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ITEM 22
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Environmental Activities Staff
General Motors Corporation
General Motors Technical Center
Warren, Michigan 48090

July 16, 1984

Mr. Kenneth E. Feith
Docket OPM-0184
Office of Air and Radiation (OAR-445)
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Feith:

Reference: U.S. EPA Information Request, dated April 12, 1984, regarding General Motors petition to postpone the effective date of the 80 dB federal truck noise standard.

General Motors response to the questions contained in the referenced letter to General Motors is attached. The information presented is supplementary to our previous petition for deferral of the effective date of the 80 dB medium and heavy truck noise standard from January 1, 1986 to coincide with or follow the effective date of heavy duty NOx and diesel particulate exhaust emission standards.

The closing paragraph of your letter restates the Agency's mandate to protect the public health and welfare and indicates that the Agency would welcome suggestions which could help ensure continued public benefits (relative to noise) and assist the trucking industry in its economic recovery. We believe that deferral of the 80 dB standard will have no perceptible impact on the environment and thus no adverse effects on the public welfare. As a matter of fact, we fully expect that a continued reduction in overall truck noise, a trend that noticeably began with imposition of the 83 dB standard in 1978, will be realized for a variety of reasons, primarily economic in nature. For example, truck purchasers are tending to order those features that improve fuel economy, such as engines with lower rated speeds and lower horsepower ratings, demand actuated cooling fans, more efficient gear boxes and radial tires, all of which generally result in lower noise levels. At the present time, based on 1984 model year test data, we estimate that upwards of 70 percent of current General Motors production trucks over 10,000 pounds gross vehicle weight rating are at or below a mean noise level of 80 dB when tested according to the federal truck noise compliance test. We believe incentives will remain so that this level of performance is expected to continue.

We believe these factors will continue to lead to gradual reductions in environmental noise levels provided in-use trucks manufactured after 1977 are properly maintained according to the present 83 dB regulation under which they were originally manufactured. To this end, General Motors is not opposed to a reduction of the in-use noise standard, to 83 dB, for all medium and heavy trucks manufactured after January 1, 1978.

File:

rec. d. 8/24/84

Accordingly, inasmuch as:

- the truck manufacturing industry is still in the process of economic recovery,
- there will be no adverse environmental impact,
- there are foreseeable technological changes to be required for truck engines that will be necessitated by new heavy duty exhaust emissions regulations, along with the fact that,
- engines meeting the future exhaust emission standards are not presently available for in-depth noise reduction development work,

we question the efficacy and the necessity of continuing to expend significant amounts of money and manpower to meet an 80 dB standard in 1986, only to repeat the effort on the new technology engines required when the heavy duty diesel engine NOx and particulate standards become effective.

Please note that the information presented herein indicates the potential savings resulting from deferral of the 80 dB standard to both the truck manufacturing industry and truck purchasers, in addition to the on-going expenditure of money and manpower required to meet the 1986 80 dB standard. In order to facilitate the economic recovery of the trucking industry, an early response by the Agency to the petitions for deferral is urgently requested.

Appendices B, C and E contain sales volume information in more detail than has historically been available to General Motors competitors or to the public. Release of any of this information to General Motors competitors specifically or to the public generally would result in significant competitive damage to General Motors. Thus, such confidential and proprietary data are submitted on the basis that they are entitled to confidential treatment under V USC Section 552(b)(4), as well as under 18 USC Section 1905 and CFR 2.201 et seq.

If a request for disclosure is received by the EPA, General Motors requests notification of receipt of each such request and an opportunity to explain further the significant competitive damage to General Motors that would result from disclosure.

If you have any questions regarding the attached material, please contact Mr. Eugene R. Pezon at (313)575-2008.

Very truly yours,

Robert J. Anglinski

for Dr. B. Ancker-Johnson
Vice President

Encs.

General Motors Response to US EPA Request for Information Dated April 12, 1984 Relating to Deferral of the 80 dB Medium and Heavy Truck Noise Standard

Background Information:

It should be noted that previous GM comments concerning federal truck noise standards have been directed virtually exclusively toward those vehicles above 10,000 pounds Gross Vehicle Weight Rating (GVWR) that are designed specifically for medium and heavy duty applications, i.e., class 4 and above, rather than class 3 vehicles in the 10,000 to 14,000 pound GVWR weight group. The class 3 vehicles are basically derivatives of light vehicles (below 10,000 pounds GVWR) with some dimensional and suspension changes to accommodate the higher GVW ratings. The primary noise-related equipment, i.e., power trains and related equipment, is the same as that used on like vehicles built to meet heavy duty exhaust emissions requirements applicable to vehicles over 8,500 pounds GVWR. These vehicles are designed to comply with state and local light duty vehicle noise standards of 80 dB when tested according to SAE J986 NOV81. Almost without exception, these vehicles also meet an 80 dB standard with an adequate noise design margin when tested according to the SAE J366b noise test procedure. This test procedure is essentially equivalent to the federal truck noise compliance test.

In the discussions that follow, class 3 vehicles are not included in the percentages of production volume. It is pointed out, however, that the production volume of class 3 vehicles rivals the total volume of vehicles in classes 4 through 8. Considering the total production population of class 3 and above, in actuality, over 70 percent of the total General Motors truck production population over 10,000 pounds GVWR is currently at or below a mean noise level of 80 dB when measured according to the federal truck noise compliance test or its SAE equivalent. Where the following discussions address the truck population, reference is made only to medium and heavy trucks in class 4 and above.

EPA Question Number 1:

> ***"Please provide your technical assessment of the interrelationship of oxides of nitrogen and particulate exhaust emission controls to the engineering and design associated with the 80 dB noise emission requirement for your trucks."***

General Motors Response:

The interrelationship of oxides of nitrogen and particulate exhaust emission controls on engine noise generation is addressed in the matrix entitled "Estimated effect of lower emissions on engine noise" included as Appendix A. This matrix reflects Detroit Diesel Allison Division engine design and development experience which encompasses evaluation of noise changes related to each specific design concept used for lower emissions or lower fuel consumption. The noise changes are indicated as increase, decrease, no change, or '?' to indicate that noise-related characteristics are unknown. Where the change in noise level is shown as either an increase or decrease, the magnitude of the engine noise change as a function of the emissions-related change is unknown. Pages 2 and 3 of Appendix A provide a brief explanation of how each proposed engine change is expected to affect the resulting engine noise.

Not all engines will necessarily require all of the emission design changes listed. Some engines will require further reduction of exhaust particulates, and, as presently seen, will require the use of some type of "trap" to collect and dispose of particulates. Particulate traps are presently the object of intensive research and development efforts, primarily because they affect exhaust back pressure and, hence, engine performance and fuel economy, and also because of the problems of storing and disposing of trapped particulates. Nonetheless, the overall noise impact of what is presently an unknown emission requirement, along with technology that is not fully developed, cannot be predicted at this time, other than to say that it is highly likely that there will be an impact.

These arguments are further substantiated by the previous responses of other engine manufacturers to the same question. Specifically, General Motors is in agreement with the comment that noise design evaluation can only be undertaken when engine designs have been finalized, engines are built, and emission testing is well underway.

EPA Question Number 2:

> ***"Please quantify the cost and economic benefits that you would expect to realize by combining the engineering and design of future exhaust emission controls with noise control features requisite to meeting the 80 dB noise emission standard. The cost savings determinations should be independent of "effective date" considerations."***

General Motors Response:

Cost savings at GM cannot be determined without regard to the effective date due to planned product program changes during the immediate period ahead (1988). Cost savings, as displayed below, are accordingly impacted differently depending upon the timing of the product program changes relative to proposed common effective dates of the separate noise and exhaust emission regulations.

Due to timing constraints, resources are presently being spent by the GM Truck and Bus Group to meet the January 1, 1986 effective date. Postponement of the 80 dB noise standard will result in the savings as shown, less the money projected to be spent to comply with the 1986 80 dB standard. A deferral sooner than December 1, 1984 will result in greater savings.

	Corporate Savings	
	$ (Million)	Equivalent Man Years
Savings with Assumed Effective Date 1-1-87	4.5	36
Less Projected Amounts Spent Through 12-1-84*	(2.0)	(16)
NET SAVINGS	2.5	20
Savings with Assumed Effective Date 1-1-88 and After	5.3	42
Less Projected Amounts Spent Through 12-1-84	(2.0)	(16)
NET SAVINGS	3.3	26

Assumption/Notes:

Costs are in 1984 dollars.

Product program changes currently being considered for 1988 will include new variants in the medium and heavy duty trucks.

Economic benefits are reflected in avoidance of expenditures, referred to as "savings."

"Savings" is the variance of estimated expenditures to release combined noise and exhaust emission controls at a date later than 1/1/86 versus release of noise control hardware prior to 1/1/86, as currently planned, with exhaust emissions control hardware to follow at some future date.

* It is estimated that earliest date EPA could make its final decision to defer the 80 dB standard would be 12-1-84.

EPA Question Number 3:

"Please quantify to the extent possible, the potential cost benefits or disbenefits to your company that you would expect to realize from each of the following options concerning the effective date of the 80 dB noise emission standard.

(A) One year deferral to January 1, 1987.

(B) Two year deferral to January 1, 1988.

(C) Designating the effective date as the first day of the calendar year commensurate with the model year for which EPA's next set of emission standards for oxides of nitrogen and particulates are applicable.

(D) Retain January 1, 1986 effective date.

Please translate the possible benefits or disbenefits in terms of vehicle cost or savings to purchaser."

General Motors Response:

The response to this question contains sales forecast information which General Motors considers confidential and is contained in a separate enclosure marked Appendix B, "GM Confidential".

EPA Question Number 4:

"Please provide your companies' sales forecasts through the model year 1988 and how they compare with your 1980 thru 1983 sales."

General Motors Response:

Sales forecast information is considered confidential and is contained in a separate enclosure marked Appendix C, "GM Confidential".

EPA Question Number 5:

"What percentage of your over 10,000 lb GVWR truck production are vehicles primarily designed for "over the road" long haul operation."

General Motors Response:

Approximately 12 percent of General Motors production medium and heavy trucks in Class 4 and above are designed for "over the road" long haul operation.

To further quantify the exposure of these vehicles, it is necessary to look at the percent of total vehicle miles traveled (VMT) by such vehicles. A recent study1/ reveals that 25.4 percent of the total truck VMT was generated by long haul service, which is defined as over-the-road service of more than 200 miles. Of concern with respect to noise impact, this same study also characterized the age of vehicles engaged in various types of service. Approximately 83 percent of the vehicles engaged in over-the-road service are 6 years old or less. This compares to 66 percent for vehicles engaged in local service. It can therefore be reasonably assumed that these same percentages of vehicles in service today have been designed to comply with the current 83 dB standard which has been in effect since January 1, 1978.

EPA Question Number 6:

> ***"Please provide your most recent noise emission test data for trucks required to meet the 83 dB standard."***

General Motors Response:

The availability of test data on 1984 trucks is limited across the range of configurations because production vehicle noise audits are typically targeted for the "worst case" configuration in each category. The noise test data that is currently available is summarized in Appendix D. Within each category, the configurations are listed in hierarchical order, that is, from the worst case (highest sound level) to the quietest. A column containing the percent of production volume for each configuration has been added. It is worth mentioning that of the 27 categories listed, 15 have the greatest percentage of production volume for configurations with lower rpm engines, viscous fans, and/or lower horsepower engines. We believe this is happening, at least in certain vehicle categories, because customers are becoming more aware of the fuel economies that can be realized by these factors. Each of these factors that improve fuel economy tend to reduce the noise level of the vehicle.

There is a direct relationship between engine rpm and vehicle passby noise levels. Depending on the engine/vehicle combination, a resultant decrease in vehicle passby sound level of up to 1 dB for each 100 rpm decrease in engine speed may be experienced, particularly for diesel engines, so that a vehicle with a rated engine speed 300 rpm below the worst case configuration could produce a passby sound level as much as 3 dB lower than the higher rpm worst case vehicle. The net result of the engine rpm-sound level relationship is that the current production vehicle population, as it appears in commerce, consists of a majority of vehicles that are quieter than the worst case vehicles tested in each category.

Based on the percentages of the medium and heavy production volume for each vehicle configuration, the "worst case" configurations represent 22.5 percent of the total. Conversely, the other 77.5 percent of the General Motors production vehicle population is below the noise levels indicated by the worst case test data. With the continued emphasis on fuel economy, the growing tendency of truck purchasers to buy vehicles with lower rated engine speeds (which also provides the added benefit of improved engine durability) is expected to continue for economic reasons.

1/ "The Trucking Industry in the United States: A Preliminary Characterization." NHTSA, July 1983.

Overall, considering the engine rpm-sound level relationship, and based on the current audit data, it is estimated that over 70 percent of the 1984 General Motors truck production population, over 10,000 pounds GVWR, is at or below a mean noise level of 80 dB as measured during the passby noise test. This is not to say that only 30 percent of the production population over 10,000 pounds GVWR requires further noise reduction work. Those configurations that are marginally close (within 2 dB) to a passby sound level of 80 dB will require development work and additional noise control hardware to meet a design goal consistent with a not-to-exceed 80 dB regulated level to ensure that all production vehicles will be under 80 dB according to the passby noise test procedure.

It is estimated that 70 to 80 percent of all General Motors medium and heavy production trucks will require some noise control development and application. Nonetheless, clearly, with over 70% of the current General Motors production population at or below a mean noise level of 80 dB, the impact on environmental noise levels resulting from a delay in implementation of the 80 dB standard will be minimal.

Adoption and enforcement of an 83 dB in-use standard for trucks built on and after January 1, 1978 also has the potential for alleviating the environmental impact of truck noise while maintaining the existing 83 dB new vehicle noise standard.

EPA Question Number 7:

> ***"Please provide quantitative data concerning your existing surplus of new trucks."***

General Motors Response:

The number of new 1984 trucks which are classified as dealer stock stood at 12,201 units as of June 30, 1984. In addition, General Motors Truck and Bus maintains a small pool of CP or EZ specification trucks from which dealers can order. As of June 30, 1984 this pool contained 35 units.

EPA Question Number 8:

> ***"Please provide your assessment of the possible impact of used truck sales on your new truck production, that would not otherwise occur in the absence of a deferral."***

General Motors Response:

The specific effect on General Motors new truck sales is considered confidential and is contained in a separate enclosure marked Appendix E, "GM Confidential".

DETROIT DIESEL ALLISON

ESTIMATED EFFECT OF LOWER EMISSIONS ON ENGINE NOISE

Engines	Engine Ratings BHP	Engine Ratings RPM	Retd. Inj. Timing	Increase Bypass Blower	Lower Air Temp	Higher Comp. Ratio	Higher Comp. Press.	Electronic Fuel System	Electronic Governor	Injector	Piston	High Eff. Turb.	Overall Noise Change
8V-92T													
JWCC	350-475	1600-2100	-	0	NA	-	-	+	NA	?	?	+	?
ALCC	350-475	1600-2100	-	0	+	-	-	+	NA	?	?	+	?
6V-92T													
ALCC	290-350	1600-2100	-	0	+	-	-	+	NA	?	?	+	?
AACC	290-350	1600-2100	-	0	+	-	-	+	NA	?	?	+	?
6V-71T													
JWCC	190-220	1800-2100	-	0	NA	-	-	+	NA	?	?	+	?
AACC	190-220	1800-2100	-	0	+	-	-	+	NA	?	?	+	?
6L-71T													
AACC	250-310	1800-2100	-	0	+	-	-	+	NA	?	?	+	?
ALCC	245-305	1800-2100	-	0	+	-	-	+	NA	?	?	+	?
JWCC	240-300	1800-2100	-	0	NA	-	-	+	NA	?	?	+	?
JWCC TT	180-240	1800-2100	-	0	NA	-	-	+	NA	?	?	+	?
6L-71N													
6L-71N	180-230	1800-2100	-	NA	NA	-	-	NA	NA	?	?	NA	?
8.2 Liter													
8.2L T	205-165	2400-2600	-	NA	NA	-	-	NA	-	?	?	+	?
8.2L N	130-165	2400-2600	-	NA	NA	-	-	NA	-	?	?	NA	?
6.2 Liter													
6.2L N	160	3600	-	NA	NA	-	-	NA	NA	?	?	NA	?

NOTE:
+ = Increased Noise
- = Decreased Noise
0 = No Change in Noise
? = Change in Noise Unknown
NA = Not Applicable
ALCC = Air to Liquid Charge Cooling
AACC = Air to Air Charge Cooling
JWCC = Jacket Water Charge Cooling
Electronic Governor is a Speed Limiting Device and Would Only Reduce noise During Pass-By

DETROIT DIESEL ALLISON
ESTIMATED EFFECT OF LOWER EMISSIONS ON ENGINE NOISE

The following gives a brief explanation of the reasons for the anticipated changes in engine noise resulting from more stringent emission standards:

- **Retarded Injector Timing**

  Combustion noise in diesel engines is largely dependent on the amount of fuel that is in the cylinder at the beginning of burning. One parameter that largely controls this amount of fuel is ignition delay, defined as the time that elapes between beginning of injection of the fuel and the beginning of burning. When the injection timing is retarded, the fuel is injected into higher cylinder temperatures and pressures thus reducing both ignition delay period and combustion noise.

- **Increased Bypass Blower**

  Testing on several engines has shown that bypass blowers have little or no effect on engine noise.

- **Lower Air Temperature** (Charge Air Temperature)

  With colder charge air temperatures, cylinder temperatures and pressures are also lower resulting in an increased ignition delay period and increased combustion noise.

- **Higher Compression Ratio**

  Higher compression ratios increase cylinder pressure and temperature resulting in decreased ignition delay and combustion noise. At this time, it has not been determined if DDA engine compression ratios will increase to comply with more stringent emission standards.

- **Higher Compression Pressures**

  Higher compression pressures increase cylinder temperature resulting in decreasing ignition delay and combustion noise. At this time, it has not been determined if DDA engine compression pressures will increase to comply with more stringent emission standards.

- **Electronic Fuel Systems**

  Electronic Fuel systems can, under certain operating conditions, advance the injection timing resulting in increased ignition delay and increased combustion noise.

DETROIT DIESEL ALLISON
ESTIMATED EFFECT OF LOWER EMISSIONS ON ENGINE NOISE
(Continued)

- **Electronic Governor**

  Electronic governors reduce the amount of governor droop and overspeed during rapid accelerations. The lower speeds will result in decreased engine noise.

- **Injector**

  Injectors can have significant effect on combustion noise by controlling the amount of fuel that is injected into the cylinder during the ignition delay period. At this time DDA has not determined the exact injector configuration for compliance with more stringent emission standards.

- **Piston**

  Piston design parameters such as piston to cylinder clearance, piston pin location and materials can have a significant effect on engine noise. At this time DDA has not determined the exact piston configuration for compliance with more stringent emission standards.

- **High Efficiency Turbochargers**

  High efficiency turbochargers have demonstrated increased noise when compared to current production. At this time DDA has not determined the exact Turbocharger design for compliance with more stringent emission standards.

GENERAL MOTORS TRUCK AND BUS
NOISE EMISSION TEST DATA

VEHICLE: 1984 Medium Duty

Weight Class 4 - 7
(GVWR, 14,001 - 33,000#)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
General Motors 350 V8 Gas	161 @ 3800	Direct	4.5	79.8 (5)
	153 @ 3200	"	0.02	
	161 @ 3800	Viscous	10.4	79.5 (1)
	153 @ 3200	"	0.07	
General Motors 292 L6 Gas	125 @ 3600	Direct	0.44	80.6 (1)
	125 @ 3600	Viscous	0.02	
General Motors 366 V8 Gas	196 @ 3800	Direct	29.0	79.9 (2)
	194 @ 3600	"	0.2	
	189 @3400	"	0.2	
	185 @ 3200	"	0.06	
	199 @ 4000	Viscous	0.06	
	196 @ 3800	"	4.0	76.9 (3)
	194 @ 3600	"	0.3	
	189 @ 3400	"	0.04	
	185 @ 3200	"	3.0	
General Motors 427 V8 Gas	222 @ 4000	Viscous	0.44	
	220 @ 3800	"	6.6	76.8 (1)
	215 @ 3600	"	0.22	
	211 @ 3400	"	0.44	
	206 @ 3200	"	0.06	

( ) = Number of vehicles tested

GENERAL MOTORS TRUCK AND BUS NOISE EMISSION TEST DATA

VEHICLE: 1984 Medium Duty

Weight Class 4 - 7 (GVWR, 14,001 - 33,000#)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
Detroit Diesel 8.2L Diesel	N165 @ 2800	Viscous	11.0	80.8 (6)
	N130 @ 2800	"		
	T205 @ 2800	"	11.6	78.8 (2)
	T200 @ 2800	"	1.1	
	T160 @ 2600	"		
	T156 @ 2600	"	0.05	
Caterpiller 3208 Diesel	N185 @ 2600	Direct	1.1	80.9 (1)
	N165 @ 2600	"	0.33	
	N210 @ 2800	Viscous	8.9	81.5 (5)
	N200 @ 2800	"	0.02	
	N185 @ 2600	"	0.05	
	N175 @ 2800	"	1.8	
	N165 @ 2600	"	0.77	
	N160 @ 2800	"	0.33	
	T250 @ 2600	"	2.2	79.3 (1)
	T225 @ 2600	"	0.6	
	T210 @ 2600	"	0.2	

( ) = Number of vehicles tested

GENERAL MOTORS TRUCK AND BUS NOISE EMISSION TEST DATA

VEHICLE: 1984 Brigadier (J8C)

Weight Class 7
(GVWR, 26,000 - 33,000#)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
Caterpiller 3208N Diesel	210 @ 2800	Direct	80.6	81.2 (5)
	200 @ 2800	"	0.4	
	175 @ 2800	"	1.9	
	200 @ 2600	"	2.9	
Detroit Diesel 6V-53 Diesel	225 @ 2600	Viscous	14.0	79.6 (3)

( ) = Number of vehicles tested

GENERAL MOTORS TRUCK AND BUS NOISE EMISSION TEST DATA

VEHICLE: 1984 Brigadier (J9C)

Weight Class 8 (Over 33,000# GVWR)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
Cummins NTC/Formula Diesel	400 @ 2100	Fluid/Viscous	0.6	
	350 @ 2100	"	0.5	79.6 (2)
	300 @ 2100	"	1.6	
	290 @ 2100	"		
	270 @ 2100	"		
	250 @ 2100	"		
	240 @ 2100	"		
	400 @ 1900	"		
	350 @ 1900	"	0.1	
	300 @ 1900	"		
	350 @ 1800	"	1.6	
	300 @ 1800	"	15.9	
	270 @ 1800	"	12.7	
	240 @ 1800	"	14.7	
	290 @ 1700	"		
	300 @ 1600	"		
	270 @ 1600			
Detroit Diesel 6V-92 Diesel	330 @ 2100	Fluid/Viscous	3.3	80.8 (3)
	325 @ 2100	"		
	270 @ 1950	"	0.1	
	307 @ 1800	"	12.5	79.5 (1)
	304 @ 1800	"	0.8	
	270 @ 1800	"	2.6	
	290 @ 1600	"	0.1	
Detroit Diesel 6-71N Diesel	230 @ 2100	Fluid/Viscous	4.0	80.0 (1)
Detroit Diesel 6-71T Diesel	275 @ 2100	Fluid/Viscous	5.2	
	230 @ 1950	"	9.0	
	230 @ 1800	"	3.8	
Cummins 10L Diesel	270 @ 2100	Fluid/Viscous	1.0	80.3 (4)
	240 @ 2100	"	1.8	
	270 @ 1900	"	2.7	79.9 (5)
	240 @ 1900	"	1.7	79.4 (1)

( ) = Number of vehicles tested

GENERAL MOTORS TRUCK AND BUS
NOISE EMISSION TEST DATA

VEHICLE: 1984 General (N9F)

Weight Class 8
(Over 33,000# GVWR)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
Cummins NTC/Formula Diesel	400 @ 2100	Fluid/Viscous	20.8	81.3 (5)
	350 @ 2100	"	4.4	
	300 @ 2100	"	3.1	
	290 @ 2100	"		
	270 @ 2100	"		
	250 @ 2100	"		
	240 @ 2100	"		
	400 @ 1900	"	3.2	
	350 @ 1900	"	2.2	
	300 @ 1900	"		
	350 @ 1800	"	10.2	78.1 (1)
	300 @ 1800	"	10.9	
	270 @ 1800	"		
	240 @ 1800	"		
	290 @ 1700	"		
	300 @ 1600	"		
	270 @ 1600	"		
Detroit Diesel 8V-92 Diesel	445 @ 2100	Fluid/Viscous	21.9	81.2 (9)
	365 @ 1950	"	4.0	
	358 @ 1800	"	0.2	
	355 @ 1800	"	4.0	
Detroit Diesel 6V-92 Diesel	330 @ 2100	Fluid/Viscous	0.7	
	325 @ 2100	"		
	270 @ 1950	"		
	307 @ 1800	"	2.2	
	304 @ 1800	"		
	270 @ 1800	"	0.3	
	290 @ 1600	"		
Caterpiller 3406 Diesel	400 @ 2100	Fluid/Viscous	4.7	
	350 @ 1800	"	2.9	
	310 @ 1800	"	1.0	

( ) = Number of vehicles tested

GENERAL MOTORS TRUCK AND BUS NOISE EMISSION TEST DATA

VEHICLE: 1984 General (N9E)

Weight Class 8
(Over 33,000# GVWR)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
Cummins NTC/Formula Diesel	400 @ 2100	Fluid/Viscous		
	350 @ 2100	"	2.2	
	300 @ 2100	"	10.4	
	290 @ 2100	"		
	270 @ 2100	"		
	250 @ 2100	"		
	240 @ 2100	"	17.3	
	400 @ 1900	"		
	350 @ 1900	"	0.7	
	300 @ 1900	"	0.3	
	350 @ 1800	"	4.9	
	300 @ 1800	"	17.6	
	270 @ 1800	"		
	240 @ 1800	"		
	290 @ 1700	"		
	300 @ 1600	"		
	270 @ 1600	"		
Detroit Diesel 6-71N Diesel	230 @ 2100	Fluid/Viscous	4.8	
Detroit Diesel 6-71T Diesel	275 @ 2100	Fluid/Viscous	6.4	
	230 @ 1950	"	4.2	
	230 @ 1800	"		
Detroit Diesel 6V-92 Diesel	330 @ 2100	Fluid/Viscous	10.2	79.5 (1)
	325 @ 2100	"	3.6	
	270 @ 1950	"	13.8	
	307 @ 1800	"	0.3	
	304 @ 1800	"	1.9	
	270 @ 1800	"		
	290 @ 1600			

( ) = Number of vehicles tested

GENERAL MOTORS TRUCK AND BUS
NOISE EMISSION TEST DATA

VEHICLE: 1984 Astro (D9K)

Weight Class 8
(Over 33,000# GVWR)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
Cummins NTC/Formula Diesel	400 @ 2100	Fluid/Viscous	1.0	81.3 (3)
	350 @ 2100	"	1.7	
	300 @ 2100	"	0.2	
	290 @ 2100	"		
	270 @ 2100	"	4.5	
	250 @ 2100	"		
	240 @ 2100	"	54.4	
	400 @ 1900	"		
	350 @ 1900	"		
	300 @ 1900	"		
	350 @ 1800	"	3.0	
	300 @ 1800	"	11.8	
	270 @ 1800	"	1.7	
	240 @ 1800	"		
	290 @ 1700	"		
	300 @ 1600	"		
	270 @ 1600	"		
Detroit Diesel 9V-92 Diesel	445 @ 2100	Fluid/Viscous	1.7	81.0 (5)
	365 @ 1950	"	2.4	
	358 @ 1800	"	1.2	
	355 @ 1800	"	1.2	
Detroit Diesel 6V-92 Diesel	330 @ 2100	Fluid/Viscous	8.5	79.3 (1)
	325 @ 2100	"		
	270 @ 1950	"		
	307 @ 1800	"	1.7	78.9 (1)
	304 @ 1800	"	2.5	
	270 @ 1800	"		
	290 @ 1600			

( ) = Number of vehicles tested

GENERAL MOTORS TRUCK AND BUS NOISE EMISSION TEST DATA

VEHICLE: 1984 Astro (D9L)

Weight Class 8
(Over 33,000# GVWR)

Engine Manufacturer	Rated H.P. @ RPM	Fan Drive	% Usage	Mean Pass-By Level (dB)
Cummins NTC/Formula Diesel	400 @ 2100	Fluid/Viscous	3.1	**
	350 @ 2100	"	4.6	
	300 @ 2100	"		
	290 @ 2100	"		
	270 @ 2100	"	0.6	
	250 @ 2100	"		
	240 @ 2100	"	8.1	
	400 @ 1900	"	3.7	
	350 @ 1900	"	0.4	
	300 @ 1900	"		
	350 @ 1800	"	25.6	
	300 @ 1800	"	31.5	
	270 @ 1800	"	1.7	
	240 @ 1800	"		
	290 @ 1700	"		
	300 @ 1600	"		
	270 @ 1600	"	0.4	
Detroit Diesel 8V-92 Diesel	445 @ 2100	Fluid/Viscous	6.4	
	365 @ 1950	"	1.4	
	358 @ 1800	"		
	355 @ 1800	"	3.8	
Detroit Diesel 6V-92 Diesel	330 @ 2100	Fluid/Viscous	1.1	
	325 @ 2100	"		
	270 @ 1950	"	0.1	
	307 @ 1800	"	4.2	
	304 @ 1800	"		
	270 @ 1800	"	0.9	
	290 @ 1600	"	0.4	

** NOTE: Refer to D9K, a non-sleeper version, which is ranked higher in the noise heirarchy.