Appendix H

Survey Results for D-FW Point Source VOC and NO_x Inventory to Backcast 1990 Emissions and Predict 1999 Emissions

Texas Natural Resource Conservation Commission

INTEROFFICE MEMORANDUM

To: Randy Hamilton Date: Jan. 20, 1999

From: Kathy Pendleton

Subject: Using Survey Results for DFW Point Source VOC and NOx Inventory to Backcast 1990 Emissions and Predict 1999 Emissions

Background

A survey was sent to companies in 1996 to determine the cause of emissions change between 1990 and 1996. The survey forms were sent to companies that were in the inventory in both 1990 and 1996. The survey forms listed the NO_X and VOC emissions reported from each company for 1990 and requested the company to include their 1996 emissions and state the amount of any change of emissions, in tons per year (tpy), according to reason. The reasons for the change were listed as emission factor change, calculation methodology change, control device added, process change, added leaking fugitive inspection plan (VOC only), equipment shutdown or startup, and different operating rates.

For the DFW area, 135 forms were sent out and 77 were received for a 57% response rate for this area. A table grouping the 77 survey respondents according to their Standard Industrial Classification (SIC) code is attached to the end of this memo. The NO_X and VOC emission changes identified in the survey numbers were compared with the NO_X and VOC changes in the entire point source inventory between the two years. Reductions were reported in both the inventory and the survey emissions of NO_X and VOC, as summarized below:

NO_X	Inventory (tpod)[1]	Inventory (tpy)	Survey (tpy)
1990	108.86	26,935	23,860
1996	71.80	16,265	13,776
Difference ('90-'96)	37.06	10,670	10,084
percentage decrease	34.04%	39.61%	42.21%

[1]Tons per ozone day emissions are not part of change survey but are used for SIP projections.

VOC	Inventory (tpod)[1,2]	Inventory (tpy)	Survey (tpy)
1990	65.27	13,073	3,821
1996	26.30	8,871	1,712
Difference ('90-'96)	38.97	4,202	2,109
percentage decrease (%)	59.71%	32.14%	55.19%

[2]Rule effectiveness is applied to VOC tpod.

The survey results show that a significant percentage of the DFW emissions and sources are covered by the change survey. Because the survey data is based on actual data as reported by a significant percentage of the sources in the area, it is desired to use the data to demonstrate trends in "real" emissions from 1990 to 1996, and to predict emissions trends for the 1996 to 1999 time period.

The reasons for the changes reported were reviewed to determine "paper" or non-real changes versus actual emissions changes. The changes in emissions due to different emissions factors and calculation methodology changes were considered "paper". All other changes are considered as change reasons that actually affected emissions.

The break down for the changes reported in the survey is as follows:

Change Between 1990 and 1996 (Survey Results)	Amount NO_X (tpy)	NO_x Change (%)	Amount VOC (tpy)	VOC Change (%)
Control Devices Added	4	0.040	-451	-21.38
Inspection plan for leaking VOC added	NA	NA	-18	-0.85
Process Changes	29	0.288	-523	-24.80
Equipment Startup	27	0.268	107	5.07
Equipment Shutdown	-8	-0.079	-974	-46.18
Operating Rates	-40	-0.397	-180	-8.53
Net real change	12	0.119	-2,039	-96.68
Paper change	-10,084	-100.119	-70	-3.32
Total change = Net real + Paper change	-10,072	-100.000	-2,109	-100.00

The third and fifth columns show the survey change by reason as a percentage of the total change in the survey. For NO_X, the paper change in the survey, a reduction of 10,084 tons, is 100.119% of the total change in the NO_X survey. The paper decrease is greater than 100% of the total survey decrease, since the net real change, 12 tons, was positive, indicating a slight real increase in NO_x from 1990 to 1996. The real increase in NO_x from the category "Control Devices Added" shown above would be due to new VOC controls, such as flares and thermal oxidizers, which rely on combustion and therefore add a small amount of NO_X. For VOC, the paper change in the survey, a reduction of 70 tons, is only 3.32% of the total change in the VOC survey.

Relating the real and paper survey change to the inventory change 1990-1996

The net real NO_X change indicated in the survey is an increase of 12 tpy. Multiplying the survey net real change (as a percentage of the survey total change) by the inventory total change yields the real change in the NO_X inventory from 1990 to 1996:

0.00119 x 37.06 tpod = 0.04 tpod of real NO_X increase

The paper change is:

-1.00119 x 37.06 tpod = 37.10 tpod of paper NO_X decrease

The net real VOC change indicated in the survey is a decrease of 2,039 tpy. Multiplying the survey net real change (as a percentage of the survey total change) by the inventory total change yields the real change in the VOC inventory from 1990 to 1996:

-0.9668 x 38.97 tpod = 37.68 tpod of real VOC decrease

Similarly, the paper change is:

-0.0332 x 38.97 tpod = 1.29 tpod of paper VOC decrease

Backcasting the 1990 Emission Inventory

About 90% of the NO_X point source EI in DFW in 1996 is from utility power boilers. The quality of NO_X data from these boilers improved greatly in July 1995, when the EPA's acid rain monitoring rules took effect and most units had to report emissions based on continuous emissions monitors. Before this, emission tests at full load and the EPA's published average emission factor for NO_X from gas-fired utility boilers caused emissions to be overestimated. The paper reduction indicated in the survey is a direct outcome of the installation of these monitors. Since the drop is so large, it is more logical to backcast the 1990 inventory to remove the paper emissions, rather than to continue to use the original 1990 numbers as the baseline. This approach will avoid inflating the rate of progress targets with rather large paper emissions:

1990 backcast NO_X = 1996 NO_X - real NO_X increase = 71.80 tpod - 0.04 tpod = 71.76 tpod.

There was not a similar large, identifiable improvement in methodology for VOC during the 1990-1996 period. The survey reflects this, with only a small amount of VOC paper change. The 15% rate of progress reductions required during this period necessitated some improvement of VOC estimates to determine rule applicability and the proper design of emission controls. For consistency with the NO_X adjustment, the 1990 inventory may be backcast, or adjusted, to remove this paper emission:

1990 backcast VOC = 1996 VOC + real VOC decrease = 26.30 tpod + 37.68 tpod = 63.98 tpod.

Growth from 1996 to 1999

In order to extrapolate the real emission changes into the future, each reason for emission change was evaluated as to whether it could be expected to continue for the next 3 years.

Change	Discussion	Count Trend for 96-99?
Control Devices Added	Past changes were not a result of rule making. Future rule making will result in changes and reductions should be accounted for in that manner	No

Process Changes	Will rule making allow process changes or force process changes to gain reductions? If yes, then those changes should be accounted for in that category. Otherwise, companies may still seek these to gain process efficiency. But I suspect that the larger emitting sources have already found the changes that are easiest to obtain so trend cannot be counted on to continue.	No
Equipment Shutdown/Startup	This is a regular part of doing business. Equipment gets antiquated and is shutdown or additional capacity is sought. Older equipment is likely to be of higher emitting types than newer equipment	Yes
Operating Rates	These are probably a result of actual business trends and it is not possible to state that these trends will continue as before	No

The only items believed to continue the experienced trend are equipment startups and shutdowns.

For NO_X, the net emission change from startups and shutdowns in the survey is:

NO_X startup/shutdown growth 1990-1996: 0.268% - 0.079% = 0.189%.

For VOC, further analysis of the startups and shutdowns revealed that two of the accounts which experienced shutdowns in the 1990-1996 period were large defense plants. The changes at these plants were more likely to be unique, rather than representing a trend. For this reason, these two accounts were removed from the survey, and the projection of startup and shutdowns and total survey change was adjusted. The remaining VOC changes are:

Change Between 1990 and 1996 (Survey Results without two accounts)	Amount VOC (tpy)	VOC Change (%)
Control Devices Added	-451	-45.15
Inspection plan for leaking VOC added	-18	-1.80
Process Changes	-323	-32.33
Equipment Startup	107	10.71
Equipment Shutdown	-114	-11.41
Operating Rates	-130	-13.01
Net real change	-929	-92.99
Paper change	-70	-7.01
Total change = Net real + Paper change	-999	-100.00

For VOC, the net emission change from startups and shutdowns, from the above recalculated change table is:

VOC startup/shutdown growth 1990-1996: 10.71% - 11.41% = 0.70%.

Applying these survey percentage changes to the total DFW point source inventory changes from 1990 to 1996 yields the estimated change ("growth") in startup/shutdown emissions during this period:

NO_X startup/shutdown change from 1990 to 1996 = 0.00189 x 34.04% = 0.064%

VOC startup/shutdown change from 1990 to 1996 = - 0.007 x 59.70% = - 0.45%

These percentages reflect startup/shutdown growth factors over a six-year period, 1990 to 1996. To project the trends from 1996 to 1999, these rates must be divided by two to reflect a three-year period:

NO_X startup/shutdown change from 1996 to 1999 = 0.5 x 0.064% = 0.032%

VOC startup/shutdown change from 1996 to 1999 = 0.5 x (- 0.45%) = - 0.23%

Thus the projected 1999 point source inventory is obtained by adding this change amount to the 1996 inventory:

1999 Projected NO_X Point Source Inventory = 71.80 tpod + 0.02 tpod = **71.80 tpd**

1999 Projected VOC Point Source Inventory = 26.30 tpod - 0.14 tpod = **26.16 tpd**

cc: Paul Henry
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ACCOUNT	COMPANY	SIC_CODE	COUNTY	Industrial_C
CP0008O	CELLO WRAP PRINTING CO	2,759.00	COLLIN	COMMERCIAL PRINTING, NEC
CP0015R	INTERNATIONAL PAPER COMPAN'	2,672.00	COLLIN	PAPER COATED & LAMINATE
CP0026M	GARLAND MUNICIPAL POWER ANI	4,911.00	COLLIN	ELECTRIC SERVICES
CP0029G	G.N.B. TECHNOLOGIES, INC.	3,341.00	COLLIN	SECONDARY NONFERROUS
CP0066A	TRIANGLE PACIFIC CORPORATIOI	2,434.00	COLLIN	WOOD KITCHEN CABINETS
CP0175R	COLOR DYNAMICS	2,752.00	COLLIN	COMMERCIAL PRINTING LITH
DB0135A	HAT BRANDS, INC.	2,353.00	DALLAS	HATS, CAPS AND MILLINERY
DB0186G	ALCATEL NETWORK SYSTEMS INC	3,663.00	DALLAS	RADIO/TV COMMUNICATION
DB0249H	TEXAS UTILITIES ELECTRIC COMP	4,911.00	DALLAS	ELECTRIC SERVICES
DB0251U	TEXAS UTILITIES ELECTRIC COMP	4,911.00	DALLAS	ELECTRIC SERVICES
DB0252S	TEXAS UTILITIES ELECTRIC COMP	4,911.00	DALLAS	ELECTRIC SERVICES
DB0343O	HIGH PERFORMANCE COATINGS	3,479.00	DALLAS	METAL COATING AND ALLIED
DB0447B	HENSLEY INDUSTRIES, INC.	3,325.00	DALLAS	STEEL FOUNDRIES, NEC
DB0458T	ALUMET BUILDING PRODUCTS INC	3,479.00	DALLAS	METAL COATING AND ALLIED
DB0476R	INGERSOLL RAND COMPANY	3,532.00	DALLAS	MINING MACHINERY
DB0566P	SST TRUCKING COMPANY, INC.	3,711.00	DALLAS	MOTOR VEHICLES AND CAR
DB0594K	SGS THOMSON MICROELECTRON	3,674.00	DALLAS	SEMICONDUCTORS & RELAT
DB0748H	BROCKWAY STANDARD, INCORPC	3,412.00	DALLAS	METAL BARRELS, DRUMS & F
DB0772K	QUEBECOR PRINTING DALLAS (AS	2,759.00	DALLAS	COMMERCIAL PRINTING, NEC
DB0804W	TEXAS FINISHING COMPANY	3,442.00	DALLAS	METAL DOORS, SASH, AND T
DB0826M	TEXAS NAMEPLATE COMPANY , IN	3,479.00	DALLAS	METAL COATING AND ALLIED
DB0838F	TEXWOOD INDUSTRIES	2,434.00	DALLAS	WOOD KITCHEN CABINETS
DB0845I	BROCKWAY STANDARD, INCORPC	3,479.00	DALLAS	METAL COATING AND ALLIED
DB0931O	LUCENT TECHNOLOGIES, INC.	3,679.00	DALLAS	ELECTRONIC COMPONENTS,
DB1016C	LASTING PRODUCTS, INC.	3,446.00	DALLAS	ARCHITECTURAL METAL WO
DB1040F	WILLIAMSON PRINTING CORP	2,752.00	DALLAS	COMMERCIAL PRINTING LITH
DB1124V	ROBERT YAQUINTO PRINTING CO	2,752.00	DALLAS	COMMERCIAL PRINTING LITH
DB1163L	FRITZ INDUSTRIES, INC.	3,299.00	DALLAS	NONMETALLIC MINERAL PRC
DB1250P	HORTICULTURAL PRINTERS	2,759.00	DALLAS	COMMERCIAL PRINTING, NEC
DB1261K	HERITAGE PRESS	2,752.00	DALLAS	COMMERCIAL PRINTING LITH
DB1295Q	GUARDIAN AUTOMOTIVE TRIM, IN	3,089.00	DALLAS	PLASTICS PRODUCTS, NEC
DB1319E	BOEING DEFENSE AND SPACE -- I	3,728.00	DALLAS	AIRCRAFT PARTS & EQUIPME
DB1544S	SPECIALTY CONTAINER CORPOR/	2,759.00	DALLAS	COMMERCIAL PRINTING, NEC
DB1573L	TREASURE CHEST ADVERTISING (	2,752.00	DALLAS	COMMERCIAL PRINTING LITH
DB1767T	G.P. PLASTICS CORPORATION	2,821.00	DALLAS	PLASTICS MATERIALS AND R
DB1864U	ALLAN PRODUCTS, INCORPORATE	2,499.00	DALLAS	WOOD PRODUCTS, NEC
DB1933D	MILLET THE PRINTER, INC.	2,752.00	DALLAS	COMMERCIAL PRINTING LITH
DB2035O	FOAMLITE TEXAS CORPORATION	3,086.00	DALLAS	PLASTICS, FOAM PRODUCTS
DB2135J	AD TEAM, INCORPORATED	2,752.00	DALLAS	COMMERCIAL PRINTING LITH
DF0012T	DENTON MUNICIPAL UTILITIES	4,911.00	DENTON	ELECTRIC SERVICES
DF0051J	PETERBILT MOTORS COMPANY	3,711.00	DENTON	MOTOR VEHICLES AND CAR
DF0082V	TEXAS INSTRUMENTS, INC.	3,812.00	DENTON	SEARCH & NAVIGATION EQU
TA0021L	FINA OIL & CHEMICAL COMPANY	5,171.00	TARRANT	PETROLEUM BULK STATIONS
TA0034C	CITGO PRODUCTS PIPELINE COMI	4,613.00	TARRANT	REFINED PETROLEUM PIPE L
TA0051C	BELL HELICOPTER TEXTRON INC.	3,721.00	TARRANT	AIRCRAFT
TA0079D	DEPARTMENT OF DEFENSE	9,711.00	TARRANT	NATIONAL SECURITY
TA0102K	CONOCO INC.	5,171.00	TARRANT	PETROLEUM BULK STATIONS
TA0106C	STYROCHEM INTERNATIONAL, INC	2,821.00	TARRANT	PLASTICS MATERIALS AND R
TA0113F	CHAMPION INTERNATIONAL CORF	2,656.00	TARRANT	SANITARY FOOD CONTAINEF
TA0133W	STYROCHEM INTERNATIONAL INC	2,821.00	TARRANT	PLASTICS MATERIALS AND R
TA0142V	CITGO PETROLEUM CORPORATIO	5,171.00	TARRANT	PETROLEUM BULK STATIONS
TA0156K	LOCKHEED MARTIN TACTICAL	3,721.00	TARRANT	AIRCRAFT
TA0172M	GRAPHIC ARTS, INCORPORATED	2,752.00	TARRANT	COMMERCIAL PRINTING LITH
TA0193E	TOTAL PETROLEUM INCORPORAT	5,171.00	TARRANT	PETROLEUM BULK STATIONS
TA0229I	MENASCO AEROSYSTEMS, INC.	3,728.00	TARRANT	AIRCRAFT PARTS & EQUIPME
TA0235N	MILLER BREWING COMPANY	2,082.00	TARRANT	MALT BEVERAGES
TA0236L	REYNOLDS METALS COMPANY	3,411.00	TARRANT	METAL CANS
TA0245K	NASH MANUFACTURING COMPAN'	2,499.00	TARRANT	WOOD PRODUCTS, NEC
TA0273F	WITCO CORPORATION	2,841.00	TARRANT	SOAP AND OTHER DETERGE

ACCOUNT	COMPANY	SIC_CODE	COUNTY	Industrial_C
TA0276W	PHILLIPS PIPE LINE COMPANY	5,171.00	TARRANT	PETROLEUM BULK STATIONS
TA0282E	PRINTPACK, INCORPORATED	2,759.00	TARRANT	COMMERCIAL PRINTING, NEC
TA0285V	TRINITY INDUSTRIES, INC.	4,789.00	TARRANT	TRANSPORTATION SERVICES
TA0352I	TEXAS UTILITIES ELECTRIC COMP	4,911.00	TARRANT	ELECTRIC SERVICES
TA0353G	TEXAS UTILITIES ELECTRIC COMP	4,911.00	TARRANT	ELECTRIC SERVICES
TA0374V	THERMA FOAM INCORPORATED	3,089.00	TARRANT	PLASTICS PRODUCTS, NEC
TA0413N	WESTERN CABINETS, INC.	2,434.00	TARRANT	WOOD KITCHEN CABINETS
TA0499A	TRINITY INDUSTRIES, INC.	4,789.00	TARRANT	TRANSPORTATION SERVICES
TA0539N	TRINITY INDUSTRIES, INC.	3,743.00	TARRANT	RAILROAD EQUIPMENT
TA0555P	NATIONAL SEMICONDUCTOR COR	3,674.00	TARRANT	SEMICONDUCTORS & RELAT
TA0614B	BEHR CLIMATE SYSTEMS INC	3,585.00	TARRANT	REFRIGERATION & HEATING
TA0664J	STARRFOAM INCORPORATED	3,086.00	TARRANT	PLASTICS, FOAM PRODUCTS
TA0685B	FILM PAK INCORPORATED	3,089.00	TARRANT	PLASTICS PRODUCTS, NEC
TA0866S	FORT WORTH STAR TELEGRAM	2,711.00	TARRANT	NEWSPAPERS
TA1011H	MOODY PRINTING & MAIL MARKET	2,752.00	TARRANT	COMMERCIAL PRINTING LITH
TA1015W	SPRINT PRESS INC	2,752.00	TARRANT	COMMERCIAL PRINTING LITH
TA1093C	NU VAN TECHNOLOGY, INCORPOI	3,715.00	TARRANT	TRUCK TRAILERS
TA1222P	KOCH REFINING COMPANY, L.P.	2,999.00	TARRANT	PETROLEUM AND COAL PRO
TA2077Q	RACK TECHNOLOGY, INCORPORA	3,479.00	TARRANT	METAL COATING AND ALLIED