HIGH ALTITUDE VEHICULAR EMISSION CONTROL PROGRAM

VOLUME X STUDY OF EMISSION DETERIORATION AND ENGINE DEGRADATION

FINAL REPORT

APRIL 1975

PREPARED FOR:

STATE OF COLORADO
DEPARTMENT OF HEALTH
DENVER, COLORADO 80220

ATL / AUTOMOTIVE TESTING LABORATORIES

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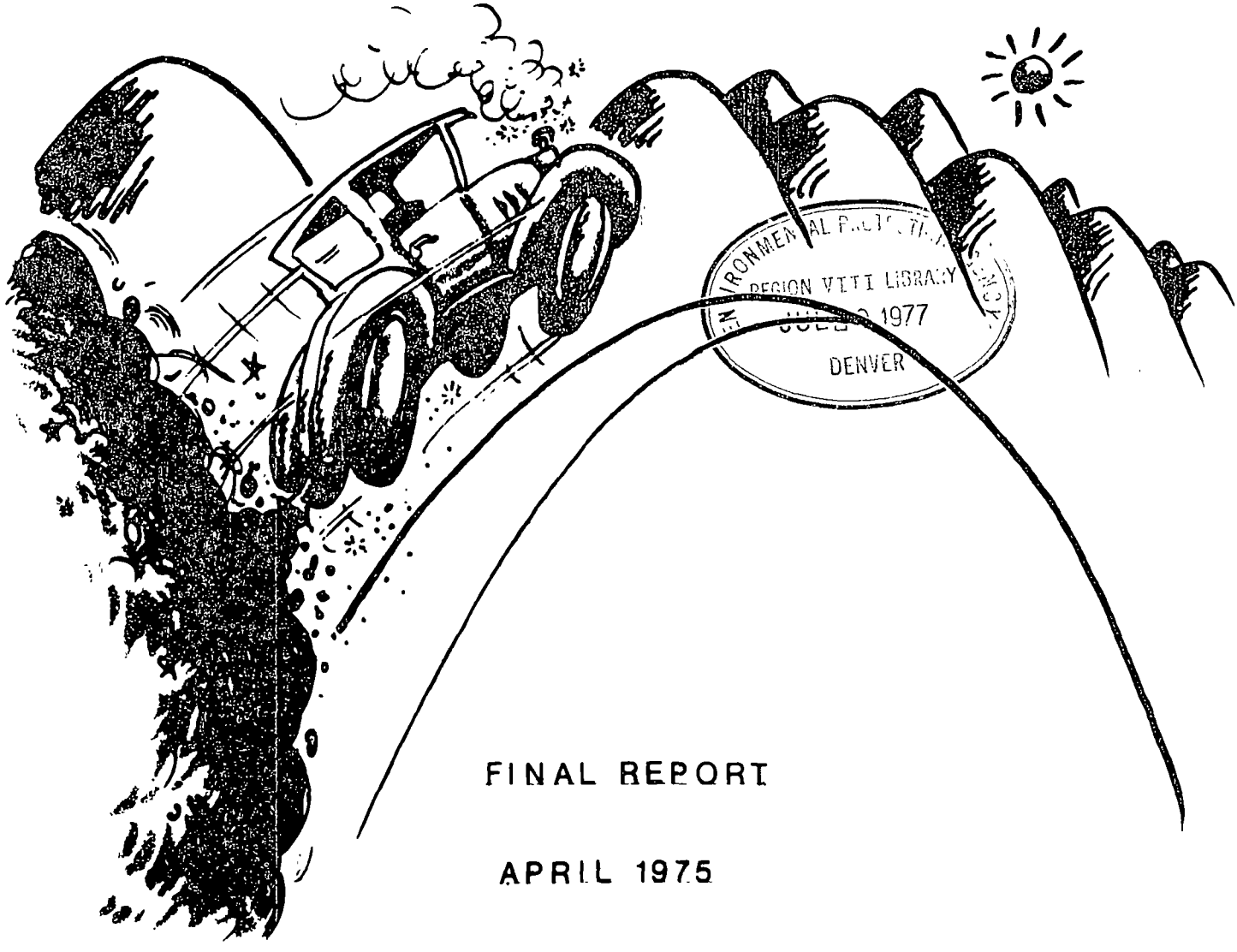

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Report

on a

Study

of

Emission Deterioration

and

Engine Degradation

(With 10 Year Exhaust Emission Forecasts)

for the

State of Colorado
Department of Health

prepared by

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SUMMARY

A sample of 1964 through 1973 model-year vehicles was utilized to evaluate emissions deterioration and engine degradation associated with a specific approach to emissions inspection/engine maintenance. Vehicles comprising the sample were tested at four stages in the program, before and after maintenance and again at six and twelve months after maintenance. Data developed from this segment of the study are combined in this report with data from several other studies and sources to define emission deterioration rates and maintenance factors relative to an annual and a semi-annual inspection/maintenance (I/M) frequency. These data are ultimately coupled with projected retrofit control program data to produce long-term (10 year) estimates on the effectiveness of I/M and retrofit emission control strategies.

Trends in Denver AQCR light-duty vehicle registration data combined with U. S. Department of Commerce sales projections indicate Denver area light-duty vehicle registrations will rise from a current level of 825,000 vehicles to 1,300,000 vehicles in 1985. Similarly, vehicle miles traveled are predicted to increase from the current 7.2 billion miles per year to a level of 11.6 billion miles per year in 1985.

Approximately 70% of the exhaust hydrocarbon emissions increase from the new car state and 85% of the carbon monoxide increase are related to degradation external to the engine. The total of these increases can initially be eliminated through engine maintenance. Although initial gains in CO reduction appear to be relatively long-term, initial gains in HC reduction are lost in a relatively short period of time. As a result, a semi-annual as opposed to an annual

I/M frequency is decisively more effective relative to HC reduction.

Data from the twelve-month deterioration/degradation study indicated owner tampering to be minimal with regards to the overall effects on emission levels. In addition, poor correlations were found to exist between changes in emission levels and changes in engine parameters.

As indicated above, a semi-annual I/M frequency is more effective relative to HC emissions control than an annual frequency. A semi-annual I/M frequency is expected to produce HC, CO and NO_x reductions of 15%, 24% and 2% in 1980 while an annual program is expected to produce corresponding reductions of 7%, 24% and 2%. A retrofit program involving 90 percent of the 1968-1974 model-year vehicles is expected to produce additional HC, CO and NO_x reductions of 7%, 19% and 3% irrespective of the I/M frequency.

1. CONCLUSIONS

1. The number of light-duty motor vehicles in the Denver AQCR is expected to increase by a factor of 1.5 over the next ten years.

2. VMT is expected to increase during the same interval by a factor of 1.6. The difference between the projected vehicle registration increase factor and projected VMT increase factor is attributed to the higher VMT rates for newer vehicles.

3. An engineering analysis coupled with computer operations provided a mathematical model whereby vehicle age can be utilized to predict emission levels which may be realized through various maintenance treatments. This model indicates that 30% of the HC emissions increase from the new car state is attributed to degradation internal to the engine and 70% is attributed to degradation in the so-called tune-up items. Corresponding CO increases from the new car state are 15% due to internal factors and 85% due to degradation in tune-up parameters. Emissions increase attributed to internal degradation is not regarded as reducible short of major engine and component overhaul or replacement. The increase attributed to external degradation is reducible, however, through the tune-up process. These same factors are probably applicable to 1975 and later model cars as well, although severe deterioration in catalyst performance could result in inordinately high deterioration rates.

4. The repair procedure employed in the I/M segment of the 1973 Colorado study program is adequate with respect to maintaining CO emissions reduction. Virtually all of the initial CO reduction obtained by the repair procedure was maintained throughout the study interval. With respect to HC reduction, however, the repair procedure employed appears to be inadequate since the initial gain in HC reduction was lost in a relatively short period of time. An alternate strategy which will result in greater overall reduction of HC is a semi-annual I/M frequency.

5. Within the confines of the twelve-month study program, owner tampering had little if any impact on emission levels. In addition, regression analysis indicated poor correlation between changes in emission levels and changes in engine operating parameters.

6. An annual I/M frequency is expected to reduce exhaust HC emissions by 7%, CO emissions by 24% and NO_x emissions by 2% in 1980. In 1975, an annual program is expected to reduce HC by 11%, CO by 44% and NO_x by 2%.

7. A semi-annual I/M program is expected to reduce exhaust HC emissions by 15%, CO emissions by 24% and NO_x emissions by 2%. In 1985, a semi-annual program is expected to reduce HC by 21%, CO by 44% and NO_x by 3%.

8. A retrofit program incorporating the current proposed emission standards is expected to produce additional emission reductions.

In 1980, HC reduction is expected to be 7%, CO reduction is expected to be 19% and NO_x reduction, 3%. In 1985, HC reduction is predicted at 2%, CO reduction is expected at 6% and NO_x reduction will be virtually zero.

9. A combined annual I/M, retrofit program is expected to result in HC, CO and NO_x reductions of 14%, 43% and 5% in 1980. In 1985, these reductions are expected to be 13% for HC, 50% for CO and 2% for NO_x.

10. A combined semi-annual I/M, retrofit program is expected to result in HC, CO and NO_x reductions of 22%, 43% and 5%. In 1985, these reductions are expected to be 23% for HC, 50% for CO and 3% for NO_x.

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3. INTRODUCTION

As reported in the Colorado air pollution control plan, mobile air pollutant sources account for the major part of the State's air pollution problems, particularly as relating to the metropolitan areas of the State. The plan, formulated and submitted to comply with requirements of the Environmental Protection Agency, indicates mobile sources in the Denver Air Quality Control Region (DAQCR) account for roughly 90 percent of the carbon monoxide emissions and 60 percent of both hydrocarbon emissions and resultant photochemical oxidants formed by atmospheric reaction of hydrocarbons and nitrogen oxides.

In dealing with these problems, the General Assembly of the State of Colorado, through legislation enacted in June of 1973, established the Colorado Vehicular Emission Control Program. The legislation directed the Colorado Department of Health to complete certain testing programs and studies, the purpose of which included the development and implementation of a specific plan for the control of motor vehicle emissions.

As part of the overall program, a project involving a sample of 1964 through 1973 model-year vehicles was initiated in July of 1973. The project was designed to evaluate several strategies for the control of emissions from motor vehicles. Areas under investigation included emission inspection and maintenance (I/M), emission control retrofit, modified engine tune-up specifications and mandatory engine maintenance (M/M). As the program developed, it became apparent that much of the data generated by the study could be utilized for

purposes outside the initial scope of the project. A program to evaluate emission deterioration and engine degradation was subsequently designed and implemented. The project involved the re-test of vehicles available at the conclusion of two consecutive six-month intervals. In initiating this segment of the study, it was hoped the resulting data would provide some insight into the rates at which gains in emission reduction achievable through an inspection/maintenance program tend to deteriorate. These data, representing a small but relatively important aspect of the complex motor vehicle emissions picture, are combined in this report with other applicable data to produce motor vehicle exhaust emission forecasts.

In addition to providing a summary of the conduct of the twelve-month deterioration study, this report describes the methodology employed to develop exhaust emission forecasts. Included are discussions and data relating to a ten-year projection of Denver area motor vehicle registrations and associated projections relating to vehicle miles traveled. Also included are discussions and data relative to the development of projected light-duty vehicle exhaust emissions, emission deterioration rates and emission maintenance factors for the past, current and future motor vehicle populations. Finally, as a result of the current interest in a mandatory emission control retrofit program, projections on the effectiveness of this strategy and the combined effectiveness of a retrofit program and an I/M program on an annual and semi-annual basis are also developed and presented.

4. TECHNICAL DISCUSSION

4.1 PROGRAM OBJECTIVES

The study was initiated to develop average emission deterioration factors for light-duty motor vehicles (passenger cars and light trucks) operating in the Denver area. Another of its purposes was to provide a basis upon which degradation in engine parameters, including degradation caused by owner tampering and normal wear and tear, could be related to emission deterioration. In these regards, the overall objective of the study was to provide estimates on the effectiveness of the mandatory I/M and retrofit program proposed for the Denver Air Quality Control Region (DAQCR).

4.2 TWELVE-MONTH DETERIORATION PROGRAM DESIGN

The twelve-month program was designed to establish emission deterioration and engine degradation rates for privately-owned light-duty DAQCR motor vehicles. Design elements included emission sampling and inspection of engine parameters over a time interval of approximately one year. Tests were performed on each vehicle initially and again at the conclusion of each of the two six month intervals following initial testing.

Deterioration/degradation (D/D) study vehicles originated from a sample of three-hundred 1964-1973 model-year vehicles selected, assembled and utilized to investigate various emission control strategies in the Colorado environment (Volume II, Experimental Characterization of Idle Inspection, Exhaust Control Retrofit and Mandatory Engine Maintenance, Colorado Health Department/EPA Region VII, December 1973). In this regard, however, 50 of these vehicles

were eliminated from consideration early in the D/D study effort chiefly as a result of the initial treatment to which they were necessarily subjected. As the study period progressed, an attrition rate of about 40 percent occurred in the two successive six-month test intervals as was anticipated.

4.2.1 Phase I - Initial Testing

The first series of tests was conducted during the period August - November, 1973.

Each of the 300 vehicles was initially subjected to mass emission tests to establish baseline light-duty vehicle emission data for the Denver area. Emission tests were performed in accordance with the 1975 EPA testing procedures. A batch of commercial summer-grade fuel was utilized to power the vehicles during laboratory testing.

Following laboratory tests, vehicles were delivered to privately operated inspection sites for idle emission inspection. Pretrained site personnel performed the inspections and either "passed" or "failed" vehicles in accordance with a set of predetermined pass/fail inspection limits. The limits were designed to fail about 50 percent of the sample. Vehicles which failed the test were subsequently brought into compliance through application of a prescribed engine adjustment/ maintenance procedure and returned to the laboratory for mass emission testing to determine effectiveness of the adjustment and repair procedures. Certain of the vehicles, without regard for their pass/ fail status in the inspection/maintenance investigation phase of the study, were then utilized to evaluate the effectiveness of other emission control strategies of the emission control program.

As a prelude to returning each vehicle to its owner, the status of engine operating parameters (idle speed, ignition timing, etc.) was checked and recorded by laboratory personnel. The final check-out procedure included provisions for a subsequent determination on the extent of owner tampering and other maintenance activities during normal vehicle operation. During the vehicle exchange process, the owner was informed of study objectives and instructed to operate and care for the vehicle in a normal fashion. He was also instructed to contact the laboratory prior to the performance of any emission related maintenance. Maintenance was defined and owner/laboratory responsibilities relative the the D/D study were outlined in a letter provided to the vehicle owner.

4.2.2 Phase II - Six-Month Testing

During the six-month interval which followed initial testing, the vehicles were presumably operated in a normal manner. At the conclusion of the interval, 180 $\pm$ 10 days for each vehicle, a concerted effort to locate and retest each of the 250 qualified D/D study vehicles was made. This was during the period February - May, 1974. As anticipated, approximately 40 percent of the vehicles comprising the original sample were not available for retest. The reasons were several; owners had either moved, sold the vehicle, had a negative reaction to the program or simply lost interest.

At the prescribed time, each available vehicle was scheduled into the laboratory for retest. Mass emission tests were again performed and idle emission inspections were conducted using garage-type inspection analyzers, this time not by inspection station personnel but by laboratory personnel. The batch of commercial

summer-grade fuel, stored in tightly sealed containers since the initial testing phase, was used for emission testing. The status of engine components and adjustment parameters was also inspected and recorded. Test vehicles were then returned to their owners for utilization during the final test interval. However, for this phase of the program, owners were not alerted to the possibility of retest. This strategy was applied for the purpose of minimizing any owner biasing relative to vehicle maintenance and operational practices which may have been inadvertently introduced.

4.2.3 Phase III - Twelve-Month Testing

Final tests were performed approximately one year after initial testing or 180 $\pm$ 10 days after the six-month testing was completed. This was during the period August - November, 1974. The testing and inspection procedures were identical to those applied in prior phases. The only notable difference in the final test phase as opposed to prior phases related to the fuel used for emission testing. The fuel batch used in the first two phases had been exhausted. However, a new batch of summer-grade fuel from the same commercial supplier was obtained and utilized.

4.2.4 Discussion of Potential Study Bias

Respective of each vehicle individually, the study spanned a period of one year with sampling limited to a one day period each six months. Respective of the overall sample, sampling was confined to time periods of about 3 months. As a result there were sizeable time gaps during which data were not developed. These gaps may or may not be significant insofar as the shape of the annual emission deterioration curves are concerned. Any seasonal factors, for example,

relating to vehicle maintenance and attendant changes in emission levels, may have over or under emphasized incremental time or mileage emission deterioration rates.

To add further to the complexity of the study, the Denver area, during the sampling interval, shared with the rest of the country in an unprecedented modern-day fuel shortage. The impact of the shortage and, presumably, the attendant alterations to mileage accumulation patterns, frequency of vehicle useage, gasoline purchasing patterns and, in general, the overall care and utilization of the automobile by the motoring public are virtually impossible to assess. In this regard, however, it has been established that overall vehicle useage was reduced during the period which may have resulted in shorter trips and fewer miles traveled at normal engine operating temperatures. This factor may have altered engine deposit build-up and subsequently changed engine operating and emission characteristics. In these same regards, the general slow-down in the local and national economy which became evident in the latter part of 1974, may have had similar impact on motor vehicle operation and care.

Another area which should be discussed in some detail is the manner in which the study was designed and conducted. As discussed earlier, prior to the first six-month segment of mileage accumulation, each participant was alerted to the possibility of retest and to the commitment by the laboratory to free emission related maintenance. Surprisingly, few of the participants took advantage of this situation. In addition, each participant was informed of overall program objectives, a factor which also may have introduced bias. In this same regard, any effects caused by an awareness of program objectives may have

diminished during the study interval. On the other hand, the mere presence of identifying marks on engine components and adjustments, utilized to assist in a determination of tampering, may have tended to discourage at least a minimal amount of emission related maintenance.

5. DATA ANALYSIS AND EMISSION PROJECTIONS

The purpose of this study relates to the impact a mandatory I/M program and a mandatory retrofit program may have on motor vehicle emissions in the Denver area over a period of several years. To make this determination with some degree of confidence, it became necessary to assemble and analyze data from several volumes of study reports. Data from these reports, all of which are based on previous observations and measurements on vehicles operating in the Denver area, are combined with and/or compared to data developed in the current deterioration study report. It also became necessary to examine and project the impact of 1975 and later model-year vehicles (presumably oxidation catalyst equipped) on future motor vehicle emission inventories. Inasmuch as practical, the following paragraphs of this section describe the methodology employed which ultimately produced projections of motor vehicle emission inventories for calendar-years 1975 through 1985 with and without implementation of the I/M and retrofit control strategies.

5.1 METHODOLOGY

Basically, the methodology employed was comprised of six major tasks as follows:

Develop a projection of motor vehicle registrations in the Denver AQCR.

Develop a projection of vehicle miles traveled (VMT) for the region.

Develop projections of motor vehicle HC, CO and NO_x emissions for the various vehicle populations.

Develop emission maintenance factors and deterioration rates for the various populations.

Develop retrofit emission factors for the various populations.

Combine the registration, VMT, emission, deterioration, maintenance and retrofit factors to produce a model or models to describe future light-duty motor vehicle emission inventories.

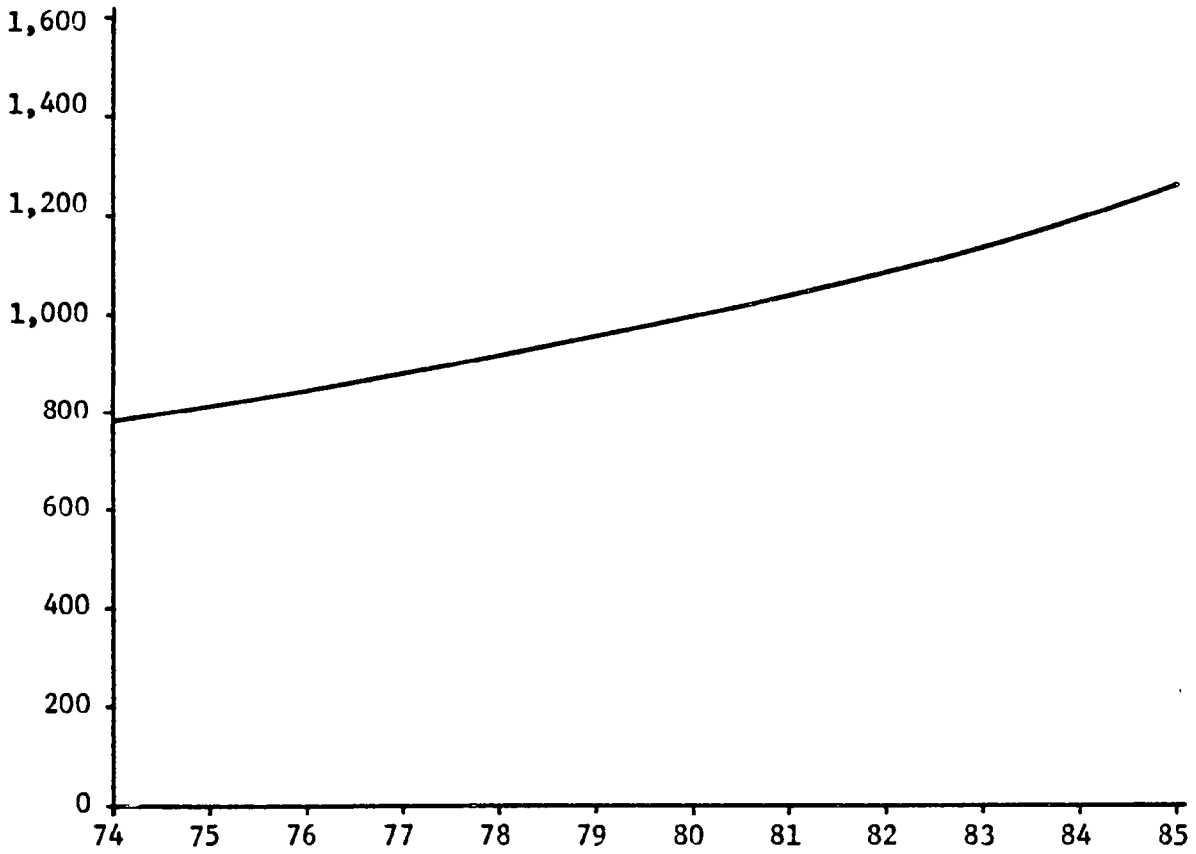
5.2 MOTOR VEHICLE REGISTRATIONS

Two reference sources were utilized to project motor vehicle registrations for the Denver AQCR for the years 1975 through 1985.

The Department of Commerce publication (Reference 1) indicates trends in car sales in the U. S. for the years 1975 through 1980. These trends were further projected through the year 1985 and reduced by a factor which describes the current relationship of total car sales in the Denver AQCR to national sales or vehicle registration data. Subsequently, vehicle attrition curves were applied to each Denver AQCR vehicle model-year using the first-year-after-introduction, least squares and Weibull distribution equations in accordance with the techniques developed in the ATL/EPA study (Reference 2). These data were then combined to produce the curve shown in Figure 1.

In viewing data from Figure 1, it may be seen that approximately 825,000 light-duty vehicles will be registered in the Denver AQCR in mid-1975. It may also be seen that the number of registered vehicles is expected to increase at a rate of about 4 percent per year such that in 1985 as many as 1,300,000 vehicles will be operating in the Denver AQCR.

FIGURE 1



Thousands of Vehicles in Service on July 1 of Indicated Year in Denver Air Quality Control Region.

5.3 VEHICLE MILES TRAVELED

VMT data from three sources are summarized in Table 1. Mileage accumulation factors listed under the column headed Denver (ATL) were developed from odometer readings taken initially and at the twelve-month test point on each of the 109 vehicles which completed the twelve-month deterioration study interval. These data represent average miles driven by vehicle age in years. Factors listed under the column headed Denver (Olson) were derived from data reported by Olson Laboratories, Inc. (Reference 3) for the Denver AQCR. The third

column is comprised of nationwide mileage accumulation factors extracted from an EPA air pollution factors report (Reference 4).

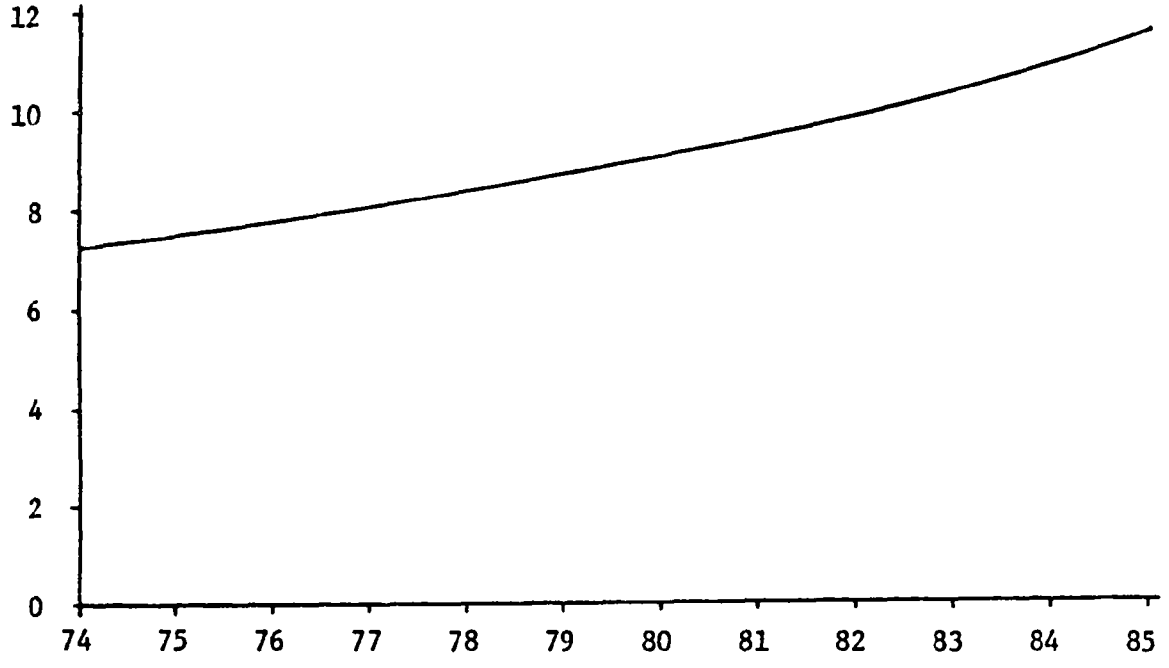
TABLE 1

Vehicle Age Years	Annual Mileage Accumulation (Miles) Denver (ATL)	Denver (Olson)	National (EPA)
1	-	-	-
2	11,100	13,300	15,000
3	8,900	12,100	14,000
4	9,100	11,000	13,100
5	9,900	10,000	12,200
6	9,200	9,100	11,300
7	8,400	8,200	10,300
8	6,600	7,400	9,400
9	7,100	6,700	8,500
10	7,100	6,100	7,600
11	5,500	5,600	6,700
12 and older	-	4,600	-
Displacement (CID)			
Less than 151	10,500	-	-
151-250	7,200	-	-
251-350	8,100	-	-
More than 350	8,200	-	-
Inertia Wt. (lbs.)			
1800-2799	9,100	-	-
2800-3799	8,700	-	-
3800-4799	7,700	-	-
4800-5799	5,800	-	-

Table 1, Annual Mileage Accumulation Factors

The task of developing VMT for the Denver area was a relatively simple one. For any given future year through 1985, the VMT factors associated with the various vehicle ages were merely combined with predictions of the number of vehicles in service for the year in question. Denver (Olson) mileage factors were utilized for this purpose. The resulting VMT curve is shown in Figure 2.

FIGURE 2



Rate of Vehicle Miles Traveled on July 1 of Indicated Year for Vehicles Registered in Denver Air Quality Control Region - Billions of Miles

5.4 PROJECTED HC, CO AND NO_x EMISSIONS FOR THE VARIOUS POPULATIONS

An engineering analysis of data obtained from the twelve-month Colorado deterioration study and several other sources was performed as a first step toward defining emissions deterioration. Preliminary plots of the combined data indicate two distinct vehicle populations respective of HC and CO emissions. These are the HC/CO controlled (1968-1974 model-years) and the uncontrolled (1967 and older) vehicles. In addition, the 1975-1976 model-year vehicles (essentially catalyst equipped), the 1977-1981 model-year vehicles (presumably catalyst equipped meeting interim standards at altitude) and the 1982 and newer model-year vehicles (presumably catalyst equipped meeting the

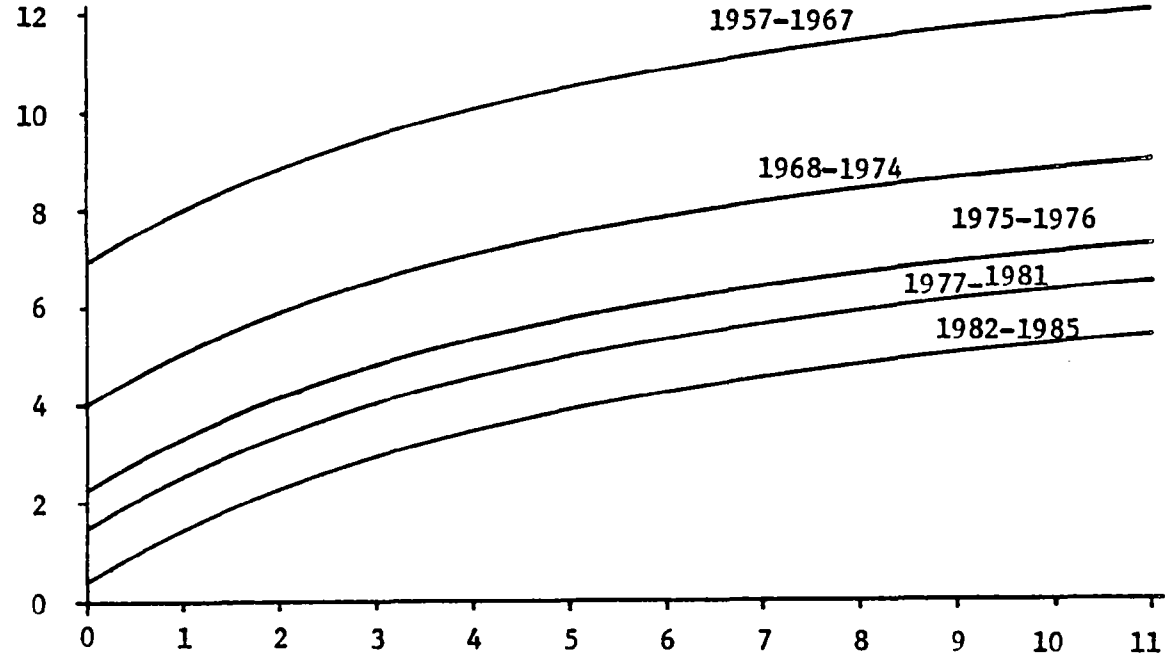
the more stringent standards) are to be considered as a third, fourth and fifth population. With respect to the pre-NO_x controlled vehicles, existing data indicate three populations respective of NO_x emissions, 1967 and older vehicles, 1968-1972 model-year vehicles and 1973-1974 model-year vehicles. A fourth and fifth population, 1975-1981 model-year vehicles and 1981 and newer model-year vehicles, are also to be considered. As will be discussed later, however, these may be treated as two populations; 1) 1968-1972 model-years and 2) all other model-years, on the basis of both measured and predicted NO_x levels.

Curves to describe HC emission levels as a function of vehicle age for the five populations are presented in Figure 3. With regards to two of the curves, empirically derived data points are based on average Denver HC exhaust emission levels extracted from EPA emission factors programs (FY 71, FY 72 and FY 73, References 5, 6 and 7), the Colorado emission study report (Reference 8) and the twelve-month Colorado deterioration study data (zero, six and twelve-month test points). In addition, the lower end of the 1967 model-year and older vehicle curve was defined through data derived from the Domke/Rose report (Reference 9) which provided an indication of the zero mile HC level for uncontrolled vehicles operating in the Denver area. Also, the upper end of the 1968 model-year and newer vehicle curve was established based on the assumption that HC emissions from the 1968-1974 vehicle population would increase at the absolute rate of increase found to exist relative to the older vehicles. The validity of this assumption is largely supported by the decrease in HC deterioration rate which

becomes apparent as the age of the 1968-1974 population approaches five years.

In the absence of historical data, the third, fourth and fifth curves, shown in Figure 3 to represent the 1975-1976, 1977-1981 and 1982 and newer model-year vehicles which presumably will be catalyst equipped, are based largely on assumption. However, some indication of catalyst emission deterioration rates, based on 1975 model-year EPA certification tests, were unofficially provided by car company representatives. These provided the basis on which assumptions relating to consumer-owned Denver area catalyst emission deteriorations were made.

FIGURE 3



Hydrocarbon Emissions (Grams/Mile) from Various Vehicle Populations as Related to Age (Years).

For reasons relating to this study, the first assumption made is that 1975-1976 cars are, or will be, delivered by the factory with emissions approximately equal to maximum levels set by Federal standards. The validity of this assumption was confirmed for prior model-years by standardizing to sea-level and projecting in-use vehicle surveillance data back to zero miles. According to the latest available information, the following current and/or proposed standards are applicable relative to Denver's altitude.

Model-Year	Grams/Mile			Compliance
	HC	CO	NO_x	Required
1975-1976	1.5	15	3.0	Sea-level
1977-1981	1.5	15	2.0	Altitude
1982-later	0.41	3.4	2.0	Altitude

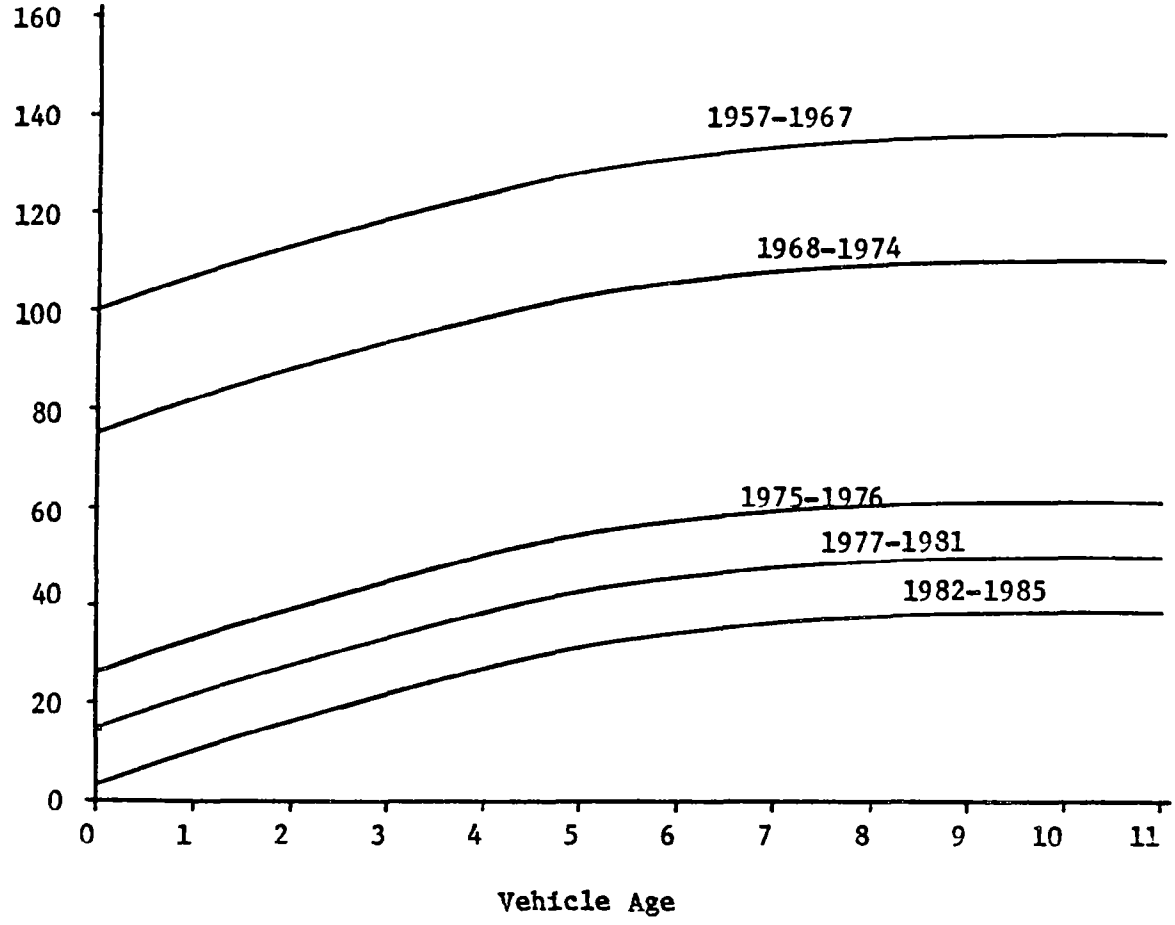
With respect to the 1975-1976 model-year vehicles, for which compliance with standards at altitude is not a requirement, altitude correction factors were applied to each pollutant respectively. The corrected HC values were utilized to establish the zero year point of Figure 3 for the 1975-1976 population. The balance of this curve was constructed by applying the HC deterioration factor developed from pre-1975 model-year vehicles.

HC emission level curves for 1977 and later model-year vehicles were developed in a similar manner with one exception. Since the 1977 and subsequent model-year vehicles are required to meet standards at altitude, the zero year point was assumed to be the applicable standard.

As shown in Figure 4, CO emission level curves were also developed for the five populations. In this regard, techniques and assumptions

similar to those employed to describe HC deteriorations were utilized. With reference to empirically derived data for the 1967 and older population, it appears that CO emissions tend to decrease with increasing vehicle age. However, this is probably not the case. This phenomenon is explained when the heretofore relatively common practice of re-jetting carburetors to improve operation at altitude is taken into consideration.

FIGURE 4



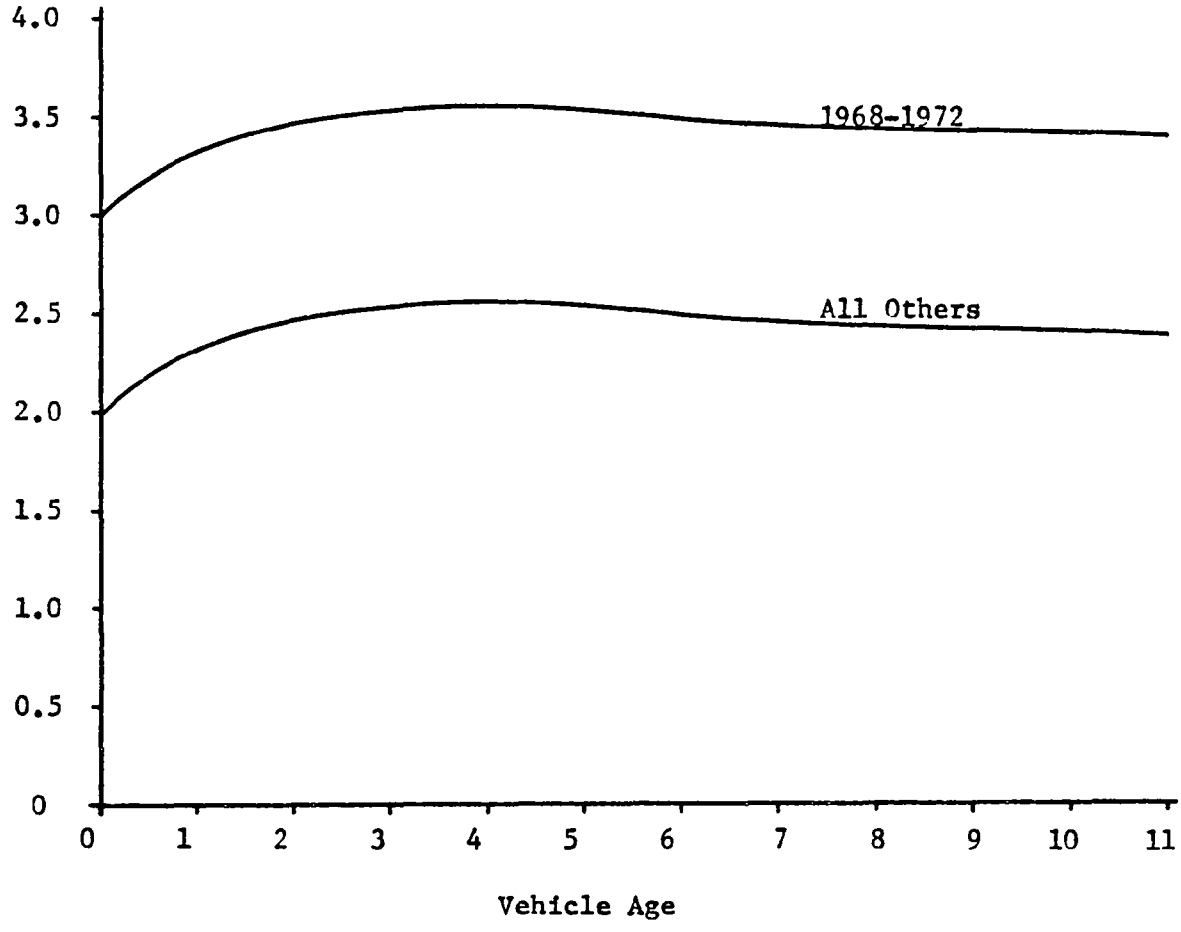
Carbon Monoxide Emissions (Grams/Mile) from Various Vehicle Populations as Related to Age (Years).

In developing the CO emission curves, the only departures from techniques applied to develop HC curves relate to defining the vehicle age at which CO emissions tend to stabilize. Firstly, since the practice of carburetor re-jetting of pre-1968 models appeared to confound the issue, a best fit second degree polynomial equation was applied to the 1968-1974 model-year CO emission test points. The curve was projected beyond the vehicle age of five years. Secondly, since 1968-1974 model-year CO emissions appeared to be near maximum at a vehicle age of five-six years, it seemed logical to assume CO emissions from pre-1967 model-year cars would have followed the same pattern had re-jetting not been a factor. In this same regard, it also seemed logical to assume the entire pre-1968 population had deteriorated to maximum or near-maximum CO values regardless of re-jetting. It also followed that the difference between near maximum CO emissions from five-year-old 1968-1974 model-year vehicles and presumably near maximum CO emissions from six-year-old pre-1968 model-year vehicles could be utilized to establish the CO deterioration rates for pre-1968 model-year vehicles in the absence of significant quantities of data. On this basis, the lower end of the pre-1968 curve was projected to zero years by using the up-slope segment of the deterioration curve developed for 1968-1974 model-year vehicles. The projected zero year CO level for the older cars compared favorably to data from the Domke/Rose report for new pre-control vehicles.

NO_x emission level curves are shown in Figure 5. As indicated earlier, it appears that NO_x emissions and the attendant deterioration rates may be considered with respect to two populations, one to comprise

the 1968-1972 model-year vehicles and the other to comprise all other vehicles.

FIGURE 5



Oxides of Nitrogen Emissions (Grams/Mile) from Various Vehicle Populations as Related to Age (Years).

The rationale applied to relate NO_x emissions to two populations is based on observed NO_x emission levels for the pre-1975 model-year vehicles and maximum NO_x levels set by Federal standards. As shown in Figure 5, data relating to the pre-1968 model-years indicate the NO_x level for this segment of the total population to be from 2 to 2.5 grams per mile. Similarly, data relating to the 1973-1974 model-year vehicles

fix the NO_x level for these cars between 2 and 2.5 grams per mile. Likewise, Federal NO_x standards for the 1977 and later model years regulate new car NO_x emissions at or below the 2 grams per mile level. With respect to the 1975-1976 model-years, however, although Federal standards allow NO_x emissions up to a 3 grams per mile level, the standards do not apply at altitude. As a result, the 1975-1976 NO_x levels for new vehicles operating in Denver will probably start at 2 grams per mile. On the basis of these observations and assumptions, the 1968-1972 population is comprised of the only vehicles not emitting or expected to emit at other than the 2 to 2.5 grams per mile level.

Regarding NO_x deterioration, the curves shown in Figure 5 are based on both assumption and observation of measured NO_x emissions. The trends in data for the 1968-1972 model-year segment indicate an initial rise in NO_x emissions during the first four-year period after vehicle introduction. Maximum NO_x levels are seen at a vehicle age of about four to five years followed by a period of decline as the vehicle continues to age. Based on data relating to the pre-1968 model-year vehicles, NO_x emission levels apparently tend to stabilize after the vehicle reaches an age of about eight or nine years.

5.5 EMISSION MAINTENANCE FACTORS AND DETERIORATION RATES

In reviewing data from the EPA emission factors programs, the Colorado emission study program of calendar year 1973, the Colorado twelve-month emission deterioration program and other sources, two factors became apparent. First of all, several emission deterioration rates emerged, each of which is related to the maintenance treatment to which a vehicle is subjected. Secondly, given the circumstances

under which emissions occur, it now becomes possible to predict, within a reasonable range of certainty, the effectiveness of an I/M emission control strategy under a variety of applications.

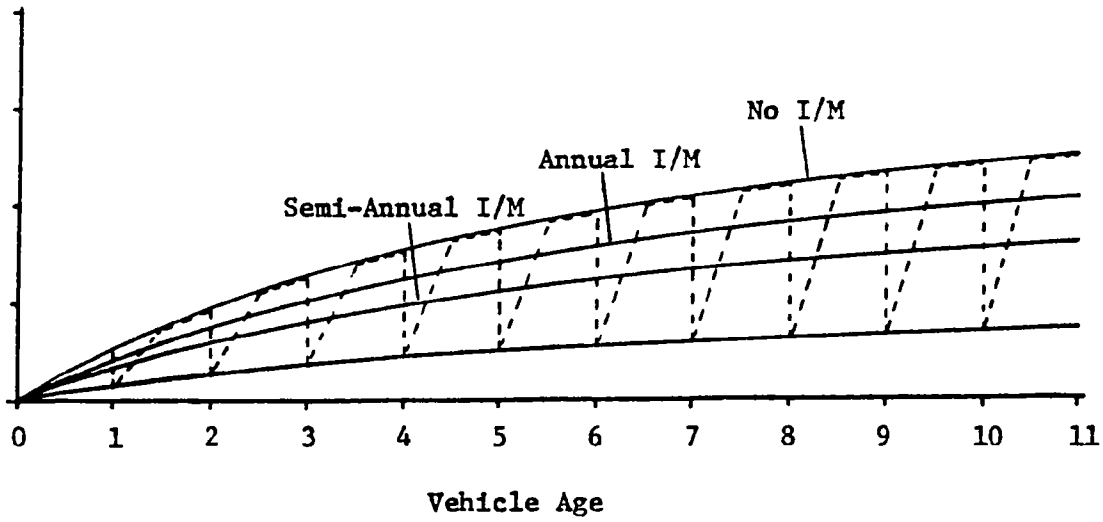
Figure 6 illustrates average HC emission deterioration rates and maintenance factors which emerged in the course of investigation. The zero (0) HC emission level represents the HC baseline for new vehicles irrespective of the population to which a vehicle belongs. As indicated, each deterioration rate and maintenance factor can be related to vehicle age.

With reference to Figure 6, the curve shown to represent the maximum levels to which HC emissions may rise above the new vehicle state is based on data which reflect current Denver area emission related maintenance practices. The curve shown to represent minimum HC emission levels is based on average HC emission reductions measured in the 1973 Colorado emission study program. Effectiveness data resulting from the 1973 study were generated on the basis of idle mode inspection with a 50% failure rate. Irrespective of this factor, idle mode inspection at 50% rejection and the resulting maintenance produce near minimum emission levels relative to the pre-1975 model-year cars. The basis for this statement is demonstrated in Colorado's 1973 program where idle inspection at 50% rejection produced reductions slightly less than the mandatory maintenance control strategy. The extent to which these factors apply to 1975 and later catalyst equipped cars are discussed later in this section.

With further reference to Figure 6, the dashed vertical lines represent emissions maintenance factors. As shown, these factors represent reduction by a constant percentage of overall HC emissions

deterioration regardless of the age of a vehicle. The dashed diagonal lines represent emissions deterioration back toward the pre-maintained state. The slope of these lines was defined from twelve-month emission deterioration study data. As indicated, HC levels from study vehicles deteriorated to the pre-maintenance state during the first six-month test interval. In the second six-month interval, HC levels followed a course of deterioration normal to the age of the vehicle. This relatively rapid return of HC levels to the pre-maintained state is of great significance relative to the I/M frequency as will be later demonstrated.

FIGURE 6

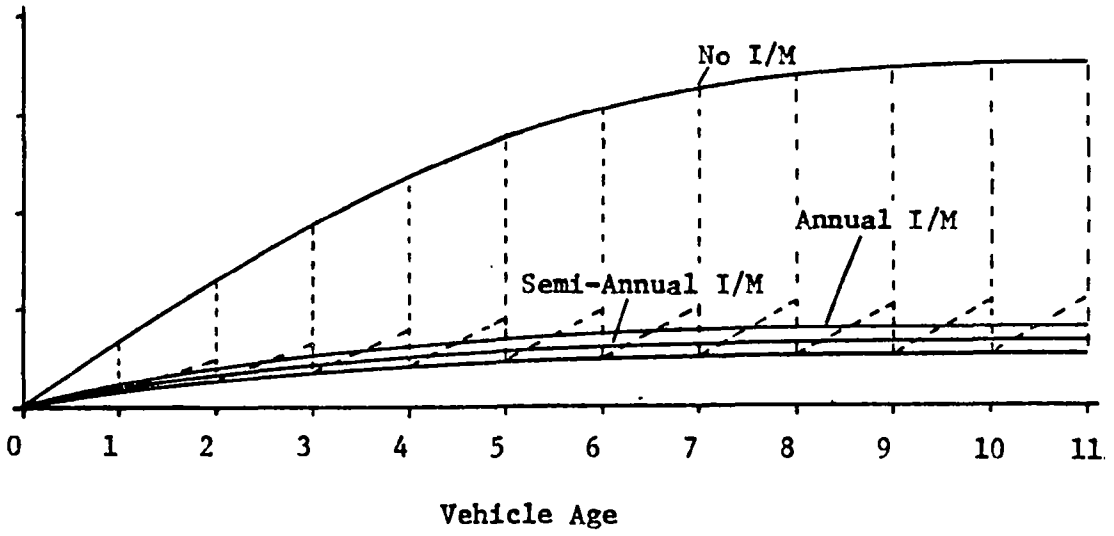


Relative Hydrocarbon Emission Levels as Related to Age (Years) with I/M Occuring at Different Intervals.

Once the HC emission maintenance factors and deterioration rates associated with I/M were established, it was a relatively simple process to predict the average levels to which HC emissions would

rise as a result of an I/M control strategy. The two intermediate curves shown in Figure 6 demonstrate average levels above baseline values to which HC emissions may deteriorate as a result of an annual and a semi-annual I/M frequency. As shown, these levels are decisively different relative to the two inspection frequencies. This difference results primarily from the fairly rapid HC deterioration which occurs in the first six months after maintenance.

FIGURE 7



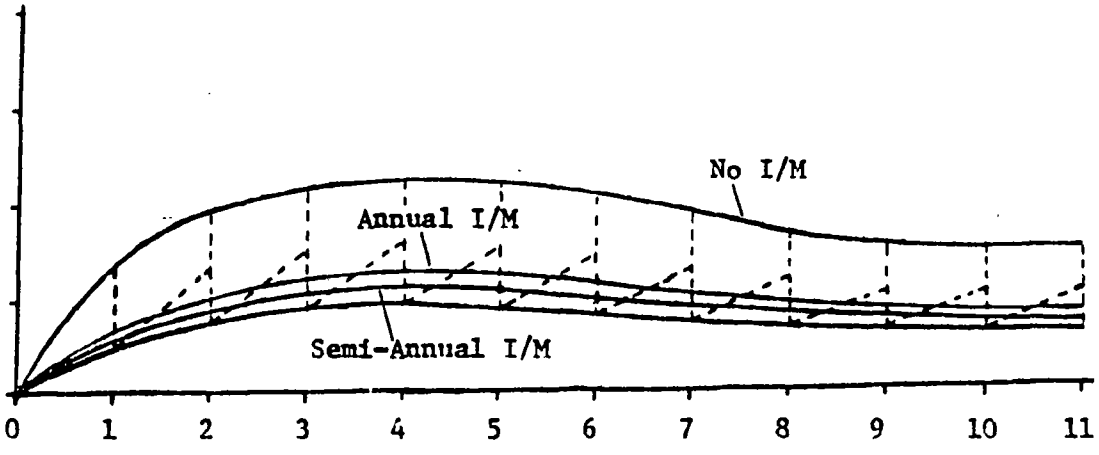
Relative Carbon Monoxide Emission Levels as Related to Age (Years) with I/M Occuring at Different Intervals.

Similar curves relating to CO emissions are shown in Figure 7. The top curve represents CO emissions above baseline values resulting from current CO emission related maintenance practices. The bottom curve represents minimum possible levels above baseline values as determined from Colorado's 1973 study program. Vertical dashed lines

indicate emission reductions attained through the I/M strategy and diagonal lines indicate CO emission deterioration rates upward toward the pre-maintained state. The slope and magnitude of these lines are exaggerated for demonstration purposes. In this regard, it may be seen that CO emission deterioration rates are considerably less than the HC deterioration rates of Figure 6 with respect to the initial reductions. As indicated, much of the CO reduction initially gained by I/M is retained over the one-year period.

NO_x curves showing minimum, maximum and intermediate levels to which NO_x emissions deteriorate and NO_x maintenance factors are presented in Figure 8. The discussions relative to Figures 6 and 7 for HC and CO emissions may be similarly applied with respect to the NO_x data of Figure 8.

FIGURE 8



Relative Oxides of Nitrogen Emission Levels as Related to Age (Years) with I/M Occuring at Different Intervals.

As may be surmised, the maintenance factors and deterioration rates presented are considered representative of the total vehicle population as reflected by and confirmed in each of the Denver area emission study reports. This assumption, based on observations of current emission related maintenance practices in the Denver area, is applied to the 1975 and later model catalyst equipped vehicles as well. In this regard, however, it should be noted that the potential for emissions deterioration in 1975 and later models is significantly greater than for the pre-1975 models with respect to initial emission levels. Whereas HC emissions from a pre-1975 model-year vehicle could increase by a factor of 10 due to a burned exhaust valve, mis-firing spark plug or other gross malfunction, this factor relative to a catalyst equipped vehicle could be as high as 100 if like malfunctions coincide with catalyst failure. In addition, it should also be noted respective of initial levels, that emission deterioration rates for 1975 and later models could be significantly higher than for pre-catalyst cars if any appreciable deterioration in catalyst performance is experienced.

In the course of the engineering analysis which was coupled with computer operations, it became apparent that emissions deterioration could be classified and related to factors both internal and external to the engine.

Degredation internal to the engine is attributed to normal wear associated with the engine and certain major engine components which is not recoverable short of major overhaul or replacement. More specifically, internal degredation is related to ring wear, valve leakage, cam wear, etc., in reference to the engine block, wear in the drive and other mechanisms in reference to the distributor and

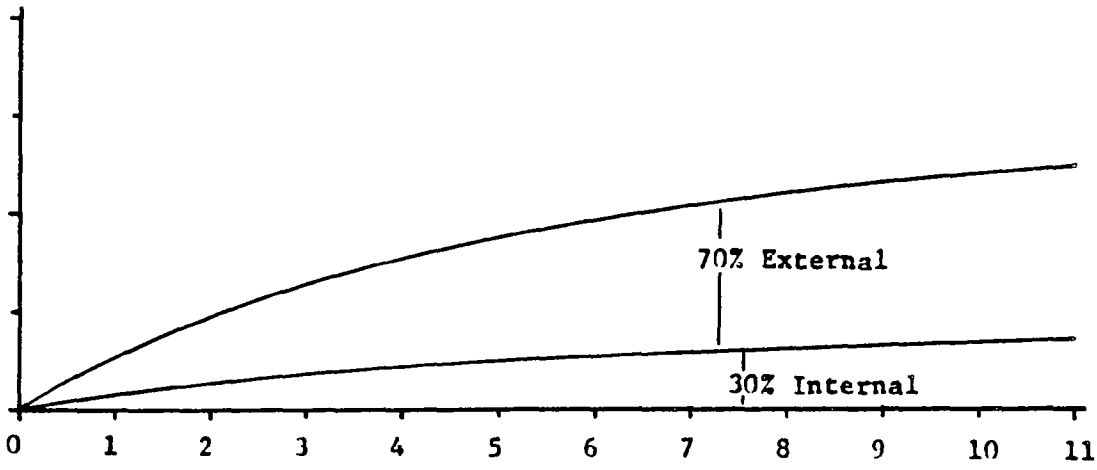
air or fuel passage clogging in reference to the carburetor to list a few examples. Degradation in catalyst performance caused by exposure to lead compounds and severe overheating which precipitates mechanical failure is also considered a form of internal degradation.

External degradation, on the other hand, is recoverable through attention to the so-called tune-up items. These are generally regarded as comprising items such as ignition parts (spark plugs, points, wires, etc.), the air filter element, the crankcase ventilation valve and external ignition and carburetor adjustments. The extent to which external degradation is recoverable was determined through experiments performed relative to the Colorado High Altitude Emission Control Program.

The curves shown in Figure 9, which are the same as certain of those shown in Figures 6 and 7, demonstrate typical differences in emission rates for HC and CO emissions. The higher rates are based on emission levels reflective of current Denver area maintenance practices. The lower rates are based on minimum emission levels which may be obtained through a totally effective maintenance program.

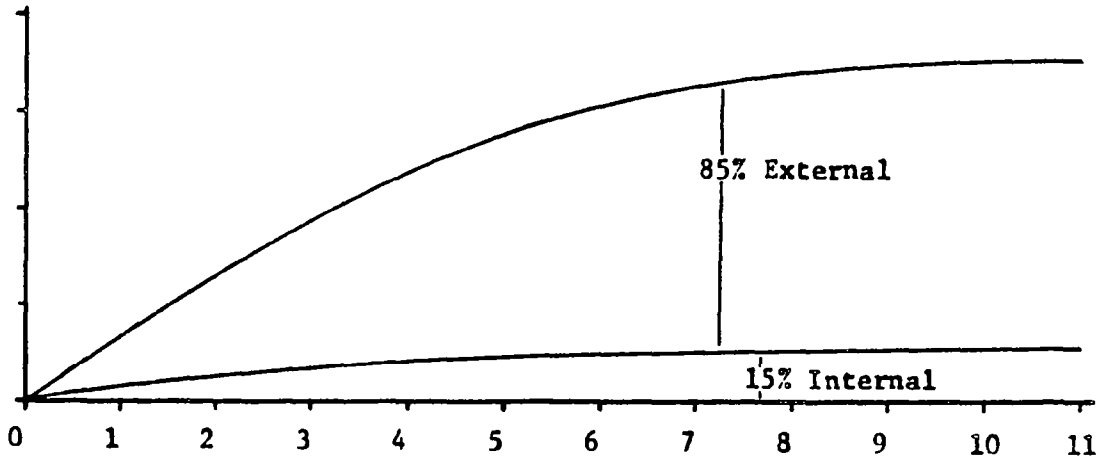
With reference to Figure 9, it can be seen that of the total HC deterioration which occurs in the Denver area as the vehicle ages, approximately 70% is related to external factors or to the so-called tune-up items. As a result, a sizeable percentage of this deterioration is recoverable through maintenance. The balance, about 30%, is internal and is not recoverable under normal conditions. The same is true of CO emissions at 85% and 15% respectively.

FIGURE 9a



Relative Hydrocarbon Emissions as Related to Age (Years).

FIGURE 9b



Relative Carbon Monoxide Emissions as Related to Age (Years).

In spite of the fact that little altitude data is available to relate deterioration to the 1975 and later model-year cars, the factors

shown in Figure 9 are considered applicable to this segment of the population nonetheless. As indicated earlier, EPA new car certification data for the 1975 model-year were unofficially provided by car company representatives. Included in these data were indications of emission deterioration rates developed for 50,000 miles of urban driving. These data were utilized to test the assumptions made relative to 1975 and later model catalyst equipped vehicles. In this respect, these assumptions, based on observations of pre-1975 model-year cars, were confirmed. The EPA certification data deterioration factors, considered as reflective of internal degradation only, bore remarkable resemblance to the same factors developed for pre-catalyst cars on the basis of more extensive historical data.

5.6 RETROFIT EMISSION FACTORS

A retrofit emission control strategy for application to the 1968-1974 model-year segment of the vehicle population was examined as part of the Colorado emission control program. As shown in study programs, retrofit is an effective control strategy.

Retrofit emission factors, which are discussed relative to the emission projections of paragraph 5.8, are based on the current proposed retrofit performance standards (Reference 10). These standards are defined with respect to two segments of the population, the 1968-1972 model-year vehicles and the 1973-1974 model year vehicles. Standards for 1968-1972 model-year vehicles require HC, CO, and NO_x emission reductions of 17%, 48% and 29% respectively. Standards for 1973 and 1974 model vehicles call for a 17% reduction in HC emissions, a 42% reduction in CO emissions and a maximum allowable increase in NO_x emissions of 24%. As proposed, these standards are measured in terms

of vehicle fleet averages and are determined from a tuned-up vehicle baseline condition. In addition, significant emissions deterioration relating to retrofit performance is neither permitted by the standards nor anticipated. As a result, the current prescribed emission reduction standards are considered synonymous relative to the retrofit emission factors.

5.7 MISCELLANEOUS INFORMATION - ENGINE DEGRADATION AND OWNER TAMPERING

The twelve-month emissions deterioration/engine degradation study was designed and conducted with provisions to assess the extent of owner tampering and provisions to establish correlations between engine degradation and changes in emission levels. As reported in the interim study report (Reference 11) on emissions deterioration and engine degradation, owner tampering in the true sense of the word was minimal. On the basis of observations made over the entire twelve-month period, owner tampering in the true sense is still considered minimal and having relatively little impact on emission levels.

Engine diagnostic and emission data were subjected to regression analysis involving all significant combinations of engine parameter changes and emission changes. These analyses established relatively poor if any correlations in these regards.

5.8 PREDICTED MOTOR VEHICLE EXHAUST EMISSION INVENTORIES

Predicted motor vehicle exhaust emission inventories presented in this section are predicated on the observations and assumptions proposed and discussed in previous paragraphs. With respect to any application to which these data may be subjected, it should be realized that 1975 and later model-year vehicles, for which little emission performance data is available, will play an increasingly more significant

role in each successive future year. As a result, the accuracy of these data will vary in accordance with the performance of these vehicles. In addition to prior assumptions and observations, the predicted inventories were established assuming; 1) ninety percent of the 1968 and later model-year vehicles would be subjected to the I/M process and 2) ninety percent of the 1968 through 1974 model-year vehicles would be retrofitted. In these regards, the status of pre-1968 model-year vehicles would remain unchanged.

Predicted exhaust HC emission inventories for light-duty vehicles are graphically shown in Figure 10. These same data are presented in tabular form in Table 2 where an approximation of exhaust HC reductions achievable through implementation of I/M and I/M/Retrofit strategies is also shown.

As may be seen from these data, implementation of an I/M program on an annual basis will result in an overall exhaust HC reduction of about 7% and 11%, respectively, in calendar years 1980 and 1985. The retrofit control strategy, on the basis of proposed retrofit standards, will result in additional corresponding exhaust HC reductions of 7% and 2%. On the other hand, a semi-annual I/M program is expected to result in exhaust HC reductions of 15% in 1980 and 21% in 1985, roughly doubling the reductions expected for an annual program. This is primarily attributed to the relatively high HC emission deterioration rates found in the twelve-month study program. Coupled with a semi-annual I/M program, HC reduction through retrofit remains unchanged.

FIGURE 10a

ANNUAL INSPECTIONS

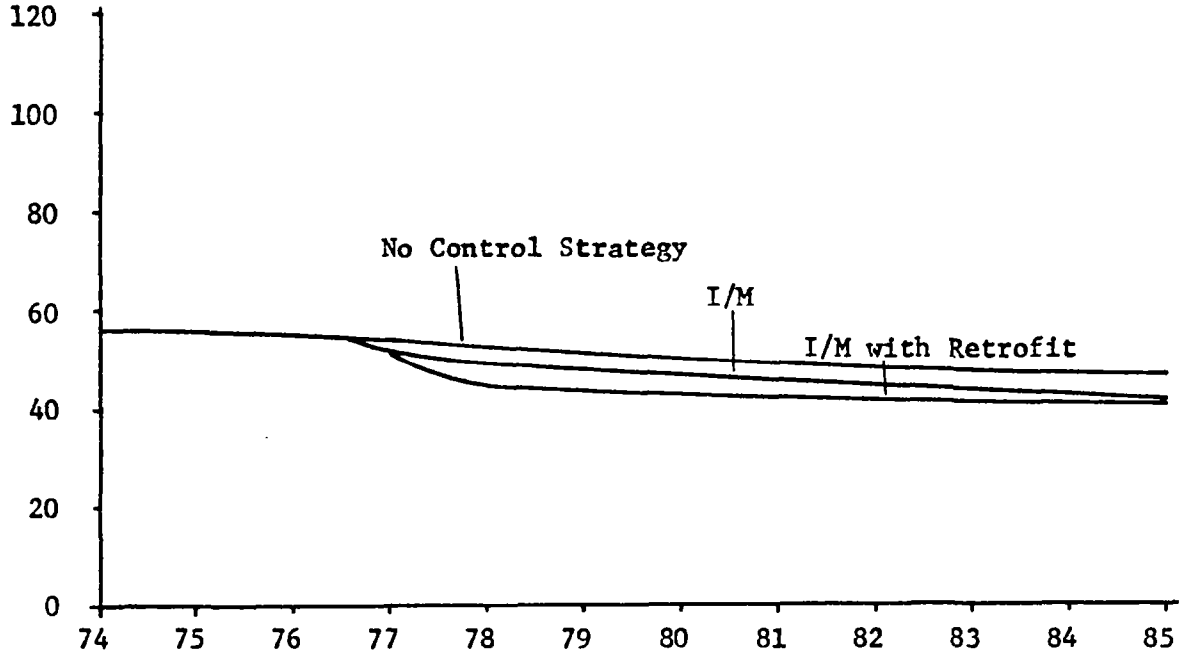
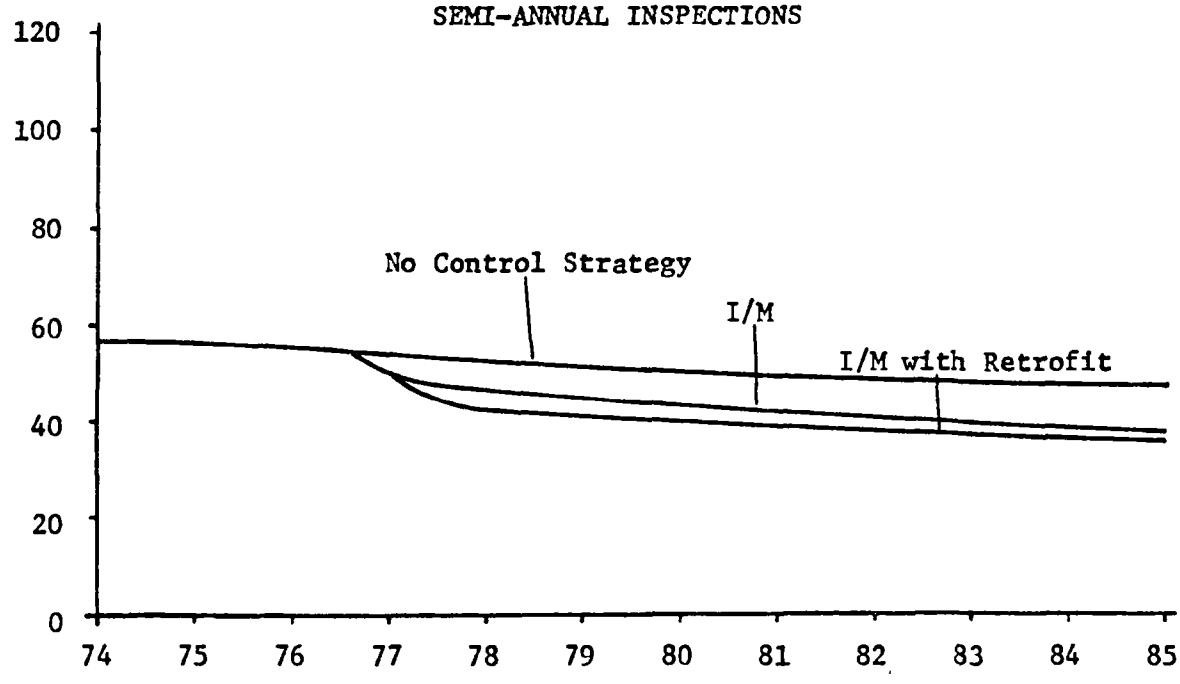


FIGURE 10b

SEMI-ANNUAL INSPECTIONS



Hydrocarbon Emission Rate (Thousands of Tons Per Year) on July 1 of Indicated Year in Denver Air Quality Control Region

TABLE 2

Predicted Exhaust HC Emission Inventory Rates
(Thousands of Tons/Year) for Different Control Strategies
Showing % Reduction from No Control Strategy Levels

July 1 of Year	No Control Strategy (Rate)	Annual I/M (Rate)	(%)	Semi-Annual I/M (Rate)	(%)	Annual I/M w/Retrofit (Rate)	(%)	Semi-Annual I/M w/Retrofit (Rate)	(%)
1974	56.9	56.9		56.9		56.9		56.9	
1975	56.5	56.5		56.5		56.5		56.5	
1976	55.4	55.4		55.4		55.4		55.4	
1977	54.0	54.0		54.0		54.0		54.0	
1978	52.4	49.5	5.5	46.6	11.1	44.9	14.3	42.3	19.3
1979	51.2	48.0	6.3	44.7	12.7	43.9	14.3	40.9	20.1
1980	50.4	46.9	6.9	43.3	14.1	43.3	14.1	40.0	20.6
1981	50.1	46.2	7.8	42.4	15.4	43.2	13.8	39.6	21.0
1982	49.1	45.0	8.4	40.8	16.9	42.5	13.4	38.6	21.4
1983	47.8	43.4	9.2	39.0	18.4	41.5	13.2	37.2	22.2
1984	46.9	42.3	9.8	37.6	19.8	40.9	12.8	36.3	22.6
1985	46.6	41.7	10.5	36.7	21.2	40.7	12.7	35.8	23.2

Predicted vehicle exhaust CO inventories are shown in Table 3 and Figure 11. Here it can be seen that relatively small differences exist relative to an annual versus a semi-annual I/M program. In both cases, CO emission reductions resulting from an I/M program are about 24% and 44% for calendar years 1980 and 1985. CO reduction through retrofit is expected to be about 19% and 6%, respectively, regardless of the I/M frequency.

TABLE 3

Predicted Exhaust CO Emission Inventory Rates
(Thousands of Tons/Year) for Different Control Strategies
Showing % Reduction from No Control Strategy Levels

July 1 of Year	No Control Strategy (Rate)	Annual I/M (Rate)	(%)	Semi-Annual I/M (Rate)	(%)	Annual I/M w/Retrofit (Rate)	(%)	Semi-Annual I/M w/Retrofit (Rate)	(%)
1974	823	823		823		823		823	
1975	804	804		804		804		804	
1976	763	763		763		763		763	
1977	716	716		716		716		716	
1978	667	548	17.8	548	17.8	395	40.8	395	40.8
1979	622	493	20.6	493	20.6	361	41.9	361	41.9
1980	583	445	23.7	445	23.7	333	42.9	333	42.9
1981	550	404	26.5	404	26.5	312	43.3	312	43.3
1982	513	358	30.2	358	30.2	286	44.2	286	44.2
1983	474	311	34.4	311	34.4	256	46.0	256	46.0
1984	443	271	38.8	271	38.8	231	47.9	231	47.9
1985	420	238	43.3	238	43.3	210	50.0	210	50.0

FIGURE 11a

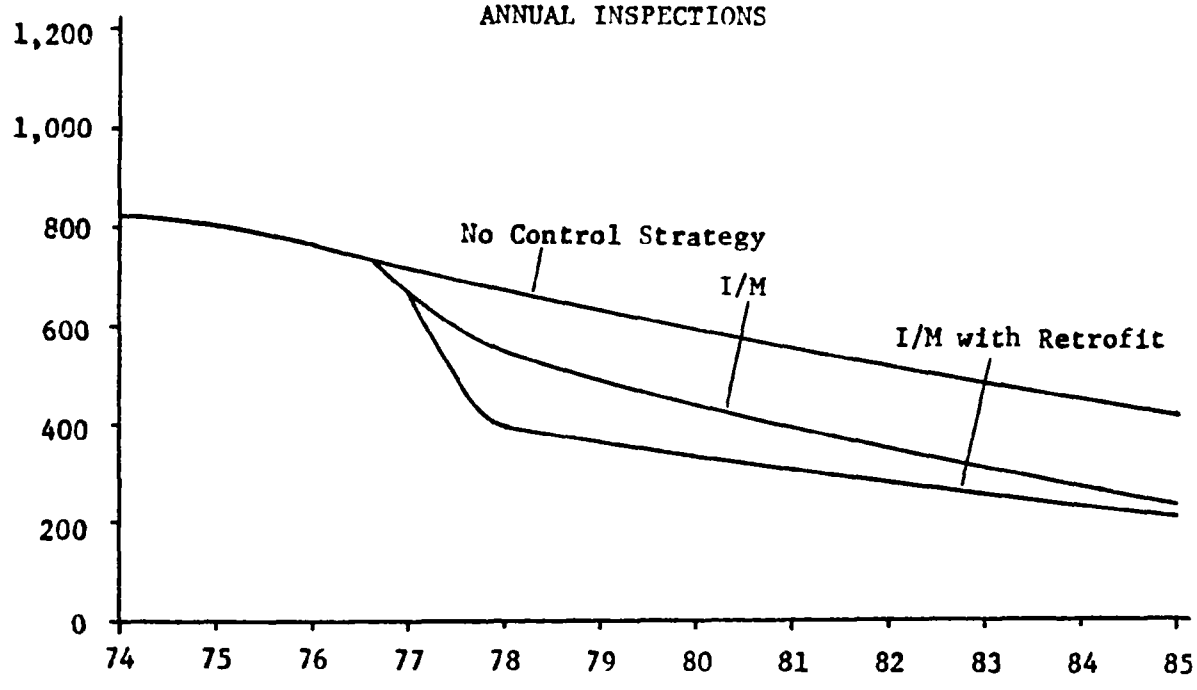
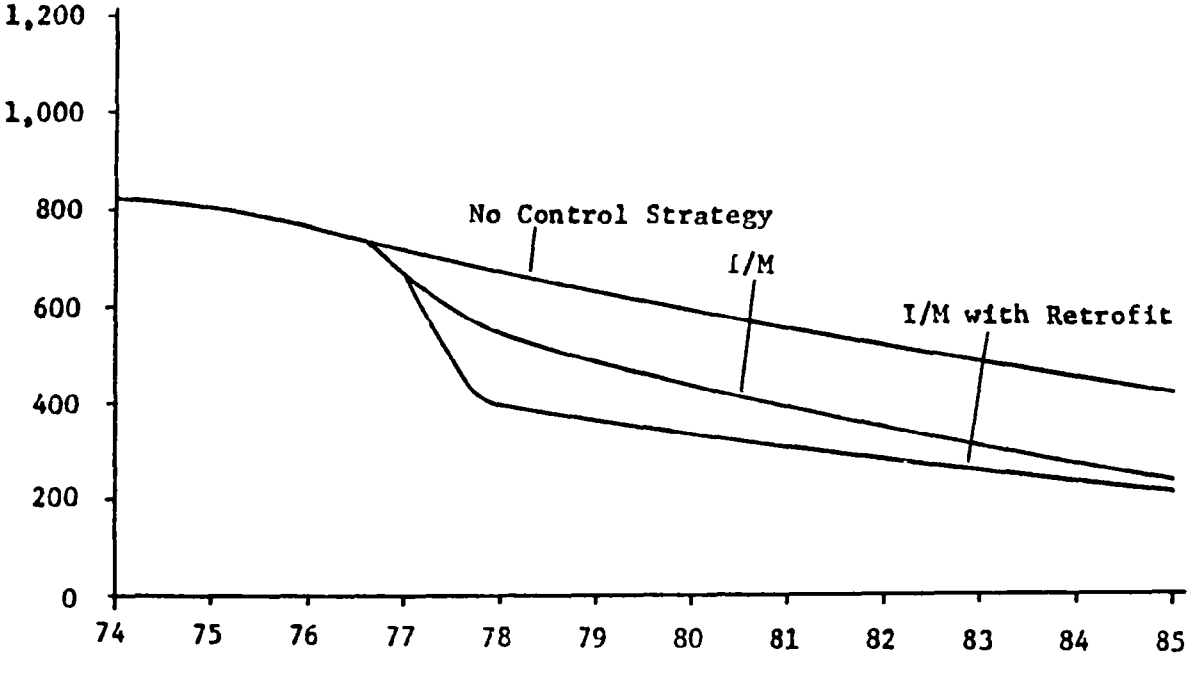


FIGURE 11b



Carbon Monoxide Emission Rate (Thousands of Tons Per Year) on July 1 of Indicated Year in Denver Air Quality Control Region

In like regards, predicted light-duty vehicle NO_x emissions are shown in Table 4 and Figure 12. Here it can be seen that relatively little differences in NO_x reductions exist with respect to an annual versus a semi-annual I/M frequency. Furthermore, a retrofit strategy will initially produce more sizeable NO_x reductions than an I/M strategy.

TABLE 4

Predicted Exhaust NO_x Emission Inventory Rates
(Thousands of Tons/Year) for Different Control Strategies
Showing % Reduction from No Control Strategy Levels

July 1 of Year	No Control Strategy (Rate)	Annual I/M (Rate)	(%)	Semi-Annual I/M (Rate)	(%)	Annual I/M w/Retrofit (Rate)	(%)	Semi-Annual I/M w/Retrofit (Rate)	(%)
1974	20.5	20.5		20.5		20.5		20.5	
1975	20.6	20.6		20.6		20.6		20.6	
1976	20.8	20.8		20.8		20.8		20.8	
1977	21.1	21.1		21.1		21.1		21.1	
1978	21.5	21.2	1.4	21.1	1.9	19.8	7.9	19.7	8.4
1979	22.0	21.6	1.8	21.6	1.8	20.5	6.8	20.4	7.3
1980	22.6	22.2	1.8	22.1	2.2	21.3	5.8	21.3	5.8
1981	23.4	22.9	2.1	22.8	2.6	22.3	4.7	22.2	5.1
1982	24.3	23.8	2.1	23.7	2.5	23.4	3.7	23.3	4.1
1983	25.4	24.8	2.4	24.7	2.8	24.6	3.1	24.5	3.5
1984	26.7	26.1	2.2	26.0	2.6	25.9	3.0	25.8	3.4
1985	28.2	27.5	2.5	27.4	2.8	27.5	2.5	27.3	3.2

FIGURE 12a

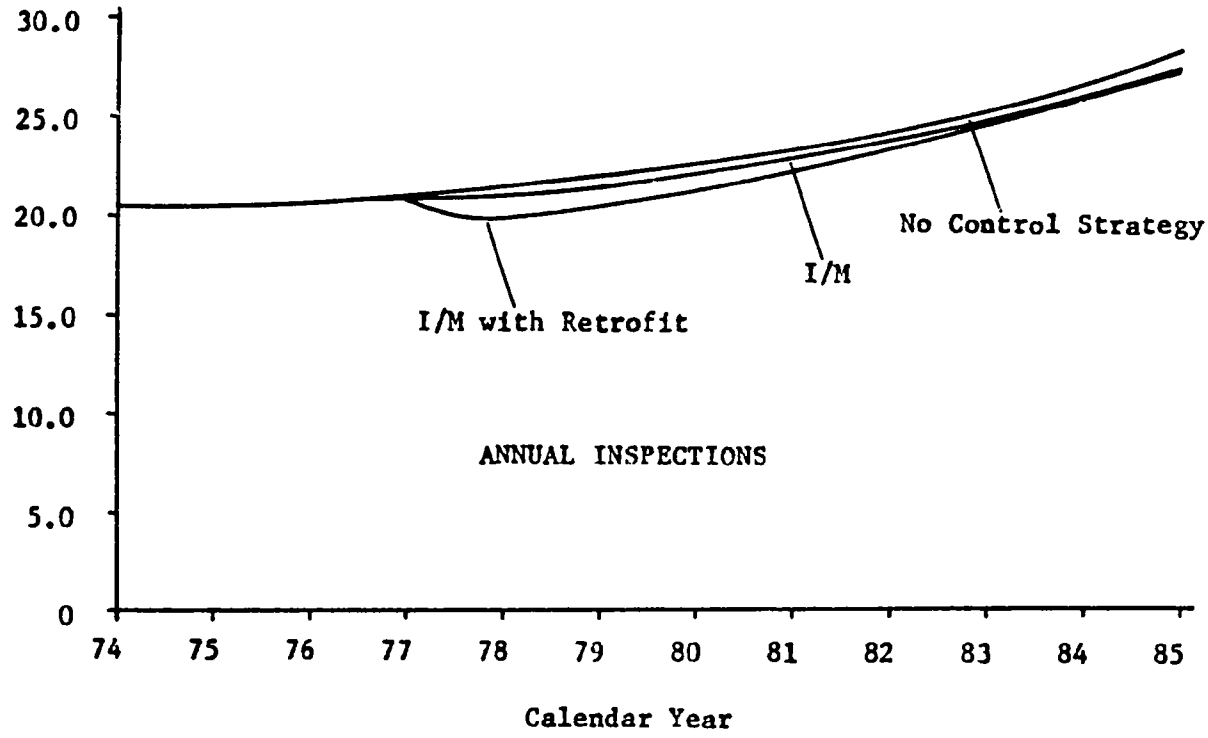
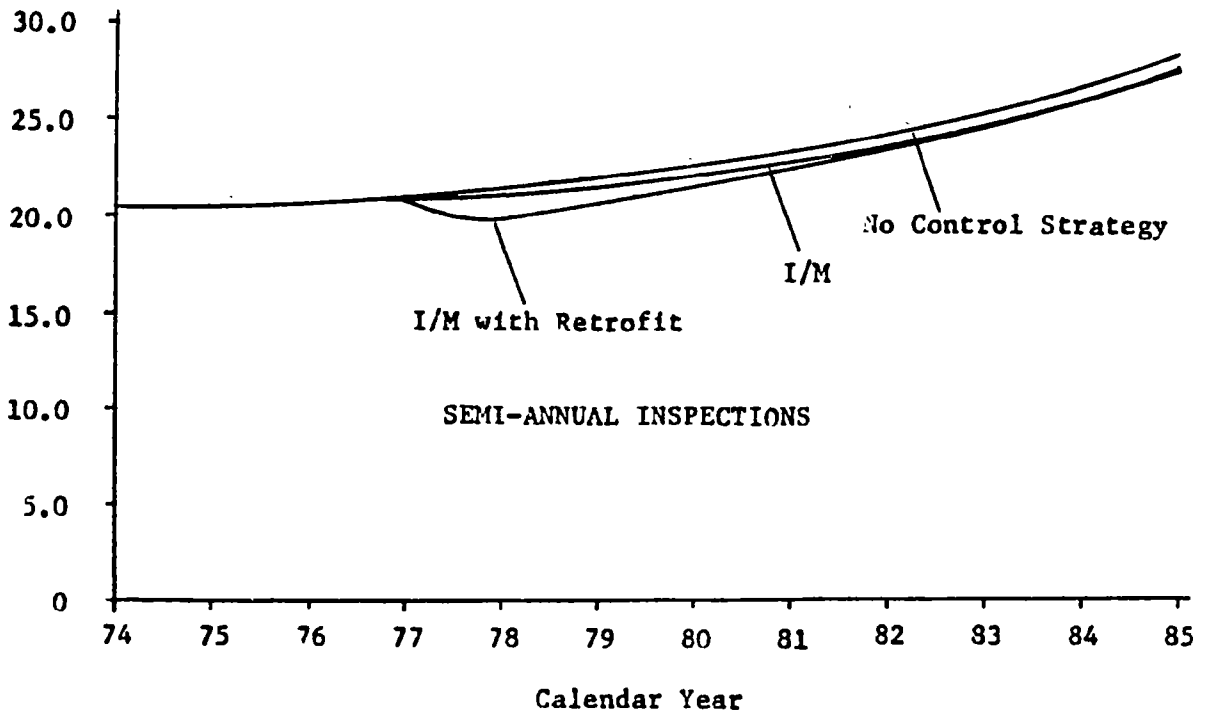


FIGURE 12b



Oxides of Nitrogen Emission Rate (Thousands of Tons Per Year) on July 1 of Indicated Year in Denver Air Quality Control Region.

5.9 SUMMARY OF OBSERVATIONS AND ASSUMPTIONS

5.9.1 A projection of trends in Denver AQCR light-duty motor vehicle registration data combined with predicted national car sales (Department of Commerce) indicate registrations in the region will rise from about 825,000 vehicles in calendar-year 1975 to about 1,300,000 vehicles in calendar-year 1985.

5.9.2 Similarly, vehicle miles traveled (VMT) are predicted to increase from the estimated current VMT of 7.2 billion miles per year to an estimated 11.6 billion miles per year in 1985.

5.9.3 Several light-duty motor vehicle populations respective of exhaust HC, CO and NO_x emissions have been identified. Categorically, these are; 1) pre-1968 model-year vehicles; 2) 1968-1974 model-year vehicles; 3) 1975-1976 model-year vehicles; 4) 1977-1981 model-year vehicles and 5) 1982 and later model-year vehicles with regards to HC and CO emissions. With regards to NO_x emissions, two populations have been identified; 1) 1968-1972 model-year vehicles and 2) all other vehicles.

The patterns by which HC, CO and NO_x emissions from pre-1975 model-year vehicles tend to rise can be predicted with respect to current Denver AQCR maintenance practices. These increases are expected to be essentially the same from population to population when considered on an absolute basis.

5.9.4 Emissions deterioration rates can be related to maintenance treatments to which a vehicle population is subjected. These rates are determined by degradation both internal and external to the engine (and/or catalyst). Under the usual circumstances, only deterioration related to external engine degradation comprising about 70% and 85% of the total HC and CO increases can be checked.

Emissions maintenance factors developed in the 1973 Colorado study program result in near maximum emissions reduction initially. With respect to HC emissions, however, the relatively high after-maintenance HC deterioration rates which occur particularly in the six-month period following maintenance tend to reduce maintenance related benefits.

These same deterioration rates and maintenance factors are assumed to apply to the 1975 and later model-year catalyst equipped vehicles. EPA 1975 model-year certification test data provide indications this assumption is correct since HC, CO and NO_x deterioration factors related to internal engine degradation compare favorably to pre-1975 model deterioration factors.

5.9.5 With regards to the twelve-month deterioration study program, owner tampering in the true sense was minimal and had relatively little impact on emission levels. In addition, regression analyses

involving all pertinent combinations of engine parameter and emission changes produced relatively poor correlations in these regards.

5.9.6 On the basis of the many observations and assumptions, an annual I/M program is expected to reduce light-duty vehicle exhaust HC, CO and NO_x emissions in the Denver AQCR by 7%, 24% and 2% in calendar year 1980. Reductions of 11%, 44% and 2% are expected for calendar year 1985. A semi-annual I/M program is expected to produce HC, CO and NO_x emission reductions of 15%, 24% and 2% in 1980 and 21%, 44% and 3% in 1985. With respect to HC reduction, a semi-annual program appears to be more beneficial.

A retrofit program, incorporating the current proposed emission reduction standards, is expected to produce additional HC, CO and NO_x reductions of 7%, 19% and 3% in 1980 and 2%, 6% and 0% in 1985.

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APPENDICES

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APPENDIX A

Calculation of Vehicular Emission Inventory

The rate at which vehicular pollutants are emitted to the atmosphere is controlled by three factors, 1) the number of vehicles in operation; 2) the rate of mileage accumulation on each of those vehicles; and 3) the rate of emissions from each of the vehicles. Since available data for these factors is presented in terms of model year or vehicle age, total emittants are easily calculated for the vehicle populations by individual model years. The total emittants for all vehicles is then obtained by summing the emittants of all the individual model years.

For the purposes of this study, vehicles older than the 1957 model year were not considered. It should be noted that the 1957 and newer model-year vehicles account for more than 99.9% of the total vehicle population. The total emittant rate can be written in equation form as follows:

$$Et = \sum_{m=57}^{85} VMTm \times Em$$

where,

Et	-	total rate of emissions into the atmosphere (Tons/Year)
m	-	subscript denoting individual model years
VMTm	-	vehicle miles traveled per year for designated model year
Em	-	emission rate (Tons/Mile) for designated model year

This equation was used to generate the curves which are labeled as resulting from no control strategy in Figures 10, 11, and 12 of the main text.

In order to project emission rates resulting from the implementation of an inspection and maintenance program, the emission rates (Em)

of individual model years must be corrected. Analysis, described in the main body of the report, has shown that as a vehicle ages the emissions rise above the new car state in a predictable manner. Further, this same analysis indicates that a certain fraction of this deterioration is recoverable through an inspection and maintenance program.

The emittant rate of the total vehicle population, with the implementation of an inspection and maintenance program, is written in equation form as follows:

$$Etim = \sum_{m=57}^{85} VMTm \times [Em - (Em - Emn) \times Rim]$$

where,

- Etim - total rate of emissions into the atmosphere (Tons/Year)
- VMTm - vehicle miles traveled per year for designated model year
- Em - emission rate (Tons/Mile) for designated model year assuming vehicle follows normal deterioration (no control strategy)
- Emn - emission rate (Tons/Mile) of a new car of designated model year
- Rim - fraction of deterioration recoverable through an inspection and maintenance program.

This equation resulted in the curves labeled as resulting from an I/M control strategy in Figures 10, 11, and 12 of the main text of this report.

A further reduction in emissions is achievable through a retrofit control program.

Such a program would be implemented in conjunction with inspection and maintenance, and would result in lowered emissions from those model years to which it was applied.

The emission rate of the total vehicle population, with the

implementation of inspection and maintenance and the added implementation of a retrofit program, is written in equation form as follows:

$$Etimr = \sum_{m=57}^{85} VMTm \times [Em - (Em-Emn) \times Rim] \times (1-Rmr)$$

where,

Etimr - the total of emissions into the atmosphere (Tons/Year) from all vehicles with the implementation of an inspection and maintenance program and a retrofit program

Rmr - the fractional reduction in emission rates achievable through retrofit for the designated model year

The other terms are as previously defined.

This equation was used to project the emission rates labeled as resulting from I/M with RETROFIT on Figures 10, 11, and 12 of the main body of this report.

APPENDIX B

LISTING OF VEHICLES UTILIZED IN TWELVE-MONTH DETERIORATION STUDY

VEHICLES REMAINING AFTER TWELVE MONTHS

VEHICLE	YEAR	MAKE	MODEL	CID	CYL	CARB	IN.WT.	TRANS
12	1967	CHRY	STAW	383	8	4	5000	A
14	1964	CHEV	CHE2	194	6	1	3000	3
15	1967	FORD	STAW	289	8	2	3500	3
16	1967	FORD	FALC	289	8	2	3000	A
17	1966	CHEV	BISC	283	8	2	4000	A
24	1964	CHRY	NEWP	361	8	2	4500	A
26	1965	CADI	DEVI	429	8	4	5000	A
27	1965	MERC	MONR	390	8	2	4000	A
28	1964	OLDS	STAW	330	8	2	4000	A
29	1965	PONT	TEMP	326	8	2	3500	A
31	1964	CHEV	IMPA	327	8	4	3500	A
37	1964	FORD	FAIR	289	8	2	3500	3
38	1966	FORD	GALA	390	8	4	4000	A
40	1968	FORD	CUST	302	8	2	4000	A
43	1971	FORD	MAVE	170	6	2	2750	3
45	1972	DODG	DART	225	6	1	3000	A
48	1967	MERC	STAW	390	8	2	4500	A
53	1964	DODG	POLA	318	8	2	4000	A
60	1970	CADI	DEVI	472	8	4	5000	A
63	1967	PLYM	FURY	318	8	2	4000	A
64	1970	AMMO	REBE	232	6	1	3500	A
66	1970	PLYM	DUST	318	8	2	3000	3
72	1972	CHEV	NOVA	250	6	1	3000	A
73	1971	FORD	TORI	351	8	2	3500	A
74	1965	FORD	FAIR	289	8	2	3500	A
75	1971	FORD	PINT	98	4	1	2250	4
76	1967	BUIC	LESA	340	8	4	4000	A
78	1972	FORD	STAW	351	8	2	4000	A
79	1971	FORD	STAW	400	8	2	4500	A
83	1970	DODG	DART	318	8	2	3000	A
90	1970	FORD	MAVE	200	6	1	2750	A
91	1973	PONT	LEMA	400	8	2	4000	A
93	1972	PLYM	DUST	198	6	1	3000	A
96	1965	PONT	CATA	389	8	4	4000	A
104	1968	PLYM	BELV	273	8	2	3500	A
107	1965	CHEV	CORV	164	6	2	2750	4
109	1966	AMMO	AMER	232	6	1	3000	3
115	1967	CHEV	IMPA	283	8	2	4000	A
118	1967	PONT	CATA	400	8	2	4000	A
122	1967	PONT	FIRE	326	8	2	3500	3
126	1966	CHEV	IMPA	327	8	4	4000	A
127	1966	DODG	CORO	318	8	2	3500	A
129	1965	CHEV	BISC	283	8	2	3500	A
130	1965	FORD	MUST	200	6	1	2750	3
132	1965	VOLK	SEDA	73	4	1	2000	4
133	1970	FORD	TORI	351	8	2	3500	A
140	1966	OLDS	DYNA	425	8	2	4500	A
142	1972	CHEV	NOVA	350	8	2	3500	A
143	1966	FORD	MUST	289	8	2	3000	A
149	1966	FORD	GALA	352	8	4	4000	A
153	1965	CHEV	BELA	283	8	2	4000	A
158	1970	OLDS	STAW	455	8	4	4500	A
161	1969	MERC	COUG	351	8	2	3500	A
166	1970	VOLK	SEDA	97	4	1	2000	4
168	1966	VOLK	SEDA	78	4	1	2000	4

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VEHICLES REMAINING AFTER TWELVE MONTHS

VEHICLE	YEAR	MAKE	MODEL	CID	CYL	CARB	IN.WT.	TRANS
170	1966	FORD	MUST	289	8	2	3000	A
171	1965	FORD	STAW	289	8	2	4500	A
175	1972	CHEV	NOVA	350	8	2	3500	A
177	1972	CHRY	NEWP	400	8	2	4500	A
179	1973	CHEV	NOVA	307	8	2	3500	A
180	1968	FORD	GALA	302	8	2	4000	A
181	1968	CHEV	NOVA	307	8	2	3000	A
185	1971	TOYO	CORO	71	4	2	2000	4
187	1973	FORD	LTD	351	8	2	4500	A
190	1973	PLYM	DUST	225	6	1	3000	A
191	1967	CHEV	CHE2	194	6	1	3000	3
196	1971	CHEV	CAPR	400	8	2	4500	A
197	1972	FORD	PINT	122	4	2	2250	A
207	1972	VOLK	SQBK	97	4	FI	2500	4
208	1971	DATS	510	97	4	1	2000	4
211	1970	PLYM	FURY	318	8	2	4000	A
212	1967	FORD	MUST	289	8	2	3000	3
213	1966	CHEV	STAW	283	8	2	4000	3
218	1973	CHEV	NOVA	307	8	2	3500	A
222	1964	AMMO	AMER	196	6	1	3000	3
235	1965	BUIC	WILD	425	8	4	4500	A
238	1969	DODG	CORO	318	8	2	3500	A
239	1968	VOLK	SEDA	91	4	1	2000	4
245	1968	FORD	FAIR	289	8	2	3500	3
247	1968	FORD	GALA	390	8	2	4000	A
249	1971	PLYM	FURY	383	8	4	4000	A
251	1973	CHEV	IMPA	350	8	4	4000	A
252	1973	OLDS	OMEG	350	8	4	3500	3
258	1965	FORD	THUN	390	8	4	5000	A
260	1971	CHRY	IMPE	440	8	4	5000	A
261	1969	FORD	MUST	200	6	1	3000	3
270	1971	CHEV	NOVA	250	6	1	3500	A
271	1967	PONT	FIRE	326	8	4	3500	A
272	1966	PLYM	FURY	318	8	2	4000	A
273	1970	CHEV	CAPR	400	8	2	4000	A
276	1966	PONT	LEMA	326	8	4	3500	A
278	1965	FORD	MUST	289	8	4	3000	A
279	1973	TOYO	STAW	120	4	2	2500	A
280	1967	CHEV	STAW	327	8	4	4000	3
286	1968	DODG	CHAR	318	8	2	3500	A
287	1971	BUIC	LESA	455	8	4	4500	A
291	1969	PLYM	FURY	318	8	2	4000	A
292	1971	CHEV	NOVA	307	8	2	3500	A
293	1972	FORD	MUST	351	8	4	3500	A
296	1965	FORD	MUST	260	8	2	3000	A
300	1973	OPEL	MANT	116	4	2	2250	4
307	1969	CHEV	NOVA	230	6	1	3000	A
309	1969	FORD	TORI	351	8	2	3500	A
312	1972	MERC	COME	302	8	2	3000	A
314	1971	FORD	BRON	302	8	2	3500	3
321	1970	CHEV	NOVA	250	6	1	3500	A
325	1973	FORD	GALA	351	8	2	4500	A
326	1969	TOYO	CORO	116	4	2	2500	4
327	1970	TOYO	CORO	113	4	2	2500	4

APPENDIX C

TEST RESULTS OF TWELVE-MONTH DETERIORATION STUDY

EXHAUST EMISSIONS BEFORE INSPECTION AND MAINTENANCE

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	ODOM.	HC MEAN	HC S.D.	CO MEAN	CO S.D.	NOX MEAN	NOX S.D.	MPG MEAN	MPG S.D.
*VEHICLE MAKE										
AMER.MOTORS	3	65856	6.27	1.8	83.8	20.8	3.42	1.65	17.61	1.12
BUICK	3	39310	13.02	10.0	194.3	52.8	1.55	.92	10.51	1.40
CADILLAC	2	65453	5.78	0.3	129.0	62.3	3.37	1.62	11.23	2.44
CHEVROLET	24	46325	7.41	3.7	103.9	47.8	2.33	1.14	14.32	2.48
CHRYSLER	4	53878	14.42	14.8	199.9	92.9	1.41	.78	10.30	1.53
DATSUN	1	27615	4.37	0.0	42.2	0.0	3.61	0.00	22.04	0.00
DODGE	6	38172	6.63	2.2	100.6	12.5	3.00	1.03	14.52	1.43
FORD	32	47606	7.52	2.9	99.6	36.6	2.98	1.62	14.82	3.35
MERCURY	4	48090	6.16	2.4	64.4	35.0	4.42	3.47	13.52	1.86
OLDSMOBILE	4	45229	7.58	5.2	118.8	60.8	2.10	1.42	11.38	.94
OPEL	1	6817	4.81	0.0	78.3	0.0	1.77	0.00	21.64	0.00
PLYMOUTH	9	45104	9.34	7.6	122.0	46.1	2.51	.80	14.19	2.67
PONTIAC	7	55483	11.85	10.1	128.0	56.7	2.15	1.03	12.97	1.39
TOYOTA	4	40399	5.22	1.4	81.2	48.3	2.49	.67	18.37	2.44
VOLKSWAGEN	5	49330	6.26	2.3	80.2	31.3	2.27	1.14	21.33	1.81
VOLVO	0	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR										
1964	7	65985	9.04	3.0	139.3	55.6	1.81	.99	14.35	3.09
1965	15	78272	11.30	7.8	130.6	52.0	2.24	1.23	14.79	4.18
1966	13	59567	9.13	2.0	132.0	26.6	2.72	.89	13.78	2.84
1967	13	55225	10.62	3.2	139.6	42.8	2.17	2.20	13.69	1.63
1968	8	58821	6.47	1.4	97.0	38.5	3.39	2.33	15.11	2.87
1969	7	57013	5.99	1.8	97.0	39.7	2.76	1.29	14.86	1.20
1970	12	37832	7.25	6.9	81.3	39.4	3.34	1.37	14.97	3.59
1971	13	30876	5.75	1.4	80.2	40.9	2.99	1.20	15.67	5.16
1972	11	16983	7.46	9.7	97.0	79.8	2.89	1.20	14.91	3.95
1973	10	9630	4.18	1.1	74.4	20.6	2.02	.70	14.32	3.45
*DISPLACEMENT										
LESS THAN 151	13	35881	5.70	1.7	77.0	32.0	2.40	.90	20.52	2.36
151 - 250	14	43771	6.39	3.2	80.0	24.4	2.69	1.12	18.51	2.23
251 - 350	47	53548	8.96	4.4	120.6	44.8	2.39	1.27	13.90	1.32
MORE THAN 350	35	44011	8.12	7.6	113.2	63.0	3.02	1.85	11.88	1.72
*INERTIA WEIGHT										
1800 - 2799	17	39888	5.86	1.8	73.2	29.1	2.45	.87	20.68	2.17
2800 - 3799	49	44365	7.11	3.1	97.6	39.3	2.56	1.27	14.93	1.79
3800 - 4799	38	52206	10.21	7.9	133.0	60.1	2.81	1.87	12.00	1.38
4800 - 5799	5	60120	6.51	1.0	134.3	34.4	2.61	1.08	11.07	1.48
*POPULATIONS										
1964 - 1967	48	65172	10.20	4.9	134.7	43.2	2.29	1.45	14.15	3.07
1968 - 1973	61	32920	6.22	5.2	86.6	46.5	2.91	1.40	15.01	3.66
ALL VEHICLES	109	47123	7.97	5.4	107.8	50.9	2.63	1.45	14.63	3.42

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EXHAUST EMISSIONS AFTER INSPECTION AND MAINTENANCE

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	ODOM.	HC MEAN	HC S.D.	CO MEAN	CO S.D.	NOX MEAN	NOX S.D.	MPG MEAN	MPG S.D.
*VEHICLE MAKE										
AMER.MOTORS	3	65856	6.27	1.8	83.8	20.8	3.42	1.65	17.61	1.12
BUICK	3	39310	13.89	12.0	189.8	69.8	1.78	1.04	10.33	1.43
CADILLAC	2	65453	5.78	0.3	129.0	62.3	3.37	1.62	11.23	2.44
CHEVROLET	24	46325	6.99	3.7	103.9	50.1	2.12	1.16	14.29	2.13
CHRYSLER	4	53878	6.01	1.1	114.1	27.9	2.03	.71	11.96	1.60
DATSUN	1	27615	4.36	0.0	46.6	0.0	2.91	0.00	21.79	0.00
DODGE	6	38172	7.60	4.4	101.2	60.1	2.47	1.09	15.06	2.15
FORD	32	47606	6.94	2.6	95.9	36.9	2.67	1.35	14.92	3.53
MERCURY	4	48090	6.58	2.0	72.7	40.6	4.96	3.65	12.89	1.89
OLDSMOBILE	4	45229	6.31	2.7	117.5	62.3	2.10	1.51	11.80	.81
OPEL	1	6817	3.59	0.0	59.8	0.0	1.78	0.00	21.82	0.00
PLYMOUTH	9	45104	6.55	3.1	101.9	40.9	2.58	1.01	14.49	2.97
PONTIAC	7	55483	8.18	3.5	131.4	65.2	2.09	1.18	13.05	1.34
TOYOTA	4	40399	3.86	0.5	68.9	54.0	2.30	1.13	19.67	3.83
VOLKSWAGEN	5	49330	5.72	1.2	70.3	22.3	2.20	1.05	22.51	1.35
VOLVO	0	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR										
1964	7	65985	7.86	2.5	119.5	44.0	1.78	1.16	15.03	2.61
1965	15	78272	9.47	5.6	133.5	57.4	2.05	1.09	14.71	3.98
1966	13	59567	8.23	2.1	117.5	35.0	2.56	.72	14.69	3.45
1967	13	55225	9.99	2.8	136.3	42.5	2.09	2.20	13.83	1.74
1968	8	58821	6.79	3.6	91.0	41.8	2.76	1.77	14.66	3.55
1969	7	57013	7.08	3.3	113.4	56.7	2.60	2.19	14.46	1.49
1970	12	37832	4.86	1.1	75.1	41.2	3.11	1.06	15.26	3.77
1971	13	30876	4.80	1.0	70.1	34.3	2.94	1.33	16.05	5.75
1972	11	16983	4.70	1.8	74.7	36.4	3.01	1.11	15.38	3.82
1973	10	9630	4.09	1.1	74.4	27.1	2.00	.86	14.39	3.44
*DISPLACEMENT										
LESS THAN 151	13	35881	4.71	1.2	66.8	31.1	2.25	.93	21.55	2.79
151 - 250	14	43771	6.18	3.1	81.6	31.0	2.69	1.25	18.25	2.19
251 - 350	47	53548	7.89	3.2	115.1	46.8	2.10	1.03	14.07	1.57
MORE THAN 350	35	44011	6.64	4.3	103.4	53.8	3.06	1.84	12.09	1.53
*INERTIA WEIGHT										
1800 - 2799	17	39888	4.96	1.4	67.0	28.7	2.31	.92	21.23	2.62
2800 - 3799	49	44365	6.69	3.0	95.3	41.4	2.36	1.28	15.02	2.02
3800 - 4799	38	52206	8.03	4.5	119.7	54.9	2.75	1.75	12.33	1.33
4800 - 5799	5	60120	6.78	1.4	136.4	36.4	2.60	1.08	10.97	1.48
*POPULATIONS										
1964 - 1967	48	65172	9.04	3.7	127.9	45.5	2.16	1.40	14.51	3.10
1968 - 1973	61	32920	5.20	2.2	80.3	39.8	2.77	1.36	15.14	3.94
ALL VEHICLES	109	47123	6.89	3.5	101.3	48.4	2.50	1.41	14.86	3.59

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EXHAUST EMISSIONS AFTER SIX MONTHS

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	ODOM.	HC MEAN	HC S.D.	CO MEAN	CO S.D.	NOX MEAN	NOX S.D.	MPG MEAN	MPG S.D.
*VEHICLE MAKE										
AMER.MOTORS	3	70610	6.41	3.0	74.1	31.2	4.05	1.95	17.60	.19
BUICK	3	41407	9.99	5.5	201.6	133.6	2.03	1.33	10.36	2.37
CADILLAC	2	69122	5.75	0.3	113.5	39.8	3.22	1.22	10.78	2.35
CHEVROLET	24	50864	8.69	9.9	102.8	52.9	2.25	1.45	14.48	2.42
CHRYSLER	4	56396	6.26	1.2	124.6	39.8	1.96	.52	11.32	1.45
DATSUN	1	30858	3.75	0.0	45.2	0.0	3.43	0.00	21.12	0.00
DODGE	6	39550	7.76	4.1	118.2	76.8	2.75	1.45	14.18	2.34
FORD	32	51347	8.85	5.3	102.2	49.8	2.58	1.39	14.86	3.22
MERCURY	4	52112	6.83	3.8	81.9	55.2	3.71	2.60	13.09	1.81
OLDSMOBILE	4	47686	13.20	16.0	114.5	60.8	1.94	1.50	11.75	.77
OPEL	1	11046	3.99	0.0	63.4	0.0	1.58	0.00	22.11	0.00
PLYMOUTH	9	49402	13.68	15.2	120.6	55.0	2.47	1.30	13.68	3.50
PONTIAC	7	58908	9.68	3.8	137.9	59.3	2.14	1.30	12.65	.99
TOYOTA	4	47707	4.35	1.1	87.3	51.7	1.69	.72	20.05	3.87
VOLKSWAGEN	5	54532	6.46	4.4	77.2	35.8	1.88	.73	21.16	1.63
VOLVO	0	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR										
1964	7	68704	8.35	3.8	127.1	58.3	1.93	1.45	14.96	2.73
1965	15	81623	9.56	3.3	148.0	74.8	1.89	1.03	14.08	4.00
1966	13	63056	14.67	11.8	137.8	39.8	2.29	1.06	13.66	2.75
1967	13	58575	13.58	12.2	136.5	44.0	1.81	1.58	13.45	1.85
1968	8	62726	5.96	1.6	81.7	41.6	3.14	1.60	15.13	3.36
1969	7	61341	10.61	12.0	108.6	77.7	2.40	1.54	14.96	2.83
1970	12	42515	4.98	1.4	80.1	36.5	3.02	1.36	15.39	3.59
1971	13	35201	7.80	7.0	75.5	39.6	3.20	1.69	15.91	5.23
1972	11	20934	5.27	3.0	79.7	51.9	2.83	1.32	15.48	3.92
1973	10	14684	4.24	0.8	77.1	22.4	2.07	.89	14.32	3.58
*DISPLACEMENT										
LESS THAN 151	13	41129	5.25	2.8	77.8	35.5	1.85	.75	20.81	2.32
151 - 250	14	47419	6.01	2.7	78.9	27.0	2.96	1.51	18.39	1.96
251 - 350	47	57283	10.93	10.0	118.3	54.4	2.17	1.32	13.84	1.80
MORE THAN 350	35	47764	8.19	6.2	114.4	68.3	2.83	1.53	12.02	1.86
*INERTIA WEIGHT										
1800 - 2799	17	44442	5.58	2.9	77.5	32.7	2.02	.89	20.63	2.19
2800 - 3799	49	48434	7.62	4.7	97.8	51.4	2.44	1.42	15.03	2.20
3800 - 4799	38	55788	11.87	11.4	128.0	64.0	2.66	1.60	12.11	1.36
4800 - 5799	5	62770	6.60	1.7	141.3	55.0	2.35	1.00	10.32	1.54
*POPULATIONS										
1964 - 1967	48	68468	11.86	9.2	139.1	55.2	1.98	1.24	13.92	2.96
1968 - 1973	61	37313	6.29	5.5	82.0	44.5	2.81	1.42	15.26	3.83
ALL VEHICLES	109	51033	8.74	7.8	107.2	56.9	2.45	1.40	14.67	3.53

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EXHAUST EMISSIONS AFTER TWELVE MONTHS

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	ODOM.	HC MEAN	HC S.D.	CO MEAN	CO S.D.	NOX MEAN	NOX S.D.	MPG MEAN	MPG S.D.
*VEHICLE MAKE										
AMER.MOTORS	3	74360	6.10	2.5	73.5	21.3	2.44	.39	18.47	2.08
BUICK	3	43838	11.06	4.5	198.9	72.0	1.64	1.16	10.06	.11
CADILLAC	2	74056	4.49	0.7	89.7	37.2	4.05	2.30	12.33	2.11
CHEVROLET	24	56004	9.36	9.8	103.6	59.7	2.26	1.40	14.33	2.73
CHRYSLER	4	60233	8.91	3.6	143.1	46.9	2.35	1.01	11.54	1.31
DATSUN	1	34231	2.56	0.0	26.8	0.0	3.62	0.00	23.95	0.00
DODGE	6	42776	7.79	4.3	118.1	65.0	2.66	1.33	14.28	2.56
FORD	32	55559	8.17	5.0	100.8	43.5	2.55	1.37	15.03	3.65
MERCURY	4	55044	6.30	3.2	68.5	29.1	3.73	2.12	13.42	1.71
OLDSMOBILE	4	51514	13.69	14.9	118.2	65.5	2.06	1.12	11.66	.85
OPEL	1	14306	3.65	0.0	55.0	0.0	1.43	0.00	22.43	0.00
PLYMOUTH	9	54162	17.69	29.6	115.7	62.3	2.19	.63	13.85	3.92
PONTIAC	7	62137	11.14	4.9	165.9	94.5	1.86	1.33	12.01	1.64
TOYOTA	4	53774	7.65	4.8	47.8	21.3	3.15	.92	20.81	4.50
VOLKSWAGEN	5	60674	6.41	1.6	79.0	39.8	2.22	1.74	22.76	1.79
VOLVO	0	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR										
1964	7	71466	11.97	10.7	126.6	56.1	1.83	1.49	15.28	3.94
1965	15	85403	10.33	7.3	127.5	55.8	2.04	1.39	14.75	4.11
1966	13	66662	18.23	24.8	145.5	54.2	2.22	1.22	13.53	3.60
1967	13	61871	11.30	4.4	162.7	72.5	1.65	1.44	13.03	2.51
1968	8	67228	10.79	8.4	89.3	40.8	2.68	1.64	14.80	2.79
1969	7	66268	10.51	7.9	97.4	69.2	2.87	1.50	15.19	2.94
1970	12	47718	5.26	2.3	73.6	31.1	2.79	.47	15.41	3.50
1971	13	39967	5.12	1.6	74.1	42.9	3.27	1.55	16.52	6.07
1972	11	25906	5.44	3.1	78.2	48.1	2.94	.98	16.16	5.06
1973	10	20684	4.27	0.7	69.9	23.0	2.31	.88	14.39	3.58
*DISPLACEMENT										
LESS THAN 151	13	46379	6.00	3.1	63.2	32.3	2.41	1.37	22.33	2.74
151 - 250	14	50975	7.80	8.1	78.8	20.7	2.28	.71	18.82	2.48
251 - 350	47	61604	12.40	14.8	127.0	65.7	2.04	1.26	13.63	2.20
MORE THAN 350	35	52170	7.00	3.2	106.1	57.5	3.07	1.42	12.15	1.52
*INERTIA WEIGHT										
1800 - 2799	17	49009	7.60	7.6	64.5	29.6	2.34	1.27	21.81	2.95
2800 - 3799	49	53063	7.13	3.6	101.9	57.5	2.33	1.25	15.11	2.48
3800 - 4799	38	59870	13.30	16.2	130.4	64.1	2.50	1.45	11.87	1.44
4800 - 5799	5	65929	6.22	1.9	112.5	39.7	3.44	1.43	11.51	1.54
*POPULATIONS										
1964 - 1967	48	71921	12.97	14.3	141.8	60.4	1.95	1.35	14.03	3.56
1968 - 1973	61	42388	6.43	4.9	78.7	42.0	2.83	1.20	15.51	4.26
ALL VEHICLES	109	55394	9.31	10.6	106.5	59.6	2.44	1.33	14.86	4.02

AUTOMOTIVE TESTING LABORATORIES,INC.
19900 E. COLFAX, AURORA, COLO. 80011

EXHAUST EMISSION REDUCTIONS AFTER INSPECTION AND MAINTENANCE

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	ODOM.	HC MEAN	HC S.D.	CO MEAN	CO S.D.	NOX MEAN	NOX S.D.	MPG MEAN	MPG S.D.
*VEHICLE MAKE										
AMER.MOTORS	3	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
BUICK	3	0	-0.87	2.0	4.6	17.1	-0.23	.24	0.19	.46
CADILLAC	2	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
CHEVROLET	24	0	0.43	0.8	-0.1	16.3	0.21	.69	0.03	1.16
CHRYSLER	4	0	8.41	15.5	85.8	117.0	-0.62	.90	-1.66	2.11
DATSUN	1	0	0.01	0.0	-4.4	0.0	0.70	0.00	0.26	0.00
DODGE	6	0	-0.97	3.8	-0.6	49.9	0.53	1.53	-0.53	1.14
FORD	32	0	0.58	2.0	3.7	22.3	0.31	1.16	-0.10	1.03
MERCURY	4	0	-0.43	0.5	-8.4	19.2	-0.54	.93	0.63	1.41
OLDSMOBILE	4	0	1.27	4.8	1.3	25.5	0.01	.49	-0.42	.43
OPEL	1	0	1.22	0.0	18.5	0.0	-0.01	0.00	-0.18	0.00
PLYMOUTH	9	0	2.79	8.4	20.1	18.0	-0.07	.57	-0.30	.82
PONTIAC	7	0	3.67	7.5	-3.4	27.5	0.05	.40	-0.08	.73
TOYOTA	4	0	1.36	1.0	12.2	12.5	0.19	.52	-1.31	1.60
VOLKSWAGEN	5	0	0.55	1.5	9.8	22.7	0.07	.70	-1.19	1.37
VOLVO	0	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR										
1964	7	0	1.17	3.5	19.8	37.5	0.04	.49	-0.68	.77
1965	15	0	1.83	5.5	-2.9	25.1	0.19	.69	0.08	1.18
1966	13	0	0.89	1.9	14.5	20.8	0.16	.68	-0.91	1.13
1967	13	0	0.63	1.6	3.4	14.9	0.08	.25	-0.15	.59
1968	8	0	-0.32	3.4	6.1	34.8	0.63	1.46	0.45	1.20
1969	7	0	-1.09	2.7	-16.4	34.7	0.15	1.46	0.39	.54
1970	12	0	2.39	6.9	6.2	20.0	0.23	1.50	-0.29	1.12
1971	13	0	0.95	1.0	10.1	12.8	0.05	.62	-0.37	1.31
1972	11	0	2.76	9.6	22.2	77.4	-0.11	.91	-0.48	1.77
1973	10	0	0.09	0.6	-0.0	12.7	0.02	.36	-0.07	.45
*DISPLACEMENT										
LESS THAN 151	13	0	0.99	1.3	10.2	15.9	0.15	.51	-1.03	1.32
151 - 250	14	0	0.22	0.6	-1.6	17.0	-0.01	.39	0.26	1.12
251 - 350	47	0	1.06	4.3	5.5	25.5	0.30	.90	-0.17	1.03
MORE THAN 350	35	0	1.48	6.4	9.7	48.8	-0.03	1.07	-0.22	1.09
*INERTIA WEIGHT										
1800 - 2799	17	0	0.90	1.2	6.2	16.9	0.14	.45	-0.55	1.62
2800 - 3799	49	0	0.42	2.1	2.3	24.9	0.20	1.04	-0.08	1.08
3800 - 4799	38	0	2.18	7.3	13.3	46.9	0.06	.88	-0.33	1.00
4800 - 5799	5	0	-0.27	0.6	-2.1	4.7	0.01	.03	0.10	.22
*POPULATIONS										
1964 - 1967	48	0	1.16	3.5	6.8	24.7	0.13	.56	-0.36	1.04
1968 - 1973	61	0	1.02	5.3	6.3	38.8	0.14	1.08	-0.13	1.20
ALL VEHICLES	109	0	1.08	4.6	6.5	33.2	0.13	.88	-0.23	1.13

AUTOMOTIVE TESTING LABORATORIES,INC.
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EXHAUST EMISSION REDUCTIONS AFTER SIX MONTHS

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	ODOM.	HC MEAN	HC S.D.	CO MEAN	CO S.D.	NOX MEAN	NOX S.D.	MPG MEAN	MPG S.D.
*VEHICLE MAKE										
AMER.MOTORS	3	-4754	-0.14	1.9	9.7	19.2	-0.63	.33	0.01	.98
BUICK	3	-2097	3.03	5.2	-7.2	83.7	-0.48	.41	0.15	2.15
CADILLAC	2	-3668	0.03	0.0	15.5	22.5	0.15	.40	0.45	.09
CHEVROLET	24	-4538	-1.27	8.2	1.0	26.6	0.08	.97	-0.17	1.59
CHRYSLER	4	-2518	8.16	15.5	75.3	115.3	-0.56	.97	-1.01	2.04
DATSUN	1	-3243	0.62	0.0	-3.0	0.0	0.19	0.00	0.93	0.00
DODGE	6	-1378	-1.13	2.3	-17.6	67.4	0.25	1.71	0.34	1.59
FORD	32	-3741	-1.33	4.8	-2.6	35.4	0.40	1.12	-0.04	1.23
MERCURY	4	-4022	-0.68	3.3	-17.6	22.1	0.70	1.22	0.43	1.79
OLDSMOBILE	4	-2456	-5.62	17.7	4.3	27.5	0.16	.54	-0.37	.85
OPEL	1	-4229	0.82	0.0	14.9	0.0	0.19	0.00	-0.48	0.00
PLYMOUTH	9	-4297	-4.34	17.8	1.4	29.3	0.04	1.20	0.50	1.58
PONTIAC	7	-3425	2.16	7.7	-9.9	18.8	0.01	.58	0.32	1.09
TOYOTA	4	-7308	0.87	0.8	-6.1	19.1	0.80	.42	-1.69	1.87
VOLKSWAGEN	5	-5202	-0.20	2.2	2.9	21.1	0.40	1.08	0.17	1.48
VOLVO	0	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR										
1964	7	-2719	0.69	4.8	12.2	31.6	-0.11	.79	-0.61	.96
1965	15	-3351	1.75	6.0	-17.3	38.4	0.35	.77	0.71	1.61
1966	13	-3489	-5.55	12.8	-5.9	31.0	0.42	.97	0.12	1.39
1967	13	-3349	-2.96	11.0	3.1	33.3	0.36	.74	0.23	1.49
1968	8	-3904	0.52	1.0	15.3	26.6	0.25	1.18	-0.02	1.08
1969	7	-4328	-4.62	11.5	-11.6	60.7	0.35	1.31	-0.11	1.94
1970	12	-4682	2.27	6.7	1.2	31.1	0.32	1.53	-0.42	1.38
1971	13	-4324	-2.05	6.2	4.7	24.1	-0.21	1.07	-0.23	1.60
1972	11	-3950	2.19	10.0	17.2	80.6	0.06	1.25	-0.57	1.52
1973	10	-5053	-0.06	0.8	-2.8	17.9	-0.05	.60	0.00	.94
*DISPLACEMENT										
LESS THAN 151	13	-5247	0.45	1.5	-0.8	17.3	0.55	.74	-0.29	1.66
151 - 250	14	-3647	0.38	1.6	1.0	19.2	-0.28	.79	0.12	1.56
251 - 350	47	-3734	-1.97	10.2	2.3	35.7	0.22	1.06	0.06	1.45
MORE THAN 350	35	-3752	-0.07	8.9	-1.2	56.7	0.19	1.12	-0.14	1.31
*INERTIA WEIGHT										
1800 - 2799	17	-4553	0.28	1.4	-4.3	18.0	0.43	.70	0.05	1.83
2800 - 3799	49	-4068	-0.51	3.7	-0.2	34.7	0.13	1.17	-0.10	1.36
3800 - 4799	38	-3582	-1.66	13.6	5.0	53.4	0.15	1.03	-0.11	1.42
4800 - 5799	5	-2649	-0.09	1.1	-7.0	41.3	0.26	.31	0.74	.62
*POPULATIONS										
1964 - 1967	48	-3296	-1.66	9.8	-4.4	34.7	0.30	.82	0.23	1.46
1968 - 1973	61	-4392	-0.07	7.2	4.6	44.3	0.09	1.16	-0.25	1.39
ALL VEHICLES	109	-3909	-0.77	8.4	0.6	40.4	0.19	1.03	-0.04	1.43

AUTOMOTIVE TESTING LABORATORIES,INC.
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EXHAUST EMISSION REDUCTIONS AFTER TWELVE MONTHS

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	ODOM.	HC MEAN	HC S.D.	CO MEAN	CO S.D.	NOX MEAN	NOX S.D.	MPG MEAN	MPG S.D.
*VEHICLE MAKE										
AMER.MOTORS	3	-8504	0.17	0.9	10.3	13.4	0.98	1.28	-0.86	2.46
BUICK	3	-4528	1.97	8.6	-4.6	24.4	-0.09	.38	0.45	1.30
CADILLAC	2	-8603	1.30	0.4	39.4	25.1	-0.68	.68	-1.10	.33
CHEVROLET	24	-9678	-1.95	8.8	0.3	23.9	0.06	.74	-0.01	1.93
CHRYSLER	4	-6355	5.51	11.4	56.8	47.5	-0.94	.92	-1.24	.84
DATSUN	1	-6616	1.82	0.0	15.4	0.0	-0.01	0.00	-1.91	0.00
DODGE	6	-4604	-1.16	2.5	-17.5	56.5	0.34	1.49	0.25	1.61
FORD	32	-7953	-0.65	5.0	-1.2	29.4	0.43	1.24	-0.22	1.35
MERCURY	4	-6954	-0.15	3.0	-4.2	7.9	0.69	1.78	0.10	1.73
OLDSMOBILE	4	-6285	-6.12	9.7	0.6	30.3	0.04	.83	-0.28	.48
OPEL	1	-7489	1.16	0.0	23.3	0.0	0.33	0.00	-0.80	0.00
PLYMOUTH	9	-9057	-8.36	31.0	6.3	41.7	0.32	.89	0.34	1.95
PONTIAC	7	-6654	0.70	10.5	-37.9	68.0	0.29	.67	0.96	1.77
TOYOTA	4	-13375	-2.43	4.0	33.4	54.6	-0.66	1.35	-2.44	3.29
VOLKSWAGEN	5	-11344	-0.15	1.6	1.1	16.4	0.06	.90	-1.44	1.62
VOLVO	0	0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR										
1964	7	-5481	-2.94	7.9	12.7	31.4	-0.02	.94	-0.93	1.50
1965	15	-7131	0.97	10.2	3.2	20.5	0.20	1.04	0.04	1.72
1966	13	-7094	-9.11	25.0	-13.5	40.2	0.50	1.05	0.25	2.08
1967	13	-6645	-0.68	4.1	-23.0	56.9	0.52	.99	0.65	1.88
1968	8	-8406	-4.32	8.5	7.7	29.0	0.71	1.37	0.31	1.29
1969	7	-9254	-4.52	7.1	-0.4	69.5	-0.11	1.49	-0.34	2.16
1970	12	-9886	1.99	7.2	7.7	35.0	0.55	1.21	-0.44	1.34
1971	13	-9090	0.62	1.2	6.1	18.2	-0.28	1.02	-0.84	1.91
1972	11	-8923	2.02	6.9	18.8	36.1	-0.04	.83	-1.25	1.89
1973	10	-11053	-0.09	0.9	4.5	14.1	-0.29	.55	-0.07	.58
*DISPLACEMENT										
LESS THAN 151	13	-10498	-0.30	2.8	13.9	34.0	-0.01	1.02	-1.81	2.31
151 - 250	14	-7203	-1.41	7.4	1.1	14.4	0.41	.71	-0.31	2.05
251 - 350	47	-8055	-3.44	14.9	-6.4	43.0	0.36	1.09	0.27	1.71
MORE THAN 350	35	-8159	1.12	6.2	7.1	36.6	-0.05	1.15	-0.28	.96
*INERTIA WEIGHT										
1800 - 2799	17	-9120	-1.74	6.8	8.7	31.4	0.11	.91	-1.13	2.66
2800 - 3799	49	-8697	-0.02	2.6	-4.4	39.8	0.23	1.05	-0.17	1.53
3800 - 4799	38	-7663	-3.09	17.6	2.6	38.2	0.31	1.14	0.13	1.47
4800 - 5799	5	-5808	0.29	1.4	21.7	27.7	-0.83	.87	-0.44	.91
*POPULATIONS										
1964 - 1967	48	-6749	-2.78	14.8	-7.1	40.8	0.34	1.01	0.12	1.85
1968 - 1973	61	-9467	-0.21	6.1	7.9	33.9	0.07	1.11	-0.50	1.62
ALL VEHICLES	109	-8270	-1.34	10.9	1.3	37.7	0.19	1.07	-0.23	1.74

AUTOMOTIVE TESTING LABORATORIES,INC.
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PERCENT REDUCTIONS AFTER INSPECTION AND MAINTENANCE

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	PERCENT REDUCTIONS ODOM.	HC	CO	NOX	MPG
*VEHICLE MAKE						
AMER.MOTORS	3	0.0	0.00	0.00	0.00	0.00
BUICK	3	0.0	-6.68	2.35	-14.70	1.77
CADILLAC	2	0.0	0.00	0.00	0.00	0.00
CHEVROLET	24	0.0	5.76	-0.06	9.19	0.20
CHRYSLER	4	0.0	58.30	42.94	-43.99	-16.12
DATSUN	1	0.0	0.24	-10.42	19.51	1.16
DODGE	6	0.0	-14.65	-0.62	17.80	-3.67
FORD	32	0.0	7.71	3.73	10.54	-0.66
MERCURY	4	0.0	-6.92	-13.00	-12.33	4.66
OLDSMOBILE	4	0.0	16.79	1.13	0.28	-3.72
OPEL	1	0.0	25.30	23.67	-0.47	-0.84
PLYMOUTH	9	0.0	29.84	16.47	-2.65	-2.11
PONTIAC	7	0.0	30.95	-2.68	2.45	-0.64
TOYOTA	4	0.0	26.08	15.07	7.50	-7.11
VOLKSWAGEN	5	0.0	8.71	12.23	3.22	-5.56
VOLVO	0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR						
1964	7	0.0	13.00	14.24	2.04	-4.73
1965	15	0.0	16.22	-2.20	8.63	0.57
1966	13	0.0	9.80	10.98	5.93	-6.63
1967	13	0.0	5.93	2.41	3.80	-1.08
1968	8	0.0	-4.88	6.26	18.50	2.95
1969	7	0.0	-18.17	-16.91	5.54	2.63
1970	12	0.0	32.92	7.62	6.76	-1.96
1971	13	0.0	16.45	12.60	1.61	-2.38
1972	11	0.0	36.96	22.93	-3.91	-3.21
1973	10	0.0	2.16	-0.02	0.86	-0.45
*DISPLACEMENT						
LESS THAN 151	13	0.0	17.30	13.28	6.25	-5.02
151 - 250	14	0.0	3.36	-2.01	-0.21	1.39
251 - 350	47	0.0	11.87	4.59	12.41	-1.21
MORE THAN 350	35	0.0	18.21	8.61	-1.10	-1.82
*INERTIA WEIGHT						
1800 - 2799	17	0.0	15.35	8.44	5.68	-2.64
2800 - 3799	49	0.0	5.94	2.36	7.81	-0.56
3800 - 4799	38	0.0	21.36	9.98	2.28	-2.71
4800 - 5799	5	0.0	-4.17	-1.57	0.46	0.91
*POPULATIONS						
1964 - 1967	48	0.0	11.35	5.07	5.76	-2.55
1968 - 1973	61	0.0	16.35	7.27	4.71	-0.87
ALL VEHICLES	109	0.0	13.53	6.06	5.11	-1.58

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PERCENT REDUCTIONS AFTER SIX MONTHS

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

	# OF VEH.	PERCENT REDUCTIONS ODOM.	HC	CO	NOX	MPG
*VEHICLE MAKE						
AMER.MOTORS	3	-7.2	-2.19	11.59	-18.33	0.08
BUICK	3	-5.3	23.29	-3.73	-31.06	1.41
CADILLAC	2	-5.6	0.54	12.03	4.48	4.02
CHEVROLET	24	-9.8	-17.19	0.99	3.25	-1.17
CHRYSLER	4	-4.7	56.59	37.68	-39.47	-9.85
DATSUN	1	-11.7	14.19	-7.05	5.15	4.20
DODGE	6	-3.6	-17.11	-17.49	8.42	2.35
FORD	32	-7.9	-17.72	-2.57	13.50	-0.26
MERCURY	4	-8.4	-10.98	-27.30	15.92	3.15
OLDSMOBILE	4	-5.4	-74.21	3.64	7.78	-3.26
OPEL	1	-62.0	17.13	19.01	10.52	-2.20
PLYMOUTH	9	-9.5	-46.50	1.17	1.62	3.54
PONTIAC	7	-6.2	18.24	-7.76	0.26	2.46
TOYOTA	4	-18.1	16.74	-7.50	32.18	-9.18
VOLKSWAGEN	5	-10.5	-3.15	3.66	17.43	0.81
VOLVO	0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR						
1964	7	-4.1	7.61	8.76	-6.33	-4.28
1965	15	-4.3	15.45	-13.26	15.60	4.81
1966	13	-5.9	-60.80	-4.45	15.62	0.87
1967	13	-6.1	-27.92	2.24	16.53	1.69
1968	8	-6.6	7.99	15.75	7.24	-0.15
1969	7	-7.6	-77.11	-11.91	12.86	-0.71
1970	12	-12.4	31.32	1.51	9.56	-2.78
1971	13	-14.0	-35.75	5.89	-7.04	-1.49
1972	11	-23.3	29.35	17.78	2.24	-3.85
1973	10	-52.5	-1.36	-3.72	-2.29	0.01
*DISPLACEMENT						
LESS THAN 151	13	-14.6	7.87	-1.03	23.02	-1.41
151 - 250	14	-8.3	6.00	1.30	-10.38	0.66
251 - 350	47	-7.0	-21.99	1.91	9.35	0.43
MORE THAN 350	35	-8.5	-0.87	-1.09	6.24	-1.22
*INERTIA WEIGHT						
1800 - 2799	17	-11.4	4.83	-5.86	17.46	0.26
2800 - 3799	49	-9.2	-7.15	-0.24	4.94	-0.66
3800 - 4799	38	-6.9	-16.30	3.74	5.28	-0.90
4800 - 5799	5	-4.4	-1.44	-5.23	10.01	6.72
*POPULATIONS						
1964 - 1967	48	-5.1	-16.28	-3.25	13.31	1.61
1968 - 1973	61	-13.3	-1.10	5.29	3.27	-1.67
ALL VEHICLES	109	-8.3	-9.65	0.59	7.11	-0.27

AUTOMOTIVE TESTING LABORATORIES,INC.
19900 E. COLFAX, AURORA, COLO. 80011

PERCENT REDUCTIONS AFTER TWELVE MONTHS

1975 FEDERAL TEST PROCEDURE

ALL VEHICLES

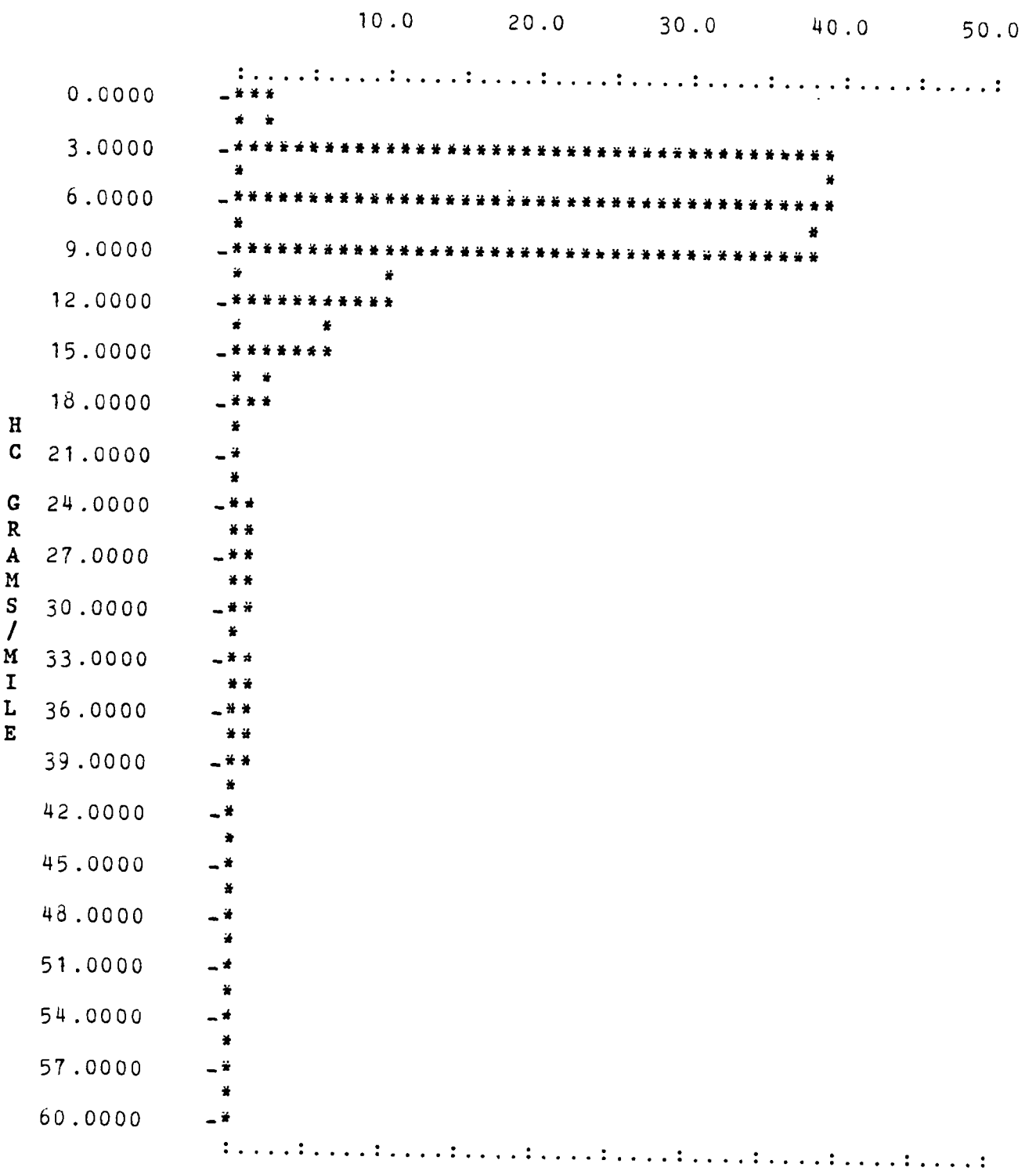
	# OF VEH.	PERCENT REDUCTIONS ODOM.	HC	CO	NOX	MPG
*VEHICLE MAKE						
AMER.MOTORS	3	-12.9	2.72	12.30	28.66	-4.88
BUICK	3	-11.5	15.10	-2.38	-5.91	4.33
CADILLAC	2	-13.1	22.42	30.50	-20.26	-9.80
CHEVROLET	24	-20.9	-26.27	0.29	2.77	-0.10
CHRYSLER	4	-11.8	38.23	28.41	-66.93	-12.03
DATSUN	1	-24.0	41.53	36.54	-0.25	-8.64
DODGE	6	-12.1	-17.58	-17.43	11.36	1.69
FORD	32	-16.7	-8.61	-1.17	14.53	-1.46
MERCURY	4	-14.5	-2.36	-6.47	15.61	0.75
OLDSMOBILE	4	-13.9	-80.69	0.52	1.88	-2.46
OPEL	1	-109.9	24.17	29.75	18.89	-3.68
PLYMOUTH	9	-20.1	-89.49	5.16	12.72	2.38
PONTIAC	7	-12.0	5.95	-29.60	13.54	7.38
TOYOTA	4	-33.1	-46.58	41.16	-26.55	-13.29
VOLKSWAGEN	5	-23.0	-2.34	1.40	2.46	-6.73
VOLVO	0	0.0	0.00	0.00	0.00	0.00
*MODEL YEAR						
1964	7	-8.3	-32.48	9.08	-0.94	-6.46
1965	15	-9.1	8.56	2.42	9.07	0.28
1966	13	-11.9	-99.81	-10.21	18.34	1.84
1967	13	-12.0	-6.43	-16.49	24.19	4.76
1968	8	-14.3	-66.73	7.95	20.91	2.05
1969	7	-16.2	-75.37	-0.43	-4.09	-2.26
1970	12	-26.1	27.44	9.45	16.59	-2.96
1971	13	-29.4	10.83	7.66	-9.31	-5.39
1972	11	-52.5	27.05	19.34	-1.45	-8.40
1973	10	-114.8	-2.08	6.00	-14.29	-0.50
*DISPLACEMENT						
LESS THAN 151	13	-29.3	-5.27	18.02	-0.43	-8.83
151 - 250	14	-16.5	-22.03	1.44	15.19	-1.67
251 - 350	47	-15.0	-38.45	-5.30	14.97	1.96
MORE THAN 350	35	-18.5	13.82	6.23	-1.54	-2.33
*INERTIA WEIGHT						
1800 - 2799	17	-22.9	-29.61	11.89	4.34	-5.46
2800 - 3799	49	-19.6	-0.25	-4.46	9.01	-1.15
3800 - 4799	38	-14.7	-30.23	1.98	11.09	1.11
4800 - 5799	5	-9.7	4.46	16.18	-31.95	-3.97
*POPULATIONS						
1964 - 1967	48	-10.4	-27.24	-5.24	14.78	0.87
1968 - 1973	61	-28.8	-3.40	9.12	2.58	-3.35
ALL VEHICLES	109	-17.6	-16.83	1.22	7.24	-1.55

AUTOMOTIVE TESTING LABORATORIES,INC.
19900 E. COLFAX, AURORA, COLO. 80011

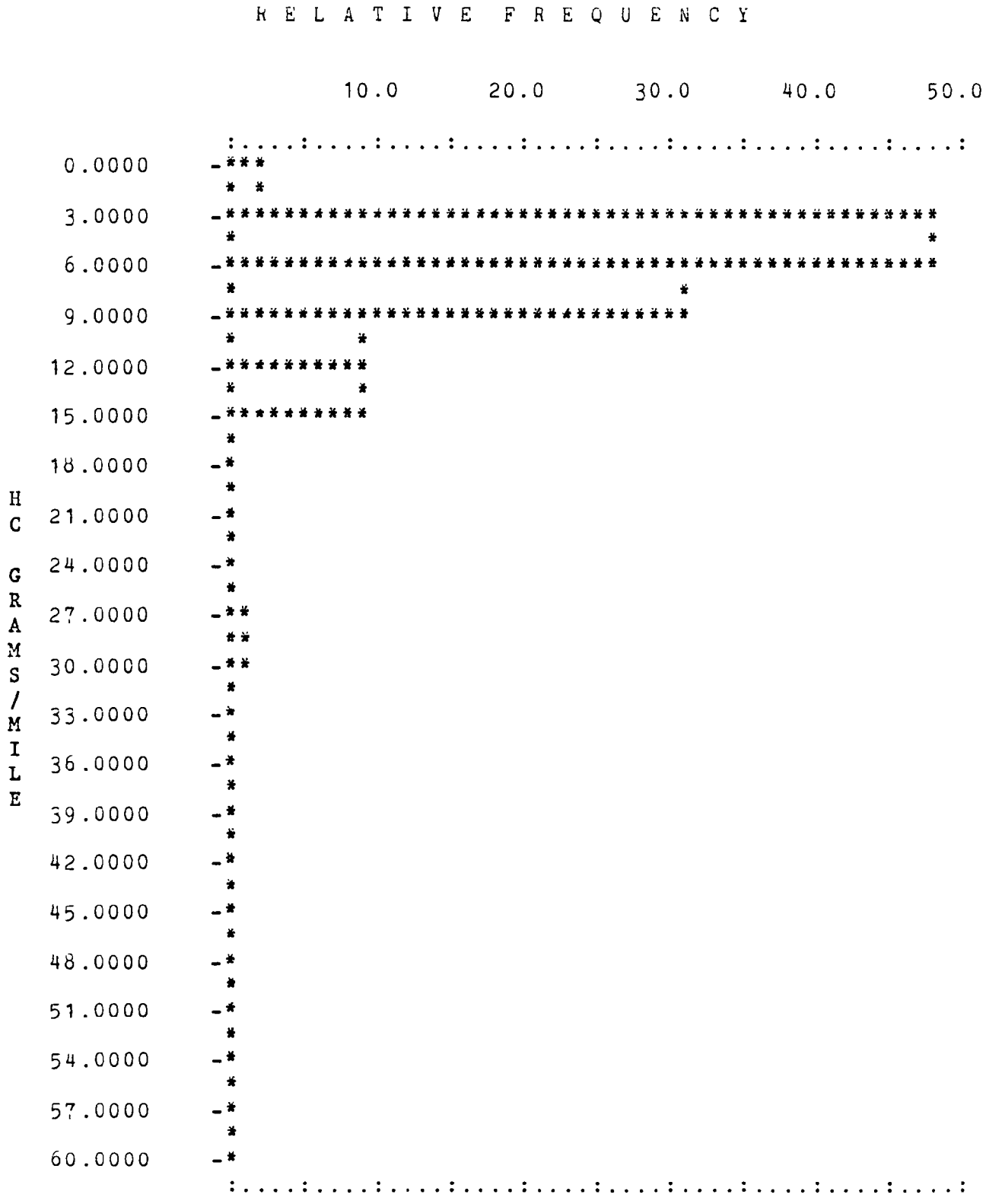
APPENDIX D

HISTOGRAMS OF EMISSIONS GENERATED FROM TWELVE-MONTH DETERIORATION STUDY

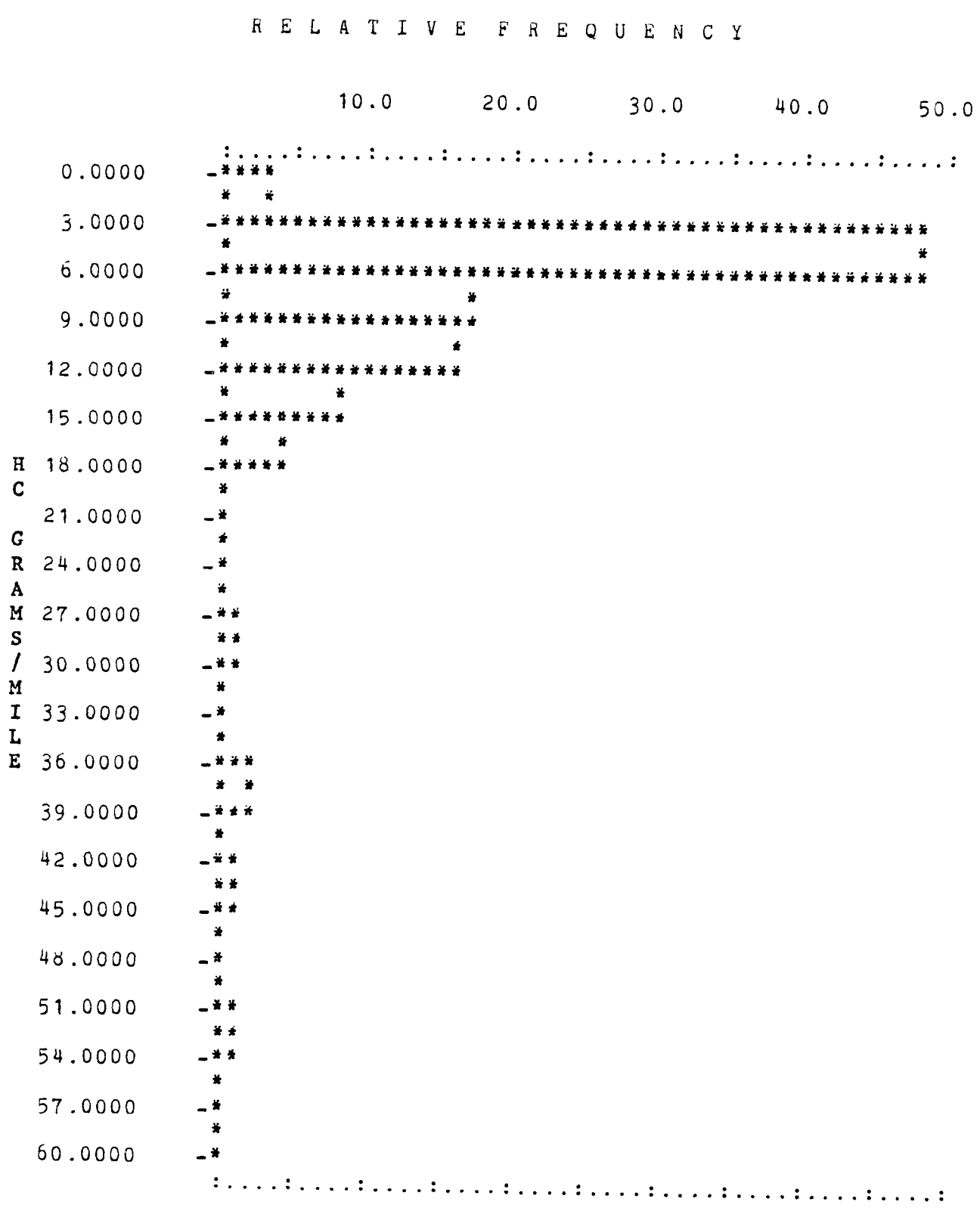
ALL VEHICLES
BEFORE INSPECTION



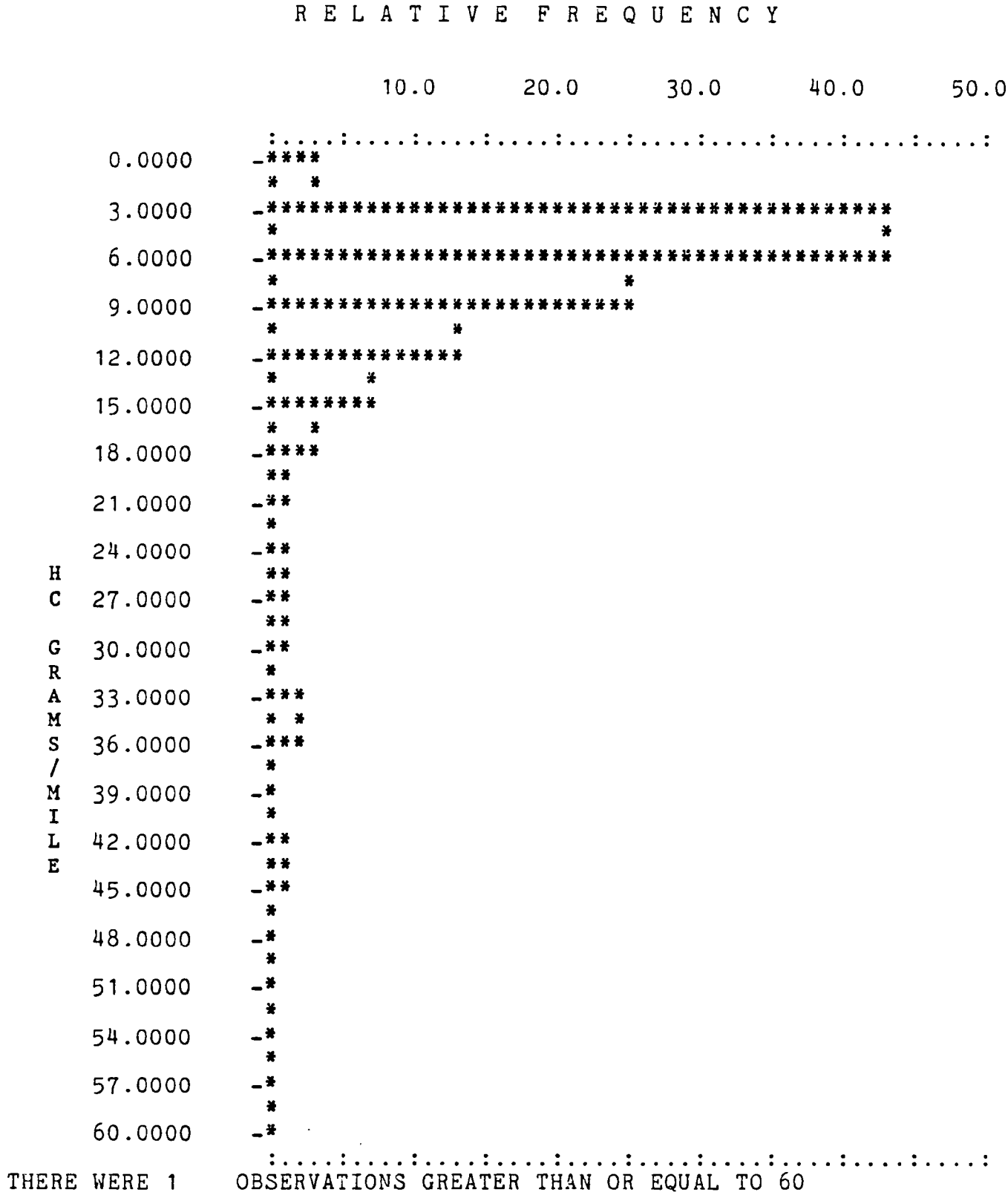
ALL VEHICLES
AFTER INSPECTION



ALL VEHICLES
AFTER SIX MONTHS

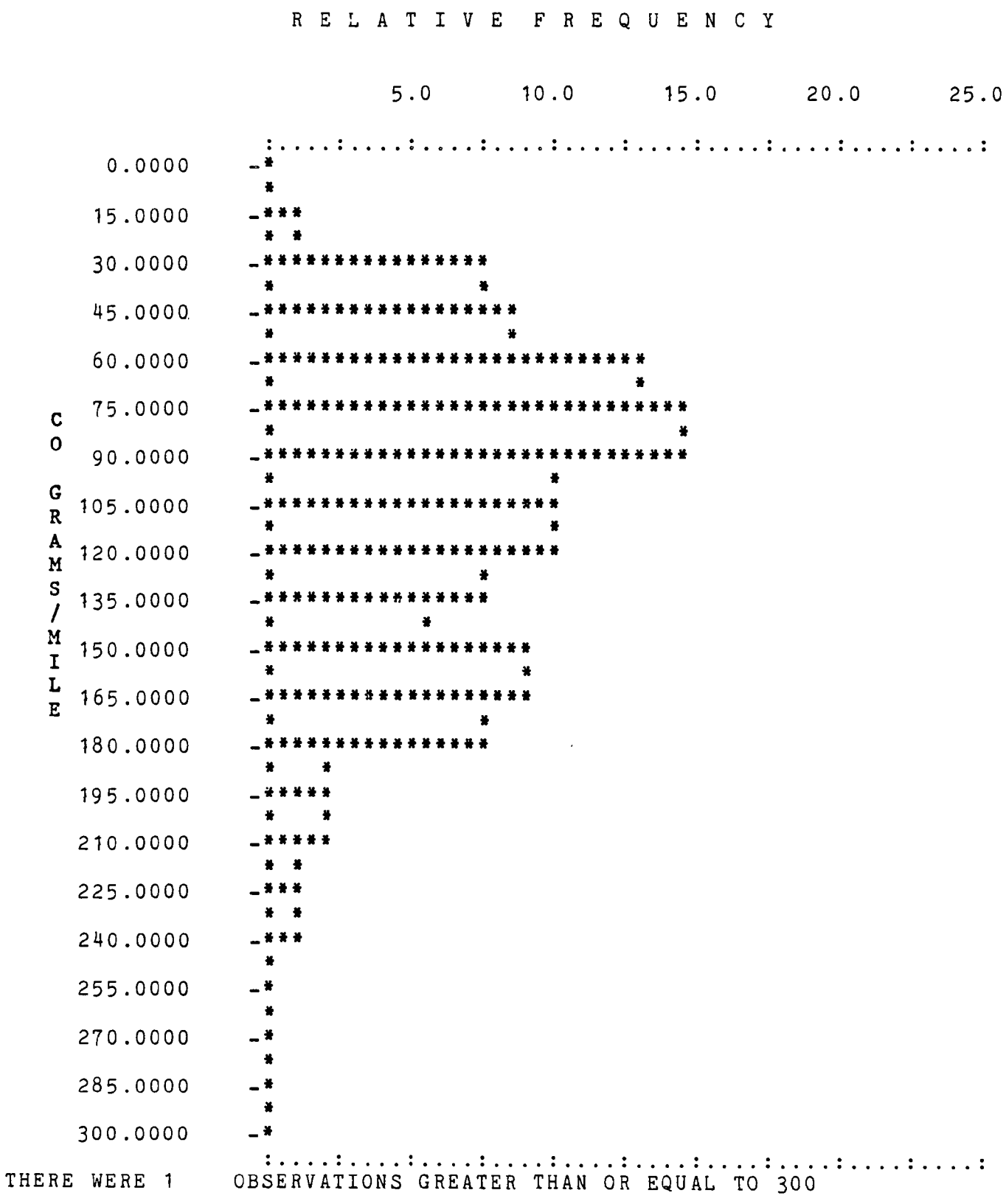


ALL VEHICLES
AFTER 12 MONTHS

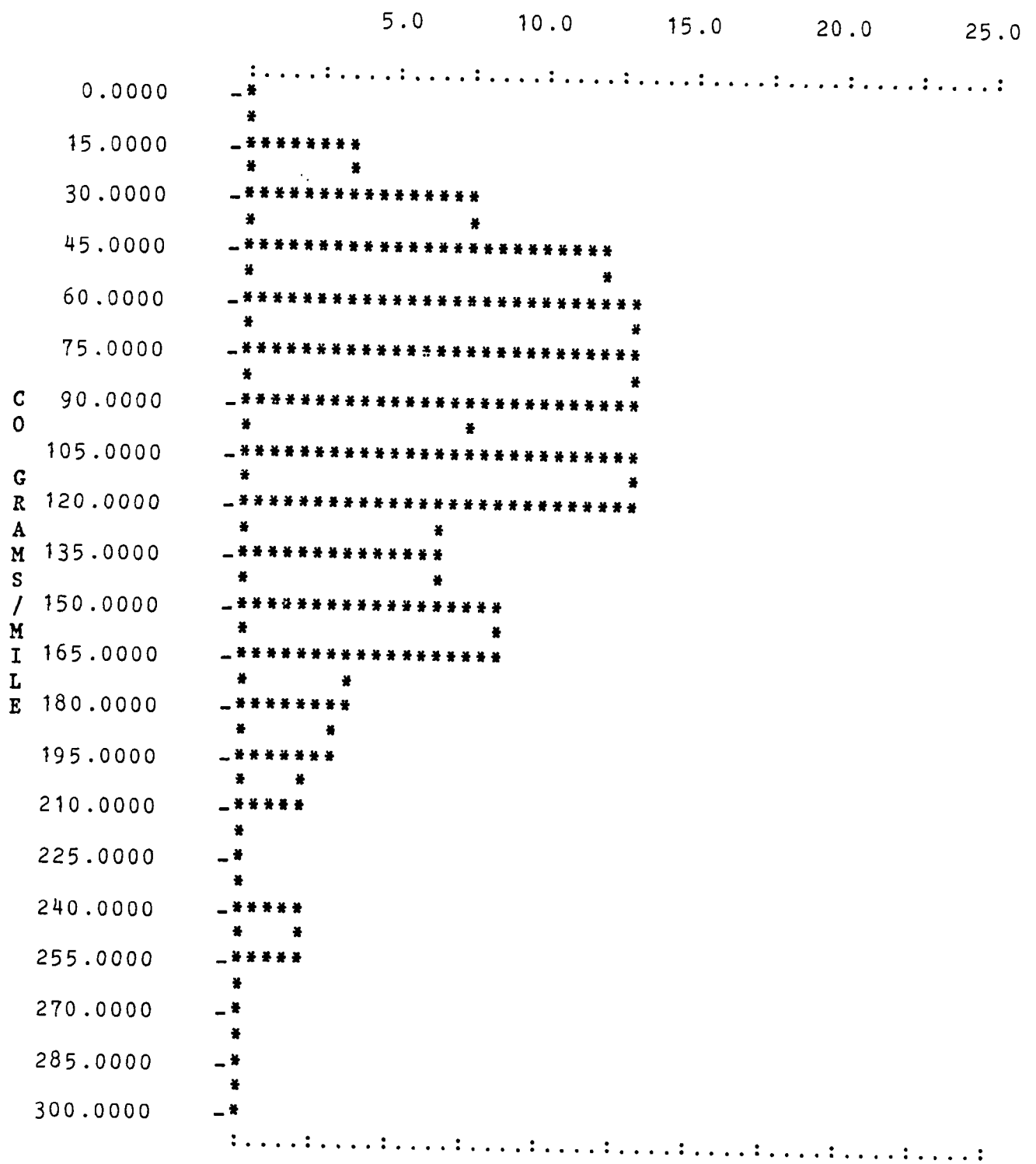


THERE WERE 1 OBSERVATIONS GREATER THAN OR EQUAL TO 60

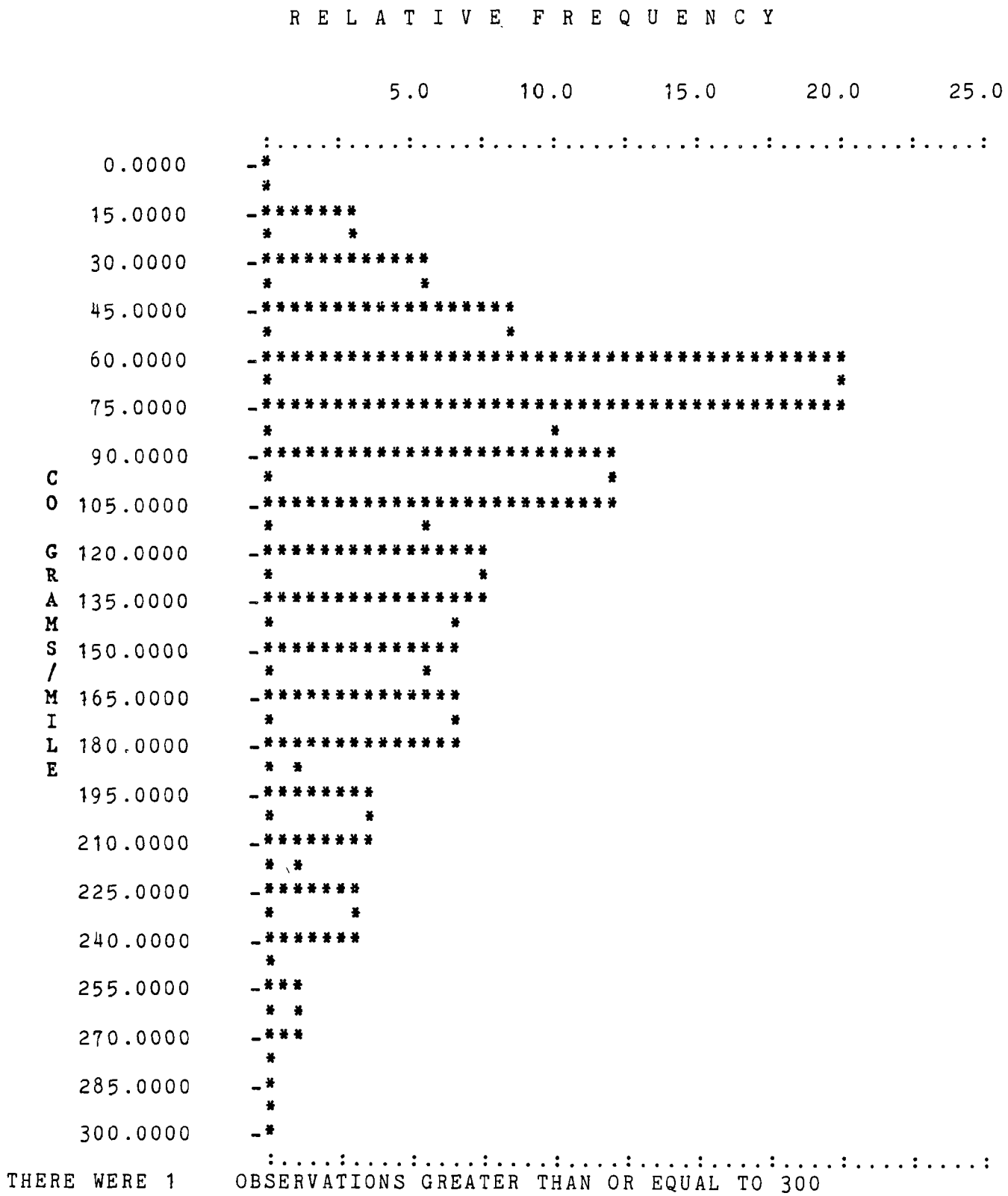
ALL VEHICLES
BEFORE INSPECTION



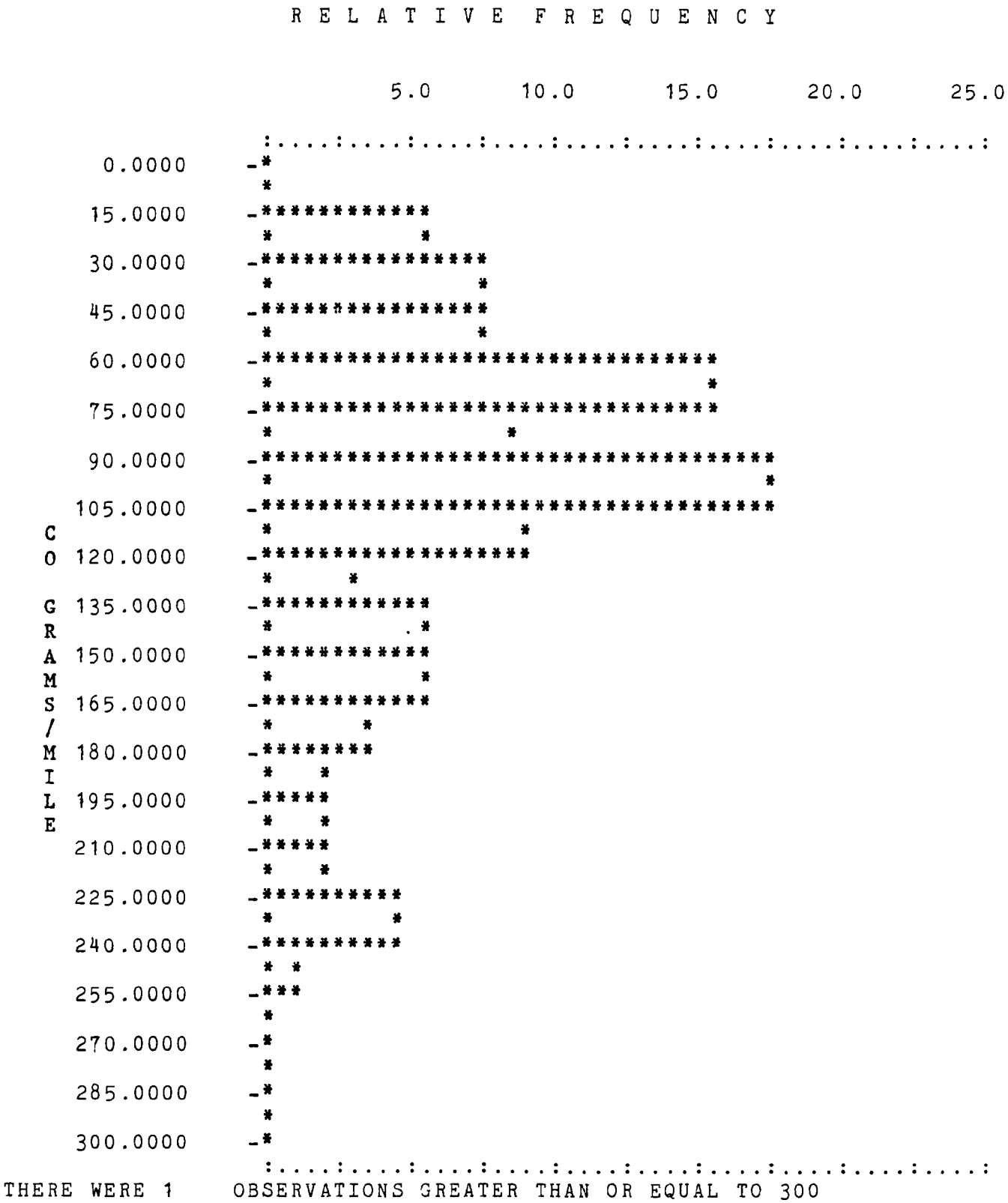
ALL VEHICLES
AFTER INSPECTION



ALL VEHICLES
AFTER SIX MONTHS

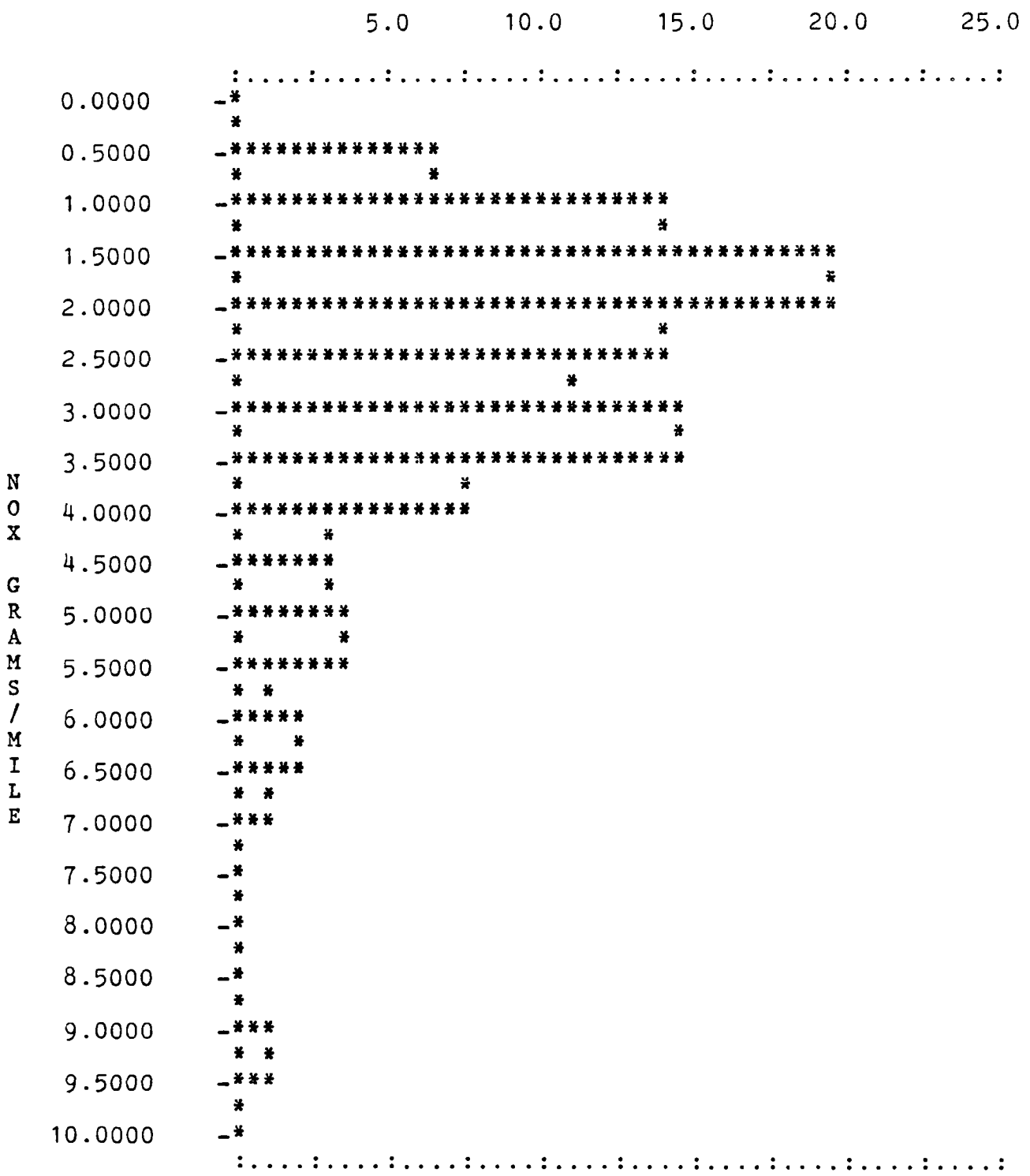


ALL VEHICLES
AFTER TWELVE MONTH

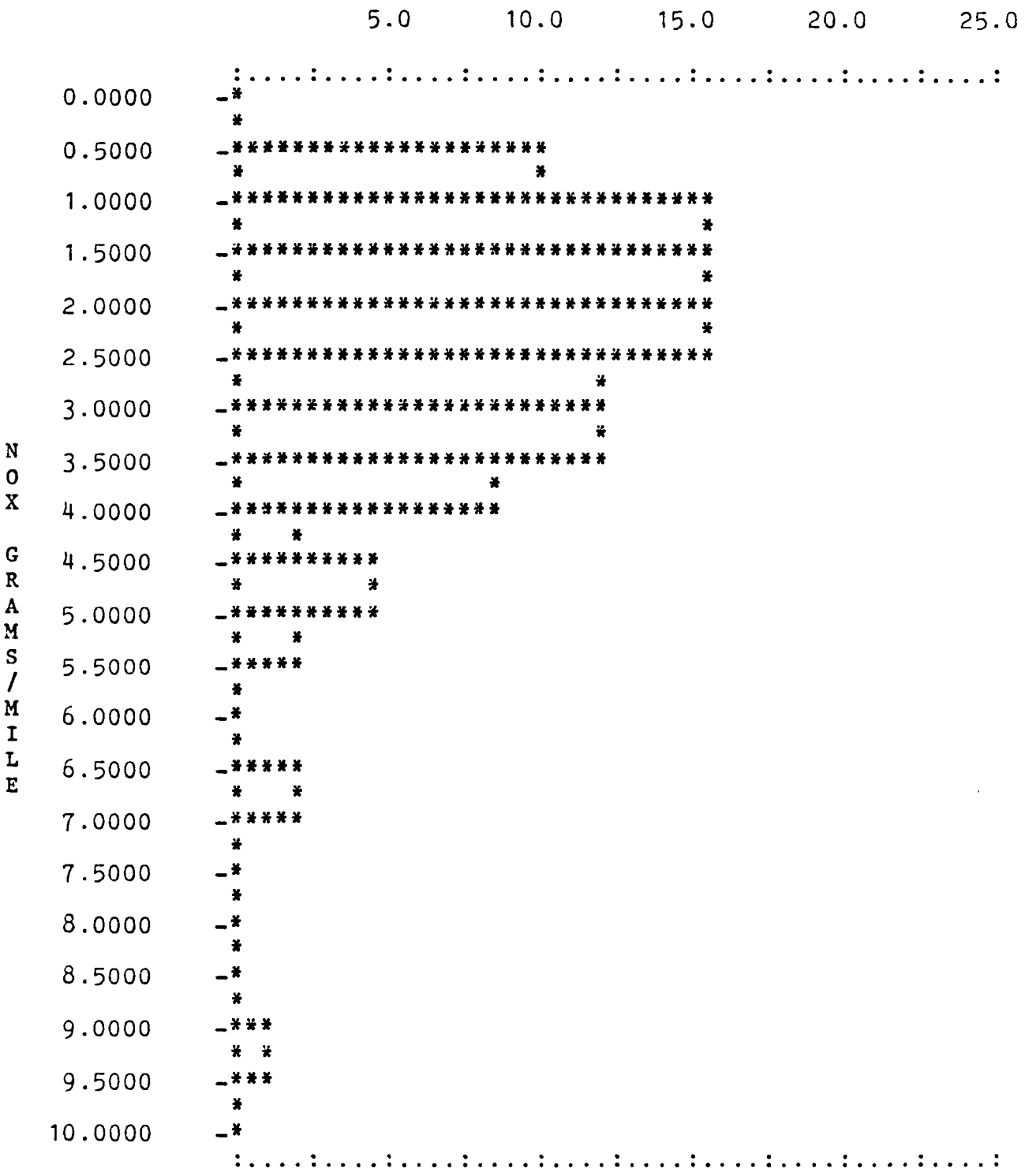


THERE WERE 1 OBSERVATIONS GREATER THAN OR EQUAL TO 300

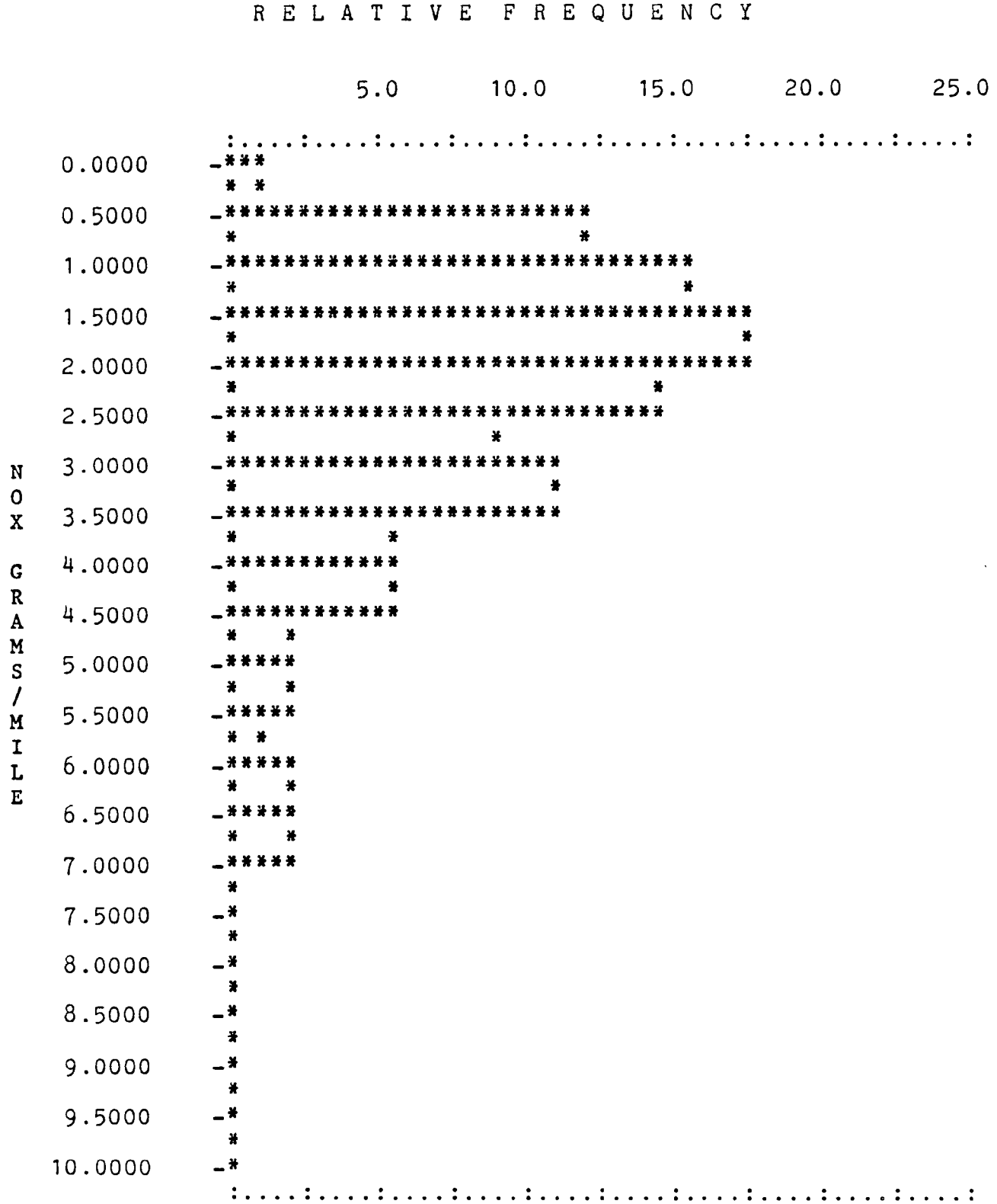
ALL VEHICLES
BEFORE INSPECTION



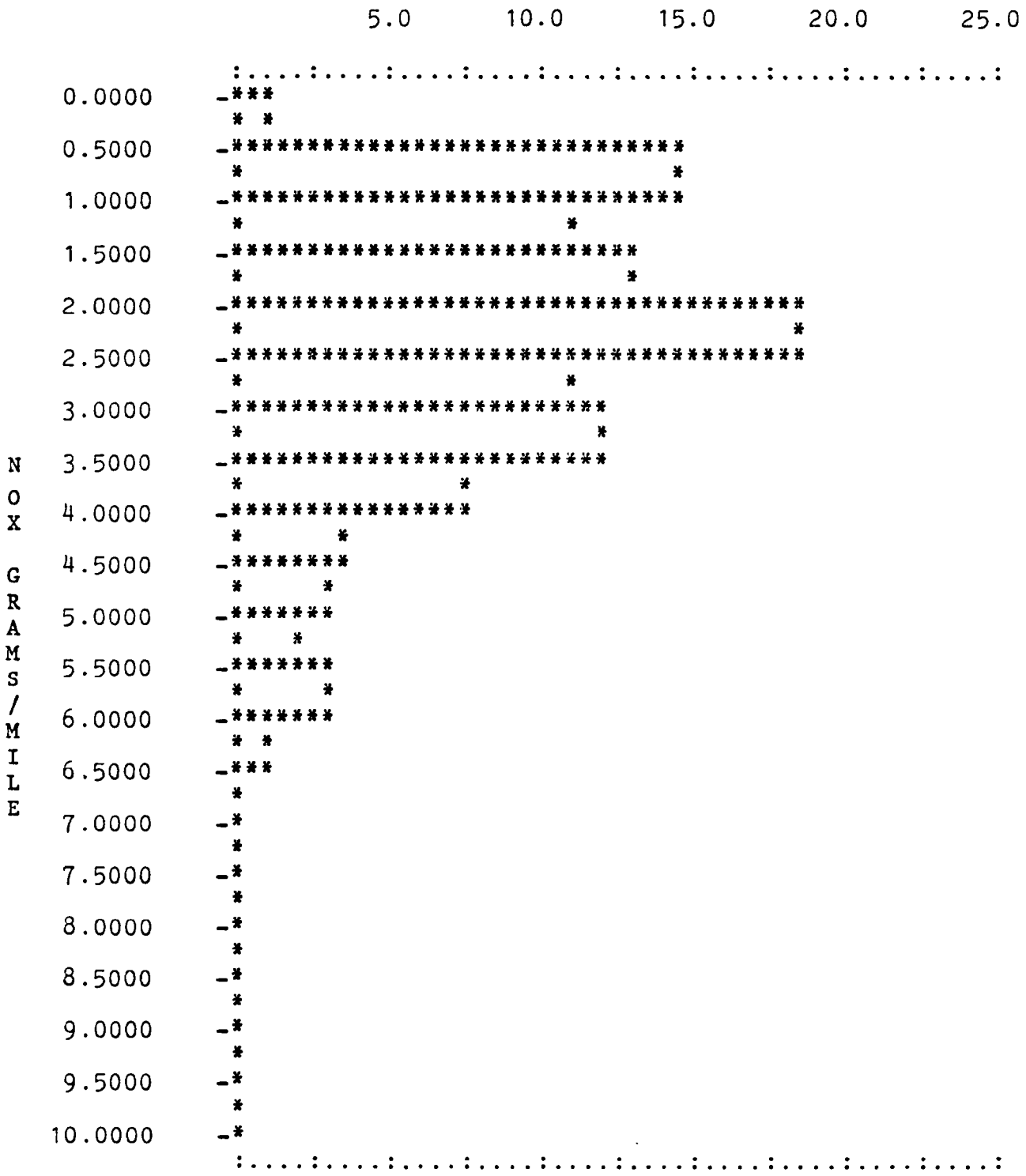
ALL VEHICLES
AFTER INSPECTION



ALL VEHICLES
AFTER SIX MONTHS



ALL VEHICLES
AFTER 12 MONTHS



APPENDIX E

PROJECTIONS OF VEHICLE POPULATION AND VMT IN DENVER AIR QUALITY CONTROL REGION TO 1985

NUMBER OF VEHICLES IN SERVICE ON JULY 1 OF INDICATED YEAR

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	761.60	373.18	167.93	70.53	27.51	9.90	3.37	1.08	0.32	0.09	0.02	0.01
1958	2076.90	1100.76	539.37	242.72	101.94	39.76	14.31	4.87	1.56	0.47	0.13	0.03
1959	5139.40	2929.46	1552.61	760.78	342.35	143.79	56.08	20.19	6.86	2.20	0.66	0.18
1960	10444.70	6371.27	3631.62	1924.76	943.13	424.41	178.25	69.52	25.03	8.51	2.72	0.82
1961	14253.40	9407.24	5738.41	3270.89	1733.57	849.45	382.25	160.55	62.61	22.54	7.66	2.45
1962	8414.00	5973.94	3942.80	2405.11	1370.91	726.58	356.03	160.21	67.29	26.24	9.45	3.21
1963	26649.70	20253.77	14380.17	9490.91	5789.45	3299.99	1748.99	857.01	385.65	161.97	63.17	22.74
1964	44508.10	36051.55	27399.18	19453.42	12839.25	7831.94	4464.20	2366.03	1159.35	521.71	219.12	85.46
1965	54761.00	47642.04	38590.05	29328.44	20823.19	13743.30	8383.41	4778.54	2532.63	1240.99	558.44	234.55
1966	61042.10	56158.72	48858.07	39575.04	30077.03	21354.69	14094.09	8597.39	4900.51	2597.27	1272.66	572.70
1967	61982.90	59503.54	54743.23	47626.60	38577.54	29318.93	20816.44	13738.85	8380.69	4776.99	2531.81	1240.59
1968	71634.44	70201.75	67393.62	62002.15	53941.87	43692.91	33206.61	23576.69	15560.61	9491.97	5410.42	2867.53
1969	70538.25	70538.25	69127.44	66362.31	61053.34	53116.39	43024.27	32698.45	23215.89	15322.49	9346.72	5327.62
1970	66938.87	67608.25	67608.25	66256.06	63605.80	58517.33	50910.04	41237.12	31340.21	22251.55	14686.02	8958.47
1971	86513.69	88244.00	89126.44	89126.44	87343.87	83850.06	77142.06	67113.56	54362.00	41315.12	29333.73	19360.26
1972	83485.44	85990.00	87709.81	88586.87	88586.87	86815.12	83342.56	76675.12	66707.31	54032.95	41065.04	29156.18
1973	84963.19	88361.69	91012.50	92832.75	93761.06	93761.06	91885.81	88210.37	81153.50	70603.56	57188.86	43463.53
1974	36093.40	68577.37	71320.50	73460.06	74929.25	75678.56	75678.56	74165.00	71193.37	65502.50	56987.17	46159.57
1975	0.00	38511.90	73172.56	76099.44	78382.37	79950.00	80749.50	80749.50	79134.50	75969.06	69391.56	60805.67
1976	0.00	0.00	41091.40	78073.56	81196.50	83632.37	85305.00	86158.06	86158.06	84434.87	81057.50	74572.87
1977	0.00	0.00	0.00	43844.50	83304.50	86636.62	89235.69	91020.44	91930.69	91930.69	90092.00	86488.31
1978	0.00	0.00	0.00	0.00	46782.40	88886.50	92441.94	95215.12	97119.44	98090.69	98090.69	96128.81
1979	0.00	0.00	0.00	0.00	0.00	49917.00	94842.25	98635.87	101594.90	103626.80	104663.10	104663.10
1980	0.00	0.00	0.00	0.00	0.00	0.00	53261.60	101196.90	105244.80	108402.10	110570.20	111675.90
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56830.20	107977.30	112296.40	115665.20	117978.60
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60637.50	115211.20	119819.60	123414.10
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64700.30	122930.50	127847.70
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69035.37	131167.20
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73660.94
TOTAL	790200	823798	857105	890793	925513	962196	1001523	1044236	1090857	1142540	1200498	1265857

VMT RATE IN MILLIONS OF MILES ON JULY 1 OF INDICATED YEAR

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	3.50	1.72	0.77	0.32	0.13	0.05	0.02	0.00	0.00	0.00	0.00	0.00
1958	9.55	5.06	2.48	1.12	0.47	0.18	0.07	0.02	0.01	0.00	0.00	0.00
1959	23.64	13.48	7.14	3.50	1.57	0.66	0.26	0.09	0.03	0.01	0.00	0.00
1960	48.05	29.31	16.71	8.85	4.34	1.95	0.82	0.32	0.12	0.04	0.01	0.00
1961	66.99	43.27	26.40	15.05	7.97	3.91	1.76	0.74	0.29	0.10	0.04	0.01
1962	41.23	28.08	18.14	11.06	6.31	3.34	1.64	0.74	0.31	0.12	0.04	0.01
1963	138.58	99.24	67.59	43.66	26.63	15.18	8.05	3.94	1.77	0.75	0.29	0.10
1964	249.25	187.47	134.26	91.43	59.06	36.03	20.54	10.88	5.33	2.40	1.01	0.39
1965	334.04	266.80	200.67	143.71	97.87	63.22	38.56	21.98	11.65	5.71	2.57	1.08
1966	408.98	342.57	273.60	205.79	147.38	100.37	64.83	39.55	22.54	11.95	5.85	2.63
1967	458.67	398.67	333.93	266.71	200.60	143.66	97.84	63.20	38.55	21.97	11.65	5.71
1968	587.40	519.49	451.54	378.21	302.07	227.20	162.71	110.81	71.58	43.66	24.89	13.19
1969	641.90	578.41	511.54	444.63	372.43	297.45	223.73	160.22	109.11	70.48	42.99	24.51
1970	669.39	615.24	554.39	490.29	426.16	356.96	285.10	214.43	153.57	104.58	67.56	41.21
1971	951.65	882.44	811.05	730.84	646.34	561.80	470.57	375.84	282.68	202.44	137.87	89.06
1972	1010.17	945.89	877.10	806.14	726.41	642.43	558.40	467.72	373.56	280.97	201.22	137.03
1973	1130.01	1069.18	1001.14	928.33	853.23	768.84	679.96	591.01	495.04	395.38	297.38	212.97
1974	526.96	912.08	862.98	808.06	749.29	688.68	620.56	548.82	477.03	399.57	319.13	240.03
1975	0.00	562.27	973.20	920.80	862.21	799.50	734.82	662.15	585.60	508.99	426.34	340.51
1976	0.00	0.00	599.93	1038.38	982.48	919.96	853.05	784.04	706.50	624.82	543.09	454.89
1977	0.00	0.00	0.00	640.13	1107.95	1048.30	981.59	910.20	836.57	753.83	666.68	579.47
1978	0.00	0.00	0.00	0.00	683.02	1182.19	1118.55	1047.37	971.19	892.63	804.34	711.35
1979	0.00	0.00	0.00	0.00	0.00	728.79	1261.40	1193.49	1117.54	1036.27	952.43	858.24
1980	0.00	0.00	0.00	0.00	0.00	0.00	777.62	1345.92	1273.46	1192.42	1105.70	1016.25
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	829.72	1436.10	1358.79	1272.32	1179.79
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	885.31	1532.31	1449.82	1357.56
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	944.62	1634.98	1546.96
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1007.92	1744.52
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1075.45
TOTAL	7299	7500	7724	7977	8263	8590	8962	9383	9855	10384	10976	11632

APPENDIX F

PROJECTIONS OF AVERAGE VEHICULAR EMISSIONS FOR DENVER AIR QUALITY CONTROL REGION TO 1985; ASSUMING VARIOUS CONTROL STRATEGIES

HC EMISSIONS IN GRAMS/MILE WITH NO CONTROL STRATEGY

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	10.73	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87
1958	11.63	11.77	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91
1959	17.38	17.53	17.67	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81
1960	18.42	18.58	18.73	18.87	19.01	19.01	19.01	19.01	19.01	19.01	19.01	19.01
1961	11.80	11.96	12.12	12.27	12.41	12.55	12.55	12.55	12.55	12.55	12.55	12.55
1962	9.80	9.98	10.14	10.30	10.45	10.59	10.73	10.73	10.73	10.73	10.73	10.73
1963	11.64	11.82	12.00	12.16	12.32	12.47	12.61	12.75	12.75	12.75	12.75	12.75
1964	9.62	9.82	10.00	10.18	10.34	10.50	10.65	10.79	10.93	10.93	10.93	10.93
1965	10.32	10.53	10.73	10.91	11.09	11.25	11.41	11.56	11.70	11.84	11.84	11.84
1966	11.52	11.75	11.96	12.16	12.34	12.52	12.68	12.84	12.99	13.13	13.27	13.27
1967	10.39	10.64	10.87	11.08	11.28	11.46	11.64	11.80	11.96	12.11	12.25	12.39
1968	7.31	7.58	7.83	8.06	8.27	8.47	8.65	8.83	8.99	9.15	9.30	9.44
1969	7.08	7.38	7.65	7.90	8.13	8.34	8.54	8.72	8.90	9.06	9.22	9.37
1970	6.56	6.90	7.20	7.47	7.72	7.95	8.16	8.36	8.54	8.72	8.88	9.04
1971	6.05	6.45	6.79	7.09	7.36	7.61	7.84	8.05	8.25	8.43	8.61	8.77
1972	5.68	6.17	6.57	6.91	7.21	7.48	7.73	7.96	8.17	8.37	8.55	8.73
1973	4.64	5.27	5.76	6.16	6.50	6.80	7.07	7.32	7.55	7.76	7.96	8.14
1974	4.00	4.93	5.56	6.05	6.45	6.79	7.09	7.36	7.61	7.84	8.05	8.25
1975	0.00	2.49	3.42	4.05	4.54	4.94	5.28	5.58	5.85	6.10	6.33	6.54
1976	0.00	0.00	2.49	3.42	4.05	4.54	4.94	5.28	5.58	5.85	6.10	6.33
1977	0.00	0.00	0.00	1.71	2.64	3.27	3.76	4.16	4.50	4.80	5.07	5.32
1978	0.00	0.00	0.00	0.00	1.71	2.64	3.27	3.76	4.16	4.50	4.80	5.07
1979	0.00	0.00	0.00	0.00	0.00	1.71	2.64	3.27	3.76	4.16	4.50	4.80
1980	0.00	0.00	0.00	0.00	0.00	0.00	1.71	2.64	3.27	3.76	4.16	4.50
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.71	2.64	3.27	3.76	4.16
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.55	2.18	2.67
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.55	2.18
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.55
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62

HC EMISSIONS IN GRAMS/MILE WITH ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	10.73	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87
1958	11.63	11.77	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91
1959	17.38	17.53	17.67	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81
1960	18.42	18.58	18.73	18.87	19.01	19.01	19.01	19.01	19.01	19.01	19.01	19.01
1961	11.80	11.96	12.12	12.27	12.41	12.55	12.55	12.55	12.55	12.55	12.55	12.55
1962	9.80	9.98	10.14	10.30	10.45	10.59	10.73	10.73	10.73	10.73	10.73	10.73
1963	11.64	11.82	12.00	12.16	12.32	12.47	12.61	12.75	12.75	12.75	12.75	12.75
1964	9.62	9.82	10.00	10.18	10.34	10.50	10.65	10.79	10.93	10.93	10.93	10.93
1965	10.32	10.53	10.73	10.91	11.09	11.25	11.41	11.56	11.70	11.84	11.84	11.84
1966	11.52	11.75	11.96	12.16	12.34	12.52	12.68	12.84	12.99	13.13	13.27	13.27
1967	10.39	10.64	10.87	11.08	11.28	11.46	11.64	11.80	11.96	12.11	12.25	12.39
1968	7.31	7.58	7.83	8.06	7.92	8.09	8.24	8.40	8.53	8.67	8.79	8.91
1969	7.08	7.38	7.65	7.90	7.81	7.98	8.15	8.30	8.45	8.59	8.72	8.85
1970	6.56	6.90	7.20	7.47	7.13	7.32	7.50	7.67	7.82	7.97	8.10	8.24
1971	6.05	6.45	6.79	7.09	6.83	7.04	7.23	7.41	7.57	7.73	7.88	8.01
1972	5.68	6.17	6.57	6.91	6.70	6.93	7.14	7.33	7.51	7.68	7.83	7.98
1973	4.64	5.27	5.76	6.16	6.10	6.35	6.58	6.79	6.99	7.16	7.33	7.48
1974	4.00	4.93	5.56	6.05	6.06	6.35	6.60	6.83	7.04	7.23	7.41	7.57
1975	0.00	2.49	3.42	4.05	4.18	4.52	4.80	5.06	5.28	5.49	5.69	5.86
1976	0.00	0.00	2.49	3.42	3.77	4.18	4.52	4.80	5.06	5.28	5.49	5.69
1977	0.00	0.00	0.00	1.71	2.46	2.99	3.40	3.74	4.02	4.28	4.50	4.71
1978	0.00	0.00	0.00	0.00	1.68	2.46	2.99	3.40	3.74	4.02	4.28	4.50
1979	0.00	0.00	0.00	0.00	0.24	1.68	2.46	2.99	3.40	3.74	4.02	4.28
1980	0.00	0.00	0.00	0.00	0.24	0.24	1.68	2.46	2.99	3.40	3.74	4.02
1981	0.00	0.00	0.00	0.00	0.24	0.24	0.24	1.68	2.46	2.99	3.40	3.74
1982	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.59	1.37	1.90	2.31
1983	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07	0.59	1.37	1.90
1984	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.59	1.37
1985	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.59

HC EMISSIONS IN GRAMS/MILE WITH SEMI-ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	10.73	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87
1958	11.63	11.77	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91
1959	17.38	17.53	17.67	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81
1960	18.42	18.58	18.73	18.87	19.01	19.01	19.01	19.01	19.01	19.01	19.01	19.01
1961	11.80	11.96	12.12	12.27	12.41	12.55	12.55	12.55	12.55	12.55	12.55	12.55
1962	9.80	9.98	10.14	10.30	10.45	10.59	10.73	10.73	10.73	10.73	10.73	10.73
1963	11.64	11.82	12.00	12.16	12.32	12.47	12.61	12.75	12.75	12.75	12.75	12.75
1964	9.62	9.82	10.00	10.18	10.34	10.50	10.65	10.79	10.93	10.93	10.93	10.93
1965	10.32	10.53	10.73	10.91	11.09	11.25	11.41	11.56	11.70	11.84	11.84	11.84
1966	11.52	11.75	11.96	12.16	12.34	12.52	12.68	12.84	12.99	13.13	13.27	13.27
1967	10.39	10.64	10.87	11.08	11.28	11.46	11.64	11.80	11.96	12.11	12.25	12.39
1968	7.31	7.58	7.83	8.06	7.58	7.72	7.84	7.96	8.07	8.18	8.28	8.38
1969	7.08	7.38	7.65	7.90	7.48	7.63	7.76	7.89	8.01	8.12	8.23	8.33
1970	6.56	6.90	7.20	7.47	6.54	6.69	6.84	6.97	7.10	7.22	7.33	7.44
1971	6.05	6.45	6.79	7.09	6.29	6.46	6.62	6.76	6.90	7.02	7.14	7.25
1972	5.68	6.17	6.57	6.91	6.19	6.37	6.54	6.70	6.84	6.98	7.10	7.23
1973	4.64	5.27	5.76	6.16	5.70	5.91	6.09	6.26	6.42	6.56	6.70	6.82
1974	4.00	4.93	5.56	6.05	5.67	5.90	6.11	6.29	6.46	6.62	6.76	6.90
1975	0.00	2.49	3.42	4.05	3.82	4.09	4.33	4.53	4.71	4.89	5.04	5.19
1976	0.00	0.00	2.49	3.42	3.49	3.82	4.09	4.33	4.53	4.71	4.89	5.04
1977	0.00	0.00	0.00	1.71	2.28	2.71	3.04	3.31	3.55	3.75	3.93	4.11
1978	0.00	0.00	0.00	0.00	1.64	2.28	2.71	3.04	3.31	3.55	3.75	3.93
1979	0.00	0.00	0.00	0.00	0.48	1.64	2.28	2.71	3.04	3.31	3.55	3.75
1980	0.00	0.00	0.00	0.00	0.48	0.48	1.64	2.28	2.71	3.04	3.31	3.55
1981	0.00	0.00	0.00	0.00	0.48	0.48	0.48	1.64	2.28	2.71	3.04	3.31
1982	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.55	1.19	1.62	1.95
1983	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.13	0.55	1.19	1.62
1984	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.55	1.19
1985	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.55

HC EMISSIONS IN GRAMS/MILE WITH ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	10.73	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87
1958	11.63	11.77	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91
1959	17.38	17.53	17.67	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81
1960	18.42	18.58	18.73	18.87	19.01	19.01	19.01	19.01	19.01	19.01	19.01	19.01
1961	11.80	11.96	12.12	12.27	12.41	12.55	12.55	12.55	12.55	12.55	12.55	12.55
1962	9.80	9.98	10.14	10.30	10.45	10.59	10.73	10.73	10.73	10.73	10.73	10.73
1963	11.64	11.82	12.00	12.16	12.32	12.47	12.61	12.75	12.75	12.75	12.75	12.75
1964	9.62	9.82	10.00	10.18	10.34	10.50	10.65	10.79	10.93	10.93	10.93	10.93
1965	10.32	10.53	10.73	10.91	11.09	11.25	11.41	11.56	11.70	11.84	11.84	11.84
1966	11.52	11.75	11.96	12.16	12.34	12.52	12.68	12.84	12.99	13.13	13.27	13.27
1967	10.39	10.64	10.87	11.08	11.28	11.46	11.64	11.80	11.96	12.11	12.25	12.39
1968	7.31	7.58	7.83	8.06	6.71	6.85	6.98	7.11	7.23	7.34	7.45	7.55
1969	7.08	7.38	7.65	7.90	6.61	6.76	6.90	7.03	7.16	7.28	7.39	7.50
1970	6.56	6.90	7.20	7.47	6.04	6.20	6.35	6.49	6.62	6.75	6.86	6.98
1971	6.05	6.45	6.79	7.09	5.78	5.96	6.12	6.27	6.42	6.54	6.67	6.79
1972	5.68	6.17	6.57	6.91	5.67	5.87	6.04	6.21	6.36	6.50	6.63	6.76
1973	4.64	5.27	5.76	6.16	5.17	5.38	5.57	5.75	5.92	6.07	6.21	6.34
1974	4.00	4.93	5.56	6.05	5.13	5.38	5.59	5.78	5.96	6.12	6.27	6.42
1975	0.00	2.49	3.42	4.05	4.18	4.52	4.80	5.06	5.28	5.49	5.69	5.86
1976	0.00	0.00	2.49	3.42	3.77	4.18	4.52	4.80	5.06	5.28	5.49	5.69
1977	0.00	0.00	0.00	1.71	2.46	2.99	3.40	3.74	4.02	4.28	4.50	4.71
1978	0.00	0.00	0.00	0.00	1.68	2.46	2.99	3.40	3.74	4.02	4.28	4.50
1979	0.00	0.00	0.00	0.00	0.24	1.68	2.46	2.99	3.40	3.74	4.02	4.28
1980	0.00	0.00	0.00	0.00	0.24	0.24	1.68	2.46	2.99	3.40	3.74	4.02
1981	0.00	0.00	0.00	0.00	0.24	0.24	0.24	1.68	2.46	2.99	3.40	3.74
1982	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.59	1.37	1.90	2.31
1983	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07	0.59	1.37	1.90
1984	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.59	1.37
1985	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.59

HC EMISSIONS IN GRAMS/MILE WITH SEMI-ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	10.73	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87
1958	11.63	11.77	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91
1959	17.38	17.53	17.67	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81	17.81
1960	18.42	18.58	18.73	18.87	19.01	19.01	19.01	19.01	19.01	19.01	19.01	19.01
1961	11.80	11.96	12.12	12.27	12.41	12.55	12.55	12.55	12.55	12.55	12.55	12.55
1962	9.80	9.98	10.14	10.30	10.45	10.59	10.73	10.73	10.73	10.73	10.73	10.73
1963	11.64	11.82	12.00	12.16	12.32	12.47	12.61	12.75	12.75	12.75	12.75	12.75
1964	9.62	9.82	10.00	10.18	10.34	10.50	10.65	10.79	10.93	10.93	10.93	10.93
1965	10.32	10.53	10.73	10.91	11.09	11.25	11.41	11.56	11.70	11.84	11.84	11.84
1966	11.52	11.75	11.96	12.16	12.34	12.52	12.68	12.84	12.99	13.13	13.27	13.27
1967	10.39	10.64	10.87	11.08	11.28	11.46	11.64	11.80	11.96	12.11	12.25	12.39
1968	7.31	7.58	7.83	8.06	6.42	6.54	6.64	6.74	6.84	6.93	7.02	7.10
1969	7.08	7.38	7.65	7.90	6.34	6.46	6.58	6.68	6.78	6.88	6.97	7.06
1970	6.56	6.90	7.20	7.47	5.54	5.67	5.79	5.91	6.01	6.11	6.21	6.30
1971	6.05	6.45	6.79	7.09	5.33	5.47	5.61	5.73	5.84	5.95	6.05	6.14
1972	5.68	6.17	6.57	6.91	5.24	5.40	5.54	5.68	5.80	5.91	6.02	6.12
1973	4.64	5.27	5.76	6.16	4.83	5.01	5.16	5.31	5.44	5.56	5.68	5.78
1974	4.00	4.93	5.56	6.05	4.80	5.00	5.17	5.33	5.47	5.61	5.73	5.84
1975	0.00	2.49	3.42	4.05	3.82	4.09	4.33	4.53	4.71	4.89	5.04	5.19
1976	0.00	0.00	2.49	3.42	3.49	3.82	4.09	4.33	4.53	4.71	4.89	5.04
1977	0.00	0.00	0.00	1.71	2.28	2.71	3.04	3.31	3.55	3.75	3.93	4.11
1978	0.00	0.00	0.00	0.00	1.64	2.28	2.71	3.04	3.31	3.55	3.75	3.93
1979	0.00	0.00	0.00	0.00	0.48	1.64	2.28	2.71	3.04	3.31	3.55	3.75
1980	0.00	0.00	0.00	0.00	0.48	0.48	1.64	2.28	2.71	3.04	3.31	3.55
1981	0.00	0.00	0.00	0.00	0.48	0.48	0.48	1.64	2.28	2.71	3.04	3.31
1982	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.55	1.19	1.62	1.95
1983	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.13	0.55	1.19	1.62
1984	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.55	1.19
1985	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.55

CO EMISSIONS IN GRAMS/MILE WITH NO CONTROL STRATEGY

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90
1958	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40
1959	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10
1960	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80
1961	154.80	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90
1962	124.90	125.00	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10
1963	117.70	117.80	117.90	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00
1964	138.20	138.30	138.40	138.50	138.60	138.60	138.60	138.60	138.60	138.60	138.60	138.60
1965	136.90	137.00	137.10	137.20	137.30	137.40	137.40	137.40	137.40	137.40	137.40	137.40
1966	134.90	135.10	135.20	135.30	135.40	135.50	135.60	135.60	135.60	135.60	135.60	135.60
1967	141.60	141.90	142.10	142.20	142.30	142.40	142.50	142.60	142.60	142.60	142.60	142.60
1968	107.90	109.20	109.50	109.70	109.80	109.90	110.00	110.10	110.20	110.20	110.20	110.20
1969	98.20	100.30	101.60	101.90	102.10	102.20	102.30	102.40	102.50	102.60	102.60	102.60
1970	95.30	98.40	100.50	101.80	102.10	102.30	102.40	102.50	102.60	102.70	102.80	102.80
1971	89.20	93.10	96.20	98.30	99.60	99.90	100.10	100.20	100.30	100.40	100.50	100.60
1972	92.40	97.20	101.10	104.20	106.30	107.60	107.90	108.10	108.20	108.30	108.40	108.50
1973	85.20	90.70	95.50	99.40	102.50	104.60	105.90	106.20	106.40	106.50	106.60	106.70
1974	74.50	80.90	86.40	91.20	95.10	98.20	100.30	101.60	101.90	102.10	102.20	102.30
1975	0.00	27.60	34.00	39.50	44.30	48.20	51.30	53.40	54.70	55.00	55.20	55.30
1976	0.00	0.00	27.60	34.00	39.50	44.30	48.20	51.30	53.40	54.70	55.00	55.20
1977	0.00	0.00	0.00	16.40	22.80	28.30	33.10	37.00	40.10	42.20	43.50	43.80
1978	0.00	0.00	0.00	0.00	16.40	22.80	28.30	33.10	37.00	40.10	42.20	43.50
1979	0.00	0.00	0.00	0.00	0.00	16.40	22.80	28.30	33.10	37.00	40.10	42.20
1980	0.00	0.00	0.00	0.00	0.00	0.00	16.40	22.80	28.30	33.10	37.00	40.10
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.40	22.80	28.30	33.10	37.00
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	11.20	16.70	21.50
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	11.20	16.70
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	11.20
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80

CO EMISSIONS IN GRAMS/MILE WITH ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90
1958	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40
1959	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10
1960	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80
1961	154.80	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90
1962	124.90	125.00	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10
1963	117.70	117.80	117.90	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00
1964	138.20	138.30	138.40	138.50	138.60	138.60	138.60	138.60	138.60	138.60	138.60	138.60
1965	136.90	137.00	137.10	137.20	137.30	137.40	137.40	137.40	137.40	137.40	137.40	137.40
1966	134.90	135.10	135.20	135.30	135.40	135.50	135.60	135.60	135.60	135.60	135.60	135.60
1967	141.60	141.90	142.10	142.20	142.30	142.40	142.50	142.60	142.60	142.60	142.60	142.60
1968	107.90	109.20	109.50	109.70	90.88	90.90	90.92	90.95	90.97	90.97	90.97	90.97
1969	98.20	100.30	101.60	101.90	89.05	89.08	89.10	89.12	89.15	89.17	89.17	89.17
1970	95.30	98.40	100.50	101.80	81.42	81.47	81.49	81.52	81.54	81.56	81.59	81.59
1971	89.20	93.10	96.20	98.30	80.83	80.90	80.95	80.97	81.00	81.02	81.04	81.07
1972	92.40	97.20	101.10	104.20	82.42	82.73	82.80	82.84	82.87	82.89	82.92	82.94
1973	85.20	90.70	95.50	99.40	81.52	82.02	82.32	82.39	82.44	82.47	82.49	82.51
1974	74.50	80.90	86.40	91.20	79.76	80.50	81.00	81.30	81.38	81.42	81.45	81.47
1975	0.00	27.60	34.00	39.50	30.49	31.41	32.15	32.65	32.95	33.03	33.07	33.10
1976	0.00	0.00	27.60	34.00	29.35	30.49	31.41	32.15	32.65	32.95	33.03	33.07
1977	0.00	0.00	0.00	16.40	16.85	18.15	19.29	20.21	20.95	21.45	21.75	21.83
1978	0.00	0.00	0.00	0.00	15.33	16.85	18.15	19.29	20.21	20.95	21.45	21.75
1979	0.00	0.00	0.00	0.00	11.44	15.33	16.85	18.15	19.29	20.21	20.95	21.45
1980	0.00	0.00	0.00	0.00	11.44	11.44	15.33	16.85	18.15	19.29	20.21	20.95
1981	0.00	0.00	0.00	0.00	11.44	11.44	11.44	15.33	16.85	18.15	19.29	20.21
1982	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	3.73	5.25	6.55	7.69
1983	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	3.73	5.25	6.55
1984	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	3.73	5.25
1985	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	2.59	3.73

CO EMISSIONS IN GRAMS/MILE WITH SEMI-ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90
1958	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40
1959	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10
1960	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80
1961	154.80	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90
1962	124.90	125.00	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10
1963	117.70	117.80	117.90	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00
1964	138.20	138.30	138.40	138.50	138.60	138.60	138.60	138.60	138.60	138.60	138.60	138.60
1965	136.90	137.00	137.10	137.20	137.30	137.40	137.40	137.40	137.40	137.40	137.40	137.40
1966	134.90	135.10	135.20	135.30	135.40	135.50	135.60	135.60	135.60	135.60	135.60	135.60
1967	141.60	141.90	142.10	142.20	142.30	142.40	142.50	142.60	142.60	142.60	142.60	142.60
1968	107.90	109.20	109.50	109.70	90.88	90.90	90.92	90.95	90.97	90.97	90.97	90.97
1969	98.20	100.30	101.60	101.90	89.05	89.08	89.10	89.12	89.15	89.17	89.17	89.17
1970	95.30	98.40	100.50	101.80	81.42	81.47	81.49	81.52	81.54	81.56	81.59	81.59
1971	89.20	93.10	96.20	98.30	80.83	80.90	80.95	80.97	81.00	81.02	81.04	81.07
1972	92.40	97.20	101.10	104.20	82.42	82.73	82.80	82.84	82.87	82.89	82.92	32.94
1973	85.20	90.70	95.50	99.40	81.52	82.02	82.32	82.39	82.44	82.47	82.49	82.51
1974	74.50	80.90	86.40	91.20	79.76	80.50	81.00	81.30	81.38	81.42	81.45	81.47
1975	0.00	27.60	34.00	39.50	30.49	31.41	32.15	32.65	32.95	33.03	33.07	33.10
1976	0.00	0.00	27.60	34.00	29.35	30.49	31.41	32.15	32.65	32.95	33.03	33.07
1977	0.00	0.00	0.00	16.40	16.85	18.15	19.29	20.21	20.95	21.45	21.75	21.83
1978	0.00	0.00	0.00	0.00	15.33	16.85	18.15	19.29	20.21	20.95	21.45	21.75
1979	0.00	0.00	0.00	0.00	11.44	15.33	16.85	18.15	19.29	20.21	20.95	21.45
1980	0.00	0.00	0.00	0.00	11.44	11.44	15.33	16.85	18.15	19.29	20.21	20.95
1981	0.00	0.00	0.00	0.00	11.44	11.44	11.44	15.33	16.85	18.15	19.29	20.21
1982	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	3.73	5.25	6.55	7.69
1983	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	3.73	5.25	6.55
1984	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	3.73	5.25
1985	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	2.59	3.73

CO EMISSIONS IN GRAMS/MILE WITH ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90
1958	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40
1959	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10
1960	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80
1961	154.80	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90
1962	124.90	125.00	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10
1963	117.70	117.80	117.90	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00
1964	138.20	138.30	138.40	138.50	138.60	138.60	138.60	138.60	138.60	138.60	138.60	138.60
1965	136.90	137.00	137.10	137.20	137.30	137.40	137.40	137.40	137.40	137.40	137.40	137.40
1966	134.90	135.10	135.20	135.30	135.40	135.50	135.60	135.60	135.60	135.60	135.60	135.60
1967	141.60	141.90	142.10	142.20	142.30	142.40	142.50	142.60	142.60	142.60	142.60	142.60
1968	107.90	109.20	109.50	109.70	51.62	51.63	51.65	51.66	51.67	51.67	51.67	51.67
1969	98.20	100.30	101.60	101.90	50.58	50.60	50.61	50.62	50.64	50.65	50.65	50.65
1970	95.30	98.40	100.50	101.80	46.25	46.28	46.29	46.30	46.32	46.33	46.34	46.34
1971	89.20	93.10	96.20	98.30	45.91	45.95	45.98	45.99	46.01	46.02	46.03	46.05
1972	92.40	97.20	101.10	104.20	46.81	46.99	47.03	47.06	47.07	47.08	47.10	47.11
1973	85.20	90.70	95.50	99.40	50.70	51.01	51.21	51.25	51.28	51.29	51.31	51.32
1974	74.50	80.90	86.40	91.20	49.61	50.07	50.38	50.57	50.62	50.64	50.66	50.67
1975	0.00	27.60	34.00	39.50	30.49	31.41	32.15	32.65	32.95	33.03	33.07	33.10
1976	0.00	0.00	27.60	34.00	29.35	30.49	31.41	32.15	32.65	32.95	33.03	33.07
1977	0.00	0.00	0.00	16.40	16.85	18.15	19.29	20.21	20.95	21.45	21.75	21.83
1978	0.00	0.00	0.00	0.00	15.33	16.85	18.15	19.29	20.21	20.95	21.45	21.75
1979	0.00	0.00	0.00	0.00	11.44	15.33	16.85	18.15	19.29	20.21	20.95	21.45
1980	0.00	0.00	0.00	0.00	11.44	11.44	15.33	16.85	18.15	19.29	20.21	20.95
1981	0.00	0.00	0.00	0.00	11.44	11.44	11.44	15.33	16.85	18.15	19.29	20.21
1982	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	3.73	5.25	6.55	7.69
1983	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	3.73	5.25	6.55
1984	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	3.73	5.25
1985	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	2.59	3.73

CO EMISSIONS IN GRAMS/MILE WITH SEMI-ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90	123.90
1958	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40	112.40
1959	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10	133.10
1960	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80	116.80
1961	154.80	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90	154.90
1962	124.90	125.00	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10	125.10
1963	117.70	117.80	117.90	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00	118.00
1964	138.20	138.30	138.40	138.50	138.60	138.60	138.60	138.60	138.60	138.60	138.60	138.60
1965	136.90	137.00	137.10	137.20	137.30	137.40	137.40	137.40	137.40	137.40	137.40	137.40
1966	134.90	135.10	135.20	135.30	135.40	135.50	135.60	135.60	135.60	135.60	135.60	135.60
1967	141.60	141.90	142.10	142.20	142.30	142.40	142.50	142.60	142.60	142.60	142.60	142.60
1968	107.90	109.20	109.50	109.70	51.62	51.63	51.65	51.66	51.67	51.67	51.67	51.67
1969	98.20	100.30	101.60	101.90	50.58	50.60	50.61	50.62	50.64	50.65	50.65	50.65
1970	95.30	98.40	100.50	101.80	46.25	46.28	46.29	46.30	46.32	46.33	46.34	46.34
1971	89.20	93.10	96.20	98.30	45.91	45.95	45.98	45.99	46.01	46.02	46.03	46.05
1972	92.40	97.20	101.10	104.20	46.81	46.99	47.03	47.06	47.07	47.08	47.10	47.11
1973	85.20	90.70	95.50	99.40	50.70	51.01	51.21	51.25	51.28	51.29	51.31	51.32
1974	74.50	80.90	86.40	91.20	49.61	50.07	50.38	50.57	50.62	50.64	50.66	50.67
1975	0.00	27.60	34.00	39.50	30.49	31.41	32.15	32.65	32.95	33.03	33.07	33.10
1976	0.00	0.00	27.60	34.00	29.35	30.49	31.41	32.15	32.65	32.95	33.03	33.07
1977	0.00	0.00	0.00	16.40	16.85	18.15	19.29	20.21	20.95	21.45	21.75	21.83
1978	0.00	0.00	0.00	0.00	15.33	16.85	18.15	19.29	20.21	20.95	21.45	21.75
1979	0.00	0.00	0.00	0.00	11.44	15.33	16.85	18.15	19.29	20.21	20.95	21.45
1980	0.00	0.00	0.00	0.00	11.44	11.44	15.33	16.85	18.15	19.29	20.21	20.95
1981	0.00	0.00	0.00	0.00	11.44	11.44	11.44	15.33	16.85	18.15	19.29	20.21
1982	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	3.73	5.25	6.55	7.69
1983	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	3.73	5.25	6.55
1984	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	3.73	5.25
1985	0.00	0.00	0.00	0.00	2.59	2.59	2.59	2.59	2.59	2.59	2.59	3.73

NOX EMISSIONS IN GRAMS/MILE WITH NO CONTROL STRATEGY

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
1958	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
1959	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
1960	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
1961	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
1962	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
1963	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
1964	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
1965	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
1966	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
1967	2.06	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04
1968	2.79	2.75	2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73
1969	3.20	3.16	3.12	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
1970	3.18	3.14	3.10	3.06	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04
1971	3.07	3.05	3.01	2.97	2.93	2.91	2.91	2.91	2.91	2.91	2.91	2.91
1972	2.99	2.99	2.97	2.93	2.89	2.85	2.83	2.83	2.83	2.83	2.83	2.83
1973	2.05	2.11	2.11	2.09	2.05	2.01	1.97	1.95	1.95	1.95	1.95	1.95
1974	1.75	1.89	1.95	1.95	1.93	1.89	1.85	1.81	1.79	1.79	1.79	1.79
1975	0.00	2.00	2.14	2.20	2.20	2.18	2.14	2.10	2.06	2.04	2.04	2.04
1976	0.00	0.00	2.00	2.14	2.20	2.20	2.18	2.14	2.10	2.06	2.04	2.04
1977	0.00	0.00	0.00	2.07	2.21	2.27	2.27	2.25	2.21	2.17	2.13	2.11
1978	0.00	0.00	0.00	0.00	2.07	2.21	2.27	2.27	2.25	2.21	2.17	2.13
1979	0.00	0.00	0.00	0.00	0.00	2.07	2.21	2.27	2.27	2.25	2.21	2.17
1980	0.00	0.00	0.00	0.00	0.00	0.00	2.07	2.21	2.27	2.27	2.25	2.21
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07	2.21	2.27	2.27	2.25
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07	2.21	2.27	2.27
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07	2.21	2.27
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07	2.21
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07

NOX EMISSIONS IN GRAMS/MILE WITH ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
1958	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
1959	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
1960	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
1961	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
1962	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
1963	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
1964	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
1965	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
1966	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
1967	2.06	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04
1968	2.79	2.75	2.73	2.73	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
1969	3.20	3.16	3.12	3.10	3.07	3.07	3.07	3.07	3.07	3.07	3.07	3.07
1970	3.18	3.14	3.10	3.06	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03
1971	3.07	3.05	3.01	2.97	2.95	2.93	2.93	2.93	2.93	2.93	2.93	2.93
1972	2.99	2.99	2.97	2.93	2.92	2.89	2.88	2.88	2.88	2.88	2.88	2.88
1973	2.05	2.11	2.11	2.09	1.95	1.92	1.89	1.88	1.88	1.88	1.88	1.88
1974	1.75	1.89	1.95	1.95	1.86	1.83	1.80	1.77	1.76	1.76	1.76	1.76
1975	0.00	2.00	2.14	2.20	2.13	2.11	2.08	2.05	2.02	2.01	2.01	2.01
1976	0.00	0.00	2.00	2.14	2.13	2.13	2.11	2.08	2.05	2.02	2.01	2.01
1977	0.00	0.00	0.00	2.07	2.15	2.20	2.20	2.18	2.15	2.12	2.09	2.08
1978	0.00	0.00	0.00	0.00	2.05	2.15	2.20	2.20	2.18	2.15	2.12	2.09
1979	0.00	0.00	0.00	0.00	0.54	2.05	2.15	2.20	2.20	2.18	2.15	2.12
1980	0.00	0.00	0.00	0.00	0.54	0.54	2.05	2.15	2.20	2.20	2.18	2.15
1981	0.00	0.00	0.00	0.00	0.54	0.54	0.54	2.05	2.15	2.20	2.20	2.18
1982	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	2.05	2.15	2.20	2.20
1983	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	0.54	2.05	2.15	2.20
1984	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	0.54	0.54	2.05	2.15
1985	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	0.54	0.54	0.54	2.05

NOX EMISSIONS IN GRAMS/MILE WITH SEMI-ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
1958	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
1959	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
1960	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
1961	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
1962	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
1963	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
1964	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
1965	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
1966	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
1967	2.06	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04
1968	2.79	2.75	2.73	2.73	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
1969	3.20	3.16	3.12	3.10	3.07	3.07	3.07	3.07	3.07	3.07	3.07	3.07
1970	3.18	3.14	3.10	3.06	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03
1971	3.07	3.05	3.01	2.97	2.95	2.94	2.94	2.94	2.94	2.94	2.94	2.94
1972	2.99	2.99	2.97	2.93	2.92	2.90	2.88	2.88	2.88	2.88	2.88	2.88
1973	2.05	2.11	2.11	2.09	1.93	1.91	1.88	1.86	1.86	1.86	1.86	1.86
1974	1.75	1.89	1.95	1.95	1.85	1.82	1.80	1.77	1.76	1.76	1.76	1.76
1975	0.00	2.00	2.14	2.20	2.11	2.10	2.07	2.05	2.02	2.01	2.01	2.01
1976	0.00	0.00	2.00	2.14	2.11	2.11	2.10	2.07	2.05	2.02	2.01	2.01
1977	0.00	0.00	0.00	2.07	2.14	2.18	2.18	2.17	2.14	2.12	2.09	2.08
1978	0.00	0.00	0.00	0.00	2.05	2.14	2.18	2.18	2.17	2.14	2.12	2.09
1979	0.00	0.00	0.00	0.00	0.63	2.05	2.14	2.18	2.18	2.17	2.14	2.12
1980	0.00	0.00	0.00	0.00	0.63	0.63	2.05	2.14	2.18	2.18	2.17	2.14
1981	0.00	0.00	0.00	0.00	0.63	0.63	0.63	2.05	2.14	2.18	2.18	2.17
1982	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	2.05	2.14	2.18	2.18
1983	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	0.63	2.05	2.14	2.18
1984	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	0.63	0.63	2.05	2.14
1985	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	0.63	0.63	0.63	2.05

NOX EMISSIONS IN GRAMS/MILE WITH ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
1958	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
1959	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
1960	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
1961	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
1962	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
1963	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
1964	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
1965	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
1966	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
1967	2.06	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04
1968	2.79	2.75	2.73	2.73	2.07	2.07	2.07	2.07	2.07	2.07	2.07	2.07
1969	3.20	3.16	3.12	3.10	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27
1970	3.18	3.14	3.10	3.06	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24
1971	3.07	3.05	3.01	2.97	2.18	2.17	2.17	2.17	2.17	2.17	2.17	2.17
1972	2.99	2.99	2.97	2.93	2.16	2.14	2.13	2.13	2.13	2.13	2.13	2.13
1973	2.05	2.11	2.11	2.09	2.37	2.34	2.30	2.28	2.28	2.28	2.28	2.28
1974	1.75	1.89	1.95	1.95	2.26	2.23	2.19	2.16	2.14	2.14	2.14	2.14
1975	0.00	2.00	2.14	2.20	2.13	2.11	2.08	2.05	2.02	2.01	2.01	2.01
1976	0.00	0.00	2.00	2.14	2.13	2.13	2.11	2.08	2.05	2.02	2.01	2.01
1977	0.00	0.00	0.00	2.07	2.15	2.20	2.20	2.18	2.15	2.12	2.09	2.08
1978	0.00	0.00	0.00	0.00	2.05	2.15	2.20	2.20	2.18	2.15	2.12	2.09
1979	0.00	0.00	0.00	0.00	0.54	2.05	2.15	2.20	2.20	2.18	2.15	2.12
1980	0.00	0.00	0.00	0.00	0.54	0.54	2.05	2.15	2.20	2.20	2.18	2.15
1981	0.00	0.00	0.00	0.00	0.54	0.54	0.54	2.05	2.15	2.20	2.20	2.18
1982	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	2.05	2.15	2.20	2.20
1983	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	0.54	2.05	2.15	2.20
1984	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	0.54	0.54	2.05	2.15
1985	0.00	0.00	0.00	0.00	0.54	0.54	0.54	0.54	0.54	0.54	0.54	2.05

NOX EMISSIONS IN GRAMS/MILE WITH SEMI-ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
1958	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
1959	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
1960	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
1961	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
1962	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
1963	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
1964	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
1965	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
1966	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
1967	2.05	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04
1968	2.79	2.75	2.73	2.73	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08
1969	3.20	3.16	3.12	3.10	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27
1970	3.13	3.14	3.10	3.06	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24
1971	3.07	3.05	3.01	2.97	2.18	2.17	2.17	2.17	2.17	2.17	2.17	2.17
1972	2.99	2.99	2.97	2.93	2.16	2.14	2.13	2.13	2.13	2.13	2.13	2.13
1973	2.05	2.11	2.11	2.09	2.35	2.32	2.28	2.27	2.27	2.27	2.27	2.27
1974	1.75	1.89	1.95	1.95	2.25	2.22	2.18	2.15	2.13	2.13	2.13	2.13
1975	0.00	2.00	2.14	2.20	2.11	2.10	2.07	2.05	2.02	2.01	2.01	2.01
1976	0.00	0.00	2.00	2.14	2.11	2.11	2.10	2.07	2.05	2.02	2.01	2.01
1977	0.00	0.00	0.00	2.07	2.14	2.18	2.18	2.17	2.14	2.12	2.09	2.03
1978	0.00	0.00	0.00	0.00	2.05	2.14	2.18	2.18	2.17	2.14	2.12	2.09
1979	0.00	0.00	0.00	0.00	0.63	2.05	2.14	2.18	2.18	2.17	2.14	2.12
1980	0.00	0.00	0.00	0.00	0.63	0.63	2.05	2.14	2.18	2.18	2.17	2.14
1981	0.00	0.00	0.00	0.00	0.63	0.63	0.63	2.05	2.14	2.18	2.18	2.17
1982	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	2.05	2.14	2.18	2.18
1983	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	0.63	2.05	2.14	2.18
1984	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	0.63	0.63	2.05	2.14
1985	0.00	0.00	0.00	0.00	0.63	0.63	0.63	0.63	0.63	0.63	0.63	2.05

APPENDIX G

VEHICULAR EMISSION INVENTORY PROJECTIONS FOR DENVER AIR QUALITY CONTROL REGION TO 1985; ASSUMING VARIOUS CONTROL STRATEGIES

VEHICULAR EMISSION RATE OF HC IN TONS/YEAR WITH NO CONTROL STRATEGY

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	41.44	20.57	9.26	3.89	1.52	0.55	0.19	0.06	0.02	0.00	0.00	0.00
1958	122.50	65.71	32.58	14.66	6.16	2.40	0.86	0.29	0.09	0.03	0.01	0.00
1959	453.00	260.44	139.13	68.72	30.92	12.99	5.07	1.82	0.62	0.20	0.06	0.02
1960	975.71	600.35	344.96	184.20	90.93	40.92	17.19	6.70	2.41	0.82	0.26	0.08
1961	871.52	570.60	352.72	203.54	109.11	54.07	24.33	10.22	3.99	1.43	0.49	0.16
1962	445.45	308.94	202.76	125.63	72.65	39.02	19.37	8.72	3.66	1.43	0.51	0.17
1963	1778.39	1293.30	894.17	585.30	361.73	208.70	111.85	55.42	24.94	10.47	4.08	1.47
1964	2643.51	2029.63	1480.17	1026.17	673.28	417.06	241.12	129.47	64.26	28.92	12.15	4.74
1965	3800.66	3097.31	2373.87	1728.57	1196.62	784.12	485.11	280.15	150.28	74.52	33.53	14.08
1966	5194.39	4437.75	3607.73	2758.91	2005.05	1385.40	906.34	559.85	322.84	172.95	85.65	38.54
1967	5254.09	4676.68	4001.92	3258.04	2494.74	1815.13	1255.56	822.18	508.33	293.38	157.29	77.95
1968	4734.04	4341.37	3897.93	3360.86	2754.22	2121.66	1551.73	1078.75	709.45	440.47	255.18	137.28
1969	5010.46	4706.23	4314.41	3872.59	3338.17	2735.02	2106.46	1540.35	1070.66	704.03	437.04	253.17
1970	4841.28	4680.24	4400.73	4037.91	3627.17	3128.67	2564.84	1976.41	1445.89	1005.43	661.38	410.71
1971	6347.62	6275.14	6071.50	5712.74	5244.70	4713.47	4067.39	3335.59	2571.17	1881.53	1308.72	861.09
1972	6325.91	6434.34	6353.19	6141.40	5774.27	5297.94	4758.82	4104.64	3364.82	2592.78	1896.76	1318.93
1973	5780.68	6212.10	6357.62	6304.64	6114.42	5763.99	5300.02	4769.62	4120.61	3382.63	2609.79	1911.28
1974	2323.91	4957.44	5289.96	5389.86	5328.31	5155.40	4850.77	4453.35	4002.28	3453.68	2332.30	2183.22
1975	0.00	1543.57	3669.48	4111.50	4315.64	4354.35	4277.53	4073.49	3776.87	3423.10	2975.34	2455.21
1976	0.00	0.00	1646.95	3915.26	4386.88	4604.70	4646.00	4564.04	4346.32	4029.84	3652.38	3174.62
1977	0.00	0.00	0.00	1206.82	3224.80	3779.31	4069.09	4174.56	4150.43	3989.27	3726.52	3393.77
1978	0.00	0.00	0.00	0.00	1287.69	3440.88	4032.56	4341.75	4454.28	4428.53	4256.58	3976.23
1979	0.00	0.00	0.00	0.00	0.00	1373.97	3671.44	4302.75	4632.66	4752.73	4725.26	4541.78
1980	0.00	0.00	0.00	0.00	0.00	0.00	1466.03	3917.43	4591.05	4943.07	5071.18	5041.86
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1564.25	4179.91	4898.66	5274.26	5410.96
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	605.15	2618.52	3484.56	3996.20
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	645.70	2793.97	3718.03
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	688.96	2981.17
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	735.12
57-67	21580.7	17361.3	13439.3	9957.6	7042.7	4760.3	3067.0	1874.9	1081.4	584.2	294.0	137.2
68-72	27259.3	26437.3	25037.8	23125.5	20738.5	17996.8	15049.2	12035.7	9162.0	6624.2	4559.1	2981.2
73-74	8104.6	11169.5	11647.6	11694.5	11442.7	10919.4	10150.8	9223.0	8122.9	6836.3	5442.1	4094.5
75-85	0.0	1543.6	5316.4	9233.6	13215.0	17553.2	22162.6	26938.3	30736.7	33729.4	36649.0	39429.9
57-85	56944.6	56511.7	55441.0	54011.2	52438.9	51229.7	50429.6	50071.8	49103.0	47774.1	46944.2	46642.8

VEHICULAR EMISSION RATE OF HC IN TONS/YEAR WITH ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	41.44	20.57	9.26	3.89	1.52	0.55	0.19	0.06	0.02	0.00	0.00	0.00
1958	122.50	65.71	32.58	14.66	6.16	2.40	0.86	0.29	0.09	0.03	0.01	0.00
1959	453.00	260.44	139.13	68.72	30.92	12.99	5.07	1.82	0.62	0.20	0.06	0.02
1960	975.71	600.35	344.96	184.20	90.93	40.92	17.19	6.70	2.41	0.82	0.26	0.08
1961	871.52	570.60	352.72	203.54	109.11	54.07	24.33	10.22	3.99	1.43	0.49	0.16
1962	445.45	308.94	202.76	125.63	72.65	39.02	19.37	8.72	3.66	1.43	0.51	0.17
1963	1778.39	1293.30	894.17	585.30	361.73	208.70	111.85	55.42	24.94	10.47	4.08	1.47
1964	2643.51	2029.63	1480.17	1026.17	673.28	417.06	241.12	129.47	64.26	28.92	12.15	4.74
1965	3300.66	3097.31	2373.87	1728.57	1196.62	784.12	485.11	280.15	150.28	74.52	33.53	14.08
1966	5194.39	4437.75	3607.73	2758.91	2005.05	1385.40	906.34	559.85	322.84	172.95	85.65	38.54
1967	5254.09	4676.68	4001.92	3258.04	2494.74	1815.13	1255.56	822.18	508.33	293.38	157.29	77.95
1968	4734.04	4341.37	3897.93	3360.86	2639.31	2027.27	1478.99	1025.72	673.19	417.12	241.22	129.56
1969	5010.46	4706.23	4314.41	3872.59	3205.64	2618.22	2010.77	1466.76	1017.10	667.46	413.53	239.12
1970	4841.28	4680.24	4400.73	4037.91	3349.26	2881.50	2356.94	1812.52	1323.67	918.90	603.59	374.30
1971	6347.62	6275.14	6071.50	5712.74	4864.00	4357.96	3750.63	3068.76	2360.57	1724.32	1197.31	786.62
1972	6325.91	6434.34	6353.19	6141.40	5365.51	4906.03	4393.71	3779.97	3091.75	2377.54	1736.27	1205.31
1973	5780.68	6212.10	6357.62	6304.64	5740.50	5386.62	4934.09	4425.66	3812.55	3122.03	2403.36	1756.72
1974	2323.91	4957.44	5289.96	5389.86	5006.50	4818.58	4514.63	4130.09	3700.41	3184.72	2605.73	2004.39
1975	0.00	1543.57	3669.48	4111.50	3974.06	3981.55	3891.10	3690.45	3410.39	3082.26	2672.66	2200.92
1976	0.00	0.00	1646.95	3915.26	4082.04	4240.24	4248.23	4151.72	3937.63	3638.82	3288.71	2851.67
1977	0.00	0.00	0.00	1206.82	3003.39	3454.05	3680.21	3750.14	3710.48	3553.20	3309.31	3010.74
1978	0.00	0.00	0.00	0.00	1262.54	3204.63	3685.50	3926.81	4001.42	3959.11	3791.29	3531.06
1979	0.00	0.00	0.00	0.00	0.00	1347.14	3419.36	3932.44	4189.92	4269.53	4224.38	4045.31
1980	0.00	0.00	0.00	0.00	0.00	0.00	1437.40	3648.46	4195.93	4470.66	4555.61	4507.43
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1533.71	3892.92	4477.06	4770.20	4860.84
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	572.56	2312.31	3034.72	3458.37
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	610.92	2467.24	3238.05
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	651.86	2632.55
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	695.53
57-67	21580.7	17361.3	13439.3	9957.6	7042.7	4760.3	3067.0	1874.9	1081.4	584.2	294.0	137.2
68-72	27259.3	26437.3	25037.8	23125.5	19423.7	16791.0	13991.0	11153.7	8466.3	6105.3	4191.9	2734.9
73-74	8104.6	11169.5	11647.6	11694.5	10747.0	10205.2	9448.7	8555.7	7513.0	6306.7	5009.1	3761.1
75-85	0.0	1543.6	5316.4	9233.6	12322.0	16227.6	20361.8	24633.7	27911.2	30373.9	32765.9	35032.5
57-85	56944.6	56511.7	55441.0	54011.2	49535.4	47984.1	46868.5	46218.1	44971.9	43370.1	42261.0	41665.7

VEHICULAR EMISSION RATE OF HC IN TONS/YEAR WITH SEMI-ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	41.44	20.57	9.26	3.89	1.52	0.55	0.19	0.06	0.02	0.00	0.00	0.00
1958	122.50	65.71	32.58	14.66	6.16	2.40	0.86	0.29	0.09	0.03	0.01	0.00
1959	453.00	260.44	139.13	68.72	30.92	12.99	5.07	1.82	0.62	0.20	0.06	0.02
1960	975.71	600.35	344.96	184.20	90.93	40.92	17.19	6.70	2.41	0.82	0.26	0.08
1961	871.52	570.60	352.72	203.54	109.11	54.07	24.33	10.22	3.99	1.43	0.49	0.16
1962	445.45	308.94	202.76	125.63	72.65	39.02	19.37	8.72	3.66	1.43	0.51	0.17
1963	1778.39	1293.30	894.17	585.30	361.73	208.70	111.85	55.42	24.94	10.47	4.08	1.47
1964	2643.51	2029.63	1480.17	1026.17	673.28	417.06	241.12	129.47	64.26	28.92	12.15	4.74
1965	3800.66	3097.31	2373.87	1728.57	1196.62	784.12	485.11	280.15	150.28	74.52	33.53	14.08
1966	5194.39	4437.75	3607.73	2758.91	2005.05	1385.40	906.34	559.85	322.84	172.95	85.65	38.54
1967	5254.09	4676.68	4001.92	3258.04	2494.74	1815.13	1255.56	822.18	508.33	293.38	157.29	77.95
1968	4734.04	4341.37	3897.93	3360.86	2524.40	1932.88	1406.26	972.69	636.93	393.78	227.26	121.84
1969	5010.46	4706.23	4314.41	3872.59	3073.11	2501.42	1915.07	1393.17	963.55	630.89	390.01	225.07
1970	4841.28	4680.24	4400.73	4037.91	3071.36	2634.34	2149.03	1648.63	1201.45	832.37	545.80	337.90
1971	6347.62	6275.14	6071.50	5712.74	4483.30	4002.44	3433.87	2801.94	2149.97	1567.11	1085.89	712.15
1972	6325.91	6434.34	6353.19	6141.40	4956.75	4514.13	4028.60	3455.29	2818.68	2162.30	1575.78	1091.68
1973	5780.68	6212.10	6357.62	6304.64	5366.58	5009.25	4568.17	4081.70	3504.49	2861.43	2196.92	1602.16
1974	2323.91	4957.44	5289.96	5389.86	4684.70	4481.77	4178.49	3806.84	3398.53	2915.75	2379.17	1825.57
1975	0.00	1543.57	3669.48	4111.50	3632.48	3608.75	3504.66	3307.41	3043.92	2741.42	2369.98	1946.64
1976	0.00	0.00	1646.95	3915.26	3777.20	3875.78	3850.47	3739.40	3528.94	3247.80	2925.04	2528.72
1977	0.00	0.00	0.00	1206.82	2781.97	3128.79	3291.33	3325.72	3270.54	3117.12	2892.09	2622.70
1978	0.00	0.00	0.00	0.00	1237.40	2968.39	3338.44	3511.87	3548.57	3489.68	3325.99	3085.88
1979	0.00	0.00	0.00	0.00	0.00	1320.31	3167.28	3562.13	3747.18	3786.33	3723.50	3548.84
1980	0.00	0.00	0.00	0.00	0.00	0.00	1408.77	3379.50	3800.80	3998.26	4040.03	3972.99
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1503.16	3605.93	4055.46	4266.14	4310.72
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	539.97	2006.09	2584.87	2920.55
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	576.15	2140.50	2758.06
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	614.75	2283.92
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	655.94
57-67	21580.7	17361.3	13439.3	9957.6	7042.7	4760.3	3067.0	1874.9	1081.4	584.2	294.0	137.2
68-72	27259.3	26437.3	25037.8	23125.5	18108.9	15585.2	12932.8	10271.7	7770.6	5586.4	3824.7	2488.6
73-74	8104.6	11169.5	11647.6	11694.5	10051.3	9491.0	8746.7	7888.5	6903.0	5777.2	4576.1	3427.7
75-85	0.0	1543.6	5316.4	9233.6	11429.1	14902.0	18560.9	22329.2	25085.8	27018.3	28882.9	30635.0
57-85	56944.6	56511.7	55441.0	54011.2	46631.9	44738.6	43307.4	42364.3	40840.9	38966.1	37577.7	36688.5

VEHICULAR EMISSION RATE OF HC IN TONS/YEAR WITH ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	41.44	20.57	9.26	3.89	1.52	0.55	0.19	0.06	0.02	0.00	0.00	0.00
1958	122.50	65.71	32.58	14.66	6.16	2.40	0.86	0.29	0.09	0.03	0.01	0.00
1959	453.00	260.44	139.13	68.72	30.92	12.99	5.07	1.82	0.62	0.20	0.06	0.02
1960	975.71	600.35	344.96	184.20	90.93	40.92	17.19	6.70	2.41	0.82	0.26	0.08
1961	871.52	570.60	352.72	203.54	109.11	54.07	24.33	10.22	3.99	1.43	0.49	0.16
1962	445.45	308.94	202.76	125.63	72.65	39.02	19.37	8.72	3.66	1.43	0.51	0.17
1963	1778.39	1293.30	894.17	585.30	361.73	208.70	111.85	55.42	24.94	10.47	4.08	1.47
1964	2643.51	2029.63	1480.17	1026.17	673.28	417.06	241.12	129.47	64.26	28.92	12.15	4.74
1965	3800.66	3097.31	2373.87	1728.57	1196.62	784.12	485.11	280.15	150.28	74.52	33.53	14.08
1966	5194.39	4437.75	3607.73	2758.91	2005.05	1385.40	906.34	559.85	322.84	172.95	85.65	38.54
1967	5254.09	4676.68	4001.92	3258.04	2494.74	1815.13	1255.56	822.18	508.33	293.38	157.29	77.95
1968	4734.04	4341.37	3897.93	3360.86	2235.49	1717.10	1252.71	868.78	570.19	353.30	204.31	109.74
1969	5010.46	4706.23	4314.41	3872.59	2715.18	2217.63	1703.12	1242.34	861.49	565.34	350.26	202.53
1970	4841.28	4680.24	4400.73	4037.91	2836.83	2440.63	1996.32	1535.20	1121.15	778.31	511.24	317.04
1971	6347.62	6275.14	6071.50	5712.74	4119.80	3691.19	3176.78	2599.24	1999.40	1460.50	1014.12	666.27
1972	6325.91	6434.34	6353.19	6141.40	4544.59	4155.41	3721.47	3201.63	2618.71	2013.78	1470.62	1020.89
1973	5780.68	6212.10	6357.62	6304.64	4862.20	4562.46	4179.18	3748.53	3229.23	2644.36	2035.64	1487.94
1974	2323.91	4957.44	5289.96	5389.86	4240.51	4081.34	3823.89	3498.19	3134.24	2697.45	2207.05	1697.72
1975	0.00	1543.57	3669.48	4111.50	3974.06	3981.55	3891.10	3690.45	3410.39	3082.26	2672.66	2200.92
1976	0.00	0.00	1646.95	3915.26	4082.04	4240.24	4248.23	4151.72	3937.63	3638.82	3238.71	2851.67
1977	0.00	0.00	0.00	1206.82	3003.39	3454.05	3680.21	3750.14	3710.48	3553.20	3309.31	3010.74
1978	0.00	0.00	0.00	0.00	1262.54	3204.63	3685.50	3926.81	4001.42	3959.11	3791.29	3531.06
1979	0.00	0.00	0.00	0.00	0.00	1347.14	3419.36	3932.44	4189.92	4269.53	4224.38	4045.31
1980	0.00	0.00	0.00	0.00	0.00	0.00	1437.40	3648.46	4195.93	4470.66	4555.61	4507.43
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1533.71	3892.92	4477.06	4770.20	4860.84
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	572.56	2312.31	3034.72	3458.37
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	610.92	2467.24	3238.05
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	651.86	2632.55
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	695.53
57-67	21580.7	17361.3	13439.3	9957.6	7042.7	4760.3	3067.0	1874.9	1081.4	584.2	294.0	137.2
68-72	27259.3	26437.3	25037.8	23125.5	16451.9	14222.0	11850.4	9447.2	7170.9	5171.2	3550.6	2316.5
73-74	8104.6	11169.5	11647.6	11694.5	9102.7	8643.8	8003.1	7246.7	6363.5	5341.8	4242.7	3185.7
75-85	0.0	1543.6	5316.4	9233.6	12322.0	16227.6	20361.8	24633.7	27911.2	30373.9	32765.9	35032.5
57-85	56944.6	56511.7	55441.0	54011.2	44919.3	43853.7	43282.2	43202.5	42527.1	41471.0	40853.2	40671.8

VEHICULAR EMISSION RATE OF HC IN TONS/YEAR WITH SEMI-ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	41.44	20.57	9.26	3.89	1.52	0.55	0.19	0.06	0.02	0.00	0.00	0.00
1958	122.50	65.71	32.58	14.66	6.16	2.40	0.86	0.29	0.09	0.03	0.01	0.00
1959	453.00	260.44	139.13	68.72	30.92	12.99	5.07	1.82	0.62	0.20	0.06	0.02
1960	975.71	600.35	344.96	184.20	90.93	40.92	17.19	6.70	2.41	0.82	0.26	0.08
1961	871.52	570.60	352.72	203.54	109.11	54.07	24.33	10.22	3.99	1.43	0.49	0.16
1962	445.45	308.94	202.76	125.63	72.65	39.02	19.37	8.72	3.66	1.43	0.51	0.17
1963	1778.39	1293.30	894.17	585.30	361.73	208.70	111.85	55.42	24.94	10.47	4.08	1.47
1964	2643.51	2029.63	1480.17	1026.17	673.28	417.06	241.12	129.47	64.26	28.92	12.15	4.74
1965	3800.66	3097.31	2373.87	1728.57	1196.62	784.12	485.11	280.15	150.28	74.52	33.53	14.08
1966	5194.39	4437.75	3607.73	2758.91	2005.05	1385.40	906.34	559.85	322.84	172.95	85.65	38.54
1967	5254.09	4676.68	4001.92	3258.04	2494.74	1815.13	1255.56	822.18	508.33	293.38	157.29	77.95
1968	4734.04	4341.37	3897.93	3360.86	2138.17	1637.15	1191.10	823.87	539.48	333.53	192.49	103.20
1969	5010.46	4706.23	4314.41	3872.59	2602.92	2118.71	1622.07	1180.02	816.12	534.36	330.34	190.64
1970	4841.28	4680.24	4400.73	4037.91	2601.44	2231.29	1820.23	1396.39	1017.63	705.02	462.29	286.20
1971	6347.62	6275.14	6071.50	5712.74	3797.36	3390.07	2908.49	2373.24	1821.02	1327.34	919.75	603.19
1972	6325.91	6434.34	6353.19	6141.40	4198.37	3823.47	3412.22	2926.63	2387.42	1831.47	1334.68	924.66
1973	5780.68	6212.10	6357.62	6304.64	4545.49	4242.84	3869.24	3457.20	2968.30	2423.63	1860.79	1357.03
1974	2323.91	4957.44	5289.96	5389.86	3967.94	3796.06	3539.18	3224.39	2878.56	2469.64	2015.15	1546.26
1975	0.00	1543.57	3669.48	4111.50	3632.48	3608.75	3504.66	3307.41	3043.92	2741.42	2369.93	1946.64
1976	0.00	0.00	1646.95	3915.26	3777.20	3875.78	3850.47	3739.40	3528.94	3247.80	2925.04	2528.72
1977	0.00	0.00	0.00	1206.82	2781.97	3128.79	3291.33	3325.72	3270.54	3117.12	2892.09	2622.70
1978	0.00	0.00	0.00	0.00	1237.40	2968.39	3338.44	3511.87	3548.57	3489.68	3325.99	3085.83
1979	0.00	0.00	0.00	0.00	0.00	1320.31	3167.28	3562.13	3747.18	3786.33	3723.50	3548.84
1980	0.00	0.00	0.00	0.00	0.00	0.00	1408.77	3379.50	3800.80	3998.26	4040.03	3972.99
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1503.16	3605.93	4055.46	4266.14	4310.72
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	539.97	2006.09	2584.87	2920.55
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	576.15	2140.50	2758.06
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	614.75	2283.92
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	655.94
57-67	21580.7	17361.3	13439.3	9957.6	7042.7	4760.3	3067.0	1874.9	1081.4	584.2	294.0	137.2
68-72	27259.3	26437.3	25037.8	23125.5	15338.3	13200.7	10954.1	8700.1	6581.7	4731.7	3239.6	2107.9
73-74	8104.6	11169.5	11647.6	11694.5	8513.4	8038.9	7408.4	6681.6	5846.9	4893.3	3875.9	2903.3
75-85	0.0	1543.6	5316.4	9233.6	11429.1	14902.0	18560.9	22329.2	25085.8	27018.3	28882.9	30635.0
57-85	56944.6	56511.7	55441.0	54011.2	42323.4	40901.9	39990.4	39585.8	38595.8	37227.4	36292.4	35783.3

VEHICULAR EMISSION RATE OF CO IN TONS/YEAR WITH NO CONTROL STRATEGY

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	478.56	234.49	105.52	44.32	17.28	6.22	2.12	0.68	0.20	0.06	0.01	0.00
1958	1183.91	627.47	307.46	138.36	58.11	22.66	8.16	2.77	0.89	0.27	0.07	0.02
1959	3469.18	1977.43	1048.04	513.54	231.09	97.06	37.85	13.63	4.63	1.48	0.44	0.12
1960	6186.93	3774.03	2151.19	1140.13	558.66	251.40	105.59	41.18	14.82	5.04	1.61	0.48
1961	11433.15	7390.09	4507.95	2569.53	1361.85	667.31	300.29	126.12	49.19	17.71	6.02	1.93
1962	5677.26	3869.43	2501.48	1525.91	869.77	460.98	225.88	101.65	42.69	16.65	5.99	2.04
1963	17982.53	12889.19	8785.25	5679.71	3464.62	1974.83	1046.66	512.86	230.79	96.93	37.80	13.61
1964	37976.40	28584.34	20485.58	13961.18	9024.84	5505.14	3137.93	1663.10	814.92	366.71	154.02	60.07
1965	50417.66	40297.43	30331.56	21737.90	14814.74	9576.66	5841.76	3329.80	1764.80	864.75	389.14	163.44
1966	60826.75	51024.74	40783.00	30697.36	22000.28	14993.70	9692.43	5912.38	3370.06	1786.13	875.20	393.84
1967	71605.31	62370.38	52315.78	41813.43	31471.79	22554.47	15370.84	9935.87	6060.87	3454.70	1830.99	897.19
1968	69877.19	62543.30	54511.23	45742.65	36567.45	27529.00	19732.93	13450.74	8696.50	5304.86	3023.77	1602.60
1969	69495.37	63961.39	57299.93	49951.54	41922.12	33515.49	25233.12	18088.45	12330.63	7972.83	4663.42	2772.15
1970	70331.44	66744.37	61426.81	55027.98	47970.66	40259.48	32186.20	24232.26	17370.95	11841.50	7656.55	4670.49
1971	93588.19	90576.00	86020.31	79204.87	70974.37	61875.97	51931.79	41518.75	31259.20	22408.72	15275.99	9877.45
1972	102907.30	101364.30	97763.69	92609.75	85132.31	76210.94	66426.50	55742.74	44562.21	33548.14	24047.83	16392.16
1973	106145.20	106914.10	105408.50	101733.90	96419.75	88663.75	79387.87	69198.56	58070.66	46423.95	34950.21	25053.23
1974	43282.81	81350.31	82203.81	81248.81	78561.56	74559.62	68622.37	61475.60	53591.64	44977.12	35957.87	27071.91
1975	0.00	17109.42	36480.22	40099.82	42110.77	42485.81	41560.14	38982.82	35315.31	30864.00	25946.06	20760.37
1976	0.00	0.00	18255.40	38923.61	42785.68	44931.32	45331.48	44343.81	41593.86	37680.71	32931.29	27683.92
1977	0.00	0.00	0.00	11574.18	27850.52	32707.82	35820.98	37129.48	36934.90	35072.34	31973.12	27982.35
1978	0.00	0.00	0.00	0.00	12349.73	29716.70	34899.50	38221.25	39617.42	39463.14	37422.45	34115.56
1979	0.00	0.00	0.00	0.00	0.00	13177.21	31707.84	37237.90	40782.21	42271.93	42107.29	39929.86
1980	0.00	0.00	0.00	0.00	0.00	0.00	14060.13	33832.36	39732.96	43514.77	45104.30	44928.64
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15002.18	36099.18	42395.13	46430.31	48126.36
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4685.05	18920.95	26693.66	32179.12
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4998.95	20188.68	28482.18
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5333.89	21541.37
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5691.27
57-67	267237.6	213038.9	163322.7	119821.2	83873.0	56110.4	35769.5	21640.0	12353.9	6610.4	3301.3	1532.7
68-72	406199.5	385189.4	357021.9	322536.7	282566.9	239390.8	195510.4	153032.9	114219.4	81076.0	54867.6	35314.9
73-74	149428.1	188264.4	187612.3	182982.7	174981.3	163223.4	148010.2	130674.1	111662.2	91401.1	70908.1	52125.1
75-85	0.0	17109.4	54735.6	90597.5	125096.6	163018.8	203379.9	244749.6	274810.6	295181.7	314130.8	331420.7
57-85	822865.1	803602.0	762692.4	715938.2	666517.7	621743.2	582670.1	550096.6	513046.1	474269.2	443207.6	420393.3

VEHICULAR EMISSION RATE OF CO IN TONS/YEAR WITH ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	478.56	234.49	105.52	44.32	17.28	6.22	2.12	0.68	0.20	0.06	0.01	0.00
1958	1183.91	627.47	307.46	138.36	58.11	22.66	8.16	2.77	0.89	0.27	0.07	0.02
1959	3469.18	1977.43	1048.04	513.54	231.09	97.06	37.85	13.63	4.63	1.48	0.44	0.12
1960	6186.93	3774.03	2151.19	1140.13	558.66	251.40	105.59	41.18	14.82	5.04	1.61	0.48
1961	11433.15	7390.09	4507.95	2569.53	1361.85	667.31	300.29	126.12	49.19	17.71	6.02	1.93
1962	5677.26	3869.43	2501.48	1525.91	869.77	460.98	225.88	101.65	42.69	16.65	5.99	2.04
1963	17932.53	12389.19	8785.25	5679.71	3464.62	1974.83	1046.66	512.86	230.79	96.93	37.80	13.61
1964	37976.40	28584.34	20485.58	13961.18	9024.84	5505.14	3137.93	1663.10	814.92	366.71	154.02	60.07
1965	50417.66	40297.43	30331.56	21737.90	14814.74	9576.66	5841.76	3329.80	1764.80	864.75	389.14	163.44
1966	60826.75	51024.74	40783.00	30697.36	22000.28	14993.70	9692.43	5912.38	3370.06	1786.13	875.20	393.84
1967	71605.31	62370.38	52315.78	41813.43	31471.79	22554.47	15370.84	9935.87	6060.87	3454.70	1830.99	897.19
1968	69377.19	62543.30	54511.23	45742.65	30265.60	22770.00	16311.07	11111.06	7179.14	4379.23	2496.19	1322.98
1969	69495.37	63961.39	57299.93	49951.54	36564.93	29211.75	21977.26	15743.29	10724.35	6929.31	4226.88	2409.32
1970	70331.44	66744.37	61426.81	55027.98	38255.65	32062.02	25615.00	19271.75	13805.55	9404.59	6076.73	3706.80
1971	93588.19	90576.00	86020.31	79204.87	57599.18	50108.59	41996.14	33551.65	25243.02	18083.18	12318.61	7959.62
1972	102907.30	101364.30	97763.69	92609.75	66006.12	58593.40	50972.55	42719.64	34129.41	25677.54	18394.34	12530.50
1973	106145.20	106914.10	105408.50	101733.90	76681.94	69519.87	61713.69	53687.17	44994.85	35947.20	27045.18	19374.10
1974	43282.81	81350.31	82203.81	81248.81	65892.31	61119.55	55415.23	49195.15	42797.23	35868.37	28055.98	21559.66
1975	0.00	17109.42	36480.22	40099.82	28982.95	27689.83	26044.93	23832.38	21276.04	18532.78	15545.56	12424.96
1976	0.00	0.00	18255.40	38923.61	31793.65	30924.20	29544.48	27789.40	25428.66	22701.10	19774.11	16586.79
1977	0.00	0.00	0.00	11574.18	20580.80	20979.34	20875.41	20284.75	19321.35	17824.08	15989.88	13943.66
1978	0.00	0.00	0.00	0.00	11545.34	21959.86	22385.12	22274.21	21643.98	20616.02	19018.43	17061.32
1979	0.00	0.00	0.00	0.00	0.00	12318.92	23431.25	23885.01	23766.66	23094.21	21997.35	20292.71
1980	0.00	0.00	0.00	0.00	0.00	0.00	13144.34	25001.22	25485.38	25359.12	24641.60	23471.26
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14025.02	26676.34	27192.95	27058.21	26292.63
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3642.43	8866.83	10473.02	11509.21
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3886.48	9460.92	11174.73
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4146.68	10094.82
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4424.73
57-67	267237.6	213038.9	163322.7	119821.2	83873.0	56110.4	35769.5	21640.0	12353.9	6610.4	3301.3	1532.7
68-72	406199.5	385189.4	357021.9	322536.7	228691.4	192745.7	156871.9	122397.3	91081.4	64473.9	43512.7	27929.2
73-74	149428.1	188264.4	187612.3	182982.7	142574.2	130639.4	117128.9	102882.3	87792.1	71815.6	55701.2	40933.6
75-85	0.0	17109.4	54735.6	90597.5	92902.7	113872.1	135425.4	157091.9	167240.6	168073.4	168105.7	167276.6
57-85	822865.1	803602.0	762692.4	715938.2	548041.2	493367.4	445195.6	404011.5	358467.8	310973.1	270620.7	237672.2

VEHICULAR EMISSION RATE OF CO IN TONS/YEAR WITH SEMI-ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	478.56	234.49	105.52	44.32	17.28	6.22	2.12	0.68	0.20	0.06	0.01	0.00
1958	1183.91	627.47	307.46	138.36	58.11	22.66	8.16	2.77	0.89	0.27	0.07	0.02
1959	3469.18	1977.43	1048.04	513.54	231.09	97.06	37.85	13.63	4.63	1.48	0.44	0.12
1960	6186.93	3774.03	2151.19	1140.13	558.66	251.40	105.59	41.18	14.82	5.04	1.61	0.48
1961	11433.15	7390.09	4507.95	2569.53	1361.85	667.31	300.29	126.12	49.19	17.71	6.02	1.93
1962	5677.26	3869.43	2501.48	1525.91	869.77	460.98	225.88	101.65	42.69	16.65	5.99	2.04
1963	17982.53	12889.19	8785.25	5679.71	3464.62	1974.83	1046.66	512.86	230.79	96.93	37.80	13.61
1964	37976.40	28584.34	20485.58	13961.18	9024.84	5505.14	3137.93	1663.10	814.92	366.71	154.02	60.07
1965	50417.66	40297.43	30331.56	21737.90	14814.74	9576.66	5841.76	3329.80	1764.80	864.75	389.14	163.44
1966	60826.75	51024.74	40783.00	30697.36	22000.28	14993.70	9692.43	5912.38	3370.06	1786.13	875.20	393.84
1967	71605.31	62370.38	52315.78	41813.43	31471.79	22554.47	15370.84	9935.87	6060.87	3454.70	1830.99	897.19
1968	69377.19	62543.30	54511.23	45742.65	30265.60	22770.00	16311.07	11111.06	7179.14	4379.28	2496.19	1322.98
1969	69495.37	63961.39	57299.93	49951.54	36564.93	29211.75	21977.26	15743.29	10724.35	6929.31	4226.88	2409.32
1970	70331.44	66744.37	61426.81	55027.98	38255.65	32062.02	25615.00	19271.75	13305.55	9404.59	6076.73	3706.80
1971	93588.19	90576.00	86020.31	79204.87	57599.18	50108.59	41996.14	33551.65	25243.02	18083.18	12318.61	7959.62
1972	102907.30	101364.30	97763.69	92609.75	66006.12	58593.40	50972.55	42719.64	34129.41	25677.54	18394.34	12530.50
1973	106145.20	106914.10	105408.50	101733.90	76681.94	69519.87	61713.69	53687.17	44994.85	35947.20	27045.18	19374.10
1974	43282.81	81350.31	82203.81	81248.81	65892.31	61119.55	55415.23	49195.15	42797.23	35868.37	28055.98	21559.66
1975	0.00	17109.42	36480.22	40099.82	28982.95	27689.83	26044.93	23832.38	21276.04	18532.78	15545.56	12424.96
1976	0.00	0.00	18255.40	38923.61	31793.65	30924.20	29544.48	27789.40	25428.66	22701.10	19774.11	16586.79
1977	0.00	0.00	0.00	11574.18	20580.80	20979.34	20875.41	20284.75	19321.35	17824.08	15989.88	13943.66
1978	0.00	0.00	0.00	0.00	11545.34	21959.86	22385.12	22274.21	21643.98	20616.02	19018.43	17061.32
1979	0.00	0.00	0.00	0.00	0.00	12318.92	23431.25	23885.01	23766.66	23094.21	21997.35	20292.71
1980	0.00	0.00	0.00	0.00	0.00	0.00	13144.34	25001.22	25485.38	25359.12	24641.60	23471.26
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14025.02	26676.34	27192.95	27058.21	26292.63
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3642.43	8866.83	10473.02	11509.21
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3886.48	9460.92	11174.73
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4146.88	10094.82
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4424.73
57-67	267237.6	213038.9	163322.7	119821.2	83873.0	56110.4	35769.5	21640.0	12353.9	6610.4	3301.3	1532.7
68-72	406199.5	385189.4	357021.9	322536.7	228691.4	192745.7	156871.9	122397.3	91081.4	64473.9	43512.7	27929.2
73-74	149428.1	188264.4	187612.3	182932.7	142574.2	130639.4	117128.9	102882.3	87792.1	71815.6	55701.2	40933.8
75-85	0.0	17109.4	54735.6	90597.5	92902.7	113872.1	135425.4	157091.9	167240.6	168073.4	168105.7	167276.6
57-85	822865.1	803602.0	762692.4	715938.2	548041.2	493367.4	445195.6	404011.5	358467.8	310973.1	270620.7	237672.2

VEHICULAR EMISSION RATE OF CO IN TONS/YEAR WITH ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	478.56	234.49	105.52	44.32	17.28	6.22	2.12	0.68	0.20	0.06	0.01	0.00
1958	1183.91	627.47	307.46	138.36	58.11	22.66	8.16	2.77	0.89	0.27	0.07	0.02
1959	3469.18	1977.43	1048.04	513.54	231.09	97.06	37.85	13.63	4.63	1.48	0.44	0.12
1960	6186.93	3774.03	2151.19	1140.13	558.66	251.40	105.59	41.18	14.82	5.04	1.61	0.48
1961	11433.15	7390.09	4507.95	2569.53	1361.85	667.31	300.29	126.12	49.19	17.71	6.02	1.93
1962	5677.26	3869.43	2501.48	1525.91	869.77	460.98	225.88	101.65	42.69	16.65	5.99	2.04
1963	17982.53	12889.19	8785.25	5679.71	3464.62	1974.83	1046.66	512.86	230.79	96.93	37.80	13.61
1964	37976.40	28584.34	20485.58	13961.18	9024.84	5505.14	3137.93	1663.10	814.92	366.71	154.02	60.07
1965	50417.66	40297.43	30331.56	21737.90	14814.74	9576.66	5841.76	3329.80	1764.80	864.75	389.14	163.44
1966	60826.75	51024.74	40783.00	30697.36	22000.28	14993.70	9692.43	5912.38	3370.06	1736.13	875.20	393.84
1967	71605.31	62370.38	52315.78	41813.43	31471.79	22554.47	15370.84	9935.87	6060.87	3454.70	1830.99	897.19
1968	69877.19	62543.30	54511.23	45742.65	17190.86	12933.36	9264.68	6311.08	4077.75	2487.43	1417.83	751.45
1969	69495.37	63961.39	57299.93	49951.54	20768.87	16592.27	12483.09	8942.18	6091.43	3935.85	2400.87	1368.49
1970	70331.44	66744.37	61426.81	55027.98	21729.21	18211.23	14549.32	10946.35	7841.55	5341.80	3451.56	2105.46
1971	93588.19	90576.00	86020.31	79204.87	32716.32	28461.67	23853.80	19057.33	14338.03	10271.25	6996.97	4521.07
1972	102907.30	101364.30	97763.69	92609.75	37491.49	33281.05	28952.41	24264.75	19385.50	14584.84	10447.98	7117.32
1973	106145.20	106914.10	105408.50	101733.90	47696.18	43241.39	38385.91	33393.41	27986.79	22359.15	16822.10	12050.68
1974	43282.81	81350.31	82203.81	81248.81	40985.05	38016.35	34468.27	30599.37	26619.87	22310.12	17824.01	13410.11
1975	0.00	17109.42	36480.22	40099.82	28982.95	27689.83	26044.93	23832.38	21276.04	18532.78	15545.56	12424.96
1976	0.00	0.00	18255.40	38923.61	31793.65	30924.20	29544.48	27789.40	25428.66	22701.10	19774.11	16586.79
1977	0.00	0.00	0.00	11574.18	20580.80	20979.34	20875.41	20284.75	19321.35	17824.08	15989.88	13943.66
1978	0.00	0.00	0.00	0.00	11545.34	21959.86	22385.12	22274.21	21643.98	20616.02	19018.43	17061.32
1979	0.00	0.00	0.00	0.00	0.00	12318.92	23431.25	23885.01	23766.66	23094.21	21997.35	20292.71
1980	0.00	0.00	0.00	0.00	0.00	0.00	13144.34	25001.22	25485.38	25359.12	24641.60	23471.26
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14025.02	26676.34	27192.95	27058.21	26292.63
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3642.43	8866.83	10473.02	11509.21
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3886.48	9460.92	11174.73
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4146.88	10094.82
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4424.73
57-67	267237.6	213038.9	163322.7	119821.2	83873.0	56110.4	35769.5	21640.0	12353.9	6610.4	3301.3	1532.7
68-72	406199.5	385189.4	357021.9	322536.7	129896.7	109479.5	89103.2	69521.7	51734.3	36621.2	24715.2	15863.8
73-74	149428.1	188264.4	187612.3	182982.7	88681.2	81257.7	72854.1	63992.8	54606.7	44669.3	34646.1	25460.8
75-85	0.0	17109.4	54735.6	90597.5	92902.7	113872.1	135425.4	157091.9	167240.6	168073.4	168105.7	167276.6
57-85	822865.1	803602.0	762692.4	715938.2	395353.4	360719.5	333152.1	312246.2	285935.2	255974.1	230768.3	210133.9

VEHICULAR EMISSION RATE OF CO IN TONS/YEAR WITH SEMI-ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	478.56	234.49	105.52	44.32	17.28	6.22	2.12	0.68	0.20	0.06	0.01	0.00
1958	1183.91	627.47	307.46	138.36	58.11	22.66	8.16	2.77	0.89	0.27	0.07	0.02
1959	3469.18	1977.43	1048.04	513.54	231.09	97.06	37.85	13.63	4.63	1.48	0.44	0.12
1960	6186.93	3774.03	2151.19	1140.13	558.66	251.40	105.59	41.18	14.82	5.04	1.61	0.48
1961	11433.15	7390.09	4507.95	2569.53	1361.85	667.31	300.29	126.12	49.19	17.71	6.02	1.93
1962	5677.26	3869.43	2501.48	1525.91	869.77	460.98	225.88	101.65	42.69	16.65	5.99	2.04
1963	17982.53	12889.19	8785.25	5679.71	3464.62	1974.83	1046.66	512.86	230.79	96.93	37.80	13.61
1964	37976.40	28584.34	20485.58	13961.18	9024.84	5505.14	3137.93	1663.10	814.92	366.71	154.02	60.07
1965	50417.66	40297.43	30331.56	21737.90	14814.74	9576.66	5841.76	3329.80	1764.80	864.75	389.14	163.44
1966	60826.75	51024.74	40783.00	30697.36	22000.28	14993.70	9692.43	5912.38	3370.06	1786.13	875.20	393.84
1967	71605.31	62370.38	52315.78	41813.43	31471.79	22554.47	15370.84	9935.87	6060.87	3454.70	1830.99	897.19
1968	69877.19	62543.30	54511.23	45742.65	17190.86	12933.36	9264.68	6311.08	4077.75	2487.43	1417.83	751.45
1969	69495.37	63961.39	57299.93	49951.54	20768.87	16592.27	12483.09	8942.18	6091.43	3935.85	2400.87	1368.49
1970	70331.44	66744.37	61426.81	55027.98	21729.21	18211.23	14549.32	10946.35	7841.55	5341.80	3451.58	2105.46
1971	93588.19	90576.00	86020.31	79204.87	32716.32	28461.67	23853.80	19057.33	14338.03	10271.25	6996.97	4521.07
1972	102907.30	101364.30	97763.69	92609.75	37491.49	33281.05	28952.41	24264.75	19385.50	14584.84	10447.93	7117.32
1973	106145.20	106914.10	105408.50	101733.90	47696.18	43241.39	38385.91	33393.41	27986.79	22359.15	16322.10	12050.63
1974	43282.81	81350.31	82203.81	81248.81	40985.05	38016.35	34468.27	30599.37	26619.87	22310.12	17824.01	13410.11
1975	0.00	17109.42	36480.22	40099.82	28932.95	27689.83	26044.93	23832.38	21276.04	18532.78	15545.56	12424.96
1976	0.00	0.00	18255.40	38923.61	31793.65	30924.20	29544.48	27789.40	25428.66	22701.10	19774.11	16586.79
1977	0.00	0.00	0.00	11574.18	20580.80	20979.34	20875.41	20284.75	19321.35	17824.08	15939.88	13943.66
1978	0.00	0.00	0.00	0.00	11545.34	21959.86	22385.12	22274.21	21643.98	20616.02	19018.43	17061.32
1979	0.00	0.00	0.00	0.00	0.00	12318.92	23431.25	23885.01	23766.66	23094.21	21997.35	20292.71
1980	0.00	0.00	0.00	0.00	0.00	0.00	13144.34	25001.22	25485.38	25359.12	24641.60	23471.26
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14025.02	26676.34	27192.95	27058.21	26292.63
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3642.43	8366.83	10473.02	11509.21
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3886.48	9460.92	11174.73
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4146.88	10094.82
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4424.73
57-67	267237.6	213038.9	163322.7	119821.2	83873.0	56110.4	35769.5	21640.0	12353.9	6610.4	3301.3	1532.7
68-72	406199.5	385189.4	357021.9	322536.7	129896.7	109479.5	89103.2	69521.7	51734.3	36621.2	24715.2	15863.8
73-74	149428.1	188264.4	187612.3	182982.7	88681.2	81257.7	72854.1	63992.8	54606.7	44669.3	34646.1	25460.8
75-85	0.0	17109.4	54735.6	90597.5	92902.7	113872.1	135425.4	157091.9	167240.6	168073.4	168105.7	167276.6
57-85	822865.1	803602.0	762692.4	715938.2	395353.4	360719.5	333152.1	312246.2	285935.2	255974.1	230768.3	210133.9

VEHICULAR EMISSION RATE OF NOX IN TONS/YEAR WITH NO CONTROL STRATEGY

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	9.58	4.69	2.11	0.89	0.35	0.12	0.04	0.01	0.00	0.00	0.00	0.00
1958	28.02	14.85	7.28	3.27	1.38	0.54	0.19	0.07	0.02	0.01	0.00	0.00
1959	35.71	20.35	10.79	5.29	2.38	1.00	0.39	0.14	0.05	0.02	0.00	0.00
1960	86.34	52.67	30.02	15.91	7.80	3.51	1.47	0.57	0.21	0.07	0.02	0.01
1961	138.85	89.69	54.71	31.19	16.53	8.10	3.64	1.53	0.60	0.21	0.07	0.02
1962	116.36	79.25	51.19	31.23	17.80	9.43	4.62	2.08	0.87	0.34	0.12	0.04
1963	314.73	225.40	153.50	99.15	60.48	34.48	18.27	8.95	4.03	1.69	0.66	0.24
1964	557.83	419.57	300.47	204.63	132.18	80.63	45.96	24.36	11.94	5.37	2.26	0.88
1965	644.49	514.75	387.16	277.27	188.83	121.97	74.40	42.41	22.48	11.01	4.96	2.08
1966	973.95	815.79	651.56	490.07	350.96	239.01	154.39	94.18	53.68	28.45	13.94	6.27
1967	1041.72	896.66	751.05	599.85	451.18	323.11	220.05	142.14	86.71	49.42	26.19	12.83
1968	1806.83	1575.04	1359.05	1138.35	909.19	683.84	489.74	333.52	215.44	131.42	74.91	39.70
1969	2264.62	2015.13	1759.60	1519.62	1272.86	1016.61	764.64	547.60	372.93	240.89	146.95	83.76
1970	2346.84	2129.85	1894.76	1654.08	1428.31	1196.37	955.53	718.69	514.70	350.52	226.42	138.12
1971	3221.03	2967.31	2691.49	2393.07	2087.90	1802.39	1509.71	1205.78	906.92	649.50	442.32	285.72
1972	3330.01	3118.10	2871.99	2604.10	2314.51	2018.60	1742.23	1459.32	1165.54	876.65	627.82	427.56
1973	2553.97	2487.20	2328.92	2139.07	1928.40	1703.77	1476.81	1270.59	1064.26	850.02	639.33	457.86
1974	1016.71	1900.52	1855.29	1737.23	1594.36	1435.01	1265.72	1095.19	941.40	788.53	629.79	473.69
1975	0.00	1239.81	2296.11	2233.41	2091.28	1921.56	1733.70	1533.03	1329.97	1144.77	958.88	765.84
1976	0.00	0.00	1322.85	2449.90	2383.00	2231.35	2050.26	1849.82	1635.71	1419.05	1221.45	1023.10
1977	0.00	0.00	0.00	1460.89	2699.55	2623.56	2456.60	2257.87	2038.32	1803.48	1565.58	1349.01
1978	0.00	0.00	0.00	0.00	1558.78	2880.44	2799.36	2621.22	2409.17	2174.90	1924.33	1670.49
1979	0.00	0.00	0.00	0.00	0.00	1663.22	3073.44	2986.93	2796.85	2570.59	2320.63	2053.27
1980	0.00	0.00	0.00	0.00	0.00	0.00	1774.66	3279.37	3187.06	2984.25	2742.83	2476.12
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1893.57	3499.09	3400.60	3184.19	2926.60
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2020.43	3733.51	3628.42	3397.52
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2155.80	3983.66	3871.53
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2300.24	4250.57
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2454.36
57-67	3947.6	3133.7	2399.8	1758.7	1229.9	821.9	523.4	316.4	180.6	96.6	48.2	22.4
68-72	12969.3	11805.4	10576.9	9309.2	8012.8	6717.8	5461.8	4264.9	3175.5	2249.0	1518.4	974.9
73-74	3570.7	4387.7	4184.2	3876.3	3522.8	3138.8	2742.5	2365.8	2005.7	1638.5	1269.1	931.6
75-85	0.0	1239.8	3619.0	6144.2	8732.6	11320.1	13888.0	16421.8	18916.6	21386.9	23830.2	26237.4
57-85	20487.6	20566.6	20779.9	21088.5	21498.0	21998.6	22615.8	23368.9	24278.3	25371.1	26665.9	28166.2

VEHICULAR EMISSION RATE OF NOX IN TONS/YEAR WITH ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	9.58	4.69	2.11	0.89	0.35	0.12	0.04	0.01	0.00	0.00	0.00	0.00
1958	28.02	14.85	7.28	3.27	1.38	0.54	0.19	0.07	0.02	0.01	0.00	0.00
1959	35.71	20.35	10.79	5.29	2.38	1.00	0.39	0.14	0.05	0.02	0.00	0.00
1960	86.34	52.67	30.02	15.91	7.80	3.51	1.47	0.57	0.21	0.07	0.02	0.01
1961	138.85	89.69	54.71	31.19	16.53	8.10	3.64	1.53	0.60	0.21	0.07	0.02
1962	116.36	79.25	51.19	31.23	17.80	9.43	4.62	2.08	0.87	0.34	0.12	0.04
1963	314.73	225.40	153.50	99.15	60.48	34.48	18.27	8.95	4.03	1.69	0.66	0.24
1964	557.83	419.57	300.47	204.63	132.18	80.63	45.96	24.36	11.94	5.37	2.26	0.88
1965	644.49	514.75	387.16	277.27	188.83	121.97	74.40	42.41	22.48	11.01	4.96	2.08
1966	973.95	815.79	651.56	490.07	350.96	239.01	154.39	94.18	53.68	28.45	13.94	6.27
1967	1041.72	896.66	751.05	599.85	451.18	323.11	220.05	142.14	86.71	49.42	26.19	12.83
1968	1806.83	1575.04	1359.05	1138.35	933.47	702.10	502.81	342.43	221.19	134.93	76.91	40.76
1969	2264.62	2015.13	1759.60	1519.62	1261.77	1007.76	757.98	542.83	369.68	238.80	145.67	83.03
1970	2346.84	2129.85	1894.76	1654.08	1423.24	1192.12	952.13	716.14	512.87	349.27	225.62	137.63
1971	3221.03	2967.31	2691.49	2393.07	2101.37	1817.44	1522.31	1215.85	914.50	654.92	446.01	288.11
1972	3330.01	3118.10	2871.99	2604.10	2338.30	2047.29	1770.49	1482.98	1184.44	890.87	638.00	434.49
1973	2553.97	2487.20	2328.92	2139.07	1834.42	1628.24	1418.11	1223.09	1024.48	818.24	615.43	440.74
1974	1016.71	1900.52	1855.29	1737.23	1538.60	1391.96	1234.31	1073.95	925.78	775.45	619.34	465.83
1975	0.00	1239.81	2296.11	2233.41	2021.98	1862.06	1687.76	1499.52	1307.31	1128.11	944.92	754.69
1976	0.00	0.00	1322.85	2449.90	2304.03	2157.41	1986.78	1800.81	1599.96	1394.88	1203.67	1008.21
1977	0.00	0.00	0.00	1460.89	2630.29	2539.31	2377.71	2190.14	1986.02	1765.34	1539.78	1329.03
1978	0.00	0.00	0.00	0.00	1544.54	2806.54	2709.46	2537.04	2336.89	2119.10	1883.63	1642.96
1979	0.00	0.00	0.00	0.00	0.00	1648.04	2994.58	2891.00	2707.03	2493.47	2261.09	2009.83
1980	0.00	0.00	0.00	0.00	0.00	0.00	1758.46	3195.23	3084.71	2888.41	2660.54	2412.59
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1876.28	3409.32	3291.39	3081.94	2838.80
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2001.98	3637.32	3511.89	3288.41
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2136.11	3881.45	3747.20
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2279.24	4141.52
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2431.95
57-67	3947.6	3133.7	2399.8	1758.7	1229.9	821.9	523.4	316.4	180.6	96.6	48.2	22.4
68-72	12969.3	11805.4	10576.9	9309.2	8058.1	6766.7	5505.7	4300.2	3202.7	2268.8	1532.2	984.0
73-74	3570.7	4387.7	4184.2	3876.3	3373.0	3020.2	2652.4	2297.0	1950.3	1593.7	1234.8	906.6
75-85	0.0	1239.8	3619.0	6144.2	8500.8	11013.3	13514.7	15990.0	18433.2	20854.5	23248.1	25605.2
57-85	20487.6	20566.6	20779.9	21088.5	21161.9	21622.2	22196.3	22903.7	23766.7	24813.6	26063.3	27518.2

VEHICULAR EMISSION RATE OF NOX IN TONS/YEAR WITH SEMI-ANNUAL I/M

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	9.58	4.69	2.11	0.89	0.35	0.12	0.04	0.01	0.00	0.00	0.00	0.00
1958	28.02	14.85	7.28	3.27	1.38	0.54	0.19	0.07	0.02	0.01	0.00	0.00
1959	35.71	20.35	10.79	5.29	2.38	1.00	0.39	0.14	0.05	0.02	0.00	0.00
1960	86.34	52.67	30.02	15.91	7.80	3.51	1.47	0.57	0.21	0.07	0.02	0.01
1961	138.85	89.69	54.71	31.19	16.53	8.10	3.64	1.53	0.60	0.21	0.07	0.02
1962	116.36	79.25	51.19	31.23	17.80	9.43	4.62	2.08	0.87	0.34	0.12	0.04
1963	314.73	225.40	153.50	99.15	60.48	34.48	18.27	8.95	4.03	1.69	0.66	0.24
1964	557.83	419.57	300.47	204.63	132.18	80.63	45.96	24.36	11.94	5.37	2.26	0.88
1965	644.49	514.75	387.16	277.27	188.83	121.97	74.40	42.41	22.48	11.01	4.96	2.08
1966	973.95	815.79	651.56	490.07	350.96	239.01	154.39	94.18	53.68	28.45	13.94	6.27
1967	1041.72	896.66	751.05	599.85	451.18	323.11	220.05	142.14	86.71	49.42	26.19	12.83
1968	1806.83	1575.04	1359.05	1138.35	937.52	705.15	504.99	343.91	222.15	135.51	77.24	40.94
1969	2264.62	2015.13	1759.60	1519.62	1259.92	1006.28	756.87	542.04	369.14	238.45	145.45	82.91
1970	2346.84	2129.85	1894.76	1654.08	1422.39	1191.41	951.57	715.71	512.56	349.06	225.48	137.54
1971	3221.03	2967.31	2691.49	2393.07	2103.61	1819.95	1524.41	1217.53	915.76	655.82	446.63	288.50
1972	3330.01	3118.10	2871.99	2604.10	2342.26	2052.07	1775.20	1486.93	1187.59	893.24	639.70	435.65
1973	2553.97	2487.20	2328.92	2139.07	1818.76	1615.66	1408.33	1215.18	1017.85	812.94	611.45	437.89
1974	1016.71	1900.52	1855.29	1737.23	1529.31	1384.78	1229.08	1070.41	923.18	773.27	617.60	464.52
1975	0.00	1239.81	2296.11	2233.41	2010.43	1852.14	1680.11	1493.94	1303.54	1125.33	942.59	752.84
1976	0.00	0.00	1322.85	2449.90	2290.87	2145.09	1976.20	1792.64	1594.00	1390.85	1200.70	1005.72
1977	0.00	0.00	0.00	1460.89	2618.74	2525.26	2364.56	2178.85	1977.31	1758.98	1535.48	1325.87
1978	0.00	0.00	0.00	0.00	1542.17	2794.22	2694.48	2523.01	2324.85	2109.80	1876.84	1638.37
1979	0.00	0.00	0.00	0.00	0.00	1645.50	2981.44	2875.02	2692.06	2480.62	2251.17	2002.60
1980	0.00	0.00	0.00	0.00	0.00	0.00	1755.76	3181.21	3067.65	2872.44	2646.83	2402.00
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1873.40	3394.35	3273.19	3064.89	2824.17
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1998.90	3621.76	3492.47	3270.22
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2132.83	3864.42	3726.47
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2275.74	4123.34
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2428.22
57-67	3947.6	3133.7	2399.8	1758.7	1229.9	821.9	523.4	316.4	180.6	96.6	48.2	22.4
68-72	12969.3	11805.4	10576.9	9309.2	8065.7	6774.9	5513.0	4306.1	3207.2	2272.1	1534.5	985.5
73-74	3570.7	4387.7	4184.2	3876.3	3348.1	3000.4	2637.4	2285.6	1941.0	1586.2	1229.0	902.4
75-85	0.0	1239.8	3619.0	6144.2	8462.2	10962.2	13452.5	15918.0	18352.6	20765.8	23151.1	25499.8
57-85	20487.6	20566.6	20779.9	21088.5	21105.8	21559.4	22126.4	22826.2	23681.4	24720.7	25962.9	27410.2

VEHICULAR EMISSION RATE OF NOX IN TONS/YEAR WITH ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	9.58	4.69	2.11	0.89	0.35	0.12	0.04	0.01	0.00	0.00	0.00	0.00
1958	23.02	14.85	7.28	3.27	1.38	0.54	0.19	0.07	0.02	0.01	0.00	0.00
1959	35.71	20.35	10.79	5.29	2.38	1.00	0.39	0.14	0.05	0.02	0.00	0.00
1960	86.34	52.67	30.02	15.91	7.80	3.51	1.47	0.57	0.21	0.07	0.02	0.01
1961	138.85	89.69	54.71	31.19	16.53	8.10	3.64	1.53	0.60	0.21	0.07	0.02
1962	116.36	79.25	51.19	31.23	17.80	9.43	4.62	2.08	0.87	0.34	0.12	0.04
1963	314.73	225.40	153.50	99.15	60.48	34.48	18.27	8.95	4.03	1.69	0.66	0.24
1964	557.83	419.57	300.47	204.63	132.18	80.63	45.96	24.36	11.94	5.37	2.26	0.88
1965	644.49	514.75	387.16	277.27	188.83	121.97	74.40	42.41	22.48	11.01	4.96	2.08
1966	973.95	815.79	651.56	490.07	350.96	239.01	154.39	94.18	53.68	28.45	13.94	6.27
1967	1041.72	896.66	751.05	599.85	451.18	323.11	220.05	142.14	86.71	49.42	26.19	12.83
1968	1806.83	1575.04	1359.05	1138.35	689.83	518.85	371.58	253.05	163.46	99.71	56.84	30.12
1969	2264.62	2015.13	1759.60	1519.62	932.45	744.73	560.15	401.15	273.19	176.47	107.65	61.36
1970	2346.84	2129.85	1894.76	1654.08	1051.77	880.98	703.63	529.23	379.01	258.11	166.73	101.71
1971	3221.03	2967.31	2691.49	2393.07	1552.91	1343.09	1124.99	898.52	675.81	483.99	329.60	212.91
1972	3330.01	3118.10	2871.99	2604.10	1728.00	1512.94	1308.39	1095.92	875.30	658.35	471.48	321.09
1973	2553.97	2487.20	2328.92	2139.07	2230.65	1979.94	1724.42	1487.28	1245.76	994.98	748.36	535.94
1974	1016.71	1900.52	1855.29	1737.23	1870.94	1692.62	1500.92	1305.92	1125.75	942.94	753.12	566.45
1975	0.00	1239.81	2296.11	2233.41	2021.98	1862.06	1687.76	1499.52	1307.31	1128.11	944.92	754.69
1976	0.00	0.00	1322.85	2449.90	2304.03	2157.41	1986.78	1800.81	1599.96	1394.88	1203.67	1008.21
1977	0.00	0.00	0.00	1460.89	2630.29	2539.31	2377.71	2190.14	1936.02	1765.34	1539.78	1329.03
1978	0.00	0.00	0.00	0.00	1544.54	2806.54	2709.46	2537.04	2336.89	2119.10	1883.63	1642.96
1979	0.00	0.00	0.00	0.00	0.00	1648.04	2994.58	2891.00	2707.03	2493.47	2261.09	2009.83
1980	0.00	0.00	0.00	0.00	0.00	0.00	1758.46	3195.23	3034.71	2888.41	2660.54	2412.59
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1876.28	3409.32	3291.39	3081.94	2838.80
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2001.98	3637.72	3511.89	3288.41
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2136.11	3881.45	3747.20
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2279.24	4141.52
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2431.95
57-67	3947.6	3133.7	2399.8	1758.7	1229.9	821.9	523.4	316.4	180.6	96.6	48.2	22.4
68-72	12969.3	11805.4	10576.9	9309.2	5955.0	5000.6	4068.7	3177.9	2366.8	1676.6	1132.3	727.2
73-74	3570.7	4387.7	4184.2	3876.3	4101.6	3672.6	3225.3	2793.2	2371.5	1937.9	1501.5	1102.4
75-85	0.0	1239.8	3619.0	6144.2	8500.8	11013.3	13514.7	15990.0	18433.2	20854.5	23248.1	25605.2
57-85	20487.6	20566.6	20779.9	21088.5	19787.2	20508.4	21332.3	22277.5	23352.1	24565.7	25930.1	27457.2

VEHICULAR EMISSION RATE OF NOX IN TONS/YEAR WITH SEMI-ANNUAL I/M & RETROFIT

MODEL YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1957	9.58	4.69	2.11	0.89	0.35	0.12	0.04	0.01	0.00	0.00	0.00	0.00
1958	28.02	14.85	7.28	3.27	1.38	0.54	0.19	0.07	0.02	0.01	0.00	0.00
1959	35.71	20.35	10.79	5.29	2.38	1.00	0.39	0.14	0.05	0.02	0.00	0.00
1960	86.34	52.67	30.02	15.91	7.80	3.51	1.47	0.57	0.21	0.07	0.02	0.01
1961	138.85	89.69	54.71	31.19	16.53	8.10	3.64	1.53	0.60	0.21	0.07	0.02
1962	116.36	79.25	51.19	31.23	17.80	9.43	4.62	2.08	0.87	0.34	0.12	0.04
1963	314.73	225.40	153.50	99.15	60.48	34.48	18.27	8.95	4.03	1.69	0.66	0.24
1964	557.83	419.57	300.47	204.63	132.18	80.63	45.96	24.36	11.94	5.37	2.26	0.88
1965	644.49	514.75	387.16	277.27	188.83	121.97	74.40	42.41	22.48	11.01	4.96	2.08
1966	973.95	815.79	651.56	490.07	350.96	239.01	154.39	94.18	53.68	28.45	13.94	6.27
1967	1041.72	896.66	751.05	599.85	451.18	323.11	220.05	142.14	86.71	49.42	26.19	12.83
1968	1806.83	1575.04	1359.05	1138.35	692.82	521.10	373.19	254.15	164.17	100.14	57.08	30.25
1969	2264.62	2015.13	1759.60	1519.62	931.08	743.64	559.33	400.56	272.79	176.21	107.49	61.27
1970	2346.84	2129.85	1894.76	1654.08	1051.15	880.45	703.21	528.91	378.78	257.96	166.63	101.64
1971	3221.03	2967.31	2691.49	2393.07	1554.57	1344.94	1126.54	899.76	676.74	484.65	330.06	213.20
1972	3330.01	3118.10	2871.99	2604.10	1730.93	1516.48	1311.87	1098.84	877.63	660.10	472.74	321.94
1973	2553.97	2487.20	2328.92	2139.07	2211.61	1964.64	1712.53	1477.66	1237.70	983.54	743.52	532.48
1974	1016.71	1900.52	1855.29	1737.23	1859.64	1683.90	1494.56	1301.61	1122.59	940.29	751.00	564.86
1975	0.00	1239.81	2296.11	2233.41	2010.43	1852.14	1680.11	1493.94	1303.54	1125.33	942.59	752.84
1976	0.00	0.00	1322.85	2449.90	2290.87	2145.09	1976.20	1792.64	1594.00	1390.85	1200.70	1005.72
1977	0.00	0.00	0.00	1460.89	2618.74	2525.26	2364.56	2178.85	1977.31	1758.98	1535.48	1325.87
1978	0.00	0.00	0.00	0.00	1542.17	2794.22	2694.48	2523.01	2324.85	2109.80	1876.84	1638.37
1979	0.00	0.00	0.00	0.00	0.00	1645.50	2981.44	2875.02	2692.06	2480.62	2251.17	2002.60
1980	0.00	0.00	0.00	0.00	0.00	0.00	1755.76	3181.21	3067.65	2872.44	2646.83	2402.00
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1873.40	3394.35	3273.19	3064.89	2824.17
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1998.90	3621.76	3492.47	3270.22
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2132.83	3864.42	3726.47
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2275.74	4123.34
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2428.22
57-67	3947.6	3133.7	2399.8	1758.7	1229.9	821.9	523.4	316.4	180.6	96.6	48.2	22.4
68-72	12969.3	11805.4	10576.9	9309.2	5960.6	5006.6	4074.1	3182.2	2370.1	1679.1	1134.0	728.3
73-74	3570.7	4387.7	4184.2	3876.3	4071.2	3648.5	3207.1	2779.3	2360.3	1928.8	1494.5	1097.3
75-85	0.0	1239.8	3619.0	6144.2	8462.2	10962.2	13452.5	15918.0	18352.6	20765.8	23151.1	25499.8
57-85	20487.6	20566.6	20779.9	21088.5	19723.9	20439.3	21257.2	22196.0	23263.6	24470.3	25827.9	27347.9