DEPARTMENT OF THE ENVIRONMENT
CONSERVATION AND PROTECTION
ENVIRONMENTAL PROTECTION SERVICE
PACIFIC REGION

1985 ANNUAL REPORT

LEAD-FREE GASOLINE REGULATIONS IMPLEMENTATION PROGRAM

Regional Program Report: 86-07

By

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ABSTRACT

This report describes the lead-free gasoline monitoring program conducted in British Columbia during 1985. Samples of lead-free gasoline were purchased and analyzed to check the lead content of lead-free gasoline and to verify compliance with the Lead-Free Gasoline Regulations published pursuant to the Clean Air Act. The diameter of leaded gasoline pump nozzles was also surveyed to determine the extent of nozzle switching practices.

RÉSUMÉ

Ce rapport décrit le programme de surveillance de l'essence sans plomb mené en Colombie Britannique en 1985. Les échantillons d'essence sans plomb ont été achetés et analysés pour contrôler le contenu en plomb de l'essence sans plomb et en vérifier la conformité avec les règlements sur l'essence sans plomb publiés selon la loi sur la qualité de l'air. Le diamètre du bec verseur de la pompe à l'essence avec plomb fut aussi étudié pour déterminer l'ampleur des pratiques de changements du bec verseur.

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SUMMARY

This Regional office of the Environmental Protection Service is responsible for monitoring the lead level in lead-free gasoline sold in British Columbia to ensure compliance with the federal Lead-Free Gasoline Regulations under the Clean Air Act.

In the 1985 compliance monitoring program, 567 samples of lead-free gasoline were purchased from 338 gasoline retail outlets. Fifteen (15) samples contained lead in excess of 0.013 grams per litre and hence the non-compliance rate was 2.6%. Nozzles of leaded gasoline pumps were also checked, and 114 out of 1215 nozzles were undersized. The nozzle switching rate was therefore 9.4%. The substantial reduction in nozzle switching as compared to 1983 (73%) is attributed to an increased public and industry awareness of the importance of preventing mis-fueling of vehicles designed to operate on lead-free gasoline.

Adding the 1985 monitoring results to the total monitoring effort in British Columbia, the number of contaminations and nozzle switching found in the past twelve years may be summarized as follows.

YEAR	TOTAL GASOLINE SAMPLES	CONTAMI-NATIONS	RATE OF CONTAMI-NATIONS	TOTAL NOZZLES SURVEYED	UNDER-SIZED NOZZLES	NOZZLE SWITCH RATE
1974	317	7	2.2 %			
1975	207	3	1.5 %			
1976	284	12	4.2 %			
1977	637	11	1.7 %			
1978	93	6	6.5 %			
1979	155	15	9.7 %			
1980	251	5	2.0 %	522	0	0 %
1981	311	9	3.0 %	434	43	10 %
1982	-	-	-	-	-	-
1983	331	6	1.8 %	626	457	73 %
1984	398	10	2.5 %	887	123	14 %
1985	567	15	2.6 %	1215	114	9 %

1 PREAMBLE

Effective July 1, 1974, the Lead-Free Gasoline Regulations placed a limit of 0.013 grams of lead per litre of lead-free gasoline that allows a very low level of lead contamination caused by routine product handling of the different grades of gasoline. Monitoring programs have been conducted by the EPS Regional office in B.C. by taking spot samples from retail outlets and petroleum refineries since the promulgation of these regulations. This status report summarizes the monitoring results for 1985.

2 PROGRAM PLANNING

Lead-free gasoline samples were purchased from retail outlets in major urban centres such as Vancouver and Victoria, and the major tourist routes from Victoria to Nanaimo and from Vancouver to the Okanagan area. The program included the actual sampling and field sample analysis, supporting laboratory analyses and contact with the oil companies when non-compliance and corrective actions were necessary.

3 ANALYSIS OF LEAD CONCENTRATION

A field test kit (manufactured by S.S. Scientific Inc., California), using a colorimetric measurement principle, was used to analyze the gasoline samples for lead concentration. Whenever a sample was identified by the field test to contain lead in excess of 0.013 g/L, a duplicate sample was sent to the EPS regional laboratory for confirmation analysis using the atomic absorption method. When enforcement action was initiated, the laboratory was able to provide analysis results within 24 hours after receipt of a sample.

4 SAMPLING RESULTS

During 1985, a total of 338 gasoline stations were visited and 567 samples of lead-free gasoline were purchased. Fifteen samples from fourteen stations were found to contain lead in excess of 0.013 g/L. Consequently, the overall non-commpliance rate based on all samples collected in B.C. was 2.6%.

In the Lower Mainland, 5 of 305 samples contained excessive lead, with a non-compliance rate of 1.6%. Of the 78 Vancouver Island samples, 3 contained excessive lead, with a non-compliance rate of 3.8%. In the Okanagan area, 7 of 184 samples contained excessive lead, with a non-compliance rate of 3.8%. The monitoring results are listed in Tables 1 and 2, and the non-compliance samples are listed in Table 3.

5 NOZZLE SURVEY

During the sampling of lead-free gasoline from retail outlets in B.C., a survey was also carried out to measure the diameter of the dispensing nozzles used for leaded gasoline. A total of 1,214 leaded gasoline nozzles were measured and 114 were found to be undersized. This resulted in an overall nozzle switching rate of 9.4%.

In the lower Mainland, 28 of the measured 649 leaded nozzles were undersized. Thus the nozzle switching rate was 4.3% in Greater Vancouver. On Vancouver Island, 15 of the 171 measured nozzles were undersized. The nozzle switching rate was therefore 8.8%. In the Okanagan area, 71 of the measured 395 nozzles were undersized. The nozzle switching rate was higher in this area, at 18.0%.

Almost all (except 5) of the 114 undersized nozzles were 20.6 mm in diameter. This nozzle size is designed for dispensing lead-free gasoline while a nozzle diameter of 23.8 mm is used for dispensing leaded gasoline. Five of the undersized nozzles were in the intermediate size range between 20.6 mm and 23.8 mm in diameter and this size of nozzle can be used to fuel cars designed for leaded and lead-free gasoline.

The overall nozzle survey results in B.C. are presented in Table 4. The survey results for the Lower Mainland, the Okanagan area, and Vancouver Island are presented in Tables 5, 6 and 7, respectively, where the survey results are grouped by brand name and area surveyed.

6 PRICE SURVEY

A survey of price for motor fuel was also carried out during the lead-free gasoline monitoring program. Eight different types of fuel were encountered during the sampling period:

(1) Premium Unleaded
(2) Regular Unleaded
(3) Premium Leaded
(4) Regular Leaded
(5) Diesel
(6) Propane
(7) Natural Gas
(8) Marine

Among the 4 grades of motor gasoline, the lowest price recorded was 42.9 cents per litre for Regular Leaded gasoline on Vancouver Island. The highest price was 57.3 cents per litre for Premium Unleaded in Vancouver. The price of diesel ranged from 35.9 to 52.4 cents per litre, and propane was in the 25.0 to 31.5 cents per litre range. Two of the surveyed gas stations sold natural gas at 42.0 cents per kg. The survey results are presented in Tables 8, 9 and 10 for the lower Mainland, the Okanagan area, and Vancouver Island, respectively.

7 MOTOR GASOLINE PRODUCTION IN B.C.

The production of motor gasoline in B.C., in 1985 was some 3.7 million cubic metres. The production of leaded regular declined slightly to some 2.2 million cubic metres while regular unleaded increased to some 1.2 million cubic metres. The premium grade of both leaded and unleaded were below 0.2 million cubic metres. The use of lead in gasoline production also continued to decline, to some 0.9 million kilograms in 1985. The average lead concentration in gasoline declined to 0.25 grams per litre in 1985. These results are depicted in Figures 1, 2 and 3.

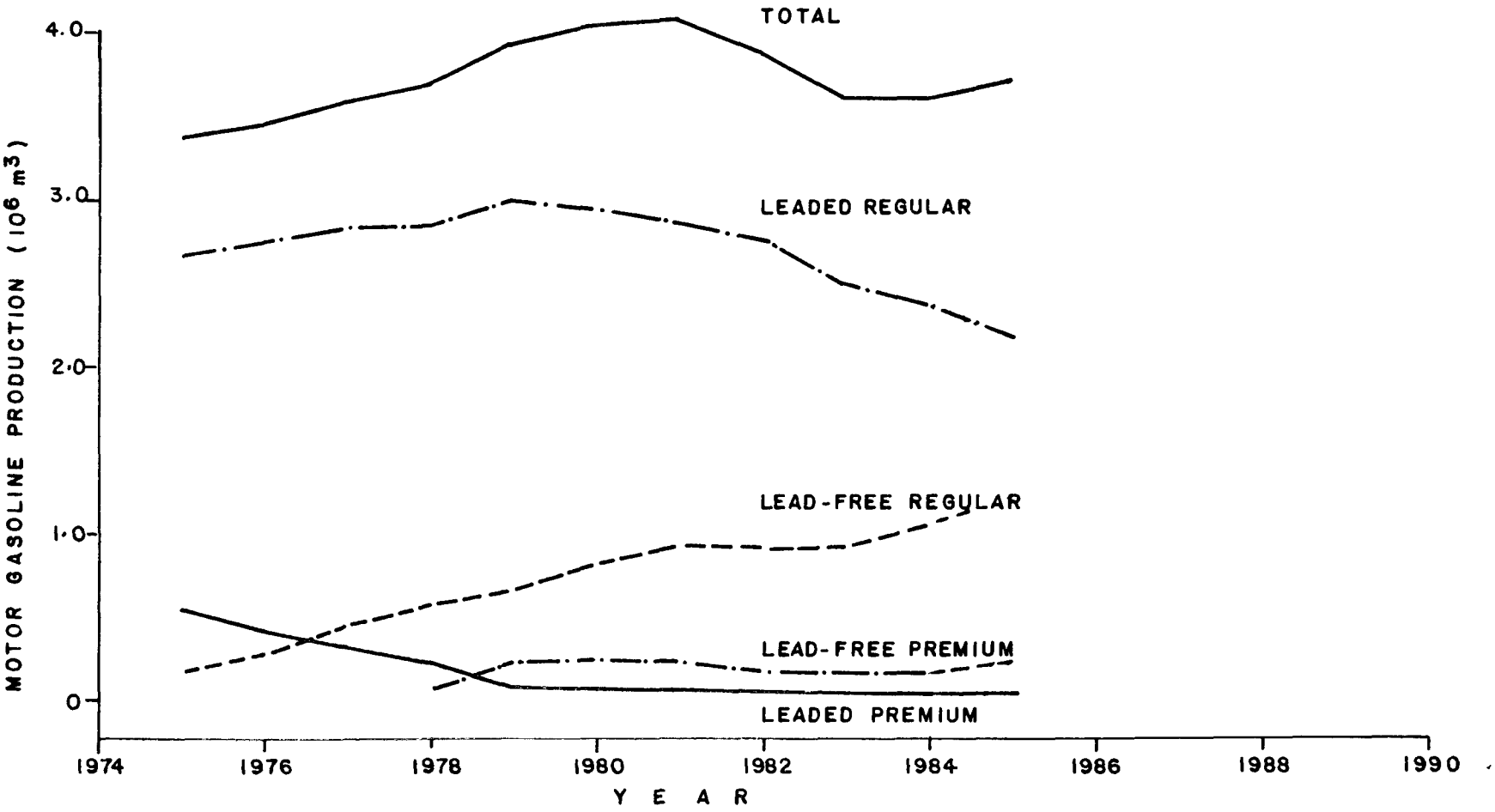

FIGURE 1 MOTOR GASOLINE PRODUCTION IN BRITISH COLUMBIA

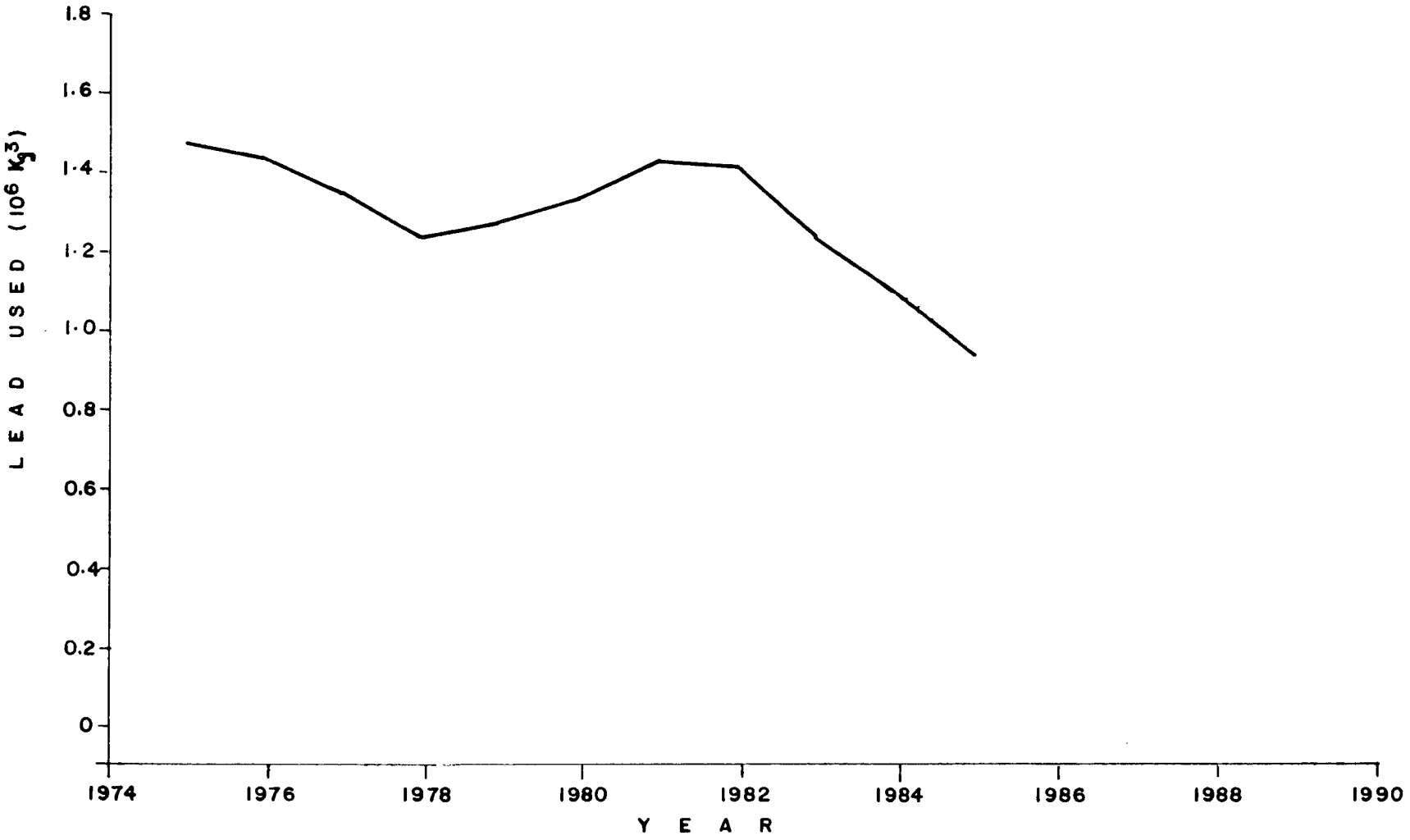

FIGURE 2 LEAD USED IN GASOLINE PRODUCTION (B.C.)

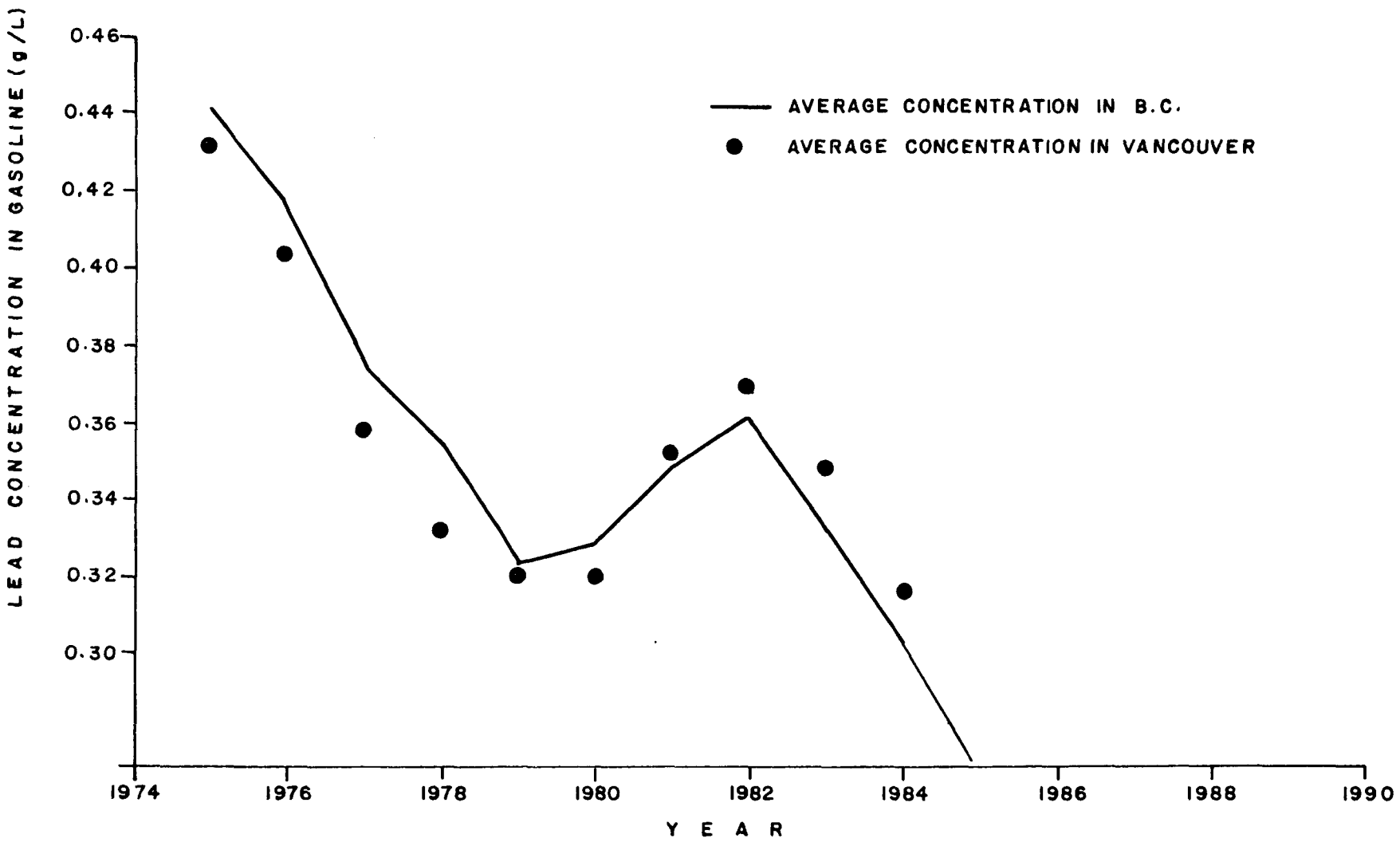

FIGURE 3 MEAN LEAD CONCENTRATION IN MOTOR GASOLINE

DISCUSSION

The possible cause of 13 non-compliance cases was contamination during gasoline handling. The usual method of purge and refill had successfully brought the products within lead specifications. Esso identified one incident of a minor intermittent leak between adjacent cargo tank compartments within a delivery truck; and as a result of this finding, the leak had been repaired. Texaco identified the cause of a contamination as the failure of clearing the leaded grade during unloading procedures in a bulk terminal. As a result of this finding, Texaco had taken additional actions to emphasize to the terminal operators that the exact unloading procedures should be carefully followed.

As a result of the EPS survey of nozzle switching in 1983, when switching rate was high at 68% in Vancouver, the B.C. Ministry of Environment advised the public, gasoline marketers, and the oil industry of the air pollution impact caused by vehicle misfueling and nozzle switching. This public information program has succeeded to encourage oil companies and station operators to use the correct nozzles. The 1984 EPS nozzle survey results showed a switching rate of 7% in Vancouver and the 1985 summer survey showed a reduction to 4% switching rate, which agreed with the provincial survey results of 3% (Vancouver) in the spring of 1985. A copy of the news release by the B.C. Ministry of Environment regarding nozzle switching is enclosed in Appendix I.

The laboratory of one oil company had a problem with their analysis of lead in gasoline. Analysis of a sample by this laboratory indicated a lead concentration of 0.0046 g/L while the same sample was found to contain 0.032 grams of lead per litre, by the EPS Pacific regional laboratory. The company laboratory employed the atomic absorption method using a Perkin-Elmer Model 303 Atomic Absorption Spectrophotometer. The discrepancy in results may be caused by an error of the company's laboratory in preparing the reference standards or in diluting the sample. As a first step to resolve this discrepancy of analytical results, NBS standards will be sent to this companys' laboratory to check its analytical procedures.

TABLE 1 LEAD-FREE GASOLINE MONITORING - AREAS SAMPLED

AREA SAMPLED	DATE SAMPLED	NO. OF SAMPLES	NO. OF NON-COMPLIANCE	PERCENTAGE
LOWER MAINLAND				
West Vancouver	May 30, June 4	9	1	11.1
North Vancouver	May 30, June 4	18	0	-
Vancouver	June 6, 10, 13, 26 July 8	93	3	3.2
Burnaby	June 13, 17	38	0	0
Coquitlam	June 17, 20	30	0	0
Port Moody	June 17	6	0	0
Port Coquitlam	June 20	8	0	0
Pitt Meadows	June 20	5	0	0
Maple Ridge	June 20	20	0	0
Richmond	June 26	40	1	2.5
Delta	July 2	32	0	0
Surrey	July 2	6	0	0
TOTAL		305	5	1.6
OKANAGAN				
Kelowna	July 11	28	0	0
Vernon	July 11	21	0	0
Armstrong	July 11	7	1	14.3
Falkland	July 13	2	0	0
Monte Lake	July 13	2	0	0
Kamloops	July 13	33	2	6.1
Merritt	July 13	7	1	14.3
Princeton	July 14	11	0	0
Hedley	July 14	1	0	0
Kereomeos	July 14	5	0	0
Osoyoos	July 14	13	1	0
Oliver	July 14	8	0	0
Penticton	July 16, 17	37	2	5.4
Hope	July 17	9	0	0
TOTAL		184	7	3.8
VANCOUVER ISLAND				
Victoria	August 7	49	3	6.1
Nanaimo	August 8	29	0	-
TOTAL		78	3	3.8
GRAND TOTAL		567	15	2.6

TABLE 2 LEAD-FREE GASOLINE MONITORING - STATIONS SURVEYED

BRAND	LOWER MAINLAND	OKANAGAN	VANCOUVER ISLAND	TOTAL	NO. OF NON-COMPLIANCES
A	39	13	6	58	2
B	31	16	7	54	2
C	27	18	6	51	2
D	19	17	5	41	3
E	17	9	6	32	0
F	11	10	3	24	1
G	10	7	2	19	2
H	5	8	1	14	1
I	5	5	0	10	0
J	7	3	0	10	1
K	2	2	0	4	0
L	0	0	3	3	0
M	1	1	1	3	0
N	1	2	0	3	0
O	1	1	0	2	0
P	0	1	1	2	0
Q	0	2	0	2	1
R	1	0	0	1	0
S	1	0	0	1	0
T	0	0	1	1	0
U	0	1	0	1	0
V	1	0	0	1	0
W	0	0	1	1	0
TOTAL	179	116	43	338	15

TABLE 3 LEAD-FREE GASOLINE MONITORING - NON-COMPLIANCES

SAMPLE NUMBER	QUICK TEST Pb CONCENTRATION (g/L)	A.A. TEST Pb CONCENTRATION (g/L)	BRAND	TYPE	DATE SAMPLED
LOM-002	0.0150	0.039	D	R.U.	85.05.30
LOM-086	0.0141	0.025	J	R.U.	85.06.10
LOM-101	0.0178	0.027	G	R.U.	85.06.10
LOM-102	0.0297	0.036	G	P.U.	85.06.10
LOM-226*	0.0178	0.030	G	R.U.	85.06.26
LOM-237	0.0178	0.033	C	R.U.	85.06.26
KG-049	0.0149	0.032	Q	P.U.	85.07.11
OKG-062	0.0231	0.038	F	P.U.	85.07.11
OKG-084	0.0418	0.057	H	P.U.	85.07.13
OKG-096	0.0211	0.038	A	R.U.	85.07.13
OKG-125	0.0140	--	D	P.U.	85.07.14
OKG-140	0.0306	0.059	D	R.U.	85.07.16
OKG-147	0.0396	0.048	B	R.U.	85.07.16
VIS-026	0.0306	0.043	C	P.U.	85.08.07
VIS-038	0.0284	0.043	B	R.U.	85.08.07
VIS-044	0.0284	0.220	A	R.U.	85.08.07

* Repeated sample

TABLE 4 NOZZLE SURVEY - BRITISH COLUMBIA

Total Number of Stations Surveyed: 338
Total Number of Leaded Nozzles Measured: 1,215
Total Number of Undersized Nozzles: 114 or 9.38%

BRAND	NUMBER OF LEADED NOZZLES	NUMBER OF INCORRECT NOZZLES	PERCENTAGE
Q	3	2	66.7
J	36	21	58.3
N	10	4	40.0
L	26	9	34.6
K	18	4	22.2
G	72	12	16.7
H	45	6	13.3
I	31	4	12.9
F	62	8	16.7
P	9	1	11.1
C	178	19	10.7
M	10	1	10.0
A	235	11	4.7
B	180	8	4.4
D	151	4	2.6
T	2	0	-
R	2	0	-
S	4	0	-
V	4	0	-
W	4	0	-
U	5	0	-
O	11	0	-
E	115	0	-

TABLE 5 NOZZLE SURVEY - LOWER MAINLAND

Total Number of Stations Surveyed: 179
Total Number of Leaded Nozzles Measured: 649
Total Number of Undersized Nozzles: 28 or 4.31%

BRAND	NUMBER OF LEADED NOZZLES	NUMBER OF INCORRECT NOZZLES	PERCENTAGE
J	22	13	59.1
N	4	1	25.0
I	14	3	21.4
G	34	4	11.8
H	15	1	6.7
F	26	1	3.8
A	153	4	2.6
D	72	1	1.4
R	4	0	-
S	4	0	-
V	4	0	-
M	4	0	-
O	6	0	-
K	8	0	-
E	65	0	-
C	102	0	-
B	112	0	-
AREA			
Pitt Meadows	8	3	37.5
Surrey	16	6	37.5
Port Coquitlam	16	2	12.5
North Vancouver	68	8	8.8
Maple Ridge	46	3	6.5
Burnaby	80	3	3.8
Delta	62	2	3.2
Coquitlam	52	1	1.9
Vancouver	187	2	1.1
Port Moody	10	0	-
West Vancouver	22	0	-
Richmond	82	0	-

TABLE 6 NOZZLE SURVEY - OKANAGAN

Total Number of Stations Surveyed: 116
Total Number of Leaded Nozzles Measured: 395
Total Number of Undersized Nozzles: 71 or 17.97%

BRAND	NUMBER OF LEADED NOZZLES	NUMBER OF INCORRECT NOZZLES	PERCENTAGE
Q	3	2	66.7
J	14	8	57.1
N	6	3	50.0
K	10	4	40.0
C	56	17	30.4
G	31	8	25.8
M	4	1	25.0
F	24	6	25.0
H	27	5	18.5
B	44	8	18.2
A	58	6	10.3
I	17	1	5.9
D	57	2	3.5
U	5	0	-
O	5	0	-
P	6	0	-
E	28	0	-
AREA			
OLIVER	12	6	50.0
MONTE LAKE	3	1	33.3
ARMSTRONG	12	4	33.3
VERNON	45	12	26.7
FALKLAND	4	1	25.0
KEREMEOS	12	3	25.0
OSOYOOS	22	5	22.7
KELOWNA	67	15	22.4
KAMLOOPS	68	11	16.2
PENTICTON	84	10	11.9
HOPE	21	2	9.5
PRINCETON	30	1	3.3
HEDLEY	2	0	-
MERRITT	13	0	-

TABLE 7 NOZZLE SURVEY - VANCOUVER ISLAND

Total Number of Stations Surveyed: 43
Total Number of Leaded Nozzles Measured: 171
Total Number of Undersized Nozzles: 15 or 8.77%

BRAND	NUMBER OF LEADED NOZZLES	NUMBER OF INCORRECT NOZZLES	PERCENTAGE
L	26	9	34.6
P	3	1	33.3
C	20	2	10.0
F	12	1	8.3
D	22	1	4.5
A	24	1	4.2
T	2	0	-
M	2	0	-
H	3	0	-
W	4	0	-
G	7	0	-
E	22	0	-
B	24	0	-
AREA			
VICTORIA	105	9	8.6
NANAIMO	66	6	9.1

TABLE 8 GASOLINE PRICE SURVEY - LOWER MAINLAND

CENTS/LITRE (# of stations)						
PREMIUM UNLEADED	REGULAR UNLEADED	PREMIUM LEADED	REGULAR LEADED	DIESEL	PROPANE	NATURAL GAS
57.3 (2)	56.3 (2)	54.6 (1)	54.5 (2)	47.2 (1)	28.2 (1)	42.0 (2)
57.1 (1)	56.1 (1)	54.4 (8)	54.3 (1)	46.8 (1)	26.9 (2)	
56.8 (3)	55.9 (1)	53.9 (2)	54.0 (1)	46.6 (1)	25.9 (1)	
56.7 (24)	55.8 (2)	53.5 (2)	53.9 (32)	46.5 (2)	25.0 (1)	
56.6 (2)	55.7 (28)		53.8 (4)	46.2 (4)		
56.5 (4)	55.6 (4)		53.7 (5)	45.9 (5)		
56.4 (6)	55.5 (4)		53.6 (6)	45.8 (1)		
56.2 (81)	55.4 (6)		53.5 (1)	45.2 (1)		
56.1 (7)	55.3 (1)		53.4 (92)	45.0 (1)		
55.8 (1)	55.2 (90)		53.3 (7)	44.9 (1)		
55.7 (6)	55.1 (8)		53.2 (1)	42.9 (1)		
55.3 (16)	54.9 (1)		53.0 (1)	42.3 (1)		
54.4 (1)	54.8 (1)		52.9 (5)	41.9 (2)		
	54.7 (5)		52.5 (19)	40.8 (3)		
	54.3 (22)		52.1 (3)	40.5 (1)		
HIGH PRICE (cents/L)						
57.3	56.3	54.6	54.5	47.2	28.2	42.0
LOW PRICE (cents/L)						
54.4	54.3	53.5	52.1	40.5	25.0	42.0
AVERAGE PRICE (cents/L)						
56.20	55.20	54.20	53.40	44.64	26.58	42.0

TABLE 10 GASOLINE PRICE SURVEY - OKANAGAN

CENTS/LITRE (# of stations)					
PREMIUM UNLEADED	REGULAR UNLEADED	PREMIUM LEADED	REGULAR LEADED	DIESEL	PROPANE
55.6 (3) 55.2 (1) 53.4 (1) 53.2 (1) 53.1 (1) 52.7 (1) 52.6 (10) 52.5 (2) 52.2 (25) 51.5 (1) 51.0 (1) 50.2 (4) 48.7 (1) 48.6 (3) 48.5 (1) 48.2 (4) 47.7 (11) 46.6 (1)	54.6 (3) 54.4 (1) 54.2 (1) 52.4 (1) 52.1 (3) 52.0 (1) 51.9 (1) 51.7 (1) 51.6 (11) 51.5 (2) 50.1 (2) 50.0 (1) 49.7 (2) 49.6 (1) 49.2 (5) 47.9 (1) 47.6 (4) 47.5 (2) 47.4 (1) 47.2 (15) 47.1 (1) 47.0 (1) 46.6 (1) 45.6 (1)	53.8 (1) 50.4 (2) 48.4 (1)	52.8 (3) 52.6 (1) 52.4 (1) 50.3 (4) 49.9 (2) 49.8 (11) 49.4 (39) 49.3 (1) 48.3 (2) 47.9 (4) 47.4 (5) 45.8 (4) 45.7 (1) 45.4 (16) 45.3 (2) 45.1 (1) 44.9 (10)	49.9 (1) 48.5 (1) 44.3 (1) 44.2 (1) 43.9 (4) 43.4 (2) 43.3 (1) 43.1 (1) 42.9 (3) 42.1 (1)	31.5 (1) 31.4 (1)
HIGH PRICE (cents/L)					
55.6	54.6	53.8	52.8	49.9	31.5
LOW PRICE (cents/L)					
46.6	45.6	48.4	44.9	40.1	31.4
AVERAGE PRICE (cents/L)					
51.12	48.77	50.75	48.16	43.71	31.45

TABLE 11 GASOLINE PRICE SURVEY - VANCOUVER ISLAND

CENTS/LITRE (# of stations)						
PREMIUM UNLEADED	REGULAR UNLEADED	PREMIUM LEADED	REGULAR LEADED	DIESEL	PROPANE	MARINE
55.9 (1)	53.3 (1)	50.9 (1)	50.4 (7)	52.4 (2)	27.0 (1)	45.3 (1)
54.3 (1)	52.9 (1)		49.9 (19)	49.9 (2)		38.2 (1)
53.5 (1)	52.5 (1)		43.4 (15)	47.9 (3)		
53.2 (5)	52.2 (6)		42.9 (1)	46.6 (1)		
53.0 (1)	52.0 (1)			35.9 (1)		
52.9 (1)	51.9 (2)					
52.8 (1)	51.7 (15)					
52.7 (11)	51.4 (1)					
52.4 (1)	45.4 (1)					
46.2 (12)	45.2 (14)					
46.0 (1)	45.0 (1)					
HIGH PRICE (cents/L)						
55.9	53.5	50.9	50.4	52.4	27.0	45.3
LOW PRICE (cents/L)						
46.0	45.0	50.9	42.9	35.9	27.0	38.2
AVERAGE PRICE (cents/L)						
50.58	49.50	50.9	47.50	47.87	27.0	41.75

APPENDIX I

NEWS RELEASE BY THE B.C. MINISTRY OF ENVIRONMENT
REGARDING NOZZLE SWITCHING
IN VANCOUVER

Province of British Columbia

Ministry of Environment

NEWS RELEASE

RELEASED BY: Minister's Office
Ministry of Environment
387-5202

May 08, 1985

GAS PUMP NOZZLES CHECKED

Only three percent of the nozzles on leaded gasoline pumps in the Vancouver-Lower Mainland area are non-conforming, according to survey results released today by Environment Minister Austin Pelton.

"This is a significant improvement from the comparable seven percent in 1984, and the 68 percent in 1983," said Pelton.

The Minister said that a larger diameter nozzle allows leaded gas to be used in newer model cars that require unleaded fuel. This increases pollution emissions.

The survey was part of a report released last December that drew special attention to this practice since the use of leaded gas contributes to high levels of ozone in the Lower Mainland.

Pelton commended the petroleum industry for their performance in helping to control air quality problems in the Lower Mainland area.

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For further information contact Dr. R. Wilson, Ministry of Environment, Victoria, 387-4321.

APPENDIX II

HISTORICAL MONITORING RESULTS

APPENDIX II LIST OF CONTAMINATED LEAD-FREE GASOLINE (1974-1981)

YEAR	LEAD CONCENTRATIONS (g/IG) IN THE IDENTIFIED CONTAMINATIONS								
	C	B	D	A	E	H	F	G	OTHERS
1974	0.950	0.230	0.123 0.076	0.064 0.068	0.072	- -	- -	- -	- -
1975	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	0.190 0.180 0.080
1976	-	0.110 0.070	0.090	0.090 0.070	0.090 0.070 0.150	-	-	2.000	0.420 0.320 0.080
1977	-	0.127	0.180 0.230	0.090 0.080 0.190 0.080 1.000	0.123	-	-	-	-
1978	-	-	0.062	0.163 0.079 0.149	0.089 0.064	-	-	-	-
1979	0.086	0.244 0.244	0.065 0.244	0.082	0.076 0.263 0.147 0.101 0.168	-	0.063 0.147	0.282 0.263	-
1980*	0.074	0.071 0.063 0.078	0.942	0.068 0.065 0.188	-	-	0.090	-	-
1981*	0.220 0.076 0.093 0.082 0.063 0.063 0.069	0.070 0.200 0.200	0.130 0.100	0.200 0.085 0.088 0.096 0.072 0.062 0.074	0.065	0.150	0.150		0.200 0.104

* Data of Whitehorse Branch included

APPENDIX II LIST OF CONTAMINATED LEAD-FREE GASOLINE (1982-1985)

YEAR	LEAD CONCENTRATIONS (g/IG) IN THE IDENTIFIED CONTAMINATIONS								
	C	B	F	A	E	H	F	G	OTHERS
1982	-	-	-	-	-	-	-	-	-
1983	0.0172	0.0172	0	0.066 0.0273 0.048	0.026	0	0	0	0
1984	0	0.044 0.030 0.016	0.030 0.017	0	0	0.017	0.037	0.037	0.040 0.021
1985	0.018 0.030	0.040 0.028	0.015 0.014 0.031	0.028 0.021	0	0.042	0.023	0.018 0.030	0.014 0.015

APPENDIX II NUMBER OF CONTAMINATED SAMPLES (1974-1985)

YEAR	NO. OF CONTAMINATIONS IDENTIFIED IN EPS (Pacific & Yukon Region) MONITORING PROGRAM									TOTAL NO. OF SAMPLES
	C	B	D	A	E	H	F	G	OTHERS	
1974	1	1	2	2	1	0	0	0	0	317
1975	-	-	-	-	-	-	-	-	3	207
1976	0	2	1	2	3	0	0	1	3	284
1977	0	1	2	5	1	0	1	0	1	637
1978	0	0	1	3	2	0	0	0	0	93
1979	1	2	2	1	5	0	2	2	0	155
1980	1	3	2	2	0	0	1	0	0	273
1981	7	3	2	7	1	1	1	-	2	350
1982	-	-	-	-	-	-	-	-	-	-
1983	1	1	0	3	1	0	0	0	0	331
1984	0	3	2	0	0	1	1	1	2	398
1985	2	2	3	2	0	1	1	2	2	567
TOTAL	13	18	17	27	14	3	7	6	13	3612/118