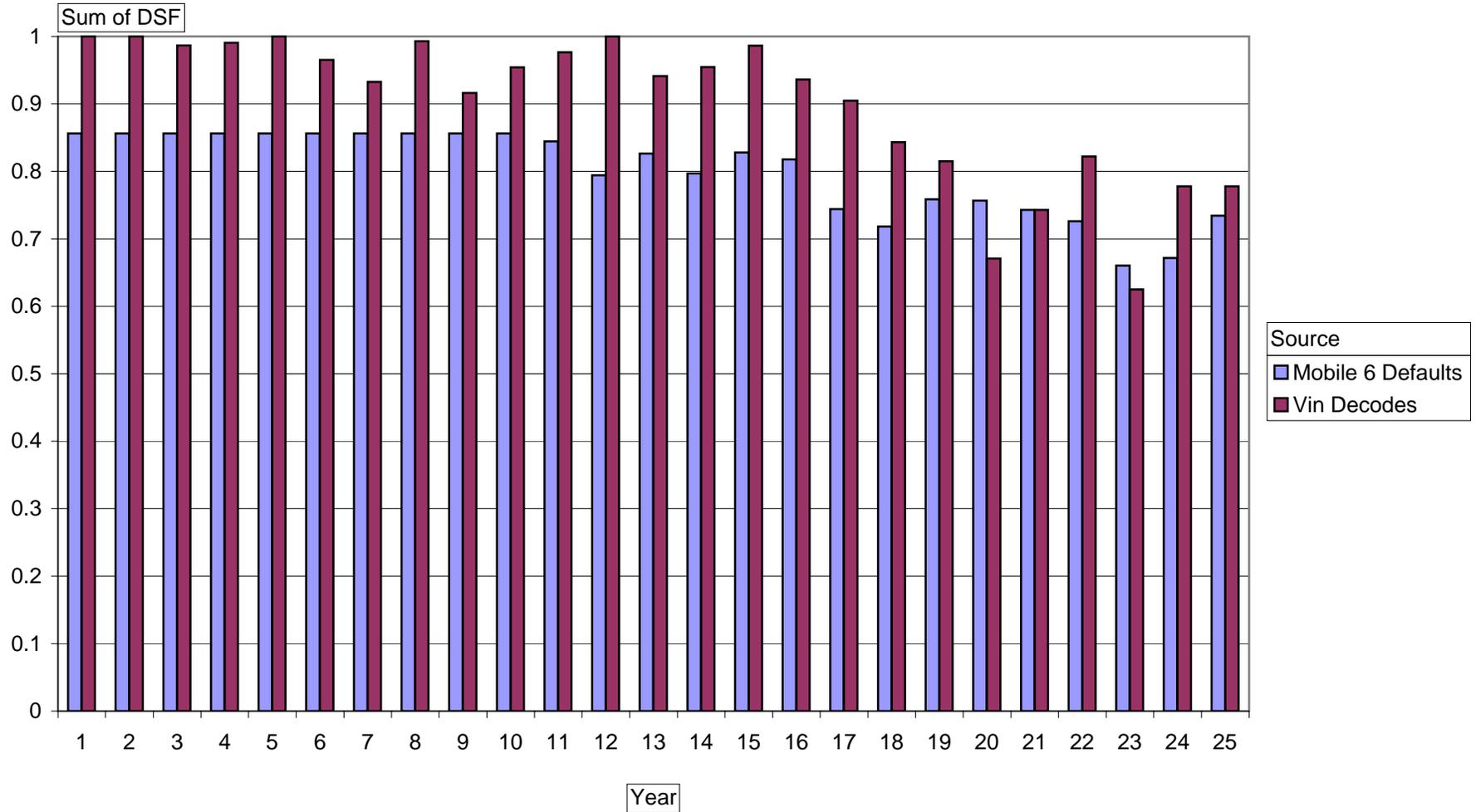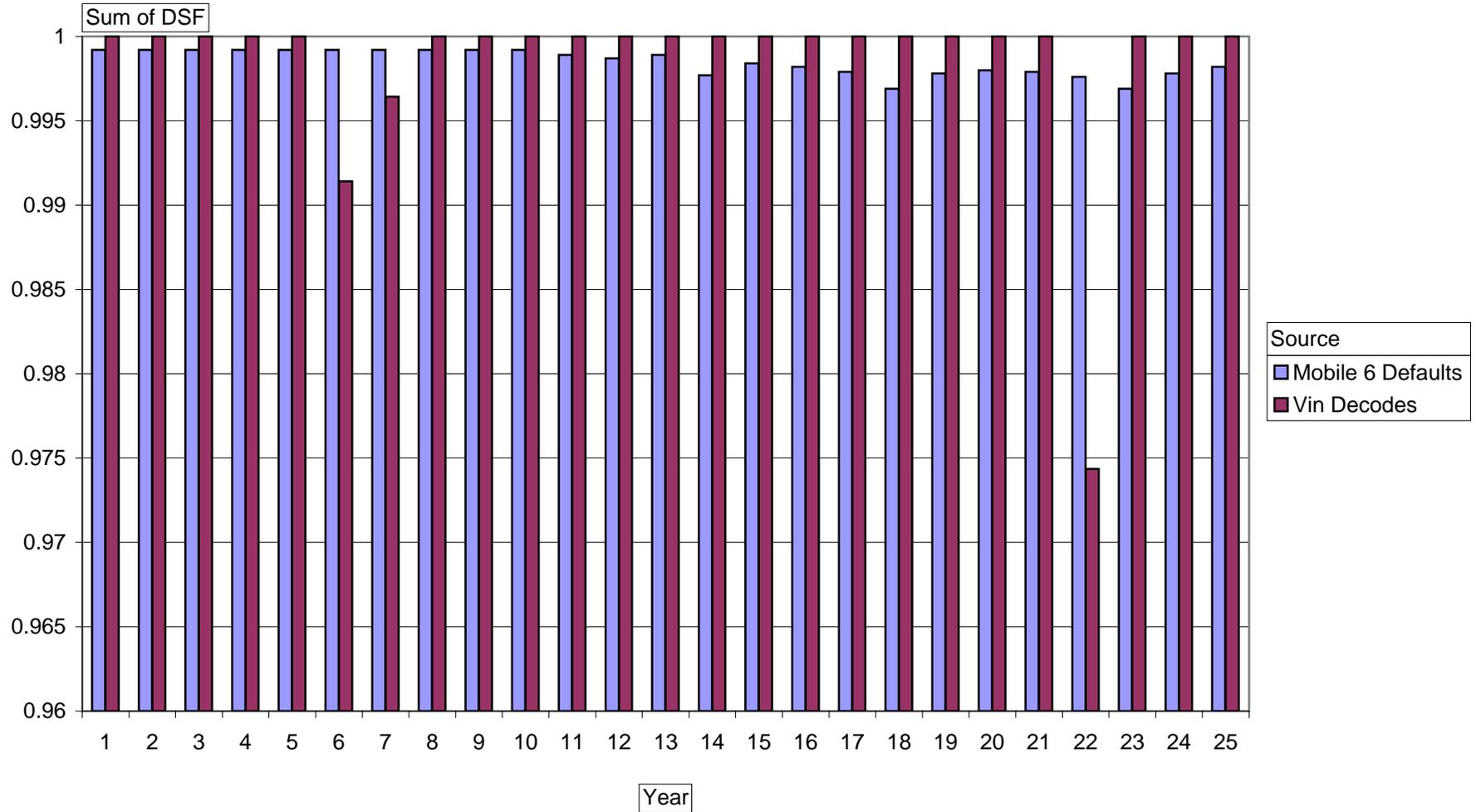
Diesel Sales Fractions
Northern Virginia Jurisdictions Combined
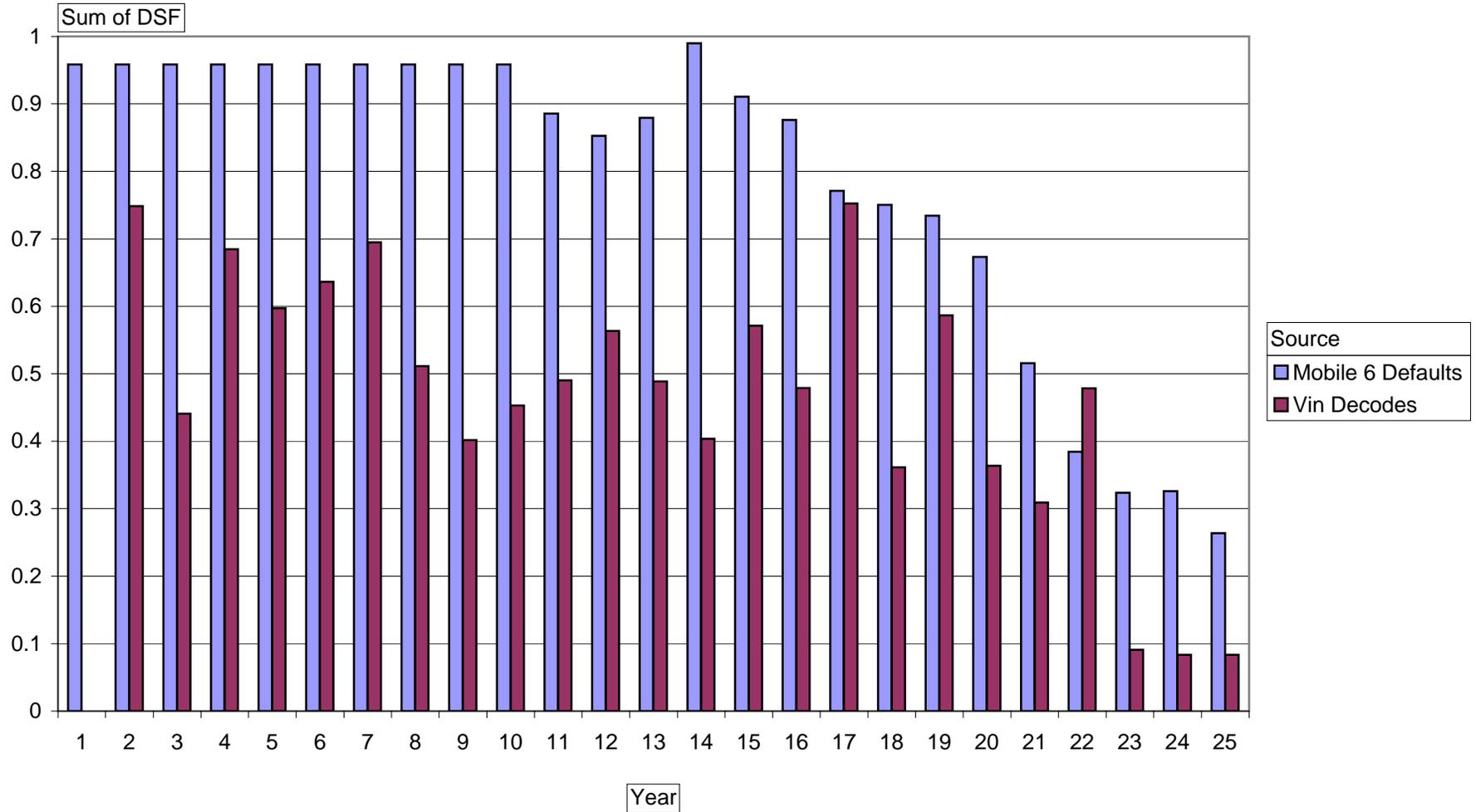
ATTACHMENT 5

Vehicle Type | HDBT

Diesel Sales Fractions
Northern Virginia Jurisdictions Combined
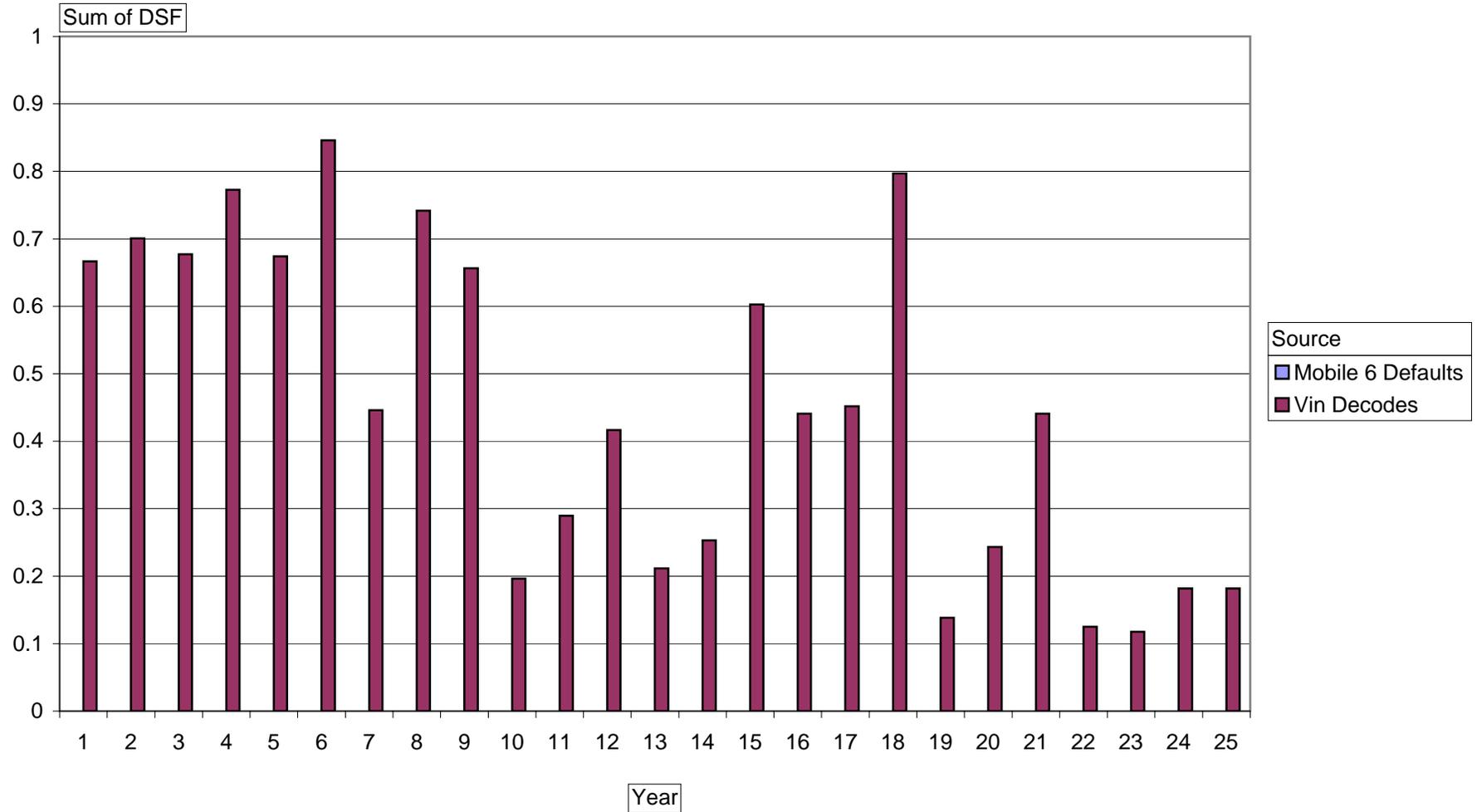
From: Ponticello, James [mailto:James.Ponticello@VDOT.Virginia.gov]
Sent: Wednesday, March 08, 2006 2:38 PM
To: Daivamani Sivasailam
Subject: VIN results

Siva/Michael,

Thanks for forwarding the VIN decoder results. The results look good and I'd certainly support the use of the VIN decoder (knowing all the skeleton's in the DMV data...) I'd offer the following comments/observations;

1.   When you present this, I'd note that "EPA encourages States to work to develop local age distributions for all of the vehicle classes and.....develop tools such as VIN decoders to do this" listed in Section 3.1.1 of the Technical Users Guidance on MOBILE6.2.

2.   I'm guessing the air folks might want to see the difference in emission estimates using both methods, or at least the emission factors. Can that be easily done?

3.   On page 4 of the memorandum, you compare the DSF values of the VIN decoder and the MOBILE defaults. Can you compare a composite of all NOVA jurisdictions' DSF's to the VIN decoder? I'd be more concerned with that than a comparison to the M6 defaults.

4.   Regarding the MC category, M5 and the first version of M6 required all MC's older than 12 years to be put in the 12th year category with zeros for years 13 through 25. However, I didn't see any mention of that in a quick scan of the updated manual. Has DC and MD been providing MC data for all 25 years? I obviously have it if need be.

5.   Last, under age distribution recommendations on page 5, for school and transit bus use you recommend use of M6 defaults because bus reg data reflects that busses are purchased infrequently in large numbers with big variations from year to year. Wouldn't that be a good reason to NOT use the M6 defaults, since the local data will reflect the actual variation that exists in our region?

Please forward to Michael Freeman, as I don't have his email in my VDOT Outlook yet.

Thanks

Jim Ponticello

Air Quality Program Manager

VDOT Environmental Division

(804) 371-6769

2005 Vehicle Age Distribution and Diesel Vehicle Percentages

TPB Technical Committee

4/7/06

I. Introduction/Objective

- Past approach
  - For 2002 State Air agencies and DMV developed 8 vehicle age distribution and two light duty diesel vehicle percentages.
  - Converted to 16 vehicle age distribution files using Mobile 6.2 guidance; used defaults for 12 of the 14 diesel vehicle percentages

- Proposed approach
  - VIN Decoder capable of decoding VINs into Mobile 6.2 specified 28 vehicle categories
  - Decoding VIN database and obtaining 28 Mobile 6.2 vehicle types which would aggregated to 16 vehicle age distributions and 14 diesel vehicle percentages
  - Did a pilot study in the Spring 2005 to test the software and discussed the results with the air agencies
  - Obtained registration database as of July 1, 2005

II. Analysis/Methodolgoy

- Methodology
  - Data bases from the three states were reviewed and duplicates removed.
  - VIN decoder software used to decode VIN numbers by State and Jurisdiction
  - Decoder decoded 96% of the VIN numbers and provided full 28 vehicle type results for model year 1 through 24 and partial for model years 25+ since non-standard VINs prior to 1980 generally not decoded.
  - Results obtained at the Jurisdictional level.
  - The 4% that were not decoded and the associated VIN error codes are shown in Attachment 1A of the documentation memorandum posted on the web.
  - In order to account for vehicles older than 1980 and not decoded, the registration database was used to obtain the percentage of vehicles that meet this criterion.
  - Mobile 6.2 model requires vehicle age distribution for 16 vehicle types and needs the percentage of diesel vehicles for 14 vehicle types and internally converts them to the 28 vehicle types for assigning the vehicle miles of travel.
  - LDV (1 of 16 vehicle types) is obtained by the sum of LDGV and LDDV and the percentage of diesel vehicles for LDV is LDDV/LDV. This is illustrated in the equivalency table shown as attachment 2 of the documentation memorandum.

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- Methodology (continued)
  – Vehicle type LDDT12 is split 11% to LDT1 and 89% to LDT2 using the GVWR available from the decoded database. Similarly LDDT34 was split 59% to LDT3 and 41% to LDT4 in Virginia. HDGB was assigned to different heavy duty vehicle categories based on the GWVR distribution.
  – As described above vehicle age distribution files were developed for 16 vehicle types and compared against 2002 data for the District of Columbia and Maryland, and 2005 data for Virginia.
  – Diesel percentages for 14 vehicle types were developed at the jurisdictional level, and also for northern Virginia as a single entity, and the Maryland Counties in the Washington non-attainment area as a single entity.

III. Observations
  – Review of the plots that were included in the documentation memo show that the age distributions map well against 2002 data with a few exceptions
  – LDT1 in VA dips in the second year; City of Alexandria has a higher number of model year 1 vehicles compared to all the other jurisdictions in VA
  – Motorcycles were capped at model year 12 in the prior year registration data base
  – Due to bus purchases occurring in lumps, transit bus age distribution spikes in some years, such as model year 9 in the District, 8th and 18th year in Fairfax County VA, 11th and 19th year in Montgomery County, MD

4

- Observations (continued)
  - Diesel vehicle percentages at jurisdictional level would be spotty due to low number of heavy duty vehicles in some jurisdiction
  - Diesel vehicle percentages for school buses lower than anticipated due to the addition of heavy duty gasoline buses into the mix

IV. Preliminary Recommendations
  - Based on our review of the data we recommend using the age distribution data at the jurisdictional level with the exception of the school bus and transit bus.
  - For school bus and transit bus we recommend using the Mobile 6.2 default
  - Apply Diesel vehicle percentages at an aggregate level such as Maryland Counties together, Northern Virginia together, and District of Columbia (or a regional number or other combinations).
  - Motorcycles use all 25+ years age distribution

1-46

DATE: March 21, 2006

TO: Joan Rohlfs

CC: Mike Clifford, Sunil Kumar, Daivamani Sivasailam

FROM: Eulalie G. Lucas

SUBJECT: Results of Monthly Versus Seasonal Emissions Analysis

I. Introduction

This memo transmits results associated with sensitivity tests conducted by DTP staff to show the difference in emissions based on a set of Mobile model monthly input streams and a set of seasonal input streams, for later use in the preparation of annual inventories associated with SIP planning and for air quality conformity analysis of plans and programs. These tests were conducted in response to a request from Air Agency staff for a complete inventory utilizing the two approaches.

II. Objective

While a four seasons approach was applied in the last conformity assessment, the three seasons approach was selected for this test to better address the effects of two significant inputs: one, Evaluation Month which affects fleet composition, and two, the effects of reformulated gasoline (RFG). These two inputs are applied in the Mobile model as either "1", for a winter run, or "7", a summer run. Adherence to the Mobile guidance was crucial in averaging the inputs of the seasons for the creation of seasonal inputs for a third season and it was also a collaborative effort between DEP and DTP staff. Other factors that might change between January and July, such as temperature and fuel volatility, did not influence the selection of months associated with the three seasons.

III. Seasonal Definitions:

Winter: January thru April
Summer: May thru September
Fall: October thru December

IV. Operations:

    A. Development of travel data Vehicle Miles of Travel (VMT).

        Adjustment factors developed by DTP staff were applied to base 2002 VMT to convert average annual weekday travel (AAWDT) to Average Daily Travel (ADT). Two sets of factors were developed one set was applied to the annual VMT to produce monthly travel data and another set was developed to produce seasonal VMT. See attachment 1

    B. Emission Factors.

        1. Apply EPA's fuel program 4 using region-specific fuel specifications for winter and summer months.

        2. Develop Averages for fall:
- Hourly temperatures and associated humidity values were averaged using the same formula developed by DEP staff. See attachment 2
- Month specific RVP values were used for winter and summer months and weighted averages based on region-specific values for fall months. See attachment 3
- Diesel and gasoline sulfur content values were applied per winter and summer months values and averaged for fall months. See attachment 4

    C. Emissions Calculations

        The seasonal emission factors were read into the post-processor and the VMT seasonal adjustments were applied resulting in seasonal emissions estimates.

V. Results

  A. PM 2.5 results are illustrated in table 1 the difference between the difference between the annual and seasonal runs is 0.27%

  B. Precursor NOx results are shown in Table 2, with a difference of 0.15% between the two approaches.
.

VI. Conclusion

Using the seasonal approach for the preparation of annual inventories gives the same results as the monthly approach at one fourth of the computer time.

Tables and Attachments

Tables 1 and 2: Emissions Results
Attachment 1:   Travel Data
Attachment 2:   Seasonal Temperature and Humidity
Attachment 3:   Monthly Fuel Inputs
Attachment 4:   Seasonal Averages for Fuel Program
Attachment 5:   2002 Running Emission Rates for DC

Table 1 Direct PM 2.5 Results
2002 Network Monthly Emissions vs Seasonal Emissions

Season	Month	Total Trip Cycle		Absolute Difference	Percent Difference
		Tons per month	Tons per season (AQC)		
Winter	Jan	124.93			
	Feb	116.62			
	Mar	132.28			
	Apr	128.01			
	Sub-Total	501.84	504.96	3.13	0.62%
Summer	May	128.34			
	Jun	127.53			
	Jul	130.82			
	Aug	130.60			
	Sep	122.22			
	Sub-Total	639.52	639.85	0.33	0.05%
Fall	Oct	125.80			
	Nov	117.87			
	Dec	121.34			
	Sub-Total	365.01	365.70	0.69	0.19%
	Annual	1506.36	1510.51	4.15	0.27%

Table 2: Precursor NOx
2002 Network Monthly Emissions vs Seasonal Emissions

Season	Month	Total Trip Cycle		Absolute Difference	Percent Difference
		Tons per month	Tons per season (AQC)		
Winter	Jan	8720.65			
	Feb	7986.47			
	Mar	8584.93			
	Apr	7996.11			
	Sub-Total	33288.15	33418.44	130.29	0.39%
Summer	May	7526.02			
	Jun	7248.18			
	Jul	7304.96			
	Aug	7297.68			
	Sep	7000.11			
	Sub-Total	36376.96	36303.23	-73.73	-0.20%
Fall	Oct	7804.57			
	Nov	7709.91			
	Dec	8474.56			
	Sub-Total	23989.03	24077.42	88.38	0.37%
	Annual	93654.14	93799.09	144.94	0.15%

Attachment 1

Comparison of Monthly and Seasonal VMT's

Daily VMT   121,000,000

		Number of Days	Monthly Factor	AAWDT (1,000s)	Monthly VMT (1,000s)	Number of Days	Seasonal Factor	Seasonal VMT (1,000
	Jan	31	0.880	121000	3,300,880			
	Feb	28	0.912	121000	3,088,495			
Winter	Mar	31	0.934	121000	3,502,147	120	0.92	
	Apr	30	0.959	121000	3,482,220			
				subtotal	**13,373,743**			**13,381,632**
	May	31	0.978	121000	3,668,688			
	Jun	30	1.004	121000	3,643,754			
Summer	Jul	31	0.996	121000	3,734,602	153	0.99	
	Aug	31	0.996	121000	3,734,803			
	Sep	30	0.964	121000	3,497,685			
				subtotal	**18,279,532**			**18,277,885**
	Oct	31	0.953	121000	3,574,387			
Fall	Nov	30	0.917	121000	3,328,509	92	0.93	
	Dec	31	0.910	121000	3,413,410			
				subtotal	**10,316,305**			**10,332,722**
				Annual	41,969,580			41,992,239

Spring Season Hourly Temperature and Relative Humidity

Winter/Spring Months (01, 02, 03 and 04)

Hour	Temp	DPT	Cal. RH	NCDC RH	Station Pressure
1	39.8	29.5	66.5	69.1	29.9
2	39.0	29.3	68.0	70.2	29.9
3	38.2	29.1	69.3	71.5	29.9
4	37.6	29.1	71.0	72.8	29.9
5	37.2	29.0	72.0	73.9	29.9
6	36.9	28.9	72.4	74.3	29.9
7	37.4	29.1	71.7	73.7	29.9
8	38.9	29.3	68.2	70.7	29.9
9	41.2	29.7	63.4	66.3	29.9
10	43.4	29.7	58.1	61.2	29.9
11	45.5	29.9	54.2	57.8	29.9
12	47.2	30.0	50.7	54.7	29.9
13	48.6	29.9	48.1	52.4	29.9
14	49.7	30.1	46.5	51.1	29.8
15	50.2	30.0	45.5	50.3	29.8
16	50.2	30.0	45.5	50.4	29.8
17	49.3	30.0	47.1	51.7	29.8
18	47.5	29.8	49.9	54.3	29.8
19	45.8	29.8	53.4	57.2	29.9
20	44.3	30.0	56.9	60.3	29.9
21	43.1	30.0	59.4	62.5	29.9
22	42.3	29.7	60.8	63.9	29.9
23	41.4	29.8	63.0	65.8	29.9
24	40.6	29.8	65.0	67.6	29.9

Summer Season Hourly Temperature and Relative Humidity
Summer Months (05, 06, 07, 08 and 09)

Hour	Temp	DPT	Cal. RH	NCDC RH	Station Pressure
1	67.3	61.9	82.5	83.5	29.8
2	66.6	61.5	83.5	84.5	29.8
3	66.2	61.4	84.3	85.5	29.8
4	65.8	61.1	84.7	86.2	29.8
5	65.3	60.9	85.5	86.6	29.8
6	65.7	61.1	85.1	85.9	29.8
7	67.6	61.7	81.0	82.3	29.8
8	69.9	62.2	76.0	77.2	29.9
9	72.3	62.3	70.4	72.2	29.9
10	74.5	62.2	65.1	67.3	29.9
11	76.3	62.0	60.6	63.1	29.8
12	77.9	62.0	57.6	60.1	29.8
13	78.9	61.8	55.2	57.8	29.8
14	79.5	61.6	53.6	56.7	29.8
15	79.5	61.6	53.6	56.9	29.8
16	79.1	61.7	54.5	57.6	29.8
17	78.4	61.7	55.9	59.2	29.8
18	76.9	61.8	59.2	62.1	29.8
19	74.7	62.0	64.2	66.8	29.8
20	72.5	62.3	69.8	71.8	29.8
21	71.2	62.5	73.5	75.6	29.8
22	69.9	62.4	76.7	78.7	29.8
23	68.9	62.3	79.2	80.6	29.8
24	68.0	62.1	81.1	82.2	29.8

Fall Season Hourly Temperature and Relative Humidity

Months (October, November and December)

Hour	Temp	DPT	Cal. RH	NCDC RH	Station Pressure
1	44.6	37.5	75.8	77.6	29.9
2	44.1	37.3	76.8	78.4	29.9
3	43.6	37.2	78.1	79.4	29.9
4	43.2	36.8	78.1	80.3	29.9
5	42.7	36.7	79.1	80.3	29.9
6	42.4	36.4	78.9	80.6	29.9
7	42.6	36.4	78.7	80.4	29.9
8	43.9	37.2	77.1	78.9	29.9
9	46.3	37.7	71.6	73.6	29.9
10	48.8	38.0	65.8	68.2	29.9
11	50.7	37.7	60.8	63.3	29.9
12	52.4	37.6	56.6	59.8	29.9
13	53.6	37.4	53.9	57.2	29.9
14	54.2	37.4	52.7	56.3	29.8
15	54.3	37.5	52.6	56.2	29.8
16	53.7	37.6	53.9	57.6	29.8
17	52.0	37.4	57.2	60.4	29.9
18	50.1	37.6	61.7	64.6	29.9
19	48.8	37.7	65.1	67.8	29.9
20	47.7	37.6	67.5	70.1	29.9
21	46.9	37.9	70.4	72.4	29.9
22	46.3	37.7	71.6	74.0	29.9
23	45.6	37.6	73.4	75.5	29.9
24	45.0	37.6	74.9	76.6	29.9

Month	DC		DC	Washington, DC-MD-VA Mobile Modeling Area RFG Counties			
	Gasoline Sulfur	RVP	Highway Diesel Sulfur	Ether Oxy. Content (% by wt)	Ether Market Share (%)	Ethanol Oxy. Content (%)	Ethanol Market Share (%)
Jan	230.0	13.1	324	1.5	70	3.5	30
Feb	199.57	10.4	324	1.5	70	3.5	30
Mar	199.57	10.4	326	1.5	70	3.5	30
Apr	159.0	6.8	326	1.5	70	3.5	30
May	159.0	6.8	326	2.1	100	0	0
Jun	159.0	6.8	329	2.1	100	0	0
Jul	159.0	6.8	329	2.1	100	0	0
Aug	159.0	6.8	329	2.1	100	0	0
Sep	159.0	6.8	326	2.1	100	0	0
Oct	159.0	6.8	326	1.5	70	3.5	30
Nov	199.57	10.4	326	1.5	70	3.5	30
Dec	230.0	13.1	324	1.5	70	3.5	30

Month	VA - RFG Counties		VA - Non-RFG Counties		VA - All Counties	Wash, DC-MD-VA Mobile Modeling Area RFG Counties			
	Gasoline Sulfur	RVP	Gasoline Sulfur	RVP	Highway Diesel Sulfur	Ether Oxy. Content (% by wt)	Market Share	Oxy. Content	Ethanol Market Share (%)
Jan	279.0	12.9		12.9	330	1.5	70	3.5	30
Feb	279.0	12.9		12.9	330	1.5	70	3.5	30
Mar	279.0	12.9		12.9	344	1.5	70	3.5	30
Apr	279.0	12.9		12.9	344	1.5	70	3.5	30
May	129.0	6.7		8.4	344	2.1	100	0	0
Jun	129.0	6.7	Conventional	8.4	357	2.1	100	0	0
Jul	129.0	6.7	Gasoline East Values	8.4	357	2.1	100	0	0
Aug	129.0	6.7		8.4	357	2.1	100	0	0
Sep	129.0	6.7		8.4	344	2.1	100	0	0
Oct	279.0	12.9		12.9	344	1.5	70	3.5	30
Nov	279.0	12.9		12.9	344	1.5	70	3.5	30
Dec	279.0	12.9		12.9	330	1.5	70	3.5	30

Month	MD - RFG Counties		MD - Non-RFG Counties		MD - All Counties	Washington, DC-MD-VA Mobile Modeling Area RFG Counties			
	Gasoline Sulfur	RVP	Gasoline Sulfur	RVP	Highway Diesel Sulfur	Ether Oxy. Content (% by wt)	Market Share	Oxy. Content	Ethanol Market Share (%)
Jan	279.0	12.9		12.9	477	1.5	70	3.5	30
Feb	279.0	12.9		12.9	478	1.5	70	3.5	30
Mar	279.0	12.6		12.6	500	1.5	70	3.5	30
Apr	279.0	11.0		11.0	467	1.5	70	3.5	30
May	129.0	7.5		7.5	481	2.1	100	0	0
Jun	129.0	6.7	Conventional	8.4	480	2.1	100	0	0
Jul	129.0	6.5	Gasoline East Values	8.2	500	2.1	100	0	0
Aug	129.0	6.6		8.1	455	2.1	100	0	0
Sep	129.0	7.2		7.2	464	2.1	100	0	0
Oct	279.0	10.0		10.0	469	1.5	70	3.5	30
Nov	279.0	11.3		11.3	491	1.5	70	3.5	30
Dec	279.0	12.2		12.2	484	1.5	70	3.5	30

Attachment 4
Seasonal Values for fuel parameters and RVP

DC

	Gas S	Diesel S	RVP
Winter	197.0	325.0	12.9
Summer	159.0	327.8	6.7
Fall	196.2	325.3	12.9

MD / MD - NonRFG

MD			**MD - NonRFG**
Gas S	Diesel S	RVP	RVP
279.0	480.5	12.4	12.4
129.0	476.0	6.9	7.9
279.0	481.3	11.2	11.2

VA / VA - NonRFG

VA			**VA - NonRFG**
Gas S	Diesel S	RVP	RVP
279.0	337.0	12.9	12.9
129.0	351.8	6.7	8.4
279.0	339.3	12.9	12.9

Ether Oxy. Con	Ether Market Sh	Ethanol Oxy. Co	Ethanol Market Share (%)
1.5	70	3.5	30
2.1	100	0	0
1.5	70	3.5	30

Average of monthly values

**Attachment 5a
2002 Mobile Rates Nox Rates by Month
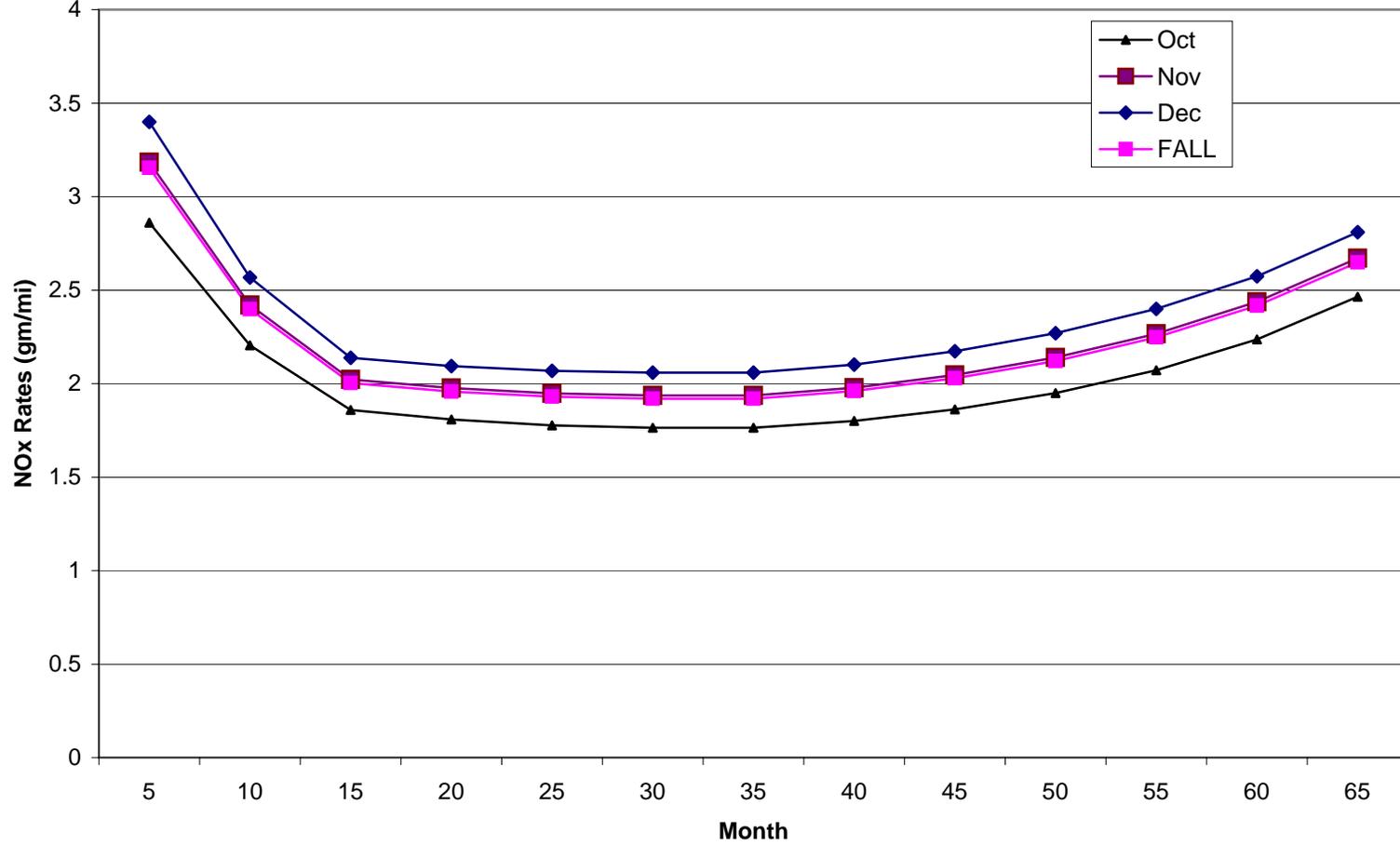at Varying Speeds for DC Freeways
Reg Inputs**
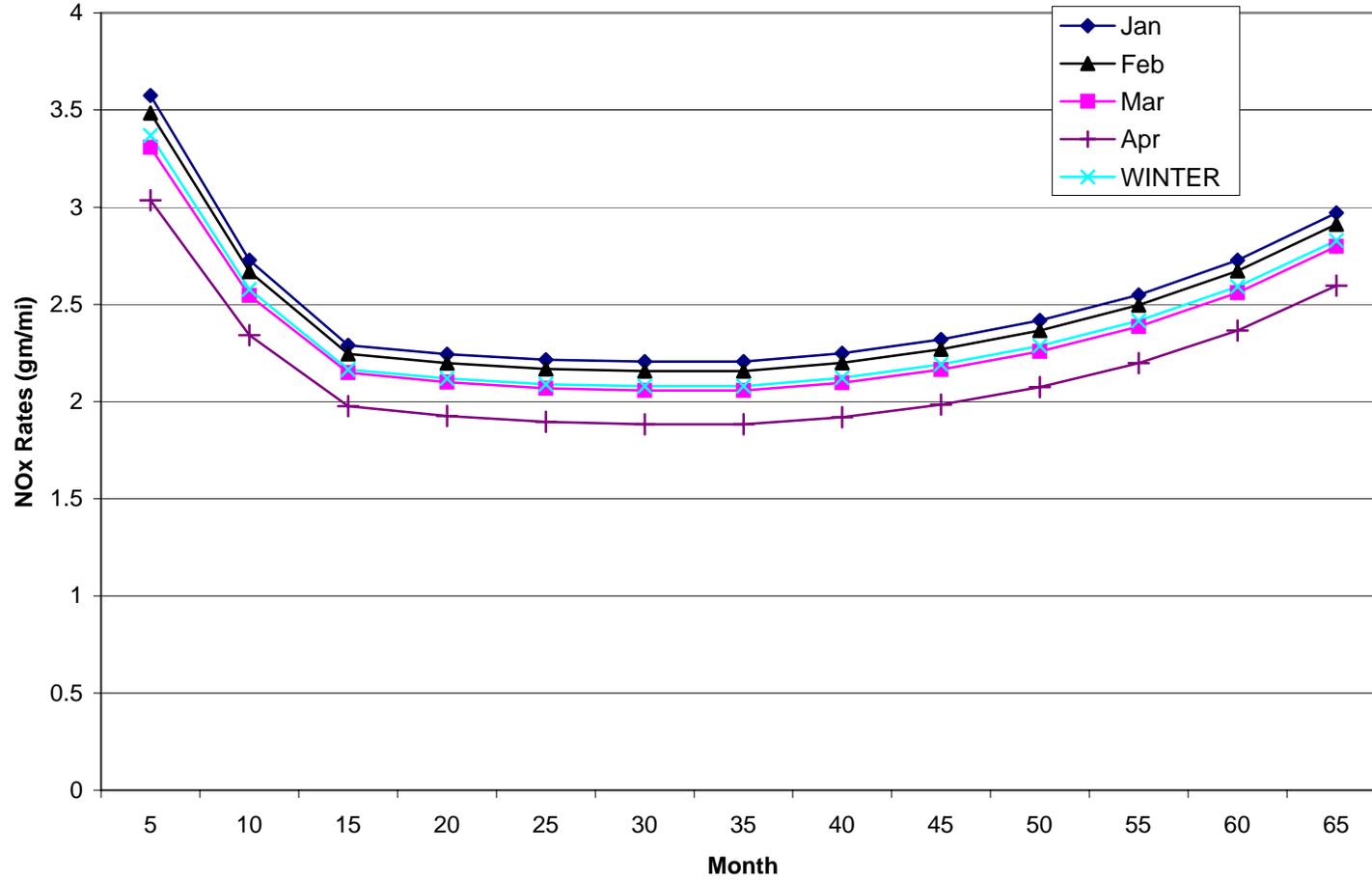
Attachment 5b
2002 Mobile Rates Nox Rates by Month
at Varying Speeds for DC Freeways
Reg Inputs
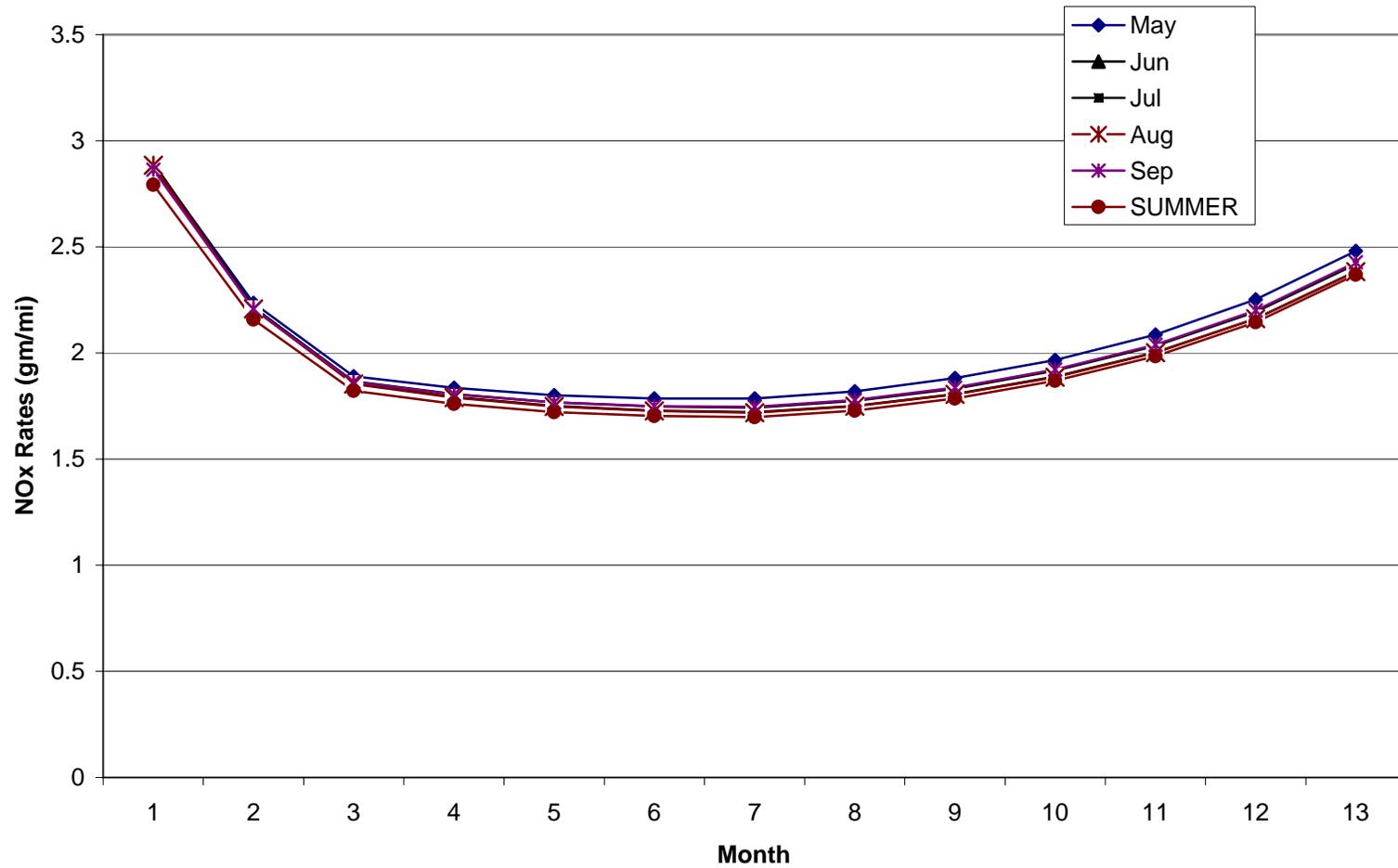
Attachment 5c
2002 Mobile Rates Nox Rates by Month
at Varying Speeds for DC Freeways
Reg Inputs

ITEM #4 - SIP SCHEDULE COMPARISION

Task	Responsible Party	Deadline 12/06	New Deadline	Status 3/22/06
8-Hour Ozone SIP Planning				
Proposed Schedule (Revised 3/10/06)				
Control Measure Development				
Develop Master List of Control Measures	Staff w/input	Oct-May '05	Oct-May '05	✔
Criteria for Priority Measures	Work Group			✔
Identify Priority Measures	Work Group	Sept-May 2005	Sept-May 2005	✔
Monthly Workgroup Calls	States, TAC			✔
Preliminary control strategy	TAC,MWAQC	May-June 05	May-June 05	✔
Public meetings on control measures	MWAQC	Sept-Oct 05	Sept-Oct 05	✔
Analysis of regional (OTC) measures*	MWAQC/OTC	Jan-Feb'06	Jan-Feb'06	✔
Analysis of RACM	MWAQC	Dec-Mar '06	Dec-Mar '06	✔
Public meetings on control measures	MWAQC	Mar-Sept	June-Oct '06	
Adopt control strategy	MWAQC	Mar-April 06	Apr-June '06	
Funding commitments	States/locals			
Draft regulations	States			
Introduce regulations	States	Sept-Feb'07	Sept-Feb'07	
Inventory Development				
Inventory Update: 2002 Base Year	States/Staff	Sept-Nov '04	Sept-Nov '04	✔
Submit 2002 Inventory & QAPlan-EPA	States/Staff	June 06	June 06	
Prepare Prelim. 2009 SIP Inventories	States/Staff	April-June 05	April-June 05	✔
Calculate Preliminary ROP Targets	COG Staff	Dec-April 06	Dec-May '06	
Finalize 2009 SIP Inventories	COG Staff	Dec-Mar 06	Dec-May '06	
Finalize Reduction Requirements	States/Staff	Feb-April 06	Feb-May '06	
Attainment Modeling				
Draft protocol document	States	April 2005	April 2005	✔
Model Base Case 2002	States	June 05	June 05	✔
Test control strategy scenarios	States	Jan-Apr 06	Jan-June 06	
Model Future scenarios	States	Dec-Apr 06	Dec-June 06	
Report on Photochemical modeling	States	Mar 06	Mar 06	✔
Weight of Evidence	States/Staff	Feb-Mar 06	May-Aug 06	
Finalize Attainment Demonstration	States/MWAQC	Sept 06	Sept 06	
SIP Submittal - 2007				
Draft 8-Hour Ozone SIP Template	Staff	Dec. 2005	Dec. 2005	
Draft SIP to TAC	Staff	June-Sept 06	Sept 06	
Draft SIP to MWAQC	Staff	July-Sept 06	Oct 06	
Public Comment, Hearings	States	Oct-Nov '06	Oct-Nov '06	
Response to Public Comment	States/Staff	Oct-Nov 06	Oct-Nov 06	
MWAQC approval	MWAQC	Nov-Dec 06	Dec-Jan 07	
Transmit SIP to IAQC	MWAQC	Dec-Feb '07	Jan-Mar 07	
SIP SUBMITTAL DEADLINE	**States**		**June 2007**	
Transportation/AQ Conformity				
8-Hour Conformity Determination	Staff/TPB		Dec./Jan '05	✔
FY 2005-2010 TIP				
8 Hour Conformity Determination				
FY 2006-2011, 2005 CLRP	Staff/TPB		July-Sept '05	✔
8 Hr Conformity Determination				
FY2007-2012 TIP, 2006 CLRP	Staff/TPB		Sept '06	
8-Hour Mobile Budgets Proposed	Staff/MWAQC	Mar-Apr '06	June-Aug 06	

Prepared by jrohlfs 3/16/2006