Before The
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268-0001

Postal Rate and Fee Changes, 2000 — Docket No. R2000-1

RESPONSE OF THE UNITED STATES POSTAL SERVICE WITNESS BARON TO ADVO INTERROGATORY REDIRECTED FROM WITNESS RAYMOND (ADVO/USPS-T13-23(a), 23(c))

The United States Postal Service hereby provides the response of witness Baron to the following interrogatories of Advo, Inc.: ADVO/USPS-T13-23(a), 23(c), filed on February 22, 2000. Interrogatory ADVO/USPS-T13-23 was intended originally to be redirected to the Postal Service, but in the course of developing the answer, it became clear that parts (a) and (b) should be redirected to the witness Baron, while part (b) could be answered by witness Raymond.

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

Respectfully submitted,

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RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS BARON TO
INTERROGATORY OF ADVO, INC. REDIRECTED FROM WITNESS RAYMOND

ADVO/USPS-T13-23. Please provide the following information with respect to the sample survey that generated the data presented in your testimony and used by USPS witness Baron:

(a) the "definition of the universe under study, the sampling frame and units, and the validity and confidence limits that can be placed on major estimates," as required by Rule 31(k)(2)(ii) of the Commission's Rules of Practice.

(c) the results of all such sampling and statistical tests.

RESPONSE:

(a) The universe under study and the sampling frame can be defined as the population of all city carrier routes (other than phantom routes) in existence during PFY 1997 – Quarter 4. The units of the analysis are, according to this view, the individual routes. The universe and sampling frame can also be viewed as a set of six sub-populations. One sub-population is defined for each of the six major route categories: foot, business motorized, residential curb, residential park & loop, mixed curb, and mixed park & loop.

The street-time percentages presented in sheet 7.0.4.1 of the segment 7 workbook, Cs06&7.xls (Docket No. R2000-1, USPS LR-I-80) for each route type should be regarded as sample-based estimates of the corresponding sub-population street-time percentages. In order to derive standard errors for these estimates, we can also view them as "ratio" estimates of the sub-population ratios of total tallies for the given street activities (load, street support, driving time, route/access FAT, route/access CAT, and street-box collection) to gross total tallies over all activities combined.

Table 1 shows the application of this approach to the sub-population of all residential park & loop routes. In FY 1997 – QTR 4, there were 82,908 such

routes. The portion of the ES database used to estimate the residential park & loop street-time percentages consists of a sample of 110 of these routes. Each of the six residential park & loop street-time percentages reported in Cs06&7.xls, lines 9-14, can be viewed as the sample ratio of total weighted tallies over all 110 routes for the given street-activity to the total of the weighted tallies over all six activities over all such routes. The standard error for each ratio is derived from William Cochran's formula for the standard error of the sample ratio. This formula is equation 2.46 in Cochran's book Sampling Techniques (John Wiley & Sons, 1977, at 32). USPS LR-I-292 presents in greater detail the application of that formula to the estimation of the standard errors for all the street-time percentages.

Table 1 also shows 95% confidence intervals for the estimated street-time percentages. These intervals are derived from the standard normal probability distribution under the assumption that the ratio of the deviation of each estimated percentage from its mean over its estimated standard error is normally distributed with a mean of 0 and variance of 1.

TABLE 1. ESTIMATED STANDARD ERRORS AND 95% CONFIDENCE INTERVALS FOR SAMPLE ESTIMATES OF RESIDENTIAL PARK & LOOP STREET-TIME PERCENTAGES

Street-Time Activity	Ratio of Total Tallies for the Activity Over 110 Sample Routes to Total Tallies for all Street Activities over all such Routes	Estimated Standard Error of Ratio	95% Confidence Interval
Load	.3527	.0196	.3143-.3910
Street Support	.1779	.0083	.1616-.1942
Driving Time	.1123	.0093	.0940-.1306
Route/Access FAT	.3320	.0219	.2891-.3749
Route/Access CAT	.0222	.0050	.0124-.0321
Collection	.0029	.0009	.0011-.0047

Additional results comparable to table 1 could be prepared for all other route types: mixed park & loop, business motorized, etc. However, a few concerns relating to the correct interpretation of the estimated standard errors and confidence intervals must be considered before the appropriate course of action can be determined. First, ratio estimates (i.e., sample street-time percentages) derived from small samples are usually slightly biased estimates of the population ratios (Cochran 31). Also, for small sample sizes, the sampling distributions of the sample street-time percentages are skew, and the estimated standard errors might be too low (Cochran, 31-32, 153, 156). Moreover, the skewness of the sampling distribution implies that the ratio of the deviation of each sample percentage from its expected value over its estimated standard error also has a distribution that may be too highly skewed to justify using the

standard normal distribution to derive confidence intervals (Cochran 31-32, 153, 156).

Cochran also observes, however, that this skewness of the sampling distribution of the sample ratio and the bias of that ratio and of its standard error estimate become inconsequential for large samples (Cochran 31-32, 153, 156, 160). The obvious question is: how large is large enough? Cochran states that "as a working rule," the ratio estimate and its estimated standard error can be regarded as unbiased, and the sampling distribution of this ratio as being normal, for sample sizes in excess of 30, provided the coefficients of variation of the numerator and denominator of the ratio are both less than 10% (Cochran, 153). Given this rule, the samples for the mixed park & loop, mixed curb, and business motorized categories are small enough for one to question whether street-time percentages derived from these samples, and the estimated standard errors of these percentages are unbiased, and whether the sampling distributions of the percentages achieve normality.

It should also be emphasized, however, that there exists an important alternative costing approach that eliminates this issue of small sample sizes. This approach is to aggregate the existing six route type categories into only three categories. Specifically, the mixed park & loop, business motorized and residential park & loop categories are aggregated into a single park & loop route type. The mixed curb and residential curb categories are aggregated into a single curb route type. The foot category is left as is.

The key advantage of this new approach is that the three remaining categories – foot, aggregate park & loop, and aggregate curb – all have large samples. The foot category, which is unchanged from the original analysis, has 36 routes. The new, aggregate park & loop category has 121 sample routes, and the new, aggregate curb route category has 179 sample routes.

Tables 2-4 show standard errors and confidence intervals for the new street-time percentages calculated for this new set of route types. (These new percentages, standard errors and confidence intervals are derived in USPS LR-I-292). The results are clearly valid, given the large sample sizes, and they generally show relatively narrow confidence intervals for the new, estimated street-time percentages.[1] The exceptions are the wide confidence intervals calculated for the load time, street support, and route-access/FAT activities within the foot route-type category.

TABLE 2. ESTIMATED STANDARD ERRORS AND 95% CONFIDENCE INTERVALS FOR SAMPLE ESTIMATES OF FOOT STREET-TIME PERCENTAGES

Street-Time Activity	Ratio of Total Tallies for the Activity Over 36 Sample Routes to Total Tallies for all Street Activities over all such Routes	Estimated Standard Error of Ratio	95% Confidence Interval
Load	.4935	.1127	.2725-.7145
Street Support	.1523	.0408	.0725-.2322
Driving Time	.0216	.0092	.0036-.0396
Route/Access FAT	.3251	.0740	.1801-.4702
Route/Access CAT	.0044	.0036	-.0027-.0115
Collection	.0031	.0019	-.0006-.0067

[1] This assertion that the confidence limits are statistically valid is supported by the fact that all three samples exceed the 30 unit threshold suggested by Cochran. In addition, the coefficients of variation of the numerators and denominators of all 18 street-time percentages calculated for the foot, aggregate park & loop, and aggregate curb route categories are, with one exception, less than 0.10, thus satisfying the second of Cochran's conditions for the unbiasedness of the ratio estimate and validity of the confidence intervals (Cochran 153). See USPS LR-I-292 for the derivation of these coefficients of variation.

TABLE 3. ESTIMATED STANDARD ERRORS AND 95% CONFIDENCE INTERVALS FOR SAMPLE ESTIMATES OF STREET-TIME PERCENTAGES FOR THE AGGREGATE PARK & LOOP ROUTE TYPE

Street-Time Activity	Ratio of Total Tallies for the Activity Over 121 Sample Routes to Total Tallies for all Street Activities over all such Routes	Estimated Standard Error of Ratio	95% Confidence Interval
Load	.3516	.0185	.3154-.3879
Street Support	.1769	.0082	.1608-.1929
Driving Time	.1157	.0090	.0980-.1333
Route/Access FAT	.3288	.0209	.2878-.3697
Route/Access CAT	.0242	.0051	.0143-.0341
Collection	.0029	.0009	.0011-.0047

TABLE 4. ESTIMATED STANDARD ERRORS AND 95% CONFIDENCE INTERVALS FOR SAMPLE ESTIMATES OF STREET-TIME PERCENTAGES FOR THE AGGREGATE CURB ROUTE TYPE

Street-Time Activity	Ratio of Total Tallies for the Activity Over 179 Sample Routes to Total Tallies for all Street Activities over all such Routes	Estimated Standard Error of Ratio	95% Confidence Interval
Load	.4780	.0181	.4425-.5136
Street Support	.1775	.0076	.1627-.1923
Driving Time	.0978	.0140	.0703-.1252
Route/Access FAT	.0977	.0144	.0695-.1259
Route/Access CAT	.1479	.0131	.1222-.1737
Collection	.0010	.0003	.0004-.0017

Another critical advantage of the aggregation approach, aside from producing large sample sizes for all route categories, is that the consolidation of the official six route types into only three route types does not significantly affect the final segment 7 cost results. Tables 5 and 6 show that the final segment 7

volume-variable costs by component that are estimated through the aggregation approach differ by only a few million dollars per mail subclass from the official BY 1998 volume-variable costs estimated in the Cs06&7.xls workbook presented in USPS LR-I-80.

Tables 5-6 demonstrate this result on a component by component basis. Observe, first, that Table 5 is broken into two parts. The first part, shown on pages 10-11, compares the volume-variable costs derived through the aggregation approach just for the load time and access activities with corresponding official Cs06&7.xls BY 1998 costs. The second part of table 5, shown on pages 12-13, compares volume-variable costs derived through the aggregation approach with official volume-variable costs for the route-time and street-support activities.

Table 6 sums the volume-variable costs from parts 1 and 2 of table 5. Thus, table 6 shows the changes in gross total segment 7 volume-variable costs by mail subclass summed over all street activities that result from substituting the aggregation approach for the official BY 1998 approach. Overall, table 6 shows that gross total volume-variable costs summed across all mail subclasses increase by only $10,050,000 or 0.32%. However, for some mail subclasses, such as Periodicals, costs decrease by small amounts. The largest relative cost increase is the 1.31% increase in Certified and Insurance costs. The largest relative cost decrease is the 1.85% decrease in Standard B Library Mail.

Moreover, this relative insignificance of the cost changes resulting from substitution of the route-category aggregation approach for the official BY 1998

analysis is not an unexpected result. A critical aspect of the segment 7 letter-route cost analysis is that once accrued costs have been allocated to the residential park & loop, mixed park & loop, and business motorized categories all subsequent cost calculations are identical across all three cost pools. Specifically, the parameters that split accrued route/access FAT and route/access CAT costs into route and access portions, and that determine the volume-variable access costs by mail subclass are the same for mixed loop and business motorized route costs as they are residential park & loop costs. So, also, are the parameters applied to accrued driving time, load-time, collection box, and street support costs in order to derive volume-variable costs by subclass.

The same conclusions apply to the mixed curb and residential curb route types. Once accrued costs have been allocated to the mixed curb and residential curb categories, all subsequent cost calculations are identical across the resulting two cost pools. Again, the parameters that split accrued route/access FAT and CAT foot route costs into route and access portions, and that determine the volume-variable access costs by mail subclass are the same for both cost pools. So, also, are the parameters applied to accrued driving time, load-time, collection box, and street-support costs in order to derive volume-variable costs by subclass.

Thus, the aggregate approach offers a logical alternative for deriving total segment 7 volume-variable costs by mail subclass. These costs differ very little from corresponding official BY 1998 costs presented in LR-I-180. Moreover, the

route samples used to derive the new street-time percentages estimated in the aggregate approach are now unequivocally large enough in all cases to ensure that estimated standard errors and confidence intervals for these percentages are statistically valid.

A final, key implication of this virtual equality between the aggregate analysis volume-variable costs and corresponding official BY 1998 costs is that it negates concerns raised earlier regarding possible biases in the official street-time percentages calculated for all six route-type categories. The fact that the aggregation procedure's elimination of the concern of too few routes in some of the six official route-category samples, which was the very problem that had raised the bias issue in the first place, nevertheless produces the same costs as do the official samples establishes that any such biases are insignificant.

TABLE 5, PART 1. COMPARISON OF BY 1998 SEGMENT 7 VOLUME-VARIABLE LOAD-TIME AND ACCESS COSTS DERIVED FROM THE AGGREGATE APPROACH WITH OFFICIAL BY 1998 VOLUME-VARIABLE LOAD-TIME AND ACCESS COSTS PRESENTED IN CS06&7.XLS, USPS LR-I-80 ($1,000)

CLASS, SUBCLASS, OR SPECIAL SERVICE	OFFICIAL LOAD-TIME COST	LOAD-TIME COST, AGGREGATE APPROACH	DIFFERENCE	OFFICIAL ACCESS COST	ACCESS COST, AGGREGATE APPROACH	DIFFERENCE
FIRST-CLASS MAIL:						
SINGLE-PIECE LETTERS	314,079	317,929	3,850	66,291	65,571	(720)
PRESORT LETTERS	307,014	310,878	3,864	25,939	25,947	8
TOTAL LETTERS	621,093	628,807	7,714	92,230	91,518	(712)
SINGLE-PIECE CARDS	22,510	22,788	278	4,476	4,438	(38)
PRESORT CARDS	16,732	16,943	211	1,750	1,751	1
TOTAL CARDS	39,242	39,731	489	6,226	6,189	(37)
TOTAL FIRST-CLASS	660,335	668,538	8,203	98,456	97,707	(749)
PRIORITY MAIL	49,856	50,470	614	27,369	27,356	(13)
EXPRESS MAIL	22,406	22,662	256	7,752	7,751	(1)
MAILGRAMS	103	105	2	85	85	-
PERIODICALS:						
IN-COUNTY	8,891	9,003	112	678	679	1
OUTSIDE COUNTY:						
REGULAR	69,247	70,118	871	5,281	5,288	7
NON-PROFIT	20,566	20,825	259	1,568	1,570	2
CLASSROOM	585	592	7	45	45	-
TOTAL PERIODICALS	99,289	100,538	1,249	7,572	7,582	10
STANDARD A:						
SINGLE PIECE RATE	1,496	1,511	15	2,790	2,768	(22)
COMMERCIAL STANDARD:						
ENHANCED CARR RTE	352,282	356,715	4,433	32,931	32,940	9
REGULAR	297,595	301,340	3,745	17,661	17,667	6
TOTAL COMMERCIAL	649,877	658,055	8,178	50,592	50,607	15
AGGREGATE NONPROFIT:						
ENHANCED CARR RTE	16,495	16,702	207	2,197	2,201	4
REGULAR	72,771	73,687	916	1,645	1,646	1
TOTAL NONPROFIT	89,266	90,389	1,123	3,842	3,847	5

TABLE 5, PART 1. COMPARISON OF BY 1998 SEGMENT 7 VOLUME-VARIABLE LOAD-TIME AND ACCESS COSTS DERIVED FROM THE AGGREGATE APPROACH WITH OFFICIAL BY 1998 VOLUME-VARIABLE LOAD-TIME AND ACCESS COSTS PRESENTED IN CS06&7.XLS, USPS LR-I-80 ($1,000)

CLASS, SUBCLASS, OR SPECIAL SERVICE	OFFICIAL LOAD-TIME COST	LOAD-TIME COST, AGGREGATE APPROACH	DIFFERENCE	OFFICIAL ACCESS COST	ACCESS COST, AGGREGATE APPROACH	DIFFERENCE
TOTAL STANDARD A	740,639	749,955	9,316	57,224	57,222	(2)
STANDARD MAIL (B):						
PARCELS ZONE RATE	25,240	25,553	313	10,028	10,023	(5)
BOUND PRINTED MATTER	22,082	22,353	271	15,024	15,024	-
SPECIAL STANDARD	10,313	10,441	128	5,877	5,877	-
LIBRARY MAIL	1,492	1,510	18	878	877	(1)
TOTAL STANDARD (B)	59,127	59,857	730	31,807	31,801	(6)
US POSTAL SERVICE	1,619	1,639	20	408	404	(4)
FREE MAIL	1,835	1,858	23	69	68	(1)
INTERNATIONAL MAIL	6,134	6,206	72	4,076	4,068	(8)
TOTAL MAIL	1,641,343	1,661,828	20,485	234,818	234,044	(774)
SPECIAL SERVICES:						
REGISTRY	5,163	5,224	61	-	-	-
CERTIFIED	93,882	95,064	1,182	-	-	-
INSURANCE	4,516	4,572	56	-	-	-
COD	1,960	1,984	24	-	-	-
SPECIAL DELIVERY						
MONEY ORDERS						
STAMPED ENVELOPES						
SPECIAL HANDLING						
POST OFFICE BOX						
OTHER	522	522	-	-	-	-
TOTAL SPECIAL SERVICES	106,043	107,366	1,323	-	-	-
TOTAL VOLUME-VARIABLE	1,747,386	1,769,194	21,808	234,818	234,044	(774)
INSTITUTIONAL	880,255	890,907	10,652	1,403,993	1,406,577	2,584
GRAND TOTAL	2,627,641	2,660,101	32,460	1,638,811	1,640,621	1,810

TABLE 5, PART 2. COMPARISON OF BY 1998 SEGMENT 7 VOLUME-VARIABLE ROUTE-TIME AND STREET-SUPPORT COSTS DERIVED FROM THE AGGREGATE APPROACH WITH OFFICIAL BY 1998 VOLUME-VARIABLE ROUTE-TIME AND STREET SUPPORT COSTS PRESENTED IN CS06&7.XLS, USPS LR-I-80 ($1,000)

CLASS, SUBCLASS, OR SPECIAL SERVICE	OFFICIAL ROUTE-TIME COST	ROUTE-TIME COST, AGGREGATE APPROACH	DIFFERENCE	OFFICIAL COST OF STREET SUPPORT OF LOAD, ACCESS, AND ROUTE	COST OF STREET SUPPORT OF LOAD, ACCESS, AND ROUTE, AGGREGATE APPROACH	DIFFERENCE
FIRST-CLASS MAIL:						
SINGLE-PIECE LETTERS	12,637	11,817	(820)	273,790	272,690	(1,100)
PRESORT LETTERS	11,681	10,924	(757)	150,680	150,915	235
TOTAL LETTERS	24,318	22,741	(1,577)	424,470	423,604	(866)
SINGLE-PIECE CARDS	175	163	(12)	15,254	15,229	(25)
PRESORT CARDS	61	57	(4)	6,874	6,905	32
TOTAL CARDS	236	220	(16)	22,128	22,134	6
TOTAL FIRST-CLASS	24,554	22,961	(1,593)	446,597	445,738	(859)
PRIORITY MAIL	25,451	23,800	(1,651)	25,582	25,720	138
EXPRESS MAIL	2,100	1,964	(136)	6,204	6,310	106
MAILGRAMS	84	78	(6)	49	49	0
PERIODICALS:						
IN-COUNTY	2,573	2,407	(166)	3,681	3,696	15
OUTSIDE COUNTY:						
REGULAR	20,042	18,743	(1,299)	42,741	42,685	(56)
NON-PROFIT	5,953	5,567	(386)	10,855	10,861	7
CLASSROOM	169	158	(11)	213	215	2
TOTAL PERIODICALS	28,737	26,875	(1,862)	57,490	57,458	(32)
STANDARD A:						
SINGLE PIECE RATE	1,559	1,458	(101)	3,624	3,601	(22)
COMMERCIAL STANDARD						
ENHANCED CARR RTE	33,239	31,083	(2,156)	127,904	128,767	863
REGULAR	27,123	25,364	(1,759)	160,785	160,796	11
TOTAL COMMERCIAL	60,362	56,447	(3,915)	288,689	289,563	874
AGGREGATE NONPROFIT:						
ENHANCED CARR RTE	1,099	1,027	(72)	7,307	7,334	27
REGULAR	4,582	4,285	(297)	34,225	34,279	54

TABLE 5, PART 2. COMPARISON OF BY 1998 SEGMENT 7 VOLUME-VARIABLE ROUTE-TIME AND STREET-SUPPORT COSTS DERIVED FROM THE AGGREGATE APPROACH WITH OFFICIAL BY 1998 VOLUME-VARIABLE ROUTE-TIME AND STREET SUPPORT COSTS PRESENTED IN CS06&7.XLS, USPS LR-I-80 ($1,000)

CLASS, SUBCLASS, OR SPECIAL SERVICE	OFFICIAL ROUTE-TIME COST	ROUTE-TIME COST, AGGREGATE APPROACH	DIFFERENCE	OFFICIAL COST OF STREET SUPPORT OF LOAD, ACCESS, AND ROUTE	COST OF STREET SUPPORT OF LOAD, ACCESS, AND ROUTE, AGGREGATE APPROACH	DIFFERENCE
TOTAL NONPROFIT	5,681	5,312	(369)	41,532	41,613	81
TOTAL STANDARD A	67,602	63,217	(4,385)	333,845	334,777	932
STANDARD MAIL (B):						
PARCELS ZONE RATE	14,214	13,292	(922)	10,150	10,238	88
BOUND PRINTED MATTER	10,609	9,921	(688)	9,869	9,961	92
SPECIAL STANDARD	5,971	5,583	(388)	4,322	4,363	41
LIBRARY MAIL	1,691	1,582	(109)	851	854	3
TOTAL STANDARD (B)	32,485	30,378	(2,107)	25,192	25,417	225
US POSTAL SERVICE	491	459	(32)	2,479	2,460	(19)
FREE MAIL	194	181	(13)	555	561	6
INTERNATIONAL MAIL	1,273	1,190	(83)	4,161	4,168	7
TOTAL MAIL	182,971	171,103	(11,868)	902,155	902,659	504
SPECIAL SERVICES:						
REGISTRY	-	-	-	1,219	1,238	19
CERTIFIED	-	-	-	21,557	21,904	346
INSURANCE	-	-	-	990	1,007	17
COD	-	-	-	480	487	7
SPECIAL DELIVERY	-	-	-	-	-	-
MONEY ORDERS	-	-	-	-	-	-
STAMPED ENVELOPES	-	-	-	-	-	-
SPECIAL HANDLING	-	-	-	-	-	-
POST OFFICE BOX	-	-	-	82	81	(1)
OTHER	-	-	-	920	912	(8)
TOTAL SPECIAL SERVICES	-	-	-	25,249	25,629	380
TOTAL VOLUME-VARIABLE	182,971	171,103	(11,868)	927,404	928,288	884
INSTITUTIONAL	2,046,947	2,005,984	(40,963)	836,591	854,265	17,674
GRAND TOTAL	2,229,918	2,177,087	(52,831)	1,763,995	1,782,553	18,558

TABLE 6. COMPARISON OF BY 1998 GROSS TOTAL SEGMENT 7 VOLUME-VARIABLE COSTS DERIVED FROM THE AGGREGATE APPROACH WITH CORRESPONDING OFFICIAL BY 1998 VOLUME-VARIABLE COSTS PRESENTED IN CS06&7.XLS, USPS LR-I-80 ($1,000)

	TOTAL LOAD-TIME, ACCESS, ROUTE, & STREET SUPPORT			
CLASS, SUBCLASS, OR SPECIAL SERVICE	TOTAL OFFICIAL COST	TOTAL COST, AGGREGATE APPROACH	DIFFERENCE	% DIFFERENCE
FIRST-CLASS MAIL:				
SINGLE-PIECE LETTERS	666,797	668,007	1,210	0.18%
PRESORT LETTERS	495,314	498,664	3,350	0.67%
TOTAL LETTERS	1,162,111	1,166,670	4,559	0.39%
SINGLE-PIECE CARDS	42,415	42,618	203	0.48%
PRESORT CARDS	25,417	25,656	240	0.93%
TOTAL CARDS	67,832	68,274	442	0.65%
TOTAL FIRST-CLASS	1,229,942	1,234,944	5,002	0.41%
PRIORITY MAIL	128,258	127,346	(912)	-0.72%
EXPRESS MAIL	38,462	38,687	225	0.58%
MAILGRAMS	321	317	(4)	-1.15%
PERIODICALS:				
IN-COUNTY	15,823	15,785	(38)	-0.24%
OUTSIDE COUNTY:				
REGULAR	137,311	136,834	(477)	-0.35%
NON-PROFIT	38,942	38,823	(118)	-0.30%
CLASSROOM	1,012	1,010	(2)	-0.21%
TOTAL PERIODICALS	193,088	192,453	(635)	-0.33%
STANDARD A:				
SINGLE PIECE RATE	9,469	9,338	(130)	-1.40%
COMMERCIAL STANDARD:				
ENHANCED CARR RTE	546,356	549,505	3,149	0.57%
REGULAR	503,164	505,167	2,003	0.40%
TOTAL COMMERCIAL	1,049,520	1,054,672	5,152	0.49%
AGGREGATE NONPROFIT:				
ENHANCED CARR RTE	27,098	27,264	166	0.61%
REGULAR	113,223	113,897	674	0.59%
TOTAL AGGREG NONPROFIT	140,321	141,161	840	0.60%
TOTAL STANDARD A	1,199,310	1,205,171	5,861	0.49%
STANDARD MAIL (B):				
PARCELS ZONE RATE	59,632	59,106	(526)	-0.89%
BOUND PRINTED MATTER	57,584	57,259	(325)	-0.57%
SPECIAL STANDARD	26,483	26,264	(219)	-0.83%
LIBRARY MAIL	4,912	4,823	(89)	-1.85%
TOTAL STANDARD (B)	148,611	147,453	(1,158)	-0.79%
US POSTAL SERVICE	4,997	4,962	(35)	-0.71%
FREE MAIL	2,653	2,668	15	0.55%
INTERNATIONAL MAIL	15,644	15,632	(12)	-0.08%
TOTAL MAIL	2,961,287	2,969,634	8,347	0.28%
SPECIAL SERVICES:				
REGISTRY	6,382	6,462	80	1.23%
CERTIFIED	115,439	116,968	1,528	1.31%
INSURANCE	5,506	5,579	73	1.31%
COD	2,440	2,471	31	1.24%

TABLE 6. COMPARISON OF BY 1998 GROSS TOTAL SEGMENT 7 VOLUME-VARIABLE COSTS DERIVED FROM THE AGGREGATE APPROACH WITH CORRESPONDING OFFICIAL BY 1998 VOLUME-VARIABLE COSTS PRESENTED IN CS06&7.XLS, USPS LR-I-80 ($1,000)

	TOTAL LOAD-TIME, ACCESS, ROUTE, & STREET SUPPORT			
CLASS, SUBCLASS, OR SPECIAL SERVICE	TOTAL OFFICIAL COST	TOTAL COST, AGGREGATE APPROACH	DIFFERENCE	% DIFFERENCE
SPECIAL DELIVERY	-	-	-	
MONEY ORDERS	-	-	-	
STAMPED ENVELOPES	-	-	-	
SPECIAL HANDLING	-	-	-	
POST OFFICE BOX	82	81	(1)	-1.29%
OTHER	1,442	1,434	(8)	-0.54%
TOTAL SPECIAL SERVICES	131,292	12,995	1,703	1.28%
TOTAL VOLUME-VARIABLE	3,092,579	3,102,629	10,050	0.32%
INSTITUTIONAL	5,167,786	5,157,733	(10,050)	-0.19%
GRAND TOTAL	8,260,365	8,260,362	-	0.00%

An additional point that is relevant to the results just presented relates to the issue of randomness in the sample of routes that produced the street-time percentage estimates. Witness Lloyd Raymond has stated that not all of the sites from which these 336 city routes were selected were identified through a strictly random procedure. Some sites were non-randomly picked by postal management to ensure that data for all sampled routes located within all sampled sites could be located on Delivery Unit Computers. (See USPS-T-13 at 7-8).

This lack of strict adherence to a rigorous random sampling may cause some analysts to question the validity of the standard errors and confidence intervals estimated for the tally percentages. However, an alternative approach based on a methodology discussed by Cochran effectively resolves

this issue.[2] This approach views each of the six sub-populations of routes for which street-time percentages have been estimated as being itself a random sample selected from an infinitely sized superpopulation. Moreover, this approach views the unknown ratio of tallies for each street activity over total tallies for any given route in the superpopulation as being equal to the ratio of mean tallies for the activity over mean total tallies plus a random error term. Since the source of randomness according to this construction is the superpopulation, the finite population of N routes must also be random. Moreover, the observed sample of n routes for each route type is a random sample as well, regardless of how it is selected (Cochran 158-159).

This "superpopulation" approach is also useful for resolving a final concern relating to the analysis presented so far. Thus far, the sample street-time percentage for each street activity has been referred to as the ratio of total sample tallies for this activity to total sample tallies for all activities. This is an oversimplification. Recall from pages 34-35 of my testimony (USPS-T-12), that each ratio actually equals total weighted tallies for the given street activity divided by total weighted tallies over all activities. Moreover, the weight that each tally is multiplied by equals the ratio of total routes in the relevant five-digit zip code within a given route-type category to corresponding total sample routes. It can be shown that this ratio of weighted tallies for any street activity k to weighted tallies over all activities is still an unbiased estimator of the true ratio of total

[2] It should also be emphasized that although not all sites were selected randomly, a random process was used to select all sampled routes within all of the sites.

activity k tallies over grand total tallies in the entire subpopulation of routes for each route-type category.

This point can be demonstrated through the following analysis. First, let the ratio of weighted tallies for street activity k to grand total weighted tallies over all activities for any given route type be expressed as:

$$\hat{R}_k = \sum_{j=1}^{J}\sum_{i=1}^{n_j} w_j T_{ijk} \Big/ \sum_{j=1}^{J}\sum_{i=1}^{n_j} w_j TT_{ij} \qquad (1),$$

where T_{ijk} equals sample tallies for street activity k on route i within five-digit zip code j, TT_{ij} equals total tallies on route i in zip code j summed over all street activities, n_j equals total sample routes in the given route type within zip code j, and w_j equals the total population routes in zip code j that are in that same route type divided by n_j. Thus, $\hat{R}_k$ equals the sum of weighted sample tallies for activity k over all routes and over all zip codes for the given route type divided by the corresponding sum of weighted sample tallies for all street-time activities.

The superpopulation approach views the relationship between T_{ijk} and TT_{ij} in the entire subpopulation of routes for the given route type as having the form: $T_{ijk} = (\overline{T}_{ijk} / \overline{TT}_{ij}) * TT_{ij} + e_{ijk}$ (2),

where $\overline{T}_{ijk} / \overline{TT}_{ij} = R_k$, is the subpopulation ratio of mean activity k tallies over all routes and zip codes to the corresponding mean total tallies, and e_{ijk} is a stochastic error term (Cochran 158-159,).

The expected value of $\hat{R}_k$ is the expected value of the hypothetical sampling distribution of all possible $\hat{R}_k$ calculated from all possible samples of size $n = \sum_{j}^{J} n_j$. This expected value can be expressed as

$$E(\hat{R}_k) = \sum_{j=1}^{J} \sum_{i=1}^{n_j} w_j E(T_{ijk}) / \sum_{j=1}^{J} \sum_{i=1}^{n_j} w_j TT_{ij}, \quad (3)$$

since it can be assumed that the w_i and the $w_i TT_{ij}$ are fixed in the repeated samples (Cochran 159, Ronald J. Wonnacott and Thomas H. Wonnacott, Econometrics, John Wiley & Sons, 1979, at 25-26). Moreover, from (2), it is apparent that:

$$E(T_{ijk}) = (\overline{T}_{ijk}) / (\overline{TT}_{ij}) * TT_{ij} = R_k * TT_{ij} \qquad (4),$$

assuming that $E(e_{ij})$ equals 0. Substitution of (4) into (3) produces

$$E(\hat{R}_j) = \sum_{j=1}^{J} \sum_{i=1}^{n_j} w_j TT_{ij} R_k / \sum_{j=1}^{J} \sum_{i=1}^{n_j} w_j TT_{ij} = [(\sum_{j=1}^{J} \sum_{i=1}^{n_j} w_j TT_{ij} / \sum_{j=1}^{J} \sum_{i=1}^{n_j} w_j TT_{ij})] R_k = R_k \quad (5)$$

Thus, the weighting procedure still produces an estimated ratio of tallies for each activity k to total tallies over all activities that is an unbiased estimate of the true ratio R_k.

To summarize, Cochran's superpopulation approach clearly applies to the current analysis of street-time tallies. It supports the view that the sampling distributions of the sample weighted street-time percentages exist, that their expected values equal the true subpopulation ratios of tallies for the individual street activities to grand total tallies, and that the estimated standard errors of the

street-time percentages are unbiased. Moreover, these conclusions are true regardless of sample size (Cochran 158-160).

(c) Please see my response to part (a). See also Witness Raymond's response to ADVO/USPS-T13-23(b).

DECLARATION

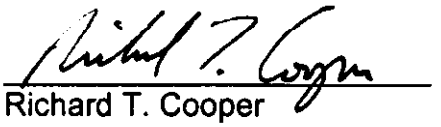
I, Donald M. Baron, declare under penalty of perjury that the foregoing answers are true and correct to the best of my knowledge, information, and belief.

Donald M. Baron

Date: 4-10-00

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.



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