BEFORE THE
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268–0001

POSTAL RATE AND FEE CHANGES, 1997

Docket No. R97–1

RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS BRADLEY TO INTERROGATORIES OF UNITED PARCEL SERVICE (UPS/USPS-T13-1 - 19)

The United States Postal Service hereby provides responses of witness Bradley to the following interrogatories of United Parcel Service:

UPS/USPS-T13-1-19, filed on July 28, 1997.

Each interrogatory is stated verbatim and is followed by the response.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

By its attorneys:

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Response of United States Postal Service Witness Bradley
to
Interrogatories of United Parcel Service

UPS/USPS-T13-1. You state on page 13, line 11, of your testimony that the Highway Contract Support System ("HCSS") contains data on "nearly all contracts in force." Please define "nearly all" and identify the contracts not included.

UPS/USPS-T13-1 Response:

I believe that my data set contains data on all of the purchased highway transportation contracts in force in August of 1995. However, I am unaware of any method of definitively proving this belief. I thus inserted the qualifier "nearly" in my testimony.

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UPS/USPS-T13-2. Please describe the investigations you conducted into the completeness of the HCSS. Describe the information generated by those investigations, and explain the reasoning that led you to the conclusion that the HCSS contains data on "nearly all contracts in force."

UPS/USPS-T13-2 Response:

Because HCSS is the system used by the Postal Service to specify and produce all of the contracts in its purchased highway transportation system, it is highly unlikely, if not impossible, for HCSS not to include all contracts in force. Moreover, the process by which the data extract from HCSS was produced was carefully designed to remove all contracts in force from each of the DNOs. Because the same program was run on the same software at each of the DNOs, I believe that I received all of the contracts in force in August of 1995. For the reasoning that led me to include the word "nearly" in my testimony, please refer to my answer to UPS/USPS-T13-1.

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UPS/USPS-T13-3. Please describe the types of contracts that are excluded from the HCSS. Do these contracts differ in any systematic way from the contracts that are included in the HCSS?

UPS/USPS-T13-3 Response:

I apologize for apparently inferring, through the use of the word "nearly," that some contracts are excluded from HCSS. To the best of my knowledge, there are no contracts excluded from HCSS.

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UPS/USPS-T13-4. Please describe the effect that collection of data on the missing contracts and their inclusion in your econometric analysis would have had on your econometric results.

UPS/USPS-T13-4 Response:

I apologize for apparently inferring, though the use of the word "nearly," that some contracts are excluded from HCSS. To the best of my knowledge, there are no contracts excluded from HCSS. Clearly, there is no additional data collection effort required to obtain information on contracts that are not missing, and there is no impact on the econometric analysis.

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UPS/USPS-T13-5. At what point in the procurement cycle is a contract entered into the HCSS data base – at the point of issuance of the original solicitation of bids, upon receipt of a bid, upon selection of a contractor, or upon the formal signing of the contract?

UPS/USPS-T13-5 Response:

The Postal Service transportation specialist first enters the specifications for a contract before it is let out to bid. In addition, any modifications in the original specifications that take place before the contract is signed would be made through HCSS. HCSS is then used to produce the contract that is ultimately signed by the contractor. In addition, any subsequent modifications to the contract are made through HCSS. Please note, however, that the HCSS *extract* that I used includes only data from signed contracts.

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UPS/USPS-T13-6. You state on page 14, lines 4-5, of your testimony that "HCSS is a live data system in the sense that it changes as the contracts themselves change." Does the HCSS capture all changes made to a contract over its period of effectiveness, or only some changes? If the latter, please describe the types of changes that are not entered into the data base.

UPS/USPS-T13-6 Response:

The HCSS is designed to include all changes to signed contracts.

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UPS/USPS-T13-7.

(a.) Do the contracts contained in the HCSS specify the exact cost, the exact numbers of trucks and miles traveled, and the exact cubic capacities of the trucks to be provided under the contract?

(b.) If the HCSS data base does not contain the exact cost, the exact numbers of trucks and miles traveled, and the exact cubic capacities of the trucks to be provided under the contract, please describe what it does contain, and how this differs from the quantities actually provided by the contractor?

(c.) Do the cost amounts recorded in the HCSS contain the exact amounts paid to each of the contractors under these contracts? If not, by how much and in what ways do the actual payments differ from the costs recorded in the HCSS?

UPS/USPS-T13-7 Response:

(a) The purchased highway transportation contracts specify the exact rate to be paid to the contractor, the exact amount of miles that must be covered, and the exact minimum cubic capacities that the contractor must provide. The contractor (at his or her own cost) may exceed this minimum up to a prescribed maximum. In addition, the number of vehicles specified on the contract is a guideline. The contractor may use more vehicles as long as he or she provides the required capacity over the required miles.

(b) Please see my answer to part a.

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(c.) No. The HCSS does not contain the exact cost paid to contractors but it does contain the exact basic contract rate paid to contractors. It is a management system, not an accounting system and, for example, does not include any payments made for exceptional service on a contract. The exact cost actually paid in a year would include the cost for exceptional service.

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UPS/USPS-T13-8.

(a.) What oversight was made of the 12 DNOs to ensure that data extraction was performed correctly and accurately?

(b.) Was there any oversight of each DNO's data collection and data entry process?

(c.) If each DNO is responsible for entering its own data into the electronic data base, does each DNO scrub its own data? How?

(d.) Is the entry error rate the same for all DNOs? If not, how might that affect the results?

UPS/USPS-T13-8 Response:

(a) The data extraction was performed by running the identical computer program at all of the HCSS sites. Postal Service data processing professionals worked with HCSS-trained employees at each of the DNOs to ensure that they understood how the program worked before it was run and to be sure that it was run correctly at each site.

(b) Yes. Please see my response to OCA/USPS-T13-22 for a description of both the initial and the ongoing data entry processes, and oversight thereof.

(c.) There are two issues relevant to data entry, the initialization of HCSS and its ongoing use. When HCSS was first established, data from the hard copy contracts

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had to be entered. These data were entered or reviewed by a Postal Service transportation specialist and were reviewed by Postal Service supervisors. The specifications included in HCSS were then printed out and sent to the contractor for verification. The contractor was required to sign that he or she accepted the contract specifications as entered in HCSS. All future payments and modifications of the contract thus work off the contract as it exists in HCSS. It is in this sense that the initialized data were scrubbed.

As an ongoing management tool, HCSS is used to produce the contract specifications that are put out to bid. In addition, HCSS is used to produce the final contract that is signed. As with the initialized data, the contractor must agree to the terms of the contract as specified in HCSS and payments are based upon that contract. It is in this sense the data for ongoing contracts are scrubbed.

(d) Because both the Postal Service and the contractor are obligated by the specifications included in HCSS, I would expect the entry error rate to be quite low, or in some sense even zero, for all of the DNOs.

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UPS/USPS-T13-9. You state on page 22, line 1, of your testimony that you included both regular and emergency contracts in your analysis. Did you conduct any test to determine whether these two groups of contracts exhibit the same relationships between volume, route length, and cost? If so, what did these investigations reveal? Please supply copies of all computer programs, outputs, and other results produced in the course of these investigations.

UPS/USPS-T13-9 Response:

Because my own analysis in Docket No. R87-1 (USPS-T-9), and the analyses of UPS witness Higinbotham (UPS-T-3), Postal Service witness Lion (USPS-RT-5), and the Postal Rate Commission all combined regular and emergency contracts, I did so in my current analysis. As such, I did not pursue the separation you propose in the question.

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UPS/USPS-T13-10. You state on page 22, lines 7-14, of your testimony that you included both tractor-trailer and "power-only" contracts in your analysis. Did you conduct any test to determine whether these two groups of contracts exhibit the same relationships between volume, route length, and cost? If so, what did these investigations reveal? Please supply copies of all computer programs, outputs, and other results produced in the course of these investigations.

UPS/USPS-T13-10 Response:

I did not perform any such analysis before I received your interrogatory. Power only contracts are "tractor-trailer" contracts in which the trailer is provided by the Postal Service. I understand the cost of providing the trailer is a small percentage of the cost of a "regular" tractor-trailer contract. I thus did not expect a material difference between the power only and the regular contracts and combining the two seemed a reasonable way to increase the size of the data set used for my analysis.

Nevertheless, because it is an easy thing to check, I investigated the question subsequent to receiving your interrogatory. Specifically, I re-estimated the final Intra-BMC equations with the power only contracts excluded and with just the power only contracts included. The SAS logs and program outputs are attached to this interrogatory. As you can see from Table 15, page 50 of my testimony, there are 328 observations in the final Intra-BMC

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regression with an estimated variability of 97.4 percent. Of those 328, 148 are power only contracts and 180 are regular contracts. As the attached programs show, the estimated variability for the power only contracts is 99.2 percent and the estimated variability for the regular contracts is 95.8 percent. These results indicate that it is proper to combine the two types of contracts in single regression. Moreover, to calculate an overall variability for the intra-BMC cost pool, these two variabilities must be combined by the method described in Exhibit USPS-13B of my testimony.

Calculation of Volume Variability For Intra-BMC Contracts				
Group	HCSS Accrued Cost	Variability	Volume Variable Cost	Overall Variability
Regular	$109,348,216	95.8%	$104,762,152	
Power Only	$57,290,353	99.1%	$56,769,011	
Total	$166,638,569		$161,531,163	96.9%

As you can see, the results are virtually identical (about one-half a percentage point lower in the separated approach) to the case in which one combines the power only contracts with the regular contracts.

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NOTE: The initialization phase used 0.13 CPU seconds and 1945K.
1          OPTIONS NODATE;                                                    00004100
2          OPTIONS LINESIZE=131 NOCENTER;                                     00003700
3          * ESTIMATING VARIABLITIES ON HCSS DATA;                            00003900
4          * BY ACCOUNT CATEGORY;                                             00004000
5          ******************************************************;            00004200
6          *  READING IN THE HCSS DATA                          *;            00004300
7          ******************************************************;
8          DATA TRAN1; INFILE TRA;                                            00004500
9          INPUT HCRID $ 1-5 REN $ 7 ACCOUNT 9-13 AREA 15-16 FY 18-19 RTYPE 21  00004600
10               CSTSEG $ 23 YRMILE 25-38 BOX 40-44 COST 46-56 FUEL 58-68     00004600
11               HDWAGE 70-80 CPICOST 82-92 CONTYPE 94 VEHGRP 96-97 NUMTRK 99-101 00004700
12               TRCUBE 103-107 SUMLNGTH 109-122 NUMTRP 124-126 RL 128-138;   00004700
13                                                                            00004100

NOTE: The infile TRA is:
      Dsname=H20558.HCSS.HGWYDAT1.DATA,
      Unit=3390,Volume=T0AA01,Disp=SHR,Blksize=480,
      Lrecl=160,Recfm=FB

NOTE: 8010 records were read from the infile TRA.
NOTE: The data set WORK.TRAN1 has 8010 observations and 20 variables.
NOTE: The DATA statement used 0.49 CPU seconds and 2568K.

14         DATA TRAN2; INFILE TRB;                                            00004500
15         INPUT HCRID $ 1-5 REN $ 7 ACCOUNT 9-13 AREA 15-16 FY 18-19 RTYPE 21  00004600
16               CSTSEG $ 23 YRMILE 25-38 BOX 40-44 COST 46-56 FUEL 58-68     00004600
17               HDWAGE 70-80 CPICOST 82-92 CONTYPE 94 VEHGRP 96-97 NUMTRK 99-101 00004700
18               TRCUBE 103-107 SUMLNGTH 109-122 NUMTRP 124-126 RL 128-138;   00004700

NOTE: The infile TRB is:
      Dsname=H20558.HCSS.HGWYDAT2.DATA,
      Unit=3390,Volume=T0AA36,Disp=SHR,Blksize=480,
      Lrecl=160,Recfm=FB

NOTE: 7704 records were read from the infile TRB.
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NOTE: The data set WORK.TRAN2 has 7704 observations and 20 variables.
NOTE: The DATA statement used 0.45 CPU seconds and 2568K.

19         DATA TRANA; SET TRAN1 TRAN2;
20
21         ********************************************************************;
22         * READING IN THE LIST OF UNUSUAL OBSERVATIONS, MERGING THE LIST    *;
23         * WITH THE TRANSPORTATION DATA AND DROPPING THE UNUSUAL OBS        *;
24         ********************************************************************;

NOTE: The data set WORK.TRANA has 15714 observations and 20 variables.
NOTE: The DATA statement used 0.13 CPU seconds and 2652K.

25         DATA HARI; INFILE SELDON;
26         INPUT HCRID $CSTSEG $CAT;

NOTE: The infile SELDON is:
      Dsname=H20558.OBSLIST.DATA,
      Unit=3390,Volume=T0AA41,Disp=SHR,Blksize=6233,
      Lrecl=256,Recfm=VB

NOTE: 193 records were read from the infile SELDON.
      The minimum record length was 17.
      The maximum record length was 17.
NOTE: The data set WORK.HARI has 193 observations and 3 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 2684K.

27         PROC SORT DATA=TRANA; BY HCRID CSTSEG;

NOTE: The data set WORK.TRANA has 15714 observations and 20 variables.
NOTE: The PROCEDURE SORT used 0.22 CPU seconds and 5360K.

28         PROC SORT DATA=HARI;   BY HCRID CSTSEG;
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NOTE: The data set WORK.HARI has 193 observations and 3 variables.
NOTE: The PROCEDURE SORT used 0.01 CPU seconds and 5360K.

29          DATA TRANTOR; MERGE TRANA HARI; BY HCRID CSTSEG;

NOTE: The data set WORK.TRANTOR has 15714 observations and 21 variables.
NOTE: The DATA statement used 0.34 CPU seconds and 5368K.

30          DATA TRAN; SET TRANTOR;
31          IF CAT GT 0 THEN DELETE;

NOTE: The data set WORK.TRAN has 15516 observations and 21 variables.
NOTE: The DATA statement used 0.14 CPU seconds and 5368K.

32          DATA INTRABMC; SET TRAN;
33          ******************************************************;
34          * IDENTIFYING THE INTRABMC CONTRACT COST SEGMENTS    *;
35          * BY THEIR ACCOUNT NUMBERS                          *;
36          ******************************************************;
37          IF  ACCOUNT = 53127 OR ACCOUNT = 53129 ;
38          ******************************************************;
39          * IDENTIFYING AND REMOVING BOX ROUTE CONTRACTS       *;
40          * FROM THE INTRA-BMC DATA SET                       *;
41          ******************************************************;
13 The SAS System

42          BOXRT=0;
43          IF RTYPE=4 THEN BOXRT=1;
44          IF RTYPE=5 AND
45          BOX > 0 AND TRCUBE LE 300 THEN BOXRT=1;
46          IF RTYPE = 6 AND
47          BOX > 0 AND TRCUBE LE 300 THEN BOXRT=1;

NOTE: The data set WORK.INTRABMC has 348 observations and 22 variables.
NOTE: The DATA statement used 0.09 CPU seconds and 5368K.

48          DATA INTRABMC BOX; SET INTRABMC;
49          IF BOXRT=0 THEN OUTPUT INTRABMC;
50          IF BOXRT=1 THEN OUTPUT BOX;

NOTE: The data set WORK.INTRABMC has 347 observations and 22 variables.
NOTE: The data set WORK.BOX has 1 observations and 22 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5368K.

51          PROC MEANS DATA=BOX;

NOTE: The PROCEDURE MEANS printed page 1.
NOTE: The PROCEDURE MEANS used 0.01 CPU seconds and 5516K.

52          PROC MEANS DATA=INTRABMC;

NOTE: The PROCEDURE MEANS printed page 2.
NOTE: The PROCEDURE MEANS used 0.02 CPU seconds and 5516K.

53          PROC FREQ DATA=INTRABMC;
54          TABLE VEHGRP*AREA;
55           ******************************************************;
56          * CREATING VEHICLE CAPACITY FOR ANY POWER ONLY       *;
57          * CONTRACTS IN THE INTER-BMC ACCOUNT                 *;
58          * CALCULATING THE TOTAL CUBE FOR EACH OBSERVATION    *;
59          ******************************************************;

NOTE: The PROCEDURE FREQ printed page 3.
NOTE: The PROCEDURE FREQ used 0.02 CPU seconds and 5743K.

60          DATA INTRABMC; SET INTRABMC;
61          IF VEHGRP = 12 AND AREA = 1 THEN TRCUBE= 2649;
62          IF VEHGRP = 12 AND AREA = 2 THEN TRCUBE= 2817;
63          IF VEHGRP = 12 AND AREA = 4 THEN TRCUBE= 2918;
64          IF VEHGRP = 12 AND AREA = 5 THEN TRCUBE=2433;
65          IF VEHGRP = 12 AND AREA = 7 THEN TRCUBE= 2700;
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66          IF VEHGRP = 12 AND AREA = 8 THEN TRCUBE= 2854;
67          IF VEHGRP = 12 AND AREA = 12 THEN TRCUBE=2320;
68          CUBE=TRCUBE*NUMTRK;
69

NOTE: The data set WORK.INTRABMC has 347 observations and 23 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5743K.

69            PROC MEANS;
70          ******************************************************;
71          * CONSTRUCTING THE DATA SET ON THE BASIS OF THE      *;
72          * HCRID & THE CONTRACT COST SEGMENT                  *;
73          ******************************************************;
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NOTE: The PROCEDURE MEANS printed page 4.
NOTE: The PROCEDURE MEANS used 0.02 CPU seconds and 5743K.

74          PROC SORT; BY HCRID CSTSEG;

NOTE: The data set WORK.INTRABMC has 347 observations and 23 variables.
NOTE: The PROCEDURE SORT used 0.01 CPU seconds and 5743K.

75          PROC MEANS NOPRINT; BY HCRID CSTSEG; ID RTYPE AREA ACCOUNT VEHGRP;
76          VAR YRMILE COST CUBE NUMTRK RL SUMLNGTH NUMTRP;
77          OUTPUT OUT=TRABMC2 MEAN=YRMILE COST MCUBE MNUMTRK RL SUMLNGTH
78              NUMTRP  SUM =SYRMILE SCOST CUBE NUMTRK SRL SLENGTH STRIP N=NOBS;
79          ******************************************************;
80          * ELIMINATING OBSERVATIONS WIHT MISSING ROUTE LENGTH,*;
81          * CUBE, ANNUAL MILES OR TRUCKS                       *;
82          ******************************************************;
83

NOTE: The data set WORK.TRABMC2 has 340 observations and 23 variables.
NOTE: The PROCEDURE MEANS used 0.03 CPU seconds and 5755K.

83            DATA MISS TRABMC2; SET TRABMC2;
84            IF RL = . THEN RL=0;
85            IF CUBE = . THEN CUBE = 0;
86            IF YRMILE = . THEN YRMILE = 0;
87            IF NUMTRK = . THEN NUMTRK = 0;
88            IF YRMILE LE 0
89            OR RL LE 0 OR CUBE LE 0 OR COST LE 0 OR NUMTRK LE 0 THEN OUTPUT MISS;
90            ELSE OUTPUT TRABMC2;
91          ******************************************************;
92          * CREATING CUBIC FOOT MILES                          *;
93          ******************************************************;
94

NOTE: The data set WORK.MISS has 12 observations and 23 variables.
NOTE: The data set WORK.TRABMC2 has 328 observations and 23 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5755K.

94            DATA TRABMC2; SET TRABMC2;
95            AVECUBE=CUBE/NUMTRK;
96            CFM=AVECUBE*YRMILE;
97            CSTCFM=COST/CFM;
98          ******************************************************;
99          * MEAN CENTERING THE RIGHT-HAND SIDE VARIABLES AND   *;
100         * CREATING THE AREA DUMMIES                          *;
101         ******************************************************;
102

NOTE: The data set WORK.TRABMC2 has 328 observations and 26 variables.
NOTE: The DATA statement used 0.01 CPU seconds and 5755K.

102           PROC MEANS;
103           VAR COST CFM RL;
104           OUTPUT OUT=MTRABMC MEAN=MNCOST MNCFM MNRL;
105
```

```
NOTE: The data set WORK.MTRABMC has 1 observations and 5 variables.
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NOTE: The PROCEDURE MEANS printed page 5.
NOTE: The PROCEDURE MEANS used 0.01 CPU seconds and 5755K.

105          DATA TRABMC3;
106          IF _N_ = 1 THEN SET MTRABMC; SET TRABMC2;
107          CFM=CFM/MNCFM;
108          RL=RL/MNRL;
109          IF COST > 0 THEN
110          COST=LOG(COST); ELSE COST=0;
111          IF CFM > 0 THEN CFM=LOG(CFM);  ELSE CFM=0;
112          RL=LOG(RL);
113          CFM2=CFM**2;
114          RL2=RL**2;
115          CFMRL=CFM*RL;
116          A1 = 0; IF AREA=1 THEN A1 =1;
117          A2 = 0; IF AREA=2 THEN A2 =1;
118          A3 = 0; IF AREA=3 THEN A3 =1;
119          A4 = 0; IF AREA=4 THEN A4 =1;
120          A5 = 0; IF AREA=5 THEN A5 =1;
121          A6 = 0; IF AREA=6 THEN A6 =1;
122          A7 = 0; IF AREA=7 THEN A7 =1;
123          A8 = 0; IF AREA=8 THEN A8 =1;
124          A9 = 0; IF AREA=9 THEN A9 =1;
125          A10 = 0; IF AREA=10 THEN A10 =1;
126          A11 = 0; IF AREA=11 THEN A11 =1;
127          A12 = 0; IF AREA=12 THEN A12 =1;
128

NOTE: The data set WORK.TRABMC3 has 328 observations and 44 variables.
NOTE: The DATA statement used 0.04 CPU seconds and 5770K.

128          DATA NODAT BMCREG; SET TRABMC3;
129          IF CFM=0 OR  COST = 0 OR RL=0 THEN OUTPUT NODAT;
130          ELSE OUTPUT BMCREG;
131

NOTE: The data set WORK.NODAT has 0 observations and 44 variables.
NOTE: The data set WORK.BMCREG has 328 observations and 44 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5770K.

131          DATA BMCREG; SET BMCREG;
132          LVLCOST=EXP(COST);
133          CFM1=EXP(CFM); LVLCFM=CFM1*MNCFM;
134          RL1=EXP(RL); LVLRL=RL1*MNRL;
135         ************************************************;
136         * CREATING THE MEANS FOR THE ANALYSIS DATA SET   *;
137         ************************************************;
138

NOTE: The data set WORK.BMCREG has 328 observations and 49 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5770K.

138          DATA BMCREG; SET BMCREG; IF VEHGRP=12 THEN DELETE;
139

NOTE: The data set WORK.BMCREG has 180 observations and 49 variables.
NOTE: The DATA statement used 0.01 CPU seconds and 5770K.

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139          PROC MEANS;
140          VAR COST CFM RL LVLCOST LVLCFM LVLRL;
141         ************************************************;
142         * ESTIMATING THE PRC'S R87-1 SPECFICATION       *;
143         * ADDING DUMMY VARIABLES FOR EACH AREA          *;
144         ************************************************;
145
146          TITLE1 'ESTIMATING INTRA-BMC VARIABILITY';
```

```
147          TITLE2 'USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED';
148          TITLE3 'INCLUDING HETEROSCEDASTICITY CORRECTION';
149

NOTE: The PROCEDURE MEANS printed page 6.
NOTE: The PROCEDURE MEANS used 0.01 CPU seconds and 5784K.

149          PROC REG;
150          MODEL COST = A5 A12
151                       CFM CFM2 RL RL2 CFMRL/ACOV;
152          T1: TEST  A5, A12;
153          ENDSAS;

NOTE: 180 observations read.
NOTE: 180 observations used in computations.
NOTE: The PROCEDURE REG printed pages 7-9.
NOTE: The PROCEDURE REG used 0.05 CPU seconds and 6217K.

NOTE: The SAS session used 2.40 CPU seconds and 6217K.
NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414
```

Variable	N	Mean	Std Dev	Minimum	Maximum
ACCOUNT	1	53127.00	.	53127.00	53127.00
AREA	1	11.0000000	.	11.0000000	11.0000000
FY	1	95.0000000	.	95.0000000	95.0000000
RTYPE	1	5.0000000	.	5.0000000	5.0000000
YRMILE	1	90557.40	.	90557.40	90557.40
BOX	1	5.0000000	.	5.0000000	5.0000000
COST	1	50569.63	.	50569.63	50569.63
FUEL	1	44543.23	.	44543.23	44543.23
HDWAGE	1	0	.	0	0
CPICOST	1	6026.40	.	6026.40	6026.40
CONTYPE	1	1.0000000	.	1.0000000	1.0000000
VEHGRP	1	2.0000000	.	2.0000000	2.0000000
NUMTRK	1	1.0000000	.	1.0000000	1.0000000
TRCUBE	1	240.0000000	.	240.0000000	240.0000000
SUMLNGTH	1	298.8000000	.	298.8000000	298.8000000
NUMTRP	1	2.0000000	.	2.0000000	2.0000000
RL	1	149.4000000	.	149.4000000	149.4000000
CAT	0	.	.	.	.
BOXRT	1	1.0000000	.	1.0000000	1.0000000

Variable	N	Mean	Std Dev	Minimum	Maximum
ACCOUNT	347	53127.05	0.3183514	53127.00	53129.00
AREA	347	6.1066282	3.4936171	1.0000000	12.0000000
FY	347	95.0000000	0	95.0000000	95.0000000
RTYPE	347	1.0317003	0.2193744	1.0000000	3.0000000
YRMILE	347	422468.24	478655.10	39.0000000	4051011.75
BOX	347	0	0	0	0
COST	347	500172.91	533711.96	0	4669948.50
FUEL	347	93012.44	138714.38	0	1257752.25
HDWAGE	347	251207.94	252632.96	0	2121161.25
CPICOST	347	82608.96	88616.35	0	728989.38
CONTYPE	347	1.0547550	0.3482394	1.0000000	4.0000000
VEHGRP	347	10.8731988	1.2658484	3.0000000	12.0000000
NUMTRK	347	5.6080692	6.3906311	0	48.0000000
TRCUBE	347	1431.41	1344.60	0	3000.00
SUMLNGTH	347	1343.05	1286.26	0	10489.40
NUMTRP	347	9.9971182	8.0254287	0	40.0000000
RL	347	162.5521037	123.5103661	0	767.5000000
CAT	0	.	.	.	.
BOXRT	347	0	0	0	0

TABLE OF VEHGRP BY AREA

VEHGRP AREA

Frequency Percent Row Pct Col Pct	1	2	3	4	5	7	8	9	10	11	12	Total
3	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29 100.00 1.79	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29
6	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29 100.00 1.52	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29
7	0 0.00 0.00 0.00	0 0.00 0.00 0.00	3 0.86 60.00 9.38	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29 20.00 4.76	0 0.00 0.00 0.00	1 0.29 20.00 1.79	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	5 1.44
9	10 2.88 32.26 26.32	1 0.29 3.23 3.85	5 1.44 16.13 15.63	3 0.86 9.68 4.55	2 0.58 6.45 14.29	1 0.29 3.23 4.76	3 0.86 9.68 11.54	1 0.29 3.23 1.79	0 0.00 0.00 0.00	5 1.44 16.13 22.73	0 0.00 0.00 0.00	31 8.93
10	18 5.19 16.67 47.37	1 0.29 0.93 3.85	17 4.90 15.74 53.13	1 0.29 0.93 1.52	0 0.00 0.00 0.00	1 0.29 0.93 4.76	4 1.15 3.70 15.38	26 7.49 24.07 46.43	26 7.49 24.07 96.30	12 3.46 11.11 54.55	2 0.58 1.85 10.53	108 31.12
11	4 1.15 9.52 10.53	0 0.00 0.00 0.00	4 1.15 9.52 12.50	1 0.29 2.38 1.52	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	26 7.49 61.90 46.43	0 0.00 0.00 0.00	5 1.44 11.90 22.73	2 0.58 4.76 10.53	42 12.10
12	6 1.73 3.77 15.79	24 6.92 15.09 92.31	3 0.86 1.89 9.38	60 17.29 37.74 90.91	12 3.46 7.55 85.71	18 5.19 11.32 85.71	19 5.48 11.95 73.08	1 0.29 0.63 1.79	1 0.29 0.63 3.70	0 0.00 0.00 0.00	15 4.32 9.43 78.95	159 45.82
Total	38 10.95	26 7.49	32 9.22	66 19.02	14 4.03	21 6.05	26 7.49	56 16.14	27 7.78	22 6.34	19 5.48	347 100.00

1The SAS System 4

Variable	N	Mean	Std Dev	Minimum	Maximum
ACCOUNT	347	53127.05	0.3183514	53127.00	53129.00
AREA	347	6.1066282	3.4936171	1.0000000	12.0000000
FY	347	95.0000000	0	95.0000000	95.0000000
RTYPE	347	1.0317003	0.2193744	1.0000000	3.0000000
YRMILE	347	422468.24	478655.10	39.0000000	4051011.75
BOX	347	0	0	0	0
COST	347	500172.91	533711.96	0	4669948.50
FUEL	347	93012.44	138714.38	0	1257752.25
HDWAGE	347	251207.94	252632.96	0	2121161.25
CPICOST	347	82608.96	88616.35	0	728989.38
CONTYPE	347	1.0547550	0.3482394	1.0000000	4.0000000
VEHGRP	347	10.8731988	1.2658484	3.0000000	12.0000000
NUMTRK	347	5.6080692	6.3906311	0	48.0000000
TRCUBE	347	2657.36	441.2336750	0	3000.00
SUMLNGTH	347	1343.05	1286.26	0	10489.40
NUMTRP	347	9.9971182	8.0254287	0	40.0000000
RL	347	162.5521037	123.5103661	0	767.5000000
CAT	0	.	.	.	.
BOXRT	347	0	0	0	0
CUBE	347	15163.71	17838.98	0	136800.00

1The SAS System 5

Variable	N	Mean	Std Dev	Minimum	Maximum
COST	328	508044.42	540018.25	20827.68	4669948.50
CFM	328	1182272546	1361931205	19688448.00	11135675325
RL	328	167.1470427	124.2749061	10.2000000	767.5000000

1ESTIMATING INTRA-BMC VARIABILITY 6
USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
INCLUDING HETEROSCEDASTICITY CORRECTION

Variable	N	Mean	Std Dev	Minimum	Maximum
COST	180	12.8655689	0.9871566	10.1614889	15.3566586
CFM	180	-0.3720576	1.1260398	-3.5345145	2.2427155
RL	180	-0.1364027	0.7817323	-2.1561815	1.5242646
LVLCOST	180	607490.09	661467.97	25886.81	4669948.50
LVLCFM	180	1416030846	1671170501	34490340.00	11135675325
LVLRL	180	191.7253889	143.2925928	19.3500000	767.5000000

1ESTIMATING INTRA-BMC VARIABILITY 7
USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
INCLUDING HETEROSCEDASTICITY CORRECTION

Model: MODEL1
Dependent Variable: COST

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	167.10127	23.87161	560.127	0.0001
Error	172	7.33033	0.04262		
C Total	179	174.43160			

Root MSE	0.20644	R-square	0.9580
Dep Mean	12.86557	Adj R-sq	0.9563
C.V.	1.60461		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	13.140229	0.02303187	570.524	0.0001
A5	1	0.202655	0.15253856	1.329	0.1858
A12	1	-0.126122	0.10679860	-1.181	0.2393
CFM	1	0.958063	0.01978443	48.425	0.0001
CFM2	1	0.030653	0.01790589	1.712	0.0887
RL	1	-0.178253	0.02773535	-6.427	0.0001
RL2	1	0.069024	0.03200890	2.156	0.0324
CFMRL	1	-0.047228	0.04121307	-1.146	0.2534

1ESTIMATING INTRA-BMC VARIABILITY
USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
INCLUDING HETEROSCEDASTICITY CORRECTION

8

Dependent Variable: COST

Consistent Covariance of Estimates

ACOV	INTERCEP	A5	A12	CFM	CFM2	RL	RL2	CFMRL
INTERCEP	0.0004983422	0.0003867224	-0.000033942	-0.000047628	-0.000350371	-0.000088936	-0.000461306	0.0007070008
A5	0.0003867224	0.01477775	0.0006315584	0.0008019897	-0.001493395	-0.000238308	-0.000522964	0.0028080995
A12	-0.000033942	0.0006315584	0.005157453	0.0001503781	-0.000157262	-0.00010715	-0.000479782	0.0005998659
CFM	-0.000047628	0.0008019897	0.0001503781	0.0002648905	-0.000104297	-0.000134659	0.0000280043	0.0002002334
CFM2	-0.000350371	-0.001493395	-0.000157262	-0.000104297	0.0005963616	0.0000550174	0.0004122352	-0.001179964
RL	-0.000088936	-0.000238308	-0.00010715	-0.000134659	0.0000550174	0.000528618	0.0000567831	-0.000025358
RL2	-0.000461306	-0.000522964	-0.000479782	0.0000280043	0.0004122352	0.0000567831	0.0010084438	-0.001185493
CFMRL	0.0007070008	0.0028080995	0.0005998659	0.0002002334	-0.001179964	-0.000025358	-0.001185493	0.0026960473

1ESTIMATING INTRA-BMC VARIABILITY
USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
INCLUDING HETEROSCEDASTICITY CORRECTION

Dependent Variable: COST
Test: T1 Numerator: 0.0686 DF: 2 F value: 1.6107
Denominator: 0.042618 DF: 172 Prob>F: 0.2027

Dependent Variable: COST
Test: T1 using ACOV estimates
DF: 2 Chisq Value: 6.3199805381 Prob>Chisq: 0.0424

```
1          OPTIONS NODATE;                                                    00004100
2          OPTIONS LINESIZE=131 NOCENTER;                                     00003700
3          * ESTIMATING VARIABLITIES ON HCSS DATA;                            00003900
4          * BY ACCOUNT CATEGORY;                                             00004000
5          ************************************************;                 00004200
6          *  READING IN THE HCSS DATA                     *;                 00004300
7          ************************************************;
8          DATA TRAN1; INFILE TRA;                                            00004500
9          INPUT HCRID $ 1-5 REN $ 7 ACCOUNT 9-13 AREA 15-16 FY 18-19 RTYPE 21   00004600
10               CSTSEG $ 23 YRMILE 25-38 BOX 40-44 COST 46-56 FUEL 58-68      00004600
11               HDWAGE 70-80 CPICOST 82-92 CONTYPE 94 VEHGRP 96-97 NUMTRK 99-101 00004700
12               TRCUBE 103-107 SUMLNGTH 109-122 NUMTRP 124-126 RL 128-138;    00004700
13                                                                          00004100

NOTE: The infile TRA is:
      Dsname=H20558.HCSS.HGWYDAT1.DATA,
      Unit=3390,Volume=T0AA01,Disp=SHR,Blksize=480,
      Lrecl=160,Recfm=FB

NOTE: 8010 records were read from the infile TRA.
NOTE: The data set WORK.TRAN1 has 8010 observations and 20 variables.
NOTE: The DATA statement used 0.47 CPU seconds and 2568K.

14         DATA TRAN2; INFILE TRB;                                            00004500
15         INPUT HCRID $ 1-5 REN $ 7 ACCOUNT 9-13 AREA 15-16 FY 18-19 RTYPE 21   00004600
16               CSTSEG $ 23 YRMILE 25-38 BOX 40-44 COST 46-56 FUEL 58-68      00004600
17               HDWAGE 70-80 CPICOST 82-92 CONTYPE 94 VEHGRP 96-97 NUMTRK 99-101 00004700
18               TRCUBE 103-107 SUMLNGTH 109-122 NUMTRP 124-126 RL 128-138;    00004700

NOTE: The infile TRB is:
      Dsname=H20558.HCSS.HGWYDAT2.DATA,
      Unit=3390,Volume=T0AA36,Disp=SHR,Blksize=480,
      Lrecl=160,Recfm=FB

NOTE: 7704 records were read from the infile TRB.
12 The SAS System

NOTE: The data set WORK.TRAN2 has 7704 observations and 20 variables.
NOTE: The DATA statement used 0.43 CPU seconds and 2568K.

19         DATA TRANA; SET TRAN1 TRAN2;
20
21         ********************************************************************;
22         * READING IN THE LIST OF UNUSUAL OBSERVATIONS, MERGING THE LIST    *;
23         * WITH THE TRANSPORTATION DATA AND DROPPING THE UNUSUAL OBS        *;
24         ********************************************************************;

NOTE: The data set WORK.TRANA has 15714 observations and 20 variables.
NOTE: The DATA statement used 0.13 CPU seconds and 2652K.

25         DATA HARI; INFILE SELDON;
26         INPUT HCRID $CSTSEG $CAT;

NOTE: The infile SELDON is:
      Dsname=H20558.OBSLIST.DATA,
      Unit=3390,Volume=T0AA41,Disp=SHR,Blksize=6233,
      Lrecl=256,Recfm=VB

NOTE: 193 records were read from the infile SELDON.
      The minimum record length was 17.
      The maximum record length was 17.
NOTE: The data set WORK.HARI has 193 observations and 3 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 2684K.

27         PROC SORT DATA=TRANA; BY HCRID CSTSEG;

NOTE: The data set WORK.TRANA has 15714 observations and 20 variables.
NOTE: The PROCEDURE SORT used 0.22 CPU seconds and 5360K.

28         PROC SORT DATA=HARI;   BY HCRID CSTSEG;
```

```
NOTE: The data set WORK.HARI has 193 observations and 3 variables.
NOTE: The PROCEDURE SORT used 0.01 CPU seconds and 5360K.

29         DATA TRANTOR; MERGE TRANA HARI; BY HCRID CSTSEG;

NOTE: The data set WORK.TRANTOR has 15714 observations and 21 variables.
NOTE: The DATA statement used 0.33 CPU seconds and 5368K.

30         DATA TRAN; SET TRANTOR;
31         IF CAT GT 0 THEN DELETE;

NOTE: The data set WORK.TRAN has 15516 observations and 21 variables.
NOTE: The DATA statement used 0.13 CPU seconds and 5368K.

32         DATA INTRABMC; SET TRAN;
33         ******************************************************;
34         * IDENTIFYING THE INTRABMC CONTRACT COST SEGMENTS    *;
35         * BY THEIR ACCOUNT NUMBERS                          *;
36         ******************************************************;
37         IF  ACCOUNT = 53127 OR ACCOUNT = 53129 ;
38         ******************************************************;
39         * IDENTIFYING AND REMOVING BOX ROUTE CONTRACTS       *;
40         * FROM THE INTRA-BMC DATA SET                       *;
41         ******************************************************;
13 The SAS System

42         BOXRT=0;
43         IF RTYPE=4 THEN BOXRT=1;
44         IF RTYPE=5 AND
45         BOX > 0 AND TRCUBE LE 300 THEN BOXRT=1;
46         IF RTYPE = 6 AND
47         BOX > 0 AND TRCUBE LE 300 THEN BOXRT=1;

NOTE: The data set WORK.INTRABMC has 348 observations and 22 variables.
NOTE: The DATA statement used 0.08 CPU seconds and 5368K.

48         DATA INTRABMC BOX; SET INTRABMC;
49         IF BOXRT=0 THEN OUTPUT INTRABMC;
50         IF BOXRT=1 THEN OUTPUT BOX;

NOTE: The data set WORK.INTRABMC has 347 observations and 22 variables.
NOTE: The data set WORK.BOX has 1 observations and 22 variables.
NOTE: The DATA statement used 0.01 CPU seconds and 5368K.

51         PROC MEANS DATA=BOX;

NOTE: The PROCEDURE MEANS printed page 1.
NOTE: The PROCEDURE MEANS used 0.01 CPU seconds and 5516K.

52         PROC MEANS DATA=INTRABMC;

NOTE: The PROCEDURE MEANS printed page 2.
NOTE: The PROCEDURE MEANS used 0.02 CPU seconds and 5516K.

53         PROC FREQ DATA=INTRABMC;
54         TABLE VEHGRP*AREA;
55          ******************************************************;
56         * CREATING VEHICLE CAPACITY FOR ANY POWER ONLY       *;
57         * CONTRACTS IN THE INTER-BMC ACCOUNT                 *;
58         * CALCULATING THE TOTAL CUBE FOR EACH OBSERVATION    *;
59         ******************************************************;

NOTE: The PROCEDURE FREQ printed page 3.
NOTE: The PROCEDURE FREQ used 0.02 CPU seconds and 5743K.

60         DATA INTRABMC; SET INTRABMC;
61         IF VEHGRP = 12 AND AREA = 1 THEN TRCUBE= 2649;
62         IF VEHGRP = 12 AND AREA = 2 THEN TRCUBE= 2817;
63         IF VEHGRP = 12 AND AREA = 4 THEN TRCUBE= 2918;
64         IF VEHGRP = 12 AND AREA = 5 THEN TRCUBE=2433;
65         IF VEHGRP = 12 AND AREA = 7 THEN TRCUBE= 2700;
```

```
66          IF VEHGRP = 12 AND AREA = 8 THEN TRCUBE= 2854;
67          IF VEHGRP = 12 AND AREA = 12 THEN TRCUBE=2320;
68          CUBE=TRCUBE*NUMTRK;
69

NOTE: The data set WORK.INTRABMC has 347 observations and 23 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5743K.

69            PROC MEANS;
70          ********************************************************;
71          * CONSTRUCTING THE DATA SET ON THE BASIS OF THE        *;
72          * HCRID & THE CONTRACT COST SEGMENT                    *;
73          ********************************************************;
14 The SAS System


NOTE: The PROCEDURE MEANS printed page 4.
NOTE: The PROCEDURE MEANS used 0.02 CPU seconds and 5743K.

74          PROC SORT; BY HCRID CSTSEG;

NOTE: The data set WORK.INTRABMC has 347 observations and 23 variables.
NOTE: The PROCEDURE SORT used 0.01 CPU seconds and 5743K.

75          PROC MEANS NOPRINT; BY HCRID CSTSEG; ID RTYPE AREA ACCOUNT VEHGRP;
76          VAR YRMILE COST CUBE NUMTRK RL SUMLNGTH NUMTRP;
77          OUTPUT OUT=TRABMC2 MEAN=YRMILE COST MCUBE MNUMTRK RL SUMLNGTH
78              NUMTRP  SUM =SYRMILE SCOST CUBE NUMTRK SRL SLENGTH STRIP N=NOBS;
79          ********************************************************;
80          * ELIMINATING OBSERVATIONS WIHT MISSING ROUTE LENGTH,*;
81          * CUBE, ANNUAL MILES OR TRUCKS                        *;
82          ********************************************************;
83

NOTE: The data set WORK.TRABMC2 has 340 observations and 23 variables.
NOTE: The PROCEDURE MEANS used 0.03 CPU seconds and 5755K.

83            DATA MISS TRABMC2; SET TRABMC2;
84            IF RL = . THEN RL=0;
85            IF CUBE = . THEN CUBE = 0;
86            IF YRMILE = . THEN YRMILE = 0;
87            IF NUMTRK = . THEN NUMTRK = 0;
88            IF YRMILE LE 0
89            OR RL LE 0 OR CUBE LE 0 OR COST LE 0 OR NUMTRK LE 0 THEN OUTPUT MISS;
90            ELSE OUTPUT TRABMC2;
91          ********************************************************;
92          * CREATING CUBIC FOOT MILES                           *;
93          ********************************************************;
94

NOTE: The data set WORK.MISS has 12 observations and 23 variables.
NOTE: The data set WORK.TRABMC2 has 328 observations and 23 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5755K.

94            DATA TRABMC2; SET TRABMC2;
95            AVECUBE=CUBE/NUMTRK;
96            CFM=AVECUBE*YRMILE;
97            CSTCFM=COST/CFM;
98          ********************************************************;
99          * MEAN CENTERING THE RIGHT-HAND SIDE VARIABLES AND     *;
100         * CREATING THE AREA DUMMIES                            *;
101         ********************************************************;
102

NOTE: The data set WORK.TRABMC2 has 328 observations and 26 variables.
NOTE: The DATA statement used 0.01 CPU seconds and 5755K.

102           PROC MEANS;
103           VAR COST CFM RL;
104           OUTPUT OUT=MTRABMC MEAN=MNCOST MNCFM MNRL;
105
```

```
NOTE: The data set WORK.MTRABMC has 1 observations and 5 variables.
15 The SAS System

NOTE: The PROCEDURE MEANS printed page 5.
NOTE: The PROCEDURE MEANS used 0.01 CPU seconds and 5755K.

105          DATA TRABMC3;
106          IF _N_ = 1 THEN SET MTRABMC; SET TRABMC2;
107          CFM=CFM/MNCFM;
108          RL=RL/MNRL;
109          IF COST > 0 THEN
110          COST=LOG(COST); ELSE COST=0;
111          IF CFM > 0 THEN CFM=LOG(CFM);  ELSE CFM=0;
112          RL=LOG(RL);
113          CFM2=CFM**2;
114          RL2=RL**2;
115          CFMRL=CFM*RL;
116          A1 = 0; IF AREA=1 THEN A1 =1;
117          A2 = 0; IF AREA=2 THEN A2 =1;
118          A3 = 0; IF AREA=3 THEN A3 =1;
119          A4 = 0; IF AREA=4 THEN A4 =1;
120          A5 = 0; IF AREA=5 THEN A5 =1;
121          A6 = 0; IF AREA=6 THEN A6 =1;
122          A7 = 0; IF AREA=7 THEN A7 =1;
123          A8 = 0; IF AREA=8 THEN A8 =1;
124          A9 = 0; IF AREA=9 THEN A9 =1;
125          A10 = 0; IF AREA=10 THEN A10 =1;
126          A11 = 0; IF AREA=11 THEN A11 =1;
127          A12 = 0; IF AREA=12 THEN A12 =1;
128

NOTE: The data set WORK.TRABMC3 has 328 observations and 44 variables.
NOTE: The DATA statement used 0.04 CPU seconds and 5770K.

128          DATA NODAT BMCREG; SET TRABMC3;
129          IF CFM=0 OR  COST = 0 OR RL=0 THEN OUTPUT NODAT;
130          ELSE OUTPUT BMCREG;
131

NOTE: The data set WORK.NODAT has 0 observations and 44 variables.
NOTE: The data set WORK.BMCREG has 328 observations and 44 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5770K.

131          DATA BMCREG; SET BMCREG;
132          LVLCOST=EXP(COST);
133          CFM1=EXP(CFM); LVLCFM=CFM1*MNCFM;
134          RL1=EXP(RL); LVLRL=RL1*MNRL;
135         ************************************************;
136         * CREATING THE MEANS FOR THE ANALYSIS DATA SET   *;
137         ************************************************;
138

NOTE: The data set WORK.BMCREG has 328 observations and 49 variables.
NOTE: The DATA statement used 0.02 CPU seconds and 5770K.

138          DATA BMCREG; SET BMCREG; IF VEHGRP=12 ;
139

NOTE: The data set WORK.BMCREG has 148 observations and 49 variables.
NOTE: The DATA statement used 0.01 CPU seconds and 5770K.

16 The SAS System

139          PROC MEANS;
140          VAR COST CFM RL LVLCOST LVLCFM LVLRL;
141         ********************************************************;
142         * ESTIMATING THE PRC'S R87-1 SPECFICATION               *;
143         * ADDING DUMMY VARIABLES FOR EACH AREA                  *;
144         ********************************************************;
145
146          TITLE1 'ESTIMATING INTRA-BMC VARIABILITY';
```

```
147          TITLE2 'USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED';
148          TITLE3 'INCLUDING HETEROSCEDASTICITY CORRECTION';
149

NOTE: The PROCEDURE MEANS printed page 6.
NOTE: The PROCEDURE MEANS used 0.01 CPU seconds and 5784K.

149          PROC REG;
150          MODEL COST = A5 A12
151                       CFM CFM2 RL RL2 CFMRL/ACOV;
152          T1: TEST  A5, A12;
153          ENDSAS;

NOTE: 148 observations read.
NOTE: 148 observations used in computations.
NOTE: The PROCEDURE REG printed pages 7-9.
NOTE: The PROCEDURE REG used 0.04 CPU seconds and 6217K.

NOTE: The SAS session used 2.31 CPU seconds and 6217K.
NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414
```

1The SAS System

Variable	N	Mean	Std Dev	Minimum	Maximum
ACCOUNT	1	53127.00	.	53127.00	53127.00
AREA	1	11.0000000	.	11.0000000	11.0000000
FY	1	95.0000000	.	95.0000000	95.0000000
RTYPE	1	5.0000000	.	5.0000000	5.0000000
YRMILE	1	90557.40	.	90557.40	90557.40
BOX	1	5.0000000	.	5.0000000	5.0000000
COST	1	50569.63	.	50569.63	50569.63
FUEL	1	44543.23	.	44543.23	44543.23
HDWAGE	1	0	.	0	0
CPICOST	1	6026.40	.	6026.40	6026.40
CONTYPE	1	1.0000000	.	1.0000000	1.0000000
VEHGRP	1	2.0000000	.	2.0000000	2.0000000
NUMTRK	1	1.0000000	.	1.0000000	1.0000000
TRCUBE	1	240.0000000	.	240.0000000	240.0000000
SUMLNGTH	1	298.8000000	.	298.8000000	298.8000000
NUMTRP	1	2.0000000	.	2.0000000	2.0000000
RL	1	149.4000000	.	149.4000000	149.4000000
CAT	0	.	.	.	.
BOXRT	1	1.0000000	.	1.0000000	1.0000000

1The SAS System

Variable	N	Mean	Std Dev	Minimum	Maximum
ACCOUNT	347	53127.05	0.3183514	53127.00	53129.00
AREA	347	6.1066282	3.4936171	1.0000000	12.0000000
FY	347	95.0000000	0	95.0000000	95.0000000
RTYPE	347	1.0317003	0.2193744	1.0000000	3.0000000
YRMILE	347	422468.24	478655.10	39.0000000	4051011.75
BOX	347	0	0	0	0
COST	347	500172.91	533711.96	0	4669948.50
FUEL	347	93012.44	138714.38	0	1257752.25
HDWAGE	347	251207.94	252632.96	0	2121161.25
CPICOST	347	82608.96	88616.35	0	728989.38
CONTYPE	347	1.0547550	0.3482394	1.0000000	4.0000000
VEHGRP	347	10.8731988	1.2658484	3.0000000	12.0000000
NUMTRK	347	5.6080692	6.3906311	0	48.0000000
TRCUBE	347	1431.41	1344.60	0	3000.00
SUMLNGTH	347	1343.05	1286.26	0	10489.40
NUMTRP	347	9.9971182	8.0254287	0	40.0000000
RL	347	162.5521037	123.5103661	0	767.5000000
CAT	0	.	.	.	.
BOXRT	347	0	0	0	0

1The SAS System

TABLE OF VEHGRP BY AREA

VEHGRP AREA

Frequency Percent Row Pct Col Pct	1	2	3	4	5	7	8	9	10	11	12	Total
3	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29 100.00 1.79	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29
6	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29 100.00 1.52	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29
7	0 0.00 0.00 0.00	0 0.00 0.00 0.00	3 0.86 60.00 9.38	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.29 20.00 4.76	0 0.00 0.00 0.00	1 0.29 20.00 1.79	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	5 1.44
9	10 2.88 32.26 26.32	1 0.29 3.23 3.85	5 1.44 16.13 15.63	3 0.86 9.68 4.55	2 0.58 6.45 14.29	1 0.29 3.23 4.76	3 0.86 9.68 11.54	1 0.29 3.23 1.79	0 0.00 0.00 0.00	5 1.44 16.13 22.73	0 0.00 0.00 0.00	31 8.93
10	18 5.19 16.67 47.37	1 0.29 0.93 3.85	17 4.90 15.74 53.13	1 0.29 0.93 1.52	0 0.00 0.00 0.00	1 0.29 0.93 4.76	4 1.15 3.70 15.38	26 7.49 24.07 46.43	26 7.49 24.07 96.30	12 3.46 11.11 54.55	2 0.58 1.85 10.53	108 31.12
11	4 1.15 9.52 10.53	0 0.00 0.00 0.00	4 1.15 9.52 12.50	1 0.29 2.38 1.52	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	26 7.49 61.90 46.43	0 0.00 0.00 0.00	5 1.44 11.90 22.73	2 0.58 4.76 10.53	42 12.10
12	6 1.73 3.77 15.79	24 6.92 15.09 92.31	3 0.86 1.89 9.38	60 17.29 37.74 90.91	12 3.46 7.55 85.71	18 5.19 11.32 85.71	19 5.48 11.95 73.08	1 0.29 0.63 1.79	1 0.29 0.63 3.70	0 0.00 0.00 0.00	15 4.32 9.43 78.95	159 45.82
Total	38 10.95	26 7.49	32 9.22	66 19.02	14 4.03	21 6.05	26 7.49	56 16.14	27 7.78	22 6.34	19 5.48	347 100.00

1The SAS System 4

Variable	N	Mean	Std Dev	Minimum	Maximum
ACCOUNT	347	53127.05	0.3183514	53127.00	53129.00
AREA	347	6.1066282	3.4936171	1.0000000	12.0000000
FY	347	95.0000000	0	95.0000000	95.0000000
RTYPE	347	1.0317003	0.2193744	1.0000000	3.0000000
YRMILE	347	422468.24	478655.10	39.0000000	4051011.75
BOX	347	0	0	0	0
COST	347	500172.91	533711.96	0	4669948.50
FUEL	347	93012.44	138714.38	0	1257752.25
HDWAGE	347	251207.94	252632.96	0	2121161.25
CPICOST	347	82608.96	88616.35	0	728989.38
CONTYPE	347	1.0547550	0.3482394	1.0000000	4.0000000
VEHGRP	347	10.8731988	1.2658484	3.0000000	12.0000000
NUMTRK	347	5.6080692	6.3906311	0	48.0000000
TRCUBE	347	2657.36	441.2336750	0	3000.00
SUMLNGTH	347	1343.05	1286.26	0	10489.40
NUMTRP	347	9.9971182	8.0254287	0	40.0000000
RL	347	162.5521037	123.5103661	0	767.5000000
CAT	0	.	.	.	.
BOXRT	347	0	0	0	0
CUBE	347	15163.71	17838.98	0	136800.00

1The SAS System 5

Variable	N	Mean	Std Dev	Minimum	Maximum
COST	328	508044.42	540018.25	20827.68	4669948.50
CFM	328	1182272546	1361931205	19688448.00	11135675325
RL	328	167.1470427	124.2749061	10.2000000	767.5000000

1ESTIMATING INTRA-BMC VARIABILITY 6
USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
INCLUDING HETEROSCEDASTICITY CORRECTION

Variable	N	Mean	Std Dev	Minimum	Maximum
COST	148	12.5653745	0.8258929	9.9440382	14.4070409
CFM	148	-0.6320949	0.9262406	-4.0951617	1.3475984
RL	148	-0.4581034	0.8111056	-2.7964862	0.9362694
LVLCOST	148	387096.98	298464.57	20827.68	1806751.25
LVLCFM	148	897971911	759640383	19688448.00	4549588776
LVLRL	148	137.2544595	87.8279165	10.2000000	426.3000000

1ESTIMATING INTRA-BMC VARIABILITY 7
USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
INCLUDING HETEROSCEDASTICITY CORRECTION

Model: MODEL1
Dependent Variable: COST

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	96.32792	13.76113	488.893	0.0001
Error	140	3.94065	0.02815		
C Total	147	100.26857			

Root MSE	0.16777	R-square	0.9607
Dep Mean	12.56537	Adj R-sq	0.9587
C.V.	1.33519		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	13.044281	0.02118230	615.811	0.0001
A5	1	0.433354	0.05643044	7.679	0.0001
A12	1	0.168569	0.05551128	3.037	0.0029
CFM	1	0.992905	0.02560167	38.783	0.0001
CFM2	1	0.010717	0.02254110	0.475	0.6352
RL	1	-0.094660	0.03633749	-2.605	0.0102
RL2	1	0.043637	0.02686796	1.624	0.1066
CFMRL	1	0.012309	0.04116881	0.299	0.7654

1ESTIMATING INTRA-BMC VARIABILITY
USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
INCLUDING HETEROSCEDASTICITY CORRECTION

8

Dependent Variable: COST

Consistent Covariance of Estimates

ACOV	INTERCEP	A5	A12	CFM	CFM2	RL	RL2	CFMRL
INTERCEP	0.0003467822	-0.000176097	-0.000032533	-0.000133873	-0.000277819	0.0000385996	-0.000249913	0.0004836427
A5	-0.000176097	0.0030414515	-0.000011613	0.0001581365	0.0002130725	0.0001881183	0.0001101661	-0.00038937
A12	-0.000032533	-0.000011613	0.0018686579	-0.000036192	-0.000460346	-0.000696578	-0.000619972	0.0008322603
CFM	-0.000133873	0.0001581365	-0.000036192	0.0007103975	0.0004758375	-0.000225865	0.0002338093	-0.000596759
CFM2	-0.000277819	0.0002130725	-0.000460346	0.0004758375	0.0007452154	-0.000076003	0.0004895088	-0.001180396
RL	0.0000385996	0.0001881183	-0.000696578	-0.000225865	-0.000076003	0.0011902109	0.0004832301	0.0000307664
RL2	-0.000249913	0.0001101661	-0.000619972	0.0002338093	0.0004895088	0.0004832301	0.0007681973	-0.000970446
CFMRL	0.0004836427	-0.00038937	0.0008322603	-0.000596759	-0.001180396	0.0000307664	-0.000970446	0.0021076032

```
TESTIMATING INTRA-BMC VARIABILITY
 USING TRANSLOG EQUATION/DATA ARE MEAN CENTERED
 INCLUDING HETEROSCEDASTICITY CORRECTION

 Dependent Variable: COST
 Test: T1       Numerator:      0.9230  DF:    2   F value:  32.7924
                Denominator:  0.028148  DF:  140   Prob>F:    0.0001


 Dependent Variable: COST
 Test: T1       using ACOV estimates
 DF:    2   Chisq Value: 77.251990825   Prob>Chisq:   0.0000
```

Response of United States Postal Service Witness Bradley
to
Interrogatories of United Parcel Service

UPS/USPS-T13-11.

(a) You state on page 27, lines 15-17, of your testimony that you can account "for the possibility of non-volume related regional variation in cost by including dummy variables for each region in the econometric specification." Does this technique also allow you to account for volume-related regional variations in cost?

(b) If there are volume-related regional variations in cost, is your model specified in such a way as to allow you to take them correctly into account? Please describe the basis for your answer.

UPS/USPS-T13-11 Response:

(a) Volume-related variation in cost is captured through investigating the variation in both costs and volume (cubic foot-miles) across contracts. The cross-sectional data base includes the variation in costs and volume (cubic foot-miles) across regions. If contract cost segments in any particular region happen to have higher cubic foot-miles than other regions, then that fact would be captured by the recorded cubic foot-miles on those contract cost segments. In addition, each observation includes the cost for the contract cost segments, so the volume-related variation in cost is captured through estimation of the cost/volume (cubic foot-mile) relationship across all of the contract cost segments.

(b) Yes. Volume-related variations in cost across regions would be captured in a cross-

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sectional database by a regression of cost on volume (cubic foot-miles). In fact, the cross-sectional regression analysis accounts for both within-region variation in volumes and cost, as well as across-region variations in volume and cost.

Response of United States Postal Service Witness Bradley
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Interrogatories of United Parcel Service

UPS/USPS-T13-12. Would you expect contractor fuel costs to be less volume-related, as volume-related, or more volume-related than total contractor costs? Please describe the basis for your answer.

UPS/USPS-T13-12 Response.

I don't have an expectation either way. On one hand, I would expect fuel consumption to be fairly closely related to the mileage component of cubic foot-miles. On the other hand, regional variations in fuel prices could bear no relationship to cubic foot-miles. Because fuel cost is a combination of price and fuel usage, these two factors work in opposite direction and are potentially offsetting.

Please note that the variable that represents fuel cost in the HCSS extract should not be used to investigate this hypothesis. As explained in my response to OCA/USPS T13-7, the Postal Service pays the total cost specified in the contract, but it is up to the contractor to decide how to allocate the total cost across the various types of costs that comprise the cost statement. This allocation has no bearing on the amount of payment. Thus, the allocation of costs to various fields like fuel cost or hired driver wages is arbitrary and cannot be used in an analysis of purchased highway contract costs.

Response of United States Postal Service Witness Bradley
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UPS/USPS-T13-13. The econometric results presented in Table 7 allow the constant terms of the translog costs models to take different values in the different regions of the country. Did you estimate, test, or examine any models based upon specifications that allow other translog cost model coefficients to take different values in the different regions of the country? If so, please provide copies of all computer programs, outputs, and other results produced in the course of these investigations.

UPS/USPS-T13-13 Response:

I did not perform any of the alternative analyses that you describe for two reasons. First except for the intra-SCF and box route categories there are not enough data in each of the regions to permit accurate estimation of separate coefficients. As shown in the table below, even in the case of inter-SCF, where there are many observations, the distribution of data across regions is uneven. Some regions are more populous and require more transportation and there are several regions for which there are not sufficient observations to accurately estimate separate coefficients.

Second, because I have a cross sectional data base, I wanted to allow for not only the variance in areas but also across areas. This approach permits more efficient estimation and generates the single, national number required for the volume variability calculation

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Distribution of Inter-SCF Observations Across Regions		
	VAN CONTRACTS	TRACTOR TRAILER CONTRACTS
AREA	FREQUENCY	FREQUENCY
1	170	118
2	67	90
3	102	83
4	226	49
5	30	27
7	74	70
8	40	64
9	92	83
10	59	27
11	83	27
12	39	31
All	982	669

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UPS/USPS-T13-14. Consider as an example an Intra-City contract whose volume, route length, etc., were equal to the mean values of the contracts used in the econometric analysis whose results are reported in Table 15. Based upon the results of your econometric analysis, what percentage change in costs would you expect to see in response to a 1% change in the volume associated with this contract, holding all else equal? Please explain the basis for your answer.

UPS/USPS-T13-14 Response:

My analysis is not designed to forecast the change in cost associated with a change in cubic foot-miles on any one contract. Instead, it is designed to measure the overall response in cost to a sustained increase in cubic foot-miles. With that caveat in place, the econometric equation would predict that a 1 percent increase in volume would lead to 0.65 percent increase in the cost of that contract.

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UPS/USPS-T13-15. Consider as an example all of the Intra-City contracts for purchased transportation entered into by the Postal Service. Based upon the results of your econometric analysis, what percentage change in total costs would you expect to see in response to a 1% change in the volumes associated with all of these contracts, holding all else equal? Please explain the basis for your answer.

UPS/USPS-T13-15 Response:

I interpret your question to imply a 1 percent increase in volume (cubic foot-miles) on Intra-City contracts nationwide. The econometric equation would predict that 1 percent increase in cubic foot-miles would lead to an increase in cost of about 0.65 percent.

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UPS/USPS-T13-16. Consider as an example all of the Intra-City contracts for purchased transportation entered into by the Postal Service. How much of an increase in total costs would you expect to see if, for each contract in the category, the Postal Service entered into a second identical contract? Please explain the basis for your answer.

UPS/USPS-T13-16 Response:

I presume that when you use the term identical in your hypothetical, that it implies identical cost on each of the new contracts. If so, the only possible outcome is a doubling of total cost for the category. Of course, this is not how actual costs would react to a doubling of cubic foot-miles. Because the variability of Intra-City contracts is less than one, a doubling of cubic foot-miles would lead to a less-than-doubling of costs.

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UPS/USPS-T13-17. Consider as an example all of the Intra-City contracts for purchased transportation entered into by the Postal Service. How much of an increase in total costs would you expect to see if, for every tenth contract in the category, the Postal Service entered into a second identical contract? Please explain the basis for your answer.

UPS/USPS-T13-17 Response:

To answer this question, let us describe the set of all Intra-City contracts as C. Let each contract in the set be represented by its annual cost, C_i, where the subscript indexes across the contracts. We then can define a subset of contracts C* where C* is made up of the contracts that were selected by an every-tenth-contract selection rule. In other words,

$$C^* = \{C_j \mid j = 10, 20, 30, \ldots\}$$

Using this definition, we can define the total cost associated with this subset of contracts as $\hat{c}_j$, where:

$$\hat{C}_j = \sum_{j=1}^{N} C_j$$

I would expect total cost in your hypothetical to increase by the amount $\hat{c}_j$. Of course, this is not how total costs actually react to the implied increase in cubic foot-miles. Because the

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variability of Intra-City contracts is less than one, the increase in cost would be proportionately smaller than the increase in cubic foot-miles.

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UPS/USPS-T13-18. Consider as an example all of the Intra-City contracts for purchased transportation entered into by the Postal Service. How much of an increase in total costs would you expect to see if, for every hundreth contract in the category, the Postal Service entered into a second identical contract? Please explain the basis for your answer.

UPS/USPS-T13-18 Response:

To answer this question, let us describe the set of all Intra-City contracts as C. Let each contract in the set be represented by its annual cost, C_i, where the subscript indexes across the contracts. We then can define a subset of contracts C* where C* is made up of the contracts that were selected by an every-one hundredth-contract selection rule. In other words,

$$C^* = \{C_k \mid k = 100, 200, 300, \ldots\}$$

Using this definition, we can define the total cost associated with this subset of contracts as $\hat{c}_k$, where:

$$\hat{C}_k = \sum_{k=1}^{N} C_k$$

I would expect total cost in your hypothetical to increase by the amount $\hat{c}_j$. Of course, this is not how total costs actually react to the implied increase in volume. Because the

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variability of Intra-City contracts is less than one, the increase in cost would be proportionately smaller than the increase in cubic foot-miles.

Response of United States Postal Service Witness Bradley
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UPS/USPS-T13-19.

(a) In your opinion, do the characteristics (i.e., volume, route length, number of routes, number of trucks, etc.) of the Postal Service's contracts for purchased transportation reflect efforts on the part of the Postal Service to obtain these services at the lowest possible cost?

(b) In attempting to obtain purchased transportation at the lowest possible cost, is the Postal Service free to select whatever contract characteristics it believes are optimal from its point of view, or are there constraints on the ability of the Postal Service to alter contract characteristics? What are the nature of any such constraints?

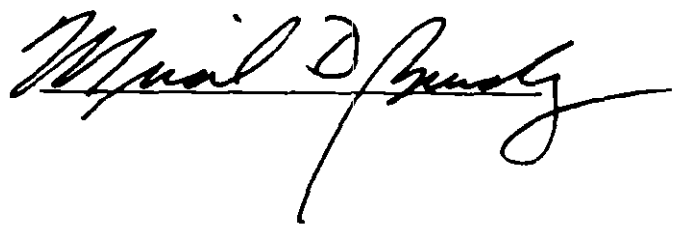
UPS/USPS-T13-19 Response:

(a) No. It is my understanding that the Postal Service, through the contracting process, attempts to get reliable transportation service at the lowest possible cost. It does not simply minimize cost because it requires reliable transportation service.

(b) It is my understanding that the Postal Service is free to pick whatever characteristics they require as constrained by applicable federal and state laws.

DECLARATION

I, Michael D. Bradley, declare under penalty of perjury that the foregoing answers are true and correct, to the best of my knowledge, information, and belief.



Dated: August 11, 1997

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon all participants of record in this proceeding in accordance with section 12 of the Rules of Practice.

Susan M. Duchek

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August 11, 1997