USPS-T-16

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

POSTAL RATE AND FEE CHANGES, 1997

Docket No. R97-1

DIRECT TESTIMONY
OF
PHILIP A. HATFIELD
ON BEHALF OF
UNITED STATES POSTAL SERVICE

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DIRECT TESTIMONY

OF

PHILIP A. HATFIELD

AUTOBIOGRAPHICAL SKETCH

My name is Philip A. Hatfield. I am a Consultant in the Office of Government Services at Price Waterhouse LLP (hereafter Price Waterhouse) in Arlington, Virginia. I have been with Price Waterhouse since 1994.

My work at Price Waterhouse has been devoted to serving the United States Postal Service and I am an affiliate of Price Waterhouse's Center for Postal Consulting. I have worked on many projects for the United States Postal Service, specializing in cost estimation, rate design analyses, and financial analysis. My experience with the Postal Service includes volume variable cost analysis in transportation and mail processing.

At Price Waterhouse, I have worked on various projects related to parcels and transportation. I have been involved with studies of the calculation of parcel post transportation costs by zone for almost three years.

Over the past three years, I have visited a number of Postal Service field offices including airport mail facilities (AMFs), bulk mail centers (BMCs), processing and distribution centers (P&DCs), and associate post offices (AOs). During these visits, I observed transportation cost system (TRACS) tests, transportation operations, mail processing operations, and delivery operations.

I received a bachelor's degree in Economics from The College of William and Mary in 1994.

I. PURPOSE AND SCOPE OF TESTIMONY

The purpose of this testimony is to develop per piece volume variable transportation cost estimates for use in parcel post rate design. Development of these cost estimates begins with the test year volume variable parcel post transportation costs. Using other inputs developed in this testimony, separate unit cost estimates by zone are calculated for each of the three existing rate categories of parcel post: inter-BMC, intra-BMC, and destination BMC (DBMC). In addition, this testimony develops separate cost estimates for two types of parcel post which are currently entered as DMBC: DBMC parcel post entered at a destination BMC and DBMC parcel post entered at a destination P&DC. Finally, this testimony estimates the potential difference in transportation costs between DBMC parcel post entered at a destination P&DC and a new rate category of parcel post entered at a destination delivery unit (DDU).

The remainder of this testimony is divided into the following three sections: improvements over previous methodology, development of parcel post unit transportation costs, and appendices. The first section describes the major differences between the methodology used to develop unit transportation cost estimates in this testimony and the methodology used in Docket Nos. R90-1 and R94-1. The second gives an overview of the entire methodology, and the appendices describe the development of the cost estimates in detail.

II. IMPROVEMENTS OVER PREVIOUS METHODOLOGY

The last time the methodology for allocating parcel post purchased transportation costs to zone was described on the record was in Docket No. R90-1 by witness Nai-Chi Wang (USPS-T-21). Since witness Wang submitted his testimony, several changes have occurred that allow a more precise estimation of parcel post unit transportation costs. Specifically, the following changes have been made to the methodology of determining parcel post transportation costs for use in rate setting:

- a new method for separating total parcel post purchased transportation costs into the component rate categories
- a more precise determination of distance relation
- a more precise method of estimating the relationship between cubic volume and weight in parcel post
- the inclusion of postal owned vehicle transportation costs
- the different treatment of terminal and line-haul costs in commercial air transportation

Other than the modifications described above, the methodology for allocating parcel post purchased transportation costs to zone mirrors the methodology described by Dr. Wang. The remainder of this section of this testimony describes these areas of improvement in more detail.

A. DIVISION OF PARCEL POST COSTS BY RATE CATEGORY

The first improvement over the previous method of allocating parcel post transportation costs to rate category and zone is the ability to separate transportation costs by rate category. In Docket No. R90-1, Dr. Wang's testimony developed an average transportation cost per piece by zone for all of parcel post. The same average transportation costs for all parcel post were used in the rate design for both the inter-BMC and intra-BMC transportation cost per piece. DBMC transportation costs were

calculated by applying a discount to the average parcel post transportation costs. This discount represented only the costs avoided between intra-BMC and DBMC.

Since Docket No. R90-1, a more precise methodology for determining the costs associated with each rate category of parcel post has been developed. The method for dividing total parcel post purchased transportation costs into the component rate categories has two steps. First, total parcel post purchased transportation costs are divided into three functional cost pools: local, intermediate, and long distance. Second, each of the functional cost pools is divided among the three existing rate categories of parcel post: inter-BMC, intra-BMC, and DBMC.

The division of total transportation costs into the three functions is relatively straightforward. By examining each transportation cost account individually, the costs can be categorized as falling into the local, intermediate, or long distance cost pool. These cost pools are described in more detail later in this testimony and in Appendix I. Once transportation costs by function are calculated, each pool of functional costs is divided among the three rate categories based on a number of factors. The factors used to determine the level of costs incurred by each rate category include: share of parcel post cubic feet, product definition, and the extent to which certain transportation legs are bypassed.

The methodology described above and used in this testimony estimates the transportation costs associated with each rate category of parcel post. Further, the unit costs developed for each rate category in this testimony account only for the costs specifically associated with that rate category. The previous methodology estimated average unit transportation costs in each zone for all parcel post (inter-BMC, intra-BMC, and DMBC combined) and assigned these average unit costs to each rate category. Clearly, the ability to separate total purchased transportation costs by rate category enables the calculation of more precise unit transportation cost estimates for each rate category.

B. DETERMINATION OF DISTANCE RELATED / NON-DISTANCE RELATED COSTS

The next improvement over the previous method of allocating volume variable parcel post purchased transportation costs to rate cells deals with the way in which costs are allocated to zone. How costs are allocated to zone depends on whether the costs have been categorized as distance related or non-distance related. Non-distance related costs are costs that would not be expected to vary between parcels in different zones. Because these costs do not vary between zones, they are allocated to zone based on the percentage of cubic feet in that zone, which implies the same transportation cost per cubic foot for parcels in each zone. Distance related costs are costs that would be expected to vary between parcels in different zones. These costs are allocated to zone based on the percentage of cubic foot miles in each zone and therefore the cost per cubic foot increases with zone.

In Docket No. R94-1, the Commission developed a non-distance related percentage for each mode of purchased transportation.[1] Each percentage was calculated by identifying specific purchased transportation accounts within the mode that are non-distance related and then dividing the costs in these accounts by the total costs for the mode. The same methodology is employed in this testimony; however, more accounts have been identified as non-distance related.

To explain why more accounts have been identified as non-distance related, all transportation cost accounts and components have been grouped into the following three categories, which are referred to hereafter as transportation functions:

- **Local:** Parcel post volume variable transportation costs incurred in transporting parcel post pieces between facilities that are within the service area of a processing and distribution center (P&DC), primarily between associate offices (AOs) and P&DCs.

[1] Docket No. R94-1, PRC LR-11 at 35 (highway, rail, and water), 38 (air).

- **Intermediate:** Parcel post volume variable purchased transportation costs incurred in transporting parcel post pieces between facilities that are within the service area of a bulk mail center (BMC), primarily between P&DCs and BMCs.
- **Long distance:** Parcel post volume variable purchased transportation costs incurred in transporting parcel post pieces between facilities that are in different BMC service areas, primarily between two BMCs.

In order to determine if the transportation costs associated with each function are distance or non-distance related, it is necessary to examine the distance traveled by parcels in different zones for each function. If the distance traveled on a particular function does not necessarily differ for parcels in different zones, then the costs associated with that function are not related to zoned distance. Likewise, if the distance traveled on a particular function could be expected to increase for parcels in higher zones, then the costs associated with that function are related to zoned distance.

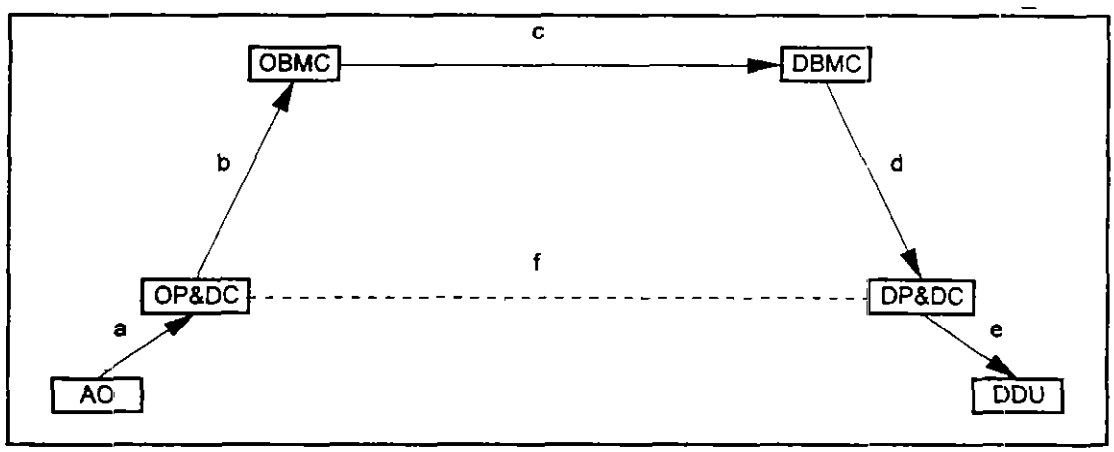
1. GCD RELATED AND NON-GCD RELATED COSTS

Before analyzing each function, it is necessary to draw a distinction between costs that are related to the total distance actually traveled and costs that are related to zoned distance. For all parcels, the majority of volume variable transportation costs can be expected to increase as distance traveled increases. Increases in the distance traveled by a parcel, however, do not necessarily imply the parcel will move towards higher zones. This is true because the distance used to calculate the zone of a parcel is not the actual distance traveled by the parcel. The distance used to calculate zones is the great circle distance (GCD) between origin and destination 3-digit ZIP Code area.[2] Therefore, GCD is roughly the shortest distance on the surface of the earth

[2] "In the determination of postal zones, the earth is considered to be divided into units of area thirty minutes square, identical with a quarter of the area formed by the intersecting parallels of latitude and meridians of longitude. The distance between these units of area is the basis of the postal zones." DMCS § 4010.

between the origin and destination P&DC of a particular parcel.[3] Figure II-1 shows the travel pattern of a typical inter-BMC parcel. The dotted line segment *f* represents the GCD. All solid lines represent the actual travel pattern of the parcel. If an increase in the distance traveled on any function of transportation for a particular parcel necessarily causes an increase in the GCD measurement for that parcel, then the costs associated with that function are related to zoned distance (hereafter referred to as "GCD related"). If an increase in the distance traveled on any function of transportation does not necessarily cause an increase in the GCD, then the costs associated with that function are not related to zoned distance (hereafter referred to as "non-GCD related").

FIGURE II-1
INTER-BMC PARCEL TRANSPORTATION PATTERN



2. LOCAL COSTS

With the definitions of GCD related and non-GCD related established, each function of transportation can be analyzed. Local transportation is represented in Figure II-1 by line segments *a* and *e*. Because the destination post office is within the 3-digit ZIP Code area of the destination P&DC and the origin post office is within the 3-digit ZIP Code area of the origin P&DC, increases in the distance traveled between post

[3] Because P&DCs in general serve one or more 3-digit ZIP Code areas, it follows that origin and destination 3-digit ZIP Code areas of a parcel correspond roughly to the origin and destination P&DC.

offices and P&DCs will not affect the GCD of a parcel. In other words, two parcels whose travel pattern is identical, except for distances between post office and P&DC, will always be in the same zone. Therefore, all local costs are non-GCD related for inter-BMC parcels. Accordingly, all costs in the transportation accounts and components that have been categorized as local in Appendix I are categorized as non-distance related. Although Figure II-1 only shows a typical inter-BMC parcel, this relationship also holds for intra-BMC and DBMC parcels. All transportation accounts that have been categorized as local and therefore non-distance related in this testimony were also treated as non-distance related by the Commission in Docket No. R94-1[4], with one exception.

One modification to the existing methodology for determining parcel post transportation costs to be used in rate setting is the inclusion of postal owned vehicle costs. This modification is described in more detail later; it involves the categorization of all postal owned vehicle costs as local transportation. Since postal owned vehicle costs were not included in the analysis of parcel post transportation costs in Docket No. R94-1, no determination regarding whether or not these costs are distance related was made in that docket. Because these costs are categorized as local, they are treated as non-distance related in this testimony. The rationale for treating these costs as local is described later.

3. LONG DISTANCE COSTS

Next, long distance costs will be examined. Again referring to Figure II-1, consider two parcels. Both parcels travel the same distance between post offices and P&DCs (lines *a* and *e*) and between P&DCs and BMCs (lines *b* and *d*), but one travels further between BMCs (line *c*). Holding all other distances constant, the parcel that travels further between BMCs will necessarily have a greater GCD and therefore will move towards a higher zone. In other words, an increase in the long distance

[4] Docket No. R94-1, PRC LR-11 at 35 (highway, rail, and water), 38 (air).

transportation of a particular parcel will cause an increase in GCD. Therefore, long distance costs are GCD related and have been treated as distance related in this testimony.[5] The purchased transportation accounts that have been categorized as long distance and therefore distance related in this testimony were also treated as distance related by the Commission in Docket No. R94-1.[6]

4. INTERMEDIATE COSTS

a. INTER-BMC

Finally, intermediate transportation costs will be discussed. The intermediate costs associated with an inter-BMC parcel will be examined first. In Docket No. R94-1, the Commission recommended that all costs that have been categorized as intermediate in this testimony be treated as distance related.[7] In this testimony, however, the intermediate transportation costs incurred by inter-BMC parcels are treated as non-GCD related, and therefore non-distance related. To explain why these costs are non-GCD related, the simple illustrative example in Figure II-2 will be used.

Imagine that in a given year the Postal Service only delivered two parcels, each measuring one cubic foot. Parcel A is deposited in Washington, DC to be delivered to Los Angeles, CA (zone 8) and parcel B is deposited in Washington, DC to be delivered to Philadelphia, PA (zone 3). Also, assume that the volume variable intermediate transportation costs for the year are $1000 and the volume variable long distance transportation costs for the year are $800. Parcel A travels 50 miles from origin P&DC to origin BMC, 2,625 miles from origin BMC to destination BMC, and 25 miles from destination BMC to destination P&DC. Parcel B travels 50 miles from origin P&DC to origin BMC, 225 miles from origin BMC to destination BMC, and 25 miles from

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[5] Exceptions include the small portion of parcel post transportation costs in commercial air terminal handling, network air, and western air accounts. These exceptions are discussed in more detail in Appendix I.

[6] The transportation costs not included in the calculation of the non-distance related factor are distance related. See Docket No. R94-1, PRC LR-11 at 35 (highway, rail, and water), 38 (air).

[7] Ibid.

destination BMC to destination P&DC. Therefore, 2,700 (90 percent) of total cubic foot miles are associated with zone 8 and 300 (10 percent) of total cubic foot miles are associated with zone 3.

Treating long distance transportation costs as distance related results in $720 per cubic foot in zone 8 and $80 per cubic foot in zone 3 for long distance transportation. This result is very reasonable considering the zone 8 parcel traveled more than ten times as many long distance miles as the zone 3 parcel. Treating intermediate transportation costs as distance related, however, results in $900 per cubic foot in zone 8 and $100 per cubic foot in zone 3 for intermediate transportation.

FIGURE II-2
EXAMPLE OF PARCEL POST TRANSPORTATION COST ALLOCATION

	Parcel A	Parcel B
Zone	8	3
Cubic Feet	1	1
Long distance miles	2,625	225
Intermediate miles	75	75

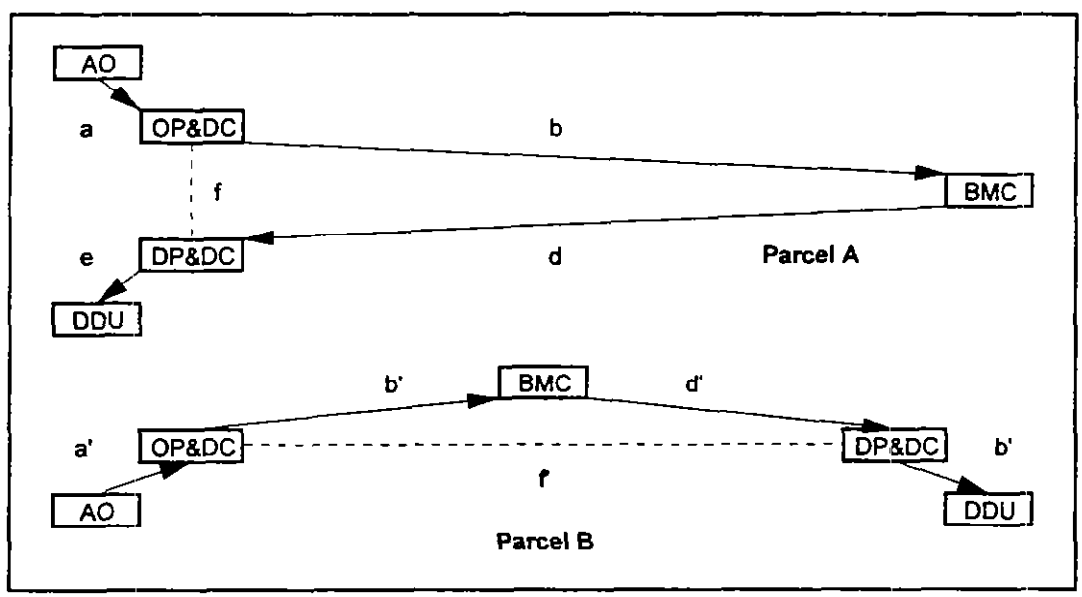
	Cubic Feet	Cubic Foot Miles	Long distance costs GCD Related	Intermediate costs GCD Related	Intermediate costs Non-GCD Related
Zone 3	1	300	80	100	500
Zone 8	1	2,700	720	900	500
Total	2	3,000	800	1000	1000

Treating intermediate transportation costs as distance related results in the zone 8 parcel costing nine times as much as the zone 3 parcel, despite the fact that both parcels travel the same distance on intermediate transportation (75 cubic foot miles). This outcome occurs because the main determinant of GCD and zone for inter-BMC parcels is miles traveled on the long distance leg. Allocation of intermediate costs on the basis of GCD miles or zone, when the two are unrelated, causes anomalies such as the one described in the above example. Because intermediate costs are unrelated to GCD for inter-BMC parcels, this testimony treats those costs as non-distance related.

b. INTRA-BMC

Intermediate transportation costs for intra-BMC parcels are treated as non-distance related. There are some situations where an increase in the number of intermediate miles for an intra-BMC parcel does not affect GCD miles and some situations where it does. However, in the cases where an increase in intermediate miles is associated with an increase in GCD, there is no causal link between the two. As depicted in Figure II-3, increasing the intermediate transportation distance (lines *b* and *d*) of parcel A will not affect the GCD of parcel A (line *f*). On the other hand, increasing the intermediate transportation distance (lines *b'* and *d'*) of parcel B will clearly affect the GCD distance (line *f'*).

FIGURE II-3
COMPARISON OF TWO INTRA-BMC PARCEL TRANSPORTATION PATERNS



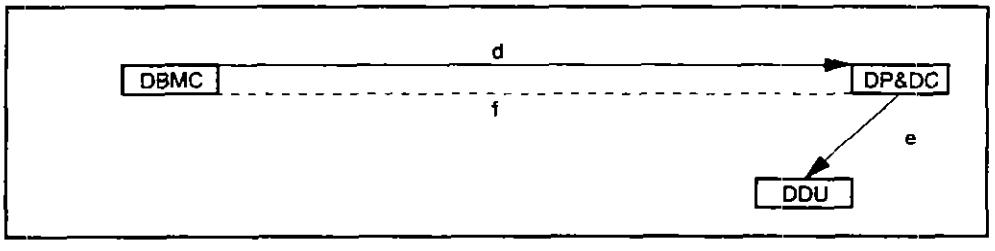
As shown above, the geographical location of processing facilities and the path that a particular parcel happens to take through the network determines if an increase in intermediate distance will increase GCD or not. Increases in intermediate transportation distance for intra-BMC parcels do not necessarily cause parcels to

migrate towards a higher zone. Therefore, intermediate transportation costs are also treated as non-distance related for intra-BMC parcels.

c. DBMC

Last, the intermediate transportation costs associated with DBMC parcels are examined. Unlike inter-BMC and intra-BMC parcels, intermediate costs are clearly related to GCD for DBMC parcels. The reason for the difference is the unique travel pattern of DBMC parcel post due to its entry location. Because DBMC parcel post is entered at a BMC and generally travels directly from that BMC to the destination P&DC, the intermediate transportation distance is the main determinant of GCD and zone. As shown in Figure II-4, an increase in intermediate distance (line *d*) will necessarily cause an increase in GCD (line *f*). Therefore, the intermediate transportation costs associated with DBMC parcel post are GCD related and are treated as distance related in this testimony.[8]

FIGURE II-4
DBMC PARCEL TRANSPORTATION PATTERN



5. SUMMARY

The distance relation analysis above can be summarized as follows. For the most part, distance related costs and non-distance related costs are determined in the

[8] This is consistent with the Commission's treatment of DBMC transportation costs that have been classified as intermediate in this testimony. See Docket No. R94-1, PRC LR-11 at 35 (highway, rail, and water), 38 (air).

same manner as in Docket Nos. R90-1 and R94-1, with one major exception. The costs incurred in moving parcels within the service area of a BMC (intermediate transportation costs) are now treated as non-distance related for inter-BMC and intra-BMC parcels. As demonstrated above, these costs are not related to GCD or zone and therefore should not be distributed to zone based on GCD.

C. CUBE-WEIGHT RELATIONSHIP ESTIMATION

Another area in which this testimony improves upon the previous methodology for allocating parcel post transportation costs to zones is in estimating the relationship between cubic volume and weight in parcel post (cube-weight relationship). The only change made to estimation of the cube-weight relationship is that instead of estimating one relationship for all parcel post, three separate cube-weight relationships are estimated, one for each rate category.

Because separate transportation cost pools are developed for each rate category within parcel post in Appendix I of this testimony, it is possible to apply a different cube-weight relationship to the costs in each rate category. The cube-weight relationship has two primary uses: (1) to convert transportation cost estimates in the form of cost per cubic foot into estimates of transportation cost per piece for use in the development of rates and (2) to calculate the total number of cubic feet by zone. Now that different cost per cubic foot estimates are available by zone for each rate category, it is possible to apply the different cube-weight relationships in each rate category to the appropriate cost per cubic foot estimates.

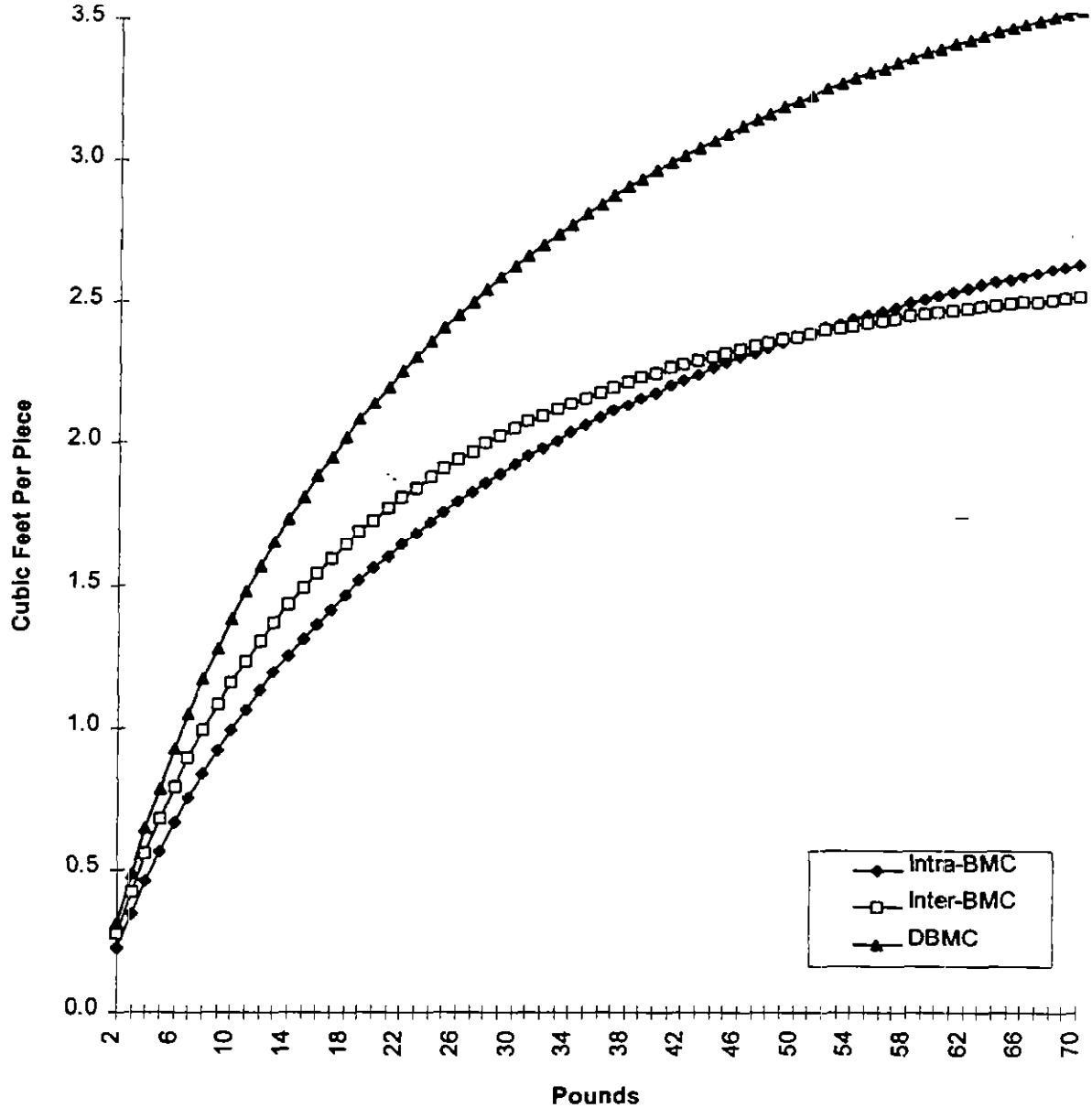
It is apparent from the regression results in USPS LR-H-176 that the relationship between cubic volume and weight in each rate category is different. Figure II-5 shows a graph of the cube-weight relationships estimated for each rate category of parcel post.[9] Since these relationships vary by rate category, the application of the overall parcel post cube-weight relationship would result in an averaging of costs between rate categories, especially when converting cost per cubic foot estimates to cost per piece

estimates. For example, assume that the DBMC relationship showed that a typical 10-pound DBMC parcel is 1.5 cubic feet in size and the inter-BMC relationship showed that a typical 10-pound inter-BMC parcel is 1 cubic foot in size. Also assume that the overall parcel post cube-weight relationship showed that a typical 10-pound parcel is 1.25 cubic feet in size. Application of the overall relationship would result in the averaging of costs between inter-BMC and DBMC, *i.e.*, DBMC costs would be lower than they actually are and inter-BMC costs would be higher. Here, since separate cost estimates can be calculated for each rate category, it is preferable to apply a different cube-weight relationship for each rate category rather than to use the average relationship for all parcel post. In calculating unit transportation cost estimates, this testimony employs a different cube-weight relationship for each rate category because these relationships are significantly different for each rate category of parcel post.[10]

[9] The data used to plot the graph in Figure II-5 are from USPS LR-H-176 at 30-31.

[10] In Docket No. R94-1, one cube-weight relationship for all parcel post was estimated (PRC Op., Docket No. R94-1, page V-116).

FIGURE II-5
ESTIMATED CUBE-WEIGHT RELATIONSHIPS BY RATE CATEGORY



D. POSTAL OWNED VEHICLE COSTS

As mentioned earlier, this testimony includes postal owned vehicle costs in the determination of parcel post transportation costs. Postal owned vehicle costs represent inter-facility transportation costs that are incurred by vehicles owned by the Postal Service as opposed to contract transportation. Because they are not contract

transportation, these costs are not reflected in cost segment 14. Rather, the costs for the labor associated with postal owned transportation are accounted for separately in cost segment 8, vehicle service drivers. These costs are included in the analysis of parcel post transportation costs because they are closely related to purchased transportation costs. This testimony distributes postal owned vehicle costs to rate category and zone of parcel post in the same manner as purchased transportation costs.

Quantifying the correct amount of postal owned vehicle costs that are associated with parcel post is a two step process. First, the direct labor costs associated with parcel post postal owned vehicles is taken directly from the test year cost segments and components. Cost segment 8, vehicle service drivers, contains the distribution of postal owned vehicle direct labor to class and subclass of mail. Second, the indirect costs associated with postal owned vehicles are determined through the use of a piggyback factor. The vehicle service driver piggyback factor for parcel post (USPS LR-H-77) is designed to account for all indirect costs associated with postal owned vehicle direct labor costs. Applying the piggyback factor to the direct labor costs results in the total volume variable postal owned vehicle costs associated with parcel post.

All parcel post postal owned vehicle costs are categorized as local transportation. The Postal Service uses its own vehicles mainly for transportation within the service area of a P&DC. Therefore, postal owned vehicle service mirrors intra-SCF purchased transportation costs.[11] In this testimony, parcel post postal owned vehicle costs are treated in the same manner as intra-SCF purchased transportation costs. Because they are categorized as local, these costs are treated as non-distance related. The earlier discussion of local transportation costs applies equally to postal owned vehicle costs as it does to purchased transportation categorized as local.

[11] See Docket No. R90-1, Exhibit USPS-T-12G at 1.

E. TERMINAL AND LINEHAUL COSTS IN COMMERCIAL AIR

For the most part, the parcel post costs in purchased transportation accounts are treated as either all distance related or all non-distance related based on how they are categorized as local, intermediate, or long distance. One exception is the treatment of parcel post costs associated with commercial air transportation. As evidenced by the transportation cost system (TRACS), a small amount of parcel post is transported on commercial air transportation. Commercial air transportation, because it tends to move mail between facilities that are in different BMC service areas, is categorized as long distance. While all long distance surface transportation costs are treated as distance related, commercial air transportation is divided between distance related costs and non-distance related costs because of the nature of air transportation.

The detail of air transportation accounts shown in Alexandrovich WP B Worksheet 14.0.1 allows for the separation of commercial air transportation costs into linehaul costs and terminal handling costs. Linehaul costs are the costs associated with flights once they have been loaded and are in the air. Terminal handling costs, on the other hand, are the costs associated with various ground activities such as loading, unloading, and moving the mail. As pointed out by the Commission in Docket No. R94-1[12], the terminal handling portion of air transportation costs is non-distance related by virtue of the fact that every flight receives these costs regardless of the distance traveled.

Because of the different properties associated with the linehaul and terminal handling portion of air transportation costs, this testimony divides parcel post commercial air transportation costs into those that are distance related (linehaul) and those that are non-distance related (terminal handling). Along with other distance related costs, the distance related portion of commercial air transportation costs in parcel post are distributed to zone based on cubic foot miles. The non-distance related portion of commercial air costs are distributed to zone based on cubic feet.

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[12] PRC Op., Docket R94-1, pages III-54-56.

III. DEVELOPMENT OF PARCEL POST UNIT TRANSPORTATION COST ESTIMATES

This section of testimony outlines the methodology used to calculate unit transportation costs by rate category and zone for parcel post. This section relies heavily on the discussions and analyses presented in Section II. The purpose of this section is to describe the methodology of developing the unit cost estimates. Additional information is contained in the appendices.

The development of parcel post unit transportation cost estimates can be broken down into three components: (1) division of parcel post transportation costs by rate category and function (*i.e.,* local, intermediate, or long distance), (2) estimation of parcel post cube-weight relationships, and (3) calculation of unit costs. Each is discussed below.

A. DIVISION OF PARCEL POST TRANSPORTATION COSTS BY FUNCTION AND RATE CATEGORY

The first step in the development of unit transportation costs by zone is to divide total parcel post purchased transportation costs two ways. First, total parcel post costs must be divided into the three transportation functions defined in Section II, *i.e.,* local, intermediate, and long distance. As stated above, this division is relatively straightforward. Local transportation costs are calculated by adding the costs in each purchased transportation account that is categorized as local (and piggybacked postal owned vehicle costs); intermediate transportation costs are calculated by adding the costs in each account that is categorized as intermediate; and long distance transportation costs are calculated by adding the costs in each long distance account.[13] The division of parcel post transportation costs into functions is presented in detail in Appendix I. A summary of the results of this division is shown in Table III-1.[14]

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[13] A detailed description of how each of the transportation cost accounts is classified is provided in Appendix I of this testimony.

[14] Alaska non-pref air costs are not included in any cost calculations in this testimony because they are accounted for separately in Ms. Mayes testimony (USPS-T-37).

TABLE III-1
DIVISION OF TEST YEAR TRANSPORTATION COSTS BY FUNCTION
(ALL COSTS IN THOUSANDS)

Mode	Local	Intermediate	Long distance	Total
Air	$ 0	$5,948	$3,279	**$9,227**
Highway	$84,367	$85,973	$47,802	**$218,142**
Rail	$ 0	$ 137	$39,683	**$39,820**
Water	$ 134	$5,780	$ 0	**$5,914**
Total	**$84,501**	**$97,838**	**$90,764**	**$273,103**

Once parcel post volume variable transportation costs are divided between the three functions, a second division of costs into rate categories is possible. As stated above, this division is accomplished based on the following considerations. First, intra-BMC and DBMC parcels do not incur any of the transportation costs which are classified as long distance. This observation is based on the product definitions of intra-BMC and DBMC parcel post. Specifically, intra-BMC rates apply to parcel post originating in the service area of a BMC/ASF and destinating within the same service area. The destination BMC (DBMC) rates apply to parcel post mail that is deposited at a BMC or ASF and is addressed for delivery within the service area of that facility.[15]

Second, the average cost per cubic foot per leg of transportation in the local and intermediate functions is the same for parcel post parcels in each rate category. This conclusion is based on the fact that all parcel post pieces travel on the same transportation from BMCs to P&DCs, and from P&DCs to delivery units.

Using the above information, each of the functional cost pools is then divided into rate categories. Long distance costs are entirely allocated to inter-BMC parcel post. Local and intermediate costs are allocated to rate categories based on the relative proportions of cubic foot legs in each rate category. In order to determine relative proportions of cubic foot legs, it is necessary to know the number of cubic feet

[15] DMCS §§ 322.15 (intra-BMC) and 322.14 (DBMC).

in each rate category and the average number of legs traveled in each function for inter-BMC, intra-BMC, and DBMC parcels. The number of cubic feet in each rate category are calculated in Appendix II of this testimony and are described later.

To calculate the average number of legs of each transportation function traveled by inter-BMC, intra-BMC, and DBMC parcels, I analyzed the transportation pattern of a 'typical' parcel. A typical inter-BMC parcel travels from post office to P&DC, from P&DC to BMC, from BMC to BMC, from BMC to P&DC, and from P&DC to delivery unit. This means that a typical inter-BMC parcel receives two legs of local transportation and two legs of intermediate transportation. Likewise, a typical intra-BMC parcel travels from post office to P&DC, from P&DC to BMC, from BMC to P&DC, and from P&DC to delivery unit. This means that a typical intra-BMC parcel also receives two legs of local transportation and two legs of intermediate transportation. Finally, a typical DBMC parcel travels from BMC to P&DC and from P&DC to delivery unit. Therefore, a typical DBMC parcel receives one leg of intermediate transportation and one leg of local transportation.

Adjustments are made to account for three cases where significant amounts of volume were identified as exceptions to the typical parcel travel patterns described above. These exceptions cause the average parcel to be different from the typical parcel:

- inter-BMC rated parcels which are entered at a BMC,
- intra-BMC parcels which are held out at a post office, and
- DBMC parcels which are entered at the destination P&DC.

The degree of each of these occurrences can be estimated and each creates a difference between the average and typical number of legs per transportation function in each rate category. Adjusting the typical number of local and intermediate legs traveled by inter-BMC, intra-BMC, and DBMC parcels yields the average number of legs. Using cubic feet and average number of legs, parcel post functional transportation costs are divided into the three rate categories. The above division of costs is described in detail in Appendix I. A summary of the results of this division is

shown in Table III-2. The results shown in Table III-2 are developed in Appendix I of this testimony.

TABLE III-2
TEST YEAR PARCEL POST TRANSPORTATION COSTS BY RATE CATEGORY
(ALL COSTS IN THOUSANDS)

	Local	Intermediate	Long distance	Total
Inter-BMC	$26,934	$32,263	$90,765	**$149,962**
Intra-BMC	$17,828	$21,355	$ 0	**$39,183**
DBMC	$39,739	$44,219	$ 0	**$83,958**
Total	**$84,501**	**$97,837**	**$90,765**	**$273,103**

B. ESTIMATION OF PARCEL POST CUBE-WEIGHT RELATIONSHIPS

Before calculating unit costs from the cost pools described above, it was necessary to develop the relationship between cubic volume and weight in each rate category of parcel post. The inputs to the development of these relationships are the average cubic feet per piece in each weight increment (2-70) and the corresponding number of pieces in each weight increment for each of the three rate categories of parcel post.

1. MODEL SPECIFICATION

The model used to estimate the cube-weight relationship in each of the three rate categories of parcel post was the same model recommended by the Commission in Docket No. R94-1.[16] It is a translog model that can be described as follows:

$$\ln(cf / pc) = a + b[\ln(lbs)] + c[\ln(lbs)]^2 \quad (1)$$

Where "cf/pc" is the average cubic feet per piece for each weight increment and "lbs" is the corresponding weight increment.

[16] PRC Op., Docket No. R94-1, page V-116.

2. ESTIMATION METHOD

The correct estimation technique to employ when estimating a relationship where each observation represents an average is a form of weighted least squares.[17] Specifically, the data for each rate category used to estimate the cube-weight relationships in this testimony are the average cubic feet per piece for each weight increment. Since the number of parcels by weight increment vary considerably, the volume in each weight increment must be accounted for explicitly in the model. For a complete explanation of the regression method, see Appendix IV and Library Reference USPS LR-H-176.

3. RESULTS

The results of each regression are statistically significant. For each of three equations, the R-square value is greater than 0.98, indicating that the model is a good fit. Also, the probability that each of the variables is not significantly different from zero is less than 0.01 percent in every case. These results indicate that the model used to estimate the cube-weight relationship is an appropriate model.

Further, the results of the three regressions show that the parcel post data represent three distinct cube-weight relationships as opposed to one for the entire subclass. To make this determination, a series of tests of structural change were conducted on data for each of the three rate categories. The test for structural change, or Chow test, is an F-test used "to test the hypothesis that some or all of the regression coefficients are different in subsets of the data."[18] Since the Chow test is used to determine the equivalence of coefficients in only two data sets, it was necessary to conduct three tests to determine if the coefficients in each of the three rate category regressions were equivalent. First, the regression coefficients of the inter-BMC and

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[17] J. Johnston, *Econometric Methods* 293-296 (McGraw-Hill 1984).
[18] William H. Greene, *Econometric Analysis* 218 (Macmillan Publishing Company 1990).

intra-BMC data were tested. Next, the regression coefficients of the inter-BMC and DBMC data were tested. Finally, the regression coefficients of the intra-BMC and DBMC data were tested. In all three tests, the null hypothesis that the coefficients were equivalent was rejected at the 95 percent level of significance.

The predicted cubic feet per piece estimates by weight increment for each rate category are listed in Exhibit USPS-16B. The input data, regression model, and regression results are described in detail in Appendix IV and in USPS LR-H-176.

C. CUBIC FEET AND CUBIC FOOT MILE ESTIMATES

One last set of information is needed before calculating unit transportation costs by zone for each rate category of parcel post. Specifically, the number of cubic feet and cubic foot miles by zone for each rate category are needed to accomplish the following tasks:

- divide functional transportation costs among rate categories (as described above),
- distribute rate category costs to zones, and
- compute a unit cost by zone for each rate category.

The calculation of cubic foot data by zone for each rate category begins with the test year piece volumes by zone and weight increment for each rate category from Ms. Mayes (Mayes WP I.A.). Every piece volume taken from Ms. Mayes is multiplied by the corresponding estimate of cubic feet per piece from Exhibit USPS-16B to yield the number of cubic feet by zone and weight increment for each rate category. For example, the number of inter-BMC pieces in the two pound weight increment in zone 5 is multiplied by the estimated number of cubic feet for an inter-BMC parcel in the two pound weight increment to yield the number of inter-BMC cubic feet in the two pound increment in zone 5. Once this calculation is completed for each rate category and weight increment, the cubic foot estimates are aggregated over all weight increments to yield the total number of cubic feet by zone for each rate category. After cubic feet by

zone are calculated for the three existing rate categories of parcel post, the DBMC cubic feet by zone are separated between DBMC parcel post that is currently entered at the destination BMC and DBMC parcel post that is currently entered at the destination P&DC. This separation of DBMC cubic feet is used to develop separate unit cost estimates for DBMC and DSCF parcel post.

Cubic foot mile data are used exclusively to distribute distance related transportation costs to zones for each rate category. In fact, only the relative proportion of cubic foot miles in each zone to total cubic foot miles in the rate category is used. The number of cubic foot miles by zone for each rate category is obtained directly from existing data (USPS LR-H-135). Cubic foot and cubic foot mile data are described in more detail in Appendix II.

D. CALCULATION OF UNIT TRANSPORTATION COSTS

Calculation of unit volume variable transportation costs by zone for each rate category of parcel post is a two step process. First, the cost pools described above (by rate category and by function) are divided among zones using total cubic feet and cubic foot miles by zone. Next, the cost pools for each zone are divided by the number of cubic feet in each zone to yield cost per cubic foot by zone for each rate category.

Within each rate category, transportation costs are allocated to zones in one of two ways. If the costs are non-distance related, they are distributed to zone based on the percentage of cubic feet in each zone. If the costs are distance related, they are distributed to zone based on the percentage of cubic foot miles in each zone. The percentage of cubic feet and cubic foot miles in each zone for each rate category is easily calculated from the total cubic feet and total cubic foot miles by zone and rate category developed in Appendix II.

The next step in the development of unit costs by rate cell is to calculate the average cost per cubic foot for each zone in each rate category. This calculation is also straightforward. Each of the cost pools by zone described above are divided by the number of cubic feet in the given zone to yield a cost per cubic foot for each zone and

transportation function. Then, the costs per cubic foot by zone are added across the three functions to produce total unit costs by zone for each rate category. For example, the intra-BMC local costs in zone 3 are divided by the total number of intra-BMC cubic feet in zone 3. Then, the intermediate costs in zone 3 are divided by total intra-BMC cubic feet in zone 3. The two costs per cubic foot are added to produce the total intra-BMC cost per cubic foot in zone 3. The resulting unit cost estimates by zone for each rate category are shown in Exhibit USPS-16A. All of the calculations described above are presented in detail in Appendix III. The resulting unit cost estimates by zone and rate category are listed in Table III-3.

The last step in the development of unit transportation cost estimates is to estimate the potential costs avoided by a new rate category of parcel post. The new rate category will be for parcels entered directly at the destination delivery unit (DDU). DDU parcel post pieces will avoid all purchased transportation costs except those incurred below the level of the delivery unit. Beginning with the purchased transportation costs associated with DBMC parcel post entered at a destination P&DC (DSCF), an avoided transportation cost is developed for DDU parcel post. The avoided transportation cost is calculated using a separation of local transportation costs into its component parts. Applying the percentage of total base year local transportation costs incurred transporting parcels to the delivery unit, to the test year DSCF unit transportation cost, results in DDU avoided transportation costs of $0.3337 per cubic foot. A detailed description of the development of DDU avoided transportation costs is provided in Appendix III.

TABLE III-3
TEST YEAR UNIT TRANSPORTATION COSTS
(ALL FIGURES ARE IN DOLLARS PER CUBIC FOOT)

	Inter-BMC	Intra-BMC	DBMC (Non-DSCF)	DBMC (DSCF)
Local	N/A	$0.9402	N/A	N/A
Zone 1/2	$2.0558	$1.7527	$0.7006	$0.3997
Zone 3	$2.5060	$1.7527	$1.5337	N/A
Zone 4	$3.2502	$1.7527	$2.6943	N/A
Zone 5	$4.3483	$1.7527	$4.5374	N/A
Zone 6	$5.7406	N/A	N/A	N/A
Zone 7	$7.4536	N/A	N/A	N/A
Zone 8	$8.8578	N/A	N/A	N/A

1

Exhibit USPS-16A

Summary of Parcel Post Unit Transportation Costs by Zone

Summary of Parcel Post Unit Transportation Costs by Zone

Cost per Cubic Foot by Zone for Each Rate Category

Inter-BMC	[1]	[2]	[3]	[4]	[5]
Zone	Local costs	Intermediate costs	Long distance DR costs	Long distance NDR costs	Total inter-BMC costs
Local	N/A	N/A	N/A	N/A	N/A
1-2	$0.7815	$0.9361	$0.2759	$0.0623	$2.0558
3	$0.7815	$0.9361	$0.7261	$0.0623	$2.5060
4	$0.7815	$0.9361	$1.4704	$0.0623	$3.2502
5	$0.7815	$0.9361	$2.5684	$0.0623	$4.3483
6	$0.7815	$0.9361	$3.9607	$0.0623	$5.7406
7	$0.7815	$0.9361	$5.6738	$0.0623	$7.4536
8	$0.7815	$0.9361	$7.0779	$0.0623	$8.8578

Intra-BMC	[6]	[7]	[8]
Zone	Local costs	Intermediate costs	Total intra-BMC costs
Local	$0.4615	$0.4788	$0.9402
1-2	$0.7952	$0.9575	$1.7527
3	$0.7952	$0.9575	$1.7527
4	$0.7952	$0.9575	$1.7527
5	$0.7952	$0.9575	$1.7527
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A

DBMC	[9]	[10]	[11]
Zone	Local / DSCF costs	Intermediate costs	DBMC (non-DSCF) costs
Local	N/A	N/A	N/A
1-2	$0.3997	$0.3010	$0.7006
3	$0.3997	$1.1340	$1.5337
4	$0.3997	$2.2947	$2.6943
5	$0.3997	$4.1378	$4.5374
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A

DDU Cost Avoidance (DSCF costs less DDU costs in $/cf) $0.3337 1/

Column [1]: Appendix III, page 6, column 7.
Column [2]: Appendix III, page 6, column 8.
Column [3]: Appendix III, page 6, column 9.
Column [4]: Appendix III, page 6, column 10.
Column [5]: Column 1 + column 2 + column 3 + column 4.
Column [6]: Appendix III, page 7, column 5.
Column [7]: Appendix III, page 7, column 6.
Column [8]: Column 6 + column 7.
Column [9]: Appendix III, page 8, column 5.
Column [10]: Appendix III, page 8, column 6.
Column [11]: Column 9 + column 10.
Row 1/: Appendix III, page 9, row 12.

Exhibit USPS-16B

Summary of Cube-Weight Relationship Results

Summary of Cube-Weight Relationship Results

Parcel Post Cube-Weight Relationship by Rate Category

Model Specification: $LN(CF/PC) = a + b(LN(Lbs)) + c(LN(Lbs))^2$

	[1] Intra-BMC		[2] Inter-BMC		[3] DBMC
a=	-2.309845	a=	-2.151951	a=	-1.979277
b=	1.270280	b=	1.324356	b=	1.278645
c=	-0.117185	c=	-0.141188	c=	-0.121248

LBS	[4] Estimated CF/PC	[5] Estimated CF/PC	[6] Estimated CF/PC
2	0.22635	0.27204	0.31624
3	0.34794	0.42004	0.48632
4	0.46113	0.55580	0.64422
5	0.56612	0.67963	0.79022
6	0.66364	0.79271	0.92542
7	0.75448	0.89629	1.05100
8	0.83938	0.99150	1.16801
9	0.91897	1.07932	1.27741
10	0.99380	1.16059	1.37998
11	1.06434	1.23602	1.47641
12	1.13099	1.30623	1.56731
13	1.19411	1.37175	1.65317
14	1.25401	1.43301	1.73446
15	1.31096	1.49043	1.81155
16	1.36518	1.54434	1.88479
17	1.41690	1.59505	1.95449
18	1.46630	1.64281	2.02091
19	1.51355	1.68788	2.08429
20	1.55879	1.73046	2.14485
21	1.60215	1.77073	2.20279
22	1.64377	1.80887	2.25827
23	1.68376	1.84503	2.31146
24	1.72220	1.87934	2.36249
25	1.75919	1.91193	2.41151
26	1.79483	1.94292	2.45862
27	1.82917	1.97240	2.50394
28	1.86230	2.00047	2.54758
29	1.89428	2.02721	2.58961
30	1.92517	2.05271	2.63013
31	1.95503	2.07704	2.66922
32	1.98390	2.10026	2.70694
33	2.01183	2.12244	2.74338
34	2.03888	2.14363	2.77858
35	2.06507	2.16389	2.81262

Column [1]: Intra-BMC parameter estimates are from USPS LR-H-176 at 20.
Column [2]: Inter-BMC parameter estimates are from USPS LR-H-176 at 14.
Column [3]: DBMC parameter estimtates are from USPS LR-H-176 at 26.
Column [4]: Exp (a + b * (LN(LBS)) + c * $(LN(LBS))^2$), using column 1 parameters.
Column [5]: Exp (a + b * (LN(LBS)) + c * $(LN(LBS))^2$), using column 2 parameters.
Column [6]: Exp (a + b * (LN(LBS)) + c * $(LN(LBS))^2$), using column 3 parameters.

Summary of Cube-Weight Relationship Results

Parcel Post Cube-Weight Relationship by Rate Category (Continued)

LBS	[1] Intra-BMC Estimated CF/PC	[2] Inter-BMC Estimated CF/PC	[3] DBMC Estimated CF/PC
36	2.09046	2.18327	2.84554
37	2.11507	2.20181	2.87740
38	2.13894	2.21955	2.90824
39	2.16211	2.23654	2.93811
40	2.18460	2.25281	2.96705
41	2.20643	2.26839	2.99510
42	2.22765	2.28333	3.02231
43	2.24827	2.29764	3.04869
44	2.26831	2.31136	3.07430
45	2.28780	2.32452	3.09915
46	2.30676	2.33714	3.12328
47	2.32522	2.34925	3.14671
48	2.34317	2.36086	3.16948
49	2.36066	2.37200	3.19161
50	2.37769	2.38269	3.21312
51	2.39428	2.39295	3.23403
52	2.41044	2.40279	3.25437
53	2.42620	2.41223	3.27415
54	2.44155	2.42129	3.29340
55	2.45653	2.42999	3.31213
56	2.47113	2.43833	3.33037
57	2.48538	2.44634	3.34812
58	2.49928	2.45402	3.36541
59	2.51284	2.46139	3.38224
60	2.52608	2.46845	3.39864
61	2.53901	2.47523	3.41462
62	2.55163	2.48173	3.43019
63	2.56395	2.48796	3.44537
64	2.57599	2.49393	3.46016
65	2.58775	2.49965	3.47458
66	2.59923	2.50513	3.48864
67	2.61046	2.51038	3.50235
68	2.62143	2.51540	3.51573
69	2.63216	2.52021	3.52877
70	2.64264	2.52481	3.54149

Column [1]: Exp (a + b * (LN(LBS)) + c * (LN(LBS))^2), using column 1 parameters from page 1.
Column [2]: Exp (a + b * (LN(LBS)) + c * (LN(LBS))^2), using column 2 parameters from page 1.
Column [3]: Exp (a + b * (LN(LBS)) + c * (LN(LBS))^2), using column 3 parameters from page 1.

USPS-T-16
Appendix I

Division of Parcel Post Transportation Costs

I. INTRODUCTION

The purpose of Appendix I of this testimony is to show how total volume variable parcel post transportation costs are divided among the three component rate categories: inter-BMC, intra-BMC, and DBMC. First, Appendix I shows how total base year volume variable parcel post transportation costs are divided into three transportation functions: local, intermediate, and long distance. Next, the appendix shows how the base year calculations are applied to test year transportation costs. Finally, Appendix I shows how test year transportation costs for each function are divided into the component rate categories. The transportation functions described above (local, intermediate, and long distance) are integral to the division of parcel post volume variable transportation costs to rate category. Each function is defined as follows:

- **Local**: The volume variable parcel post transportation costs incurred in transporting parcel post pieces between facilities that are within the service area of a P&DC, primarily between AOs and P&DCs.
- **Intermediate**: The volume variable parcel post purchased transportation costs incurred in transporting parcel post pieces between facilities that are within the service area of a BMC, primarily between P&DCs and BMCs.
- **Long distance**: The volume variable parcel post purchased transportation costs incurred in transporting parcel post pieces between facilities that are in different BMC service areas, primarily between two BMCs.

II. DIVISION OF TRANSPORTATION COSTS INTO FUNCTIONS

Page 11 of this appendix shows the division of base year volume variable transportation costs for all parcel post into the following transportation functions (defined above): local, intermediate, and long distance. Column 1 lists the base year volume variable costs in each transportation account from the base year Purchased

Transportation Report which is provided in Alexandrovich WP B.14. Alaska non-pref air costs are omitted from all cost calculations in this testimony because they are accounted for separately in Ms. Mayes testimony (USPS-T-37). Column 2 shows the costs in all accounts that are categorized as local. All accounts categorized as local are treated as non-distance related.[1] The following is a list of all local transportation accounts and components along with a brief description of the transportation associated with each account:

- **Intra-SCF highway:** This account includes the costs associated with highway contracts to transport mail within the service area of a P&DC (formerly known as a SCF). This account also includes costs for intra-city transportation and rural box service.
- **Inland water:** This account includes costs associated with water contracts that serve addresses that are on rivers, lakes, and other inland bodies of water that can be accessed only by boat.[2]
- **Postal owned vehicle:** The costs associated with parcel post postal owned vehicle service are treated as local in this testimony. The transportation associated with these costs is similar to intra-SCF purchased highway transportation.[3]

All transportation costs falling into the categories listed above are primarily incurred moving mail between facilities which are within the service area of one P&DC.

Column 3 shows the costs in all accounts which are categorized as intermediate. All accounts categorized as intermediate are treated as distance related or non-distance related based on rate category.[4] The following is a list of all intermediate transportation accounts along with a brief description of the transportation associated with each account:

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[1] For a discussion of why functional transportation costs are treated as distance related or non-distance related, please see pages 4 through 12 of this testimony.
[2] Mail Transportation Contracting Guide, USPS Publication 33 at 3, January 1996.
[3] Postal owned vehicle cost calculations are shown on page 12 of this appendix.
[4] For a discussion of how functional transportation costs are broken down into distance related or non-distance related costs, please see pages 4 through 12 of this testimony.

- **Intra-Alaska and Intra-Hawaii air:** These accounts include the costs associated with air contracts to transport mail within the states of Alaska and Hawaii.
- **Inter-SCF highway:** This account includes the costs associated with highway contracts to transport mail between P&DCs.
- **Plant loaded highway:** This account includes the costs associated with on-call or scheduled one-way highway transportation.[5]
- **Intra-BMC highway:** This account includes the costs associated with highway contracts to transport mail from facilities within the service area of a particular BMC to that BMC.
- **Alaskan highway service:** This account includes the costs associated with highway contracts to transport mail to or within the state of Alaska.
- **Plant loaded rail:** This account includes the costs associated with on-call or scheduled one-way rail transportation.
- **Offshore water:** This account includes the costs associated with water contracts to transport mail between the continental United States and Puerto Rico and Hawaii.[6]

All transportation costs falling into the above accounts were primarily incurred moving mail between facilities which are within the service area of one BMC.

Column 4 shows the costs in all accounts which were categorized as long distance and treated as distance related.[7] The following is a list of all long distance transportation accounts along with a brief description of the transportation associated with each account:

- **Loose sack container rate air (linehaul portion):** This account includes the costs associated with air contracts to move mail throughout the United States by scheduled commercial air carriers.[8] As discussed on page 16 of this testimony, only the linehaul portion of loose sack container rate air is treated as distance related.

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[5] USPS LR-H-1 at 14-5.
[6] Ibid., at 14-9.
[7] For a discussion of why functional transportation costs are treated as distance related or non-distance related, please see pages 4 through 12 of this testimony.
[8] USPS LR-H-1 at 14-2.

- **Inter-BMC highway:** This account includes the costs associated with highway contracts to transport mail between BMCs.
- **Passenger rail:** This account includes the costs associated with rail contracts to transport mail on commercial passenger trains.
- **Freight rail:** This account includes the costs associated with rail contracts to transport mail on freight trains.

All transportation costs falling into the above accounts were primarily incurred moving mail between facilities that are in different BMC service areas.

Column 5 shows the costs in all accounts which were categorized as long distance and treated as non-distance related.[9] Those accounts include:

- **Network air:** This account includes the costs associated with air contracts to transport mail throughout the United States on the Postal Service's primary dedicated air network, operated out of the central United States.
- **Western air:** This account includes the costs associated with air contracts to transport mail throughout the United States on the Postal Service's secondary dedicated air network, operated out of the western United States.
- **Loose sack container rate air (terminal handling portion):** As stated earlier, this account includes the costs associated with air contracts to move mail throughout the United States by scheduled commercial air carriers. As discussed on page 16 of this testimony, only the terminal handling portion of loose sack container rate air is treated as non-distance related.

The categories listed above are the only long distance costs that are treated as non-distance related. The rationale for treating terminal handling costs in commercial air is described on page 16 of this testimony. The special treatment of network and western air is due to the hub-and-spoke nature of the air transportation. In general, network or western air do not move a piece of mail from its origin directly to its destination. Rather, all flights move from their origin to a central processing facility and then move back out

[9] For a discussion of why functional transportation costs are treated as distance related or non-distance related please see pages 4 through 12 of this testimony.

again to their destinations. Therefore, the number of GCD miles used to determine the zone of a particular parcel gives no indication of how far it will actually fly on network or western air.

All purchased transportation accounts not listed above as either local, intermediate, or long distance, have been divided into the three functions based on the division of other transportation accounts to function. These accounts include:

- **Air taxi:** The costs in this account are distributed to transportation function in the same proportion as the composite of all other parcel post air transportation costs.[10]
- **Contract terminal and van damage:** The costs in this account are distributed to transportation function in the same proportion as the composite of intra-SCF, inter-SCF, intra-BMC, inter-BMC, and plant load highway costs.[11]
- **Highway empty equipment:** The costs in this account are distributed to transportation function in the same proportion as the composite of intra-SCF, inter-SCF, intra-BMC, inter-BMC, plant load, and contract terminal and van damage highway costs.[12]
- **Rail empty equipment:** The costs in this account are distributed to transportation function in the same proportion as the composite of passenger train, freight rail, and plant load rail costs.[13]

In determining costs by class and subclass, the accounts listed above are normally based on a combination of the distribution keys of other accounts. The costs in these accounts have been distributed to transportation function on page 11 based on the distribution of the same combination of accounts which determine their distribution to class and subclass.[14] For example, air taxi volume variable costs are distributed to classes and subclasses of mail on the basis of the composite of other air transportation costs.[15] Because air taxi costs are distributed to class on the basis of other accounts,

[10] USPS LR-H-1 at 14-5.
[11] Ibid. at 14-7.
[12] Ibid.
[13] Ibid. at 14-9.
[14] Ibid at 14-1 through 14-9.
[15] Ibid. at 14-5.

they are distributed to function (local, intermediate, and long distance) on the basis of those same accounts.

Finally, just below the total costs for each transportation mode in columns 1 through 5, the percentages of parcel post transportation costs in each function are calculated. Each percentage represents the amount of base year parcel post transportation costs that are classified as local, intermediate, or long distance, for each mode of transportation. These percentages are applied to the test year parcel post transportation costs by mode to determine the distribution of test year transportation costs by function.

III. TEST YEAR TRANSPORTATION COSTS

Page 12 of this appendix takes the categorization of transportation costs described above for the base year and applies them to the test year purchased transportation costs by mode. Rows 1 through 6 of page 12 show how test year purchased transportation costs are adjusted to reflect the removal of all Alaska non-pref air costs. As stated earlier, Alaska non-pref air costs are not considered in these cost calculations because they are accounted for separately in Ms. Mayes' testimony (USPS-T-37). Row 6 shows the adjusted test year parcel post transportation costs by mode and in total. Rows 7 through 10 represent the percentage breakdown of base year transportation costs by function. The percentage breakdowns by mode are from page 11 listed just below the total costs for each mode. Finally, the functional percentages in rows 7 through 10 are each multiplied by the adjusted test year costs by mode (row 6) to yield the test year costs by function (rows 11 through 14).

Rows 16-19 show the adjustment made to test year local cost in order to include parcel post postal owned vehicle costs. The test year parcel post vehicle service driver direct labor costs are shown in row 16. These costs are multiplied by the parcel post vehicle service driver piggyback factor (row 17) to add the indirect costs associated with postal owned vehicle service. The result, total test year volume variable parcel post

postal owned vehicle costs, is shown in row 18. This total is added into the test year local transportation costs. Adjusted local costs are shown in row 19.

IV. DIVISION OF FUNCTION COSTS TO RATE CATEGORY

Page 13 of this appendix shows how the parcel post transportation costs for each transportation function (local, intermediate, and long distance) are further divided into the three parcel post rate categories: inter-BMC, intra-BMC, and DBMC. The test year transportation costs associated with each function are shown in row 1. For each function, costs are distributed to inter-BMC, intra-BMC, and DBMC based on their relative proportions of cubic feet and the average number of legs of transportation traveled in each function. For example, if inter-BMC parcels make up 40 percent of total cubic foot legs in local parcel post, then 40 percent of the local costs will be distributed to inter-BMC. Rows 2 through 5 show cubic feet by rate category and in total. They are used to determine the relative proportions of inter-BMC, intra-BMC, and DBMC cubic feet. This method of distributing costs to rate category is based on the observation that the cost per cubic foot for one leg of a given function of transportation is the same for each rate category, *i.e.*, the cost per cubic foot to transport an average inter-BMC parcel from a P&DC to an AO is the same as the cost per cubic foot to transport an average intra-BMC parcel from a P&DC to an AO which is the same as the cost per cubic foot to transport an average DBMC parcel from a P&DC to an AO.

However, there are a number of identifiable exceptions to this conclusion that affect the relative cost of inter-BMC, intra-BMC, and DBMC transportation costs by function. First, a certain proportion of inter-BMC parcel post is entered at origin bulk mail centers. Because these parcels all fall into the inter-BMC rate category and do not incur as much local and intermediate costs per cubic foot as intra-BMC parcels and DBMC parcels, they would tend to lower the amount of local and intermediate costs distributed to inter-BMC parcels. To account for origin BMC entered parcels, the average number of legs of each transportation function was adjusted accordingly.

Specifically, a normal inter-BMC parcel will travel two legs of both local transportation and intermediate transportation. An origin BMC entered parcel will travel only one leg of each function of transportation. Therefore, the average number of legs traveled by all inter-BMC parcels is a weighted average of normal inter-BMC parcels and origin BMC entered parcels. The weighted average number of legs for inter-BMC parcels is calculated in rows 6 through 9.

The second exception to the conclusion of equal unit cost per leg for each function is intra-BMC parcels which are "held out" at the post office level. A certain percentage of local intra-BMC parcels (parcels that originate and destinate within the service area of a single post office) are set aside for delivery when they reach or are entered at the post office. These parcels are commonly referred to as "held out". Therefore, these parcels are not sent to facilities beyond the origin post office for further processing. Whereas a normal intra-BMC parcel receives two legs of both local and intermediate transportation, a parcel held out at the post office receives zero legs of each function of transportation. Just as with inter-BMC parcels, the average number of legs traveled by intra-BMC parcels is a weighted average of normal intra-BMC parcels and intra-BMC parcels held out at the post office. The weighted average number of legs for intra-BMC parcels is calculated in rows 10 through 13.

The third exception to the conclusion of equal unit cost per leg for each function is DBMC parcel post which is entered at the destination P&DC. A certain proportion of current DBMC parcel post is entered at destination P&DCs and therefore, avoids one leg of intermediate transportation. Whereas the normal DBMC parcel receives one leg of both local and intermediate transportation, the destination P&DC entered parcel receives one leg of local and no intermediate transportation. The average number of intermediate legs traveled by DBMC parcel post is calculated as a weighted average of normal DBMC and DBMC entered at the destination P&DC. The weighted average number of legs for DBMC parcels is calculated in rows 14 through 17.

Finally, the following series of adjustments are made to reflect the characteristics of each rate category. Since by definition only inter-BMC parcels receive long distance

transportation, the number of long distance legs traveled by intra-BMC and DBMC parcels is zero and the number of long distance legs traveled by inter-BMC parcels is one. All normal DBMC parcels either move from a BMC to a P&DC and from a P&DC to a post office or simply from a P&DC to a post office; therefore, the number of legs of local transportation incurred by normal DBMC parcels is one.

Using the proportion of cubic feet in each rate category adjusted by the appropriate number of legs traveled by the average parcel, the amount of transportation cost associated with each rate category in each function is calculated. These calculations are shown in rows 18 through 21.

The division of functional transportation costs by rate category can be described mathematically by the following:

$$TC_{F1} = TC_{F1_{InterBMC}} + TC_{F1_{IntraBMC}} + TC_{F1_{DBMC}} \quad (1)$$

Where TC_{F1} represents the total transportation costs for function 1 (either local, intermediate, or long distance), $TC_{F1InterBMC}$ represents the function 1 transportation costs incurred by inter-BMC parcels, $TC_{F1IntraBMC}$ represents the function 1 transportation costs incurred by intra-BMC parcels, and TC_{F1DBMC} represents the function 1 transportation costs incurred by DBMC parcels. The three right hand side terms are unknown and are, in fact, the variables which were solved for.

If the functional transportation costs were split merely on the basis of cubic feet, Equation (1) would be written as the following:

$$TC_{F1} = TC_{F1}\frac{CF_{InterBMC}}{\sum_{Inter-,Intra-,DBMC} CF} + TC_{F1}\frac{CF_{IntraBMC}}{\sum_{Inter-,Intra-,DBMC} CF} + TC_{F1}\frac{CF_{DBMC}}{\sum_{Inter-,Intra-,DBMC} CF} \quad (2)$$

However, the fact that the average number of legs traveled by inter-BMC, intra-BMC, and DBMC parcels in a given function is not equal, means that Equation 2 must be adjusted. The relationship between inter-BMC, intra-BMC, and DBMC transportation costs by function can be written as follows:

$$\frac{TC_{F1_{InterBMC}}}{CF_{InterBMC}L_{F1_{InterBMC}}} = \frac{TC_{F1_{IntraBMC}}}{CF_{IntraBMC}L_{F1_{IntraBMC}}} = \frac{TC_{F1_{DBMC}}}{CF_{DBMC}L_{F1_{DBMC}}} \quad (3)$$

Where $L_{F1InterBMC}$, $L_{F1IntraBMC}$, and L_{F1DBMC}, represent the average number of function 1 legs traveled by inter-BMC parcels, intra-BMC parcels, and DBMC parcels respectively. Manipulating the terms in equation 3 can yield the following two equations:

$$TC_{F1_{IntraBMC}} = TC_{F1_{InterBMC}} \frac{CF_{IntraBMC} L_{F1_{IntraBMC}}}{CF_{InterBMC} L_{F1_{InterBMC}}} \quad (4)$$

$$TC_{F1_{DBMC}} = TC_{F1_{InterBMC}} \frac{CF_{DBMC} L_{F1_{DBMC}}}{CF_{InterBMC} L_{F1_{InterBMC}}} \quad (5)$$

Substituting Equations 4 and 5 into Equation 1 yields:

$$TC_{F1} = TC_{F1_{InterBMC}} + TC_{F1_{InterBMC}} \frac{CF_{IntraBMC} L_{F1_{IntraBMC}}}{CF_{InterBMC} L_{F1_{InterBMC}}} + TC_{F1_{InterBMC}} \frac{CF_{DBMC} L_{F1_{DBMC}}}{CF_{InterBMC} L_{F1_{InterBMC}}} \quad (6)$$

Manipulating the terms in Equation 6 yields:

$$TC_{F1_{InterBMC}} = \frac{TC_{F1} CF_{InterBMC} L_{F1_{InterBMC}}}{\left(CF_{InterBMC} L_{F1_{InterBMC}} + CF_{IntraBMC} L_{F1_{IntraBMC}} + CF_{DBMC} L_{F1_{DBMC}}\right)} \quad (7)$$

A similar set of manipulations will yield the following results for intra-BMC and DBMC functional transportation costs:

$$TC_{F1_{IntraBMC}} = \frac{TC_{F1} CF_{IntraBMC} L_{F1_{IntraBMC}}}{\left(CF_{InterBMC} L_{F1_{InterBMC}} + CF_{IntraBMC} L_{F1_{IntraBMC}} + CF_{DBMC} L_{F1_{DBMC}}\right)} \quad (8)$$

$$TC_{F1_{DBMC}} = \frac{TC_{F1} CF_{DBMC} L_{F1_{DBMC}}}{\left(CF_{InterBMC} L_{F1_{InterBMC}} + CF_{IntraBMC} L_{F1_{IntraBMC}} + CF_{DBMC} L_{F1_{DBMC}}\right)} \quad (9)$$

Equations 7, 8 and 9 were used on page 13 of this Appendix to calculate rows 18, 19, and 20.

Division of Parcel Post Transportation Costs

Division of Total Parcel Post Costs Into Function (all figures are in thousands)

	[1] Total Parcel Post Transportation Costs	[2] Local Costs[1]	[3] Intermediate Costs[1]	[4] Long Distance - DR Costs[1]	[5] Long Distance - NDR Costs[1]
Domestic Airmail					
Loose sack container rate[2]	$1,217			$443	$774
Intra-Alaska preferential	$1,728		$1,728		
Intra-Alaska non-pref[3]	N/A		N/A		
Intra-Hawaii	$601		$601		
Network[4]	$51				$51
Western air[4]	$16				$16
Air taxi[5]	$3,539	$0	$2,281	$434	$824
Total Domestic Airmail	**$7,152**	**$0**	**$4,610**	**$877**	**$1,665**
Domestic Airmail Percent	***100.00%***	***0.00%***	***64.46%***	***12.26%***	***23.27%***
Highway Service					
Intra-SCF	$37,972	$37,972		–	
Inter-SCF	$14,027		$14,027		
Plant loaded	$1,616		$1,616		
Intra-BMC	$71,316		$71,316		
Inter-BMC	$49,189			$49,189	
Alaskan highway service	$1,511		$1,511		
Contract term van damage[5]	$262	$57	$131	$74	$0
Area bus	$0				
Empty equipment[5]	$546	$118	$275	$153	$0
Total Highway Service	**$176,439**	**$38,147**	**$88,876**	**$49,416**	**$0**
Highway Service Percent	***100.00%***	***21.62%***	***50.37%***	***28.01%***	***0.00%***
Railroad Service					
Passenger rail	$433			$433	
Freight rail	$30,372			$30,372	
Plant loaded	$106		$106		
Empty equipment[5]	$2,790	$0	$10	$2,780	$0
Total railroad service	**$33,701**	**$0**	**$116**	**$33,585**	**$0**
Railroad Service Percent	***100.00%***	***0.00%***	***0.34%***	***99.66%***	***0.00%***
Domestic Water					
Inland	$111	$111			
Offshore	$4,788		$4,788		
Total Domestic Water	**$4,899**	**$111**	**$4,788**	**$0**	**$0**
Domestic Water Percent	***100.00%***	***2.27%***	***97.73%***	***0.00%***	***0.00%***

[1]Rationale for grouping costs into local, intermediate, and long distance can be found on pages 1-5 of this appendix.

[2]Alaska Commercial air costs are split between columns 4 and 5 based on terminal handling (63.59%) and linehaul (36.41%) percentages.

[3]Alaska non-pref air costs have not been included because they are accounted for separetly in Ms. Mayes testimony (USPS-T-37).

[4]Network and western air are the only components of long distance transportation cost that are not related to GCD miles.

[5]These accounts are distributed to each cost category based on the distribution of other accounts (see pages 4 and 5 of this appendix for a complete description of how these costs are distributed to each function).

Column [1]: Alexandrovich WP B.14. (base year purchased transportation cost report).

Column [2]: Parcel post transportation costs incurred transporting parcels within the service area of a P&DC.

Column [3]: Parcel post transportation costs incurred transporting parcels within the service area of a BMC.

Column [4]. Parcel post costs that are related to GCD distance, incurred transporting parcels outside the service area of a BMC.

Column [5]: Parcel post costs that are not related to GCD distance, incurred transporting parcels outside the service area of a BMC.

Division of Parcel Post Transportation Costs

Summary of Test Year Transportation Costs

		Domestic Airmail	Highway Service	Railroad Service	Domestic Water	Total
Test Year Cost Adjustments						
Total Parcel Post Base Year Costs	1/	$89,647	$176,439	$33,701	$4,899	**$304,686**
Total Parcel Post Test Year Costs	2/	$115,665	$170,676	$39,820	$5,914	**$332,075**
Percentage Increase	3/	29.02%	-3.27%	18.16%	20.72%	**8.99%**
Base year Alaska non-pref air costs	4/	$82,495				
Test year Alaska non-pref air costs	5/	$106,437				
Adjusted Parcel Post Test Year Costs	6/	$9,228	$170,676	$39,820	$5,914	**$225,638**
Parcel Post Costs by Function						
Base Year Local Cost Percentage	7/	0.00%	21.62%	0.00%	2.27%	
Base Year Intermediate Cost Percentage	8/	64.46%	50.37%	0.34%	97.73%	
Base Year Long Distance DR Percentage	9/	12.26%	28.01%	99.66%	0.00%	
Base Year Long Distance NDR Percentage	10/	23.27%	0.00%	0.00%	0.00%	
Test Year Local Costs	11/	$0	$36,901	$0	$134	**$37,035**
Test Year Intermediate Costs	12/	$5,948	$85,973	$137	$5,780	**$97,838**
Test Year Long Distance DR Costs	13/	$1,132	$47,802	$39,683	$0	**$88,617**
Test Year Long Distance NDR Costs	14/	$2,148	$0	$0	$0	**$2,148**
Test Year Total Long Distance Costs	15/	$3,279	$47,802	$39,683	$0	**$90,765**
Postal Owned Vehicle Costs						
Test Year Postal Owned Vehicle Costs	16/					$30,687
Piggyback Factor	17/					1.54678
Total Postal Owned Vehicle Costs	18/					$47,466
Adjusted Test Year Local Costs	19/					**$84,501**

Row 1/: Total transportation cost by mode from base year purchased transportation cost report (Alexandrovich WP B.14.).
Row 2/: Total transportation cost by mode from test year roll-forward (Patelunas WP E, Table D).
Row 3/: (Row 2 - row 1) / row 1.
Row 4/: Base year purchased transportation cost report, Alaska non-pref air costs (Alexandrovich WP B.14.).
Row 5/: Row 4 * (1 + row 3).
Row 6/: Row 2 - row 5.
Row 7/: Appendix I, page 11, column 2, local cost percentages by mode.
Row 8/: Appendix I, page 11, column 3, intermediate cost percentages by mode.
Row 9/: Appendix I, page 11, column 4, long distance (distance related) cost percentages by mode.
Row 10/: Appendix I, page 11, column 5, long distance (non-distance related) cost percentages by mode.
Row 11/: Row 7 * row 6.
Row 12/: Row 8 * row 6.
Row 13/: Row 9 * row 6.
Row 14/: Row 10 * row 6.
Row 15/: Row 13 + row 14.
Row 16/: Patelunas WP E, Table D.
Row 17/: USPS LR-H-77.
Row 18/: Row 16 * row 17.
Row 19/: Row 18 + total of row 11.

Division of Parcel Post Transportation Costs

Division of Functional Costs Into Rate Categories

	Local	Inter-mediate	Long Distance	
Transportation costs for all parcel post:	$84,501	$97,838	$90,765	1/
Inter-BMC cubic feet:	34,466,346	34,466,346	34,466,346	2/
Intra-BMC cubic feet:	23,033,118	23,033,118	23,033,118	3/
DBMC cubic feet:	99,429,915	99,429,915	99,429,915	4/
Total parcel post cubic feet:	156,929,379	156,929,379	156,929,379	5/
Percentage of inter-BMC parcels entered at origin BMCs:	4.48%	4.48%	4.48%	6/
Avg. number of local legs traveled by an inter-BMC parcel:	1.96			7/
Avg. number of intermediate legs traveled by an inter-BMC parcel:		1.96		8/
Avg. number of long distance legs traveled by an inter-BMC parcel:			1.00	9/
Percentage of intra-BMC cubic feet held out at the AO:	3.17%	3.17%	3.17%	10/
Avg. number of local legs traveled by an intra-BMC parcel:	1.94			11/
Avg. number of intermediate legs traveled by an intra-BMC parcel:		1.94		12/
Avg. number of long distance legs traveled by an intra-BMC parcel:			0.00	13/
Percentage of DBMC parcels entered at destination SCFs:	7.11%	7.11%	7.11%	14/
Avg. number of local legs traveled by a DBMC parcel:	1.00			15/
Avg. number of intermediate legs traveled by a DBMC parcel:		0.93		16/
Avg. number of long distance legs traveled by a DBMC parcel:			0.00	17/
Transportation costs incurred by DBMC rated parcels:	$39,739	$44,219	$0	18/
Transportation costs incurred by intra-BMC rated parcels:	$17,828	$21,355	$0	19/
Transportation costs incurred by inter-BMC rated parcels:	$26,934	$32,263	$90,765	20/
Transportation costs for all parcel post:	$84,501	$97,838	$90,765	21/

Row 1/: Appendix I, page 12, row 19 (local), row 12 (intermediate), row 15 (long distance).
Row 2/: Appendix II, page 9, column 1, total inter-BMC cubic feet.
Row 3/: Appendix II, page 9, column 2, total intra-BMC cubic feet.
Row 4/: Appendix II, page 9, column 3, total DBMC cubic feet.
Row 5/: Row 2 + row 3 + row 4.
Row 6/: Mayes WP I.F.
Row 7/: (1 * row 6) + (2 * (1 - row 6)) .
Row 8/: (1 * row 6) + (2 * (1 - row 6)).
Row 9/: Inter-BMC rated parcels should receive one leg of long distance transportation.
Row 10/: Appendix II, page 9, column 2, intra-BMC local cubic feet (1,460,249) divided by intra-BMC total cubic feet (23,033,118). The resulting quotient is multiplied by .5 to account for half of the intra-BMC parcels being held out at the local AO.
Row 11/: (0 * row 10) + (2 * (1 - row 10)).
Row 12/: (0 * row 10) + (2 * (1 - row 10)).
Row 13/: Intra-BMC rated parcels should not receive long distance transportation.
Row 14/: Mayes WP I.F.
Row 15/: All DBMC parcels should receive one leg of local transportation.
Row 16/: (0 * row 14) + (1 * (1 - row 14)).
Row 17/: DBMC parcels should not receive long distance transportation.
Row 18/: Formula for calculating these cost is described in Appendix I, page 10, equation 9
Row 19/: Formula for calculating these cost is described in Appendix I, page 10, equation 8.
Row 20/: Formula for calculating these cost is described in Appendix I, page 9, equation 7.
Row 21/: Row 17 + row 18 + row 19.

USPS-T-16
Appendix II

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

I. INTRODUCTION

The purpose of Appendix II of this testimony is to calculate the test year cubic feet and cubic foot miles by zone for each rate category of parcel post (inter-BMC, intra-BMC, and DBMC). Beginning with test year pieces by zone and weight increment for each rate category obtained from Ms. Mayes (Mayes WP I.A.) and the estimated cubic feet per piece by weight increment for each rate category (Exhibit USPS-16B), cubic feet by zone and weight increment are calculated. The cubic feet by rate cell are summed over all weight increments to yield total cubic feet by zone. Cubic foot miles by zone and rate category are taken directly from USPS LR-H-135. These results, cubic feet and cubic foot miles by zone for each rate category, are used in Appendix III.

II. CUBIC FEET

Pages 3 and 4 of Appendix II show test year intra-BMC cubic feet by zone and by weight increment. The cubic feet in each cell are calculated by multiplying the number of pieces in each cell from Ms. Mayes (Mayes WP I.A) by the predicted cubic feet per piece for each weight increment (Exhibit USPS-16B). Likewise, pages 5 and 6 show inter-BMC cubic feet, and pages 7 and 8 show DBMC cubic feet. Each of these pages also shows the total cubic feet by weight increment in the rightmost column and total cubic feet by zone in the bottom row.

III. SUMMARY

Page 9 of Appendix II shows a summary of the data contained in pages 3 through 8. The first table shows cubic feet by zone for each rate category and the second table shows cubic foot miles by zone for each rate category. Both tables also show the total cubic feet or cubic foot miles by zone (across all rate categories) in the

rightmost column and total cubic feet or cubic foot miles for each rate category (across all zones) in the bottom row.

The last table listed on page 9 shows the separation of DBMC cubic feet into those that are entered at a destination BMC (regular DBMC) and those that are entered at a destination P&DC. The first column in the table simply restates total DBMC cubic feet by zone from the first table on page 9. The second column shows DSCF cubic feet by zone. Since parcel post entered at a destination P&DC is actually entered at the facility which serves the 3-digit ZIP Code areas in which the parcels will be delivered, all cubic feet are in zone 1/2. The percentage of DBMC parcel post that is entered at a destination P&DC is obtained from Ms. Mayes (Mayes WP I.F.). This division of DBMC cubic feet will be used in Appendix III to calculate separate transportation unit costs for the two types of DBMC parcels.

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

Intra-BMC Cubic Feet by Zone and Weight Increment

LBS	Local	Zones 1 & 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
2	422,910	3,237,736	339,802	45,791	3,253				4,049,492
3	241,224	2,892,930	316,618	66,444	30				3,517,246
4	170,251	2,212,298	227,271	48,937	2,146				2,660,903
5	121,804	1,515,609	215,975	28,070	777				1,882,235
6	93,046	1,088,767	222,895	22,767	2,768				1,430,243
7	48,975	963,377	120,911	27,937	363				1,161,561
8	59,964	597,387	95,423	28,962	1,849				783,586
9	20,653	579,901	107,342	12,750	0				720,646
10	15,297	559,464	39,673	15,665	287				630,386
11	44,371	513,565	58,268	15,926	115				632,245
12	16,619	566,818	60,386	1,733	0				645,555
13	13,757	365,768	45,828	9,546	0				434,899
14	11,590	235,785	36,883	6,083	0				290,342
15	4,849	281,695	59,546	1,993	0				348,083
16	23,936	148,782	35,009	6,427	1,151				215,305
17	13,862	259,713	18,280	5,215	0				297,070
18	6,037	179,304	16,861	3,291	1,236				206,729
19	3,576	191,574	19,060	3,850	243				218,303
20	17,543	208,726	19,226	6,714	1,301				253,511
21	6,014	95,886	19,718	869	0				122,487
22	6,674	143,211	16,873	2,559	0				169,317
23	7,984	100,497	21,312	2,025	390				132,208
24	4,113	104,974	10,920	2,604	1,750				124,362
25	15,303	143,434	8,369	1,826	407				169,339
26	7,228	175,271	8,812	19,760	0				211,071
27	1,861	83,512	12,801	917	392				99,482
28	2,076	99,087	23,447	75	399				125,084
29	3,598	59,350	3,596	3,586	1,543				71,673
30	11,547	125,543	9,147	192	0				146,429
31	7,139	77,180	33,159	878	0				118,355
32	3,560	78,736	5,298	15,724	460				103,778
33	2,042	48,506	12,019	7,036	0				69,603
34	5,674	61,784	4,578	0	0				72,035
35	1,320	68,294	2,626	0	0				72,240
36	1,326	40,285	5,339	80	0				47,030
37	1,576	70,422	8,189	392	0				80,580
38	1,068	68,496	9,781	95	0				79,439
39	937	22,568	5,059	1,068	0				29,633
40	2,386	29,442	9,313	43	0				41,184
41	761	43,833	952	23,215	0				68,760
42	649	34,063	32,338	55	0				67,105
43	893	35,968	15,818	3,004	0				55,683
44	383	54,354	3,351	0	0				58,088
45	914	15,342	1,712	0	0				17,968
46	724	9,822	7,459	0	0				18,006
47	196	20,977	2,257	0	0				23,430
48	528	5,724	1,312	0	0				7,565
49	807	4,513	1,261	44	0				6,625
50	1,163	9,023	3,584	0	0				13,769

All data are calculated by multiplying the number of pieces in each rate cell (Mayes WP I.A. at 8-13) by the corresponding estimated cubic feet per piece for intra-BMC parcels (Exhibit USPS 16B).

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

Intra-BMC Cubic Feet by Zone and Weight Increment (Continued)

LBS	Local	Zones 1 & 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
51	1,242	19,620	2,406	0	0				23,268
52	2,228	15,358	9,839	0	0				27,426
53	3,015	6,432	3,192	38,460	0				51,098
54	473	7,606	1,734	0	0				9,813
55	364	7,354	1,383	0	0				9,102
56	209	2,465	2,643	25	0				5,342
57	0	11,476	0	0	0				11,476
58	592	2,326	0	0	0				2,918
59	341	12,203	0	0	0				12,544
60	0	967	0	0	0				967
61	0	1,858	570	0	0				2,428
62	591	3,491	441	0	0				4,523
63	174	1,642	0	0	0				1,816
64	0	758	0	0	0				758
65	192	35,064	0	0	0				35,256
66	0	1,381	1,041	0	0			–	2,422
67	0	484	817	0	0				1,301
68	0	4,345	588	0	0				4,933
69	119	19,342	0	0	0				19,461
70	0	2,359	3,240	0	0				5,599
Total	1,460,249	18,685,824	2,383,554	482,631	20,861	0	0	0	23,033,118

All data are calculated by multiplying the number of pieces in each rate cell (Mayes WP I.A. at 8-13) by the corresponding estimated cubic feet per piece for intra-BMC parcels (Exhibit USPS 16B).

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

Inter-BMC Cubic Feet by Zone and Weight Increment

LBS	Local	Zones 1 & 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
2		421,207	807,413	1,160,724	882,354	498,567	253,174	494,084	4,517,521
3		384,923	795,070	1,318,551	1,198,428	401,252	265,528	453,166	4,816,918
4		320,355	664,299	1,097,568	762,717	291,063	217,747	321,165	3,674,914
5		208,392	437,374	725,096	612,559	273,780	172,404	250,107	2,679,712
6		180,164	404,420	567,783	571,059	219,197	98,957	159,571	2,201,150
7		128,438	330,121	522,630	572,128	201,882	83,600	120,123	1,958,924
8		152,595	231,395	484,291	384,270	195,494	93,480	93,225	1,634,750
9		84,467	173,599	325,508	309,226	154,000	89,002	72,878	1,208,680
10		99,724	183,777	258,681	228,861	111,414	66,595	46,263	995,315
11		58,778	143,598	225,829	209,885	134,623	60,630	59,581	892,925
12		106,571	151,703	245,703	240,582	113,810	44,750	49,001	952,120
13		47,770	106,179	191,182	231,140	107,877	63,866	65,657	813,672
14		78,818	372,523	129,870	200,164	73,205	42,268	57,514	954,362
15		55,406	57,137	126,477	167,054	94,934	37,256	53,916	592,181
16		33,648	62,171	130,464	102,450	57,033	27,482	32,636	445,884
17		18,717	30,965	93,431	78,997	71,551	51,267	19,559	364,487
18		30,366	49,198	50,784	121,693	140,340	40,137	53,974	486,491
19		22,748	118,697	63,322	89,281	32,475	34,154	23,705	384,382
20		9,851	94,116	330,848	68,009	23,852	27,879	20,399	574,954
21		28,202	47,744	80,469	102,381	50,486	28,250	28,402	365,934
22		21,433	70,316	57,606	72,888	108,470	20,684	30,284	381,683
23		19,984	16,301	64,094	97,048	75,294	31,843	31,819	336,382
24		7,078	45,123	33,666	83,707	21,561	27,383	28,811	247,329
25		11,581	21,075	33,259	56,976	29,166	15,741	24,812	192,609
26		9,021	38,412	18,264	81,096	15,324	22,405	24,376	208,897
27		24,736	11,499	42,052	44,508	13,074	12,951	34,182	183,002
28		4,341	14,341	77,054	36,892	15,543	19,710	21,423	189,305
29		2,342	26,310	26,316	33,751	12,920	33,648	30,929	166,217
30		4,419	14,130	10,069	56,271	22,457	25,058	29,654	162,059
31		1,925	10,319	17,868	30,189	25,360	12,077	22,637	120,375
32		10,347	3,819	38,966	16,423	22,821	27,157	20,636	140,169
33		1,669	4,145	27,785	46,054	37,935	20,926	27,432	165,946
34		1,071	10,817	38,811	16,818	14,298	15,219	21,318	118,351
35		9,674	6,102	13,452	17,573	8,697	21,546	20,633	97,676
36		12,992	809	29,722	18,308	10,046	1,767	10,131	83,776
37		6,495	13,684	17,868	18,319	16,856	17,893	17,559	108,673
38		10,291	1,167	14,236	22,031	16,382	2,620	39,371	106,098
39		9,225	4,135	14,443	13,742	5,124	6,007	13,782	66,458
40		3,776	4,242	29,607	51,828	2,313	4,623	7,367	103,756
41		0	9,990	28,629	19,973	17,319	4,473	19,944	100,328
42		905	6,804	32,923	13,247	5,407	5,355	28,849	93,490
43		0	2,596	5,871	12,493	12,167	2,522	7,002	42,651
44		39	0	5,040	11,533	9,464	1,557	9,278	36,912
45		3,052	2,538	10,226	1,156	3,673	18,414	10,298	49,357
46		423	370	1,872	5,778	7,601	2,842	5,692	24,579
47		340	0	0	7,335	571	1,826	6,581	16,652
48		702	0	23,566	16,243	15,125	982	28,923	85,542
49		0	486	6,535	14,052	1,443	12,273	5,417	40,206
50		345	786	4,787	1,429	1,498	2,600	7,000	18,444

All data are calculated by multiplying the number of pieces in each rate cell (Mayes WP I.A. at 8-13) by the corresponding estimated cubic feet per piece for intra-BMC parcels (Exhibit USPS 16B).

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

Inter-BMC Cubic Feet by Zone and Weight Increment (Continued)

LBS	Local	Zones 1 & 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
51		0	871	4,244	9,512	0	1,652	15,587	31,867
52		0	24,611	4,371	1,577	37	4,144	5,196	39,937
53		0	1,930	1,956	1,875	400	684	4,274	11,119
54		47	5,134	700	23,542	3,193	1,188	3,621	37,426
55		0	345	379	3,421	0	823	1,573	6,542
56		0	36	2,397	7,569	1,551	1,799	10,588	23,940
57		193	0	78	358	1,473	0	1,365	3,466
58		0	1,230	5,327	0	0	576	1,419	8,553
59		0	0	1,246	1,300	6,323	736	9,262	18,867
60		357	0	3,185	2,354	1,927	433	1,157	9,413
61		0	2,272	867	0	4,899	1,345	8,764	18,146
62		0	1,407	1,726	3,428	1,579	0	988	9,127
63		0	1,451	2,506	891	412	726	3,291	9,278
64		0	0	0	0	0	3,825	695	4,520
65		11,267	0	0	217	1,590	0	1,596	14,670
66		0	0	0	0	415	1,056	-2,316	3,788
67		0	0	0	1,071	0	536	4,277	5,884
68		0	0	0	0	0	562	607	1,169
69		0	0	0	459	606	0	547	1,611
70		0	0	2,476	332	0	0	2,018	4,826
Total	0	2,661,211	5,641,102	8,885,254	8,108,805	3,819,149	2,210,617	3,140,208	34,466,346

All data are calculated by multiplying the number of pieces in each rate cell (Mayes WP I.A. at 8-13) by the corresponding estimated cubic feet per piece for intra-BMC parcels (Exhibit USPS 16B).

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

DBMC Cubic Feet by Zone and Weight Increment

LBS	Local	Zones 1 & 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
2		8,662,407	1,315,546	248,197	140				10,226,290
3		13,671,876	2,582,315	359,137	2,713				16,616,041
4		11,425,249	1,798,000	250,580	950				13,474,780
5		8,712,360	1,360,927	225,032	261				10,298,581
6		6,807,020	1,216,037	133,441	977				8,157,475
7		5,936,723	978,995	239,647	0				7,155,365
8		4,517,369	686,612	165,051	295				5,369,328
9		3,370,170	512,358	50,554	1,428				3,934,510
10		2,532,243	356,568	63,153	0				2,951,964
11		2,277,740	277,356	65,330	0				2,620,426
12		1,828,739	335,994	50,590	756				2,216,079
13		1,658,235	366,013	12,228	0				2,036,476
14		1,198,290	85,106	35,996	0				1,319,391
15		961,037	213,127	26,691	2,226				1,203,081
16		807,697	125,432	21,131	0				954,261
17		609,257	126,993	24,810	0				761,060
18		554,337	131,452	59,850	0				745,639
19		496,477	134,318	35,651	0				666,446
20		621,171	127,632	5,839	0				754,642
21		547,613	214,604	14,869	0				777,085
22		598,860	74,204	7,365	0				680,428
23		605,229	36,133	21,842	0				663,203
24		420,007	184,659	19,208	0				623,874
25		384,223	39,287	3,592	0				427,102
26		467,787	21,395	1,134	0				490,315
27		143,068	90,091	21,228	0				254,387
28		134,318	56,467	1,175	0				191,959
29		162,448	16,216	3,861	0				182,525
30		68,665	12,115	0	0				80,781
31		221,928	55,550	909	0				278,387
32		161,487	35,683	0	0				197,170
33		342,274	630	0	0				342,904
34		104,292	17,009	0	0				121,301
35		66,611	20,174	0	0				86,785
36		52,825	941	24,447	0				78,213
37		87,420	33,611	0	0				121,031
38		38,526	26,615	24,140	0				89,281
39		64,043	10,179	3,297	0				77,519
40		50,401	7,029	391	0				57,821
41		116,923	3,777	0	0				120,701
42		81,824	399	0	0				82,223
43		85,613	11,729	8,390	0				105,733
44		278,863	15,186	21,584	0				315,633
45		37,859	708	25,197	0				63,764
46		91,735	83,928	0	0				175,664
47		149,523	26,789	0	0				176,312
48		84,923	62,436	0	0				147,359
49		139,998	4,401	0	0				144,399
50		43,531	10,757	10,220	0				64,508

All data are calculated by multiplying the number of pieces in each rate cell (Mayes WP I.A. at 8-13) by the corresponding estimated cubic feet per piece for intra-BMC parcels (Exhibit USPS 16B).

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

DBMC Cubic Feet by Zone and Weight Increment (Continued)

LBS	Local	Zones 1 & 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
51		139,225	23,527	0	0				162,752
52		52,553	0	0	0				52,553
53		33,220	4,259	0	0				37,479
54		25,370	24,365	5,938	0				55,673
55		51,954	21,017	26,928	0				99,900
56		11,963	57,366	0	0				69,329
57		11,399	399	0	0				11,798
58		5,505	401	0	0				5,906
59		15,537	0	0	0				15,537
60		14,431	0	0	0				14,431
61		59,205	7,174	0	0				66,379
62		28,866	190	12,044	0				41,100
63		7,410	21,091	0	0				28,500
64		40,811	0	0	0				40,811
65		21,348	892	0	0				22,240
66		0	0	0	0			–	0
67		0	0	0	0				0
68		0	7,786	0	0				7,786
69		0	0	0	0				0
70		0	17,539	0	0				17,539
Total	0	83,000,009	14,089,492	2,330,668	9,746	0	0	0	99,429,915

All data are calculated by multiplying the number of pieces in each rate cell (Mayes WP I.A. at 8-13) by the corresponding estimated cubic feet per piece for intra-BMC parcels (Exhibit USPS 16B).

Parcel Post Cubic Foot and Cubic Foot Mile Input Data

Summary of Cubic Feet and Cubic Foot Miles by Rate Category and Zone

TY98 Cubic Feet by Zone

Zone	[1] Inter-BMC	[2] Intra-BMC	[3] DBMC	[4] Total
Local	0	1,460,249	0	1,460,249
1-2	2,661,211	18,685,824	83,000,009	104,347,043
3	5,641,102	2,383,554	14,089,492	22,114,149
4	8,885,254	482,631	2,330,668	11,698,554
5	8,108,805	20,861	9,746	8,139,412
6	3,819,149	0	0	3,819,149
7	2,210,617	0	0	2,210,617
8	3,140,208	0	0	3,140,208
Total	**34,466,346**	**23,033,118**	**99,429,915**	**156,929,379**
Total excluding local		**21,572,869**		

FY96 Cubic Foot Miles by Zone

Zone	[5] Inter-BMC	[6] Intra-BMC	[7] DBMC	[8] Total
Local	0	0	0	0
1-2	276,755,600	841,369,000	3,243,988,990	4,362,113,590
3	1,543,791,760	529,488,250	2,268,014,880	4,341,294,890
4	4,924,129,550	206,061,460	759,160,840	5,889,351,850
5	7,849,611,410	17,915,540	5,724,540	7,873,251,490
6	5,701,197,000	0	0	5,701,197,000
7	4,727,315,130	0	0	4,727,315,130
8	8,377,045,930	0	0	8,377,045,930
Total	**33,399,846,380**	**1,594,834,250**	**6,276,889,250**	**41,271,569,880**

DSCF Cubic Foot Calculations

Zone	[9] Total DBMC Cubic Feet	[10] DSCF Cubic Feet	[11] Regular DBMC Cubic Feet
Local	0	0	0
1-2	83,000,009	7,066,584	75,933,425
3	14,089,492	0	14,089,492
4	2,330,668	0	2,330,668
5	9,746	0	9,746
6	0	0	0
7	0	0	0
8	0	0	0
Total	**99,429,915**	**7,066,584**	**92,363,332**

Column [1]: Appendix II, page 6, total cubic feet for each zone.
Column [2]: Appendix II, page 4, total cubic feet for each zone.
Column [3]: Appendix II, page 8, total cubic feet for each zone.
Column [4]: Column 1 + column 2 + column 3.
Column [5]: USPS LR-H-135.
Column [6]: USPS LR-H-135
Column [7]: USPS LR-H-135
Column [8]: Column 5 + column 6 + column 7.
Column [9]: Column 3.
Column [10]: Appendix I, page 13, row 14, multiplied by total DBMC cubic feet.
Column [11]: Column 9 - column 10.

USPS-T-16
Appendix III

Parcel Post Transportation Costs by Rate Category and Zone

I. INTRODUCTION

The purpose of Appendix III of this testimony is to show how transportation cost per cubic foot estimates by zone are developed for each parcel post rate category. First, the total costs by function for each rate category from Appendix I are distributed to zone. Next, the costs in each zone are divided by the cubic feet per zone from Appendix II to calculate unit costs. Unit transportation cost estimates are developed for inter-BMC, intra-BMC, DBMC entered at the destination BMC (normal DBMC), and DBMC entered at the destination P&DC. Finally, an avoided transportation cost is calculated for a new rate category of parcel post, parcel post entered at the destination delivery unit (DDU). The results of this appendix, transportation cost per cubic foot by zone for each rate category, are also shown in Exhibit USPS-16A.

II. INTER-BMC TRANSPORTATION COSTS

Page 6 of this appendix shows how cost per cubic foot estimates by zone are developed for inter-BMC parcels. First, the total transportation costs incurred by inter-BMC parcels are listed by function: local, intermediate, and long distance. As was discussed earlier in this testimony (pages 3-10), each of the functional cost pools is further categorized as being GCD related or non-GCD related. Again, as was discussed earlier (pages 6-10 of this testimony), all local costs incurred by inter-BMC parcel post are not related to GCD, all intermediate costs are not related to GCD, and the majority of long distance costs are related to GCD.[1]

Next, the four pools of inter-BMC cost (local, intermediate, long distance - distance related, and long distance - non-distance related), shown in rows 1 through 4 of page 6, are distributed to zones. For each cost pool that is not related to GCD, costs are distributed to zones based on the percentage of inter-BMC cubic feet in each zone

[1] As explained in Appendix I, page 4, the commercial air terminal handling, network air, and western air cost elements of long distance transportation costs are the only elements treated as non-distance related.

(calculated using data from Appendix II). For each cost pool that is related to GCD, the costs are distributed to zones based on the percentage of inter-BMC cubic foot miles in each zone (again, calculated using Appendix II data). Columns 1 and 2 show the percentage of inter-BMC cubic feet and cubic foot miles in each zone respectively. Columns 3 through 6 show the distribution of each cost pool to zone and are calculated by multiplying one of the four cost pools by column 1 or column 2, depending on distance relation.

Inter-BMC costs per cubic foot by zone are calculated for each cost pool simply by dividing the total costs in each zone (columns 3 through 6) by the total number of cubic feet in each zone. The unit costs by cost pool and zone are shown in columns 7 through 10. Each of the unit costs for a particular zone are then added to develop a total inter-BMC unit cost for each zone. These total unit costs are shown in column 11 and are simply the sum of columns 7 through 10. Finally, a check is made to ensure that total unit costs are calculated such that they recover total inter-BMC costs from row 5. The total unit costs by zone are multiplied by the total cubic feet in each zone. This result is shown in column 12. As expected, the sum of column 12 across all zones was equal to the total inter-BMC costs which are distributed to zone (row 5).

III. INTRA-BMC TRANSPORTATION COSTS

Intra-BMC unit transportation costs by zone are calculated in a slightly different manner than inter-BMC unit costs. Because the transportation pattern of intra-BMC parcel post differs significantly depending on whether the piece is in the local zone or in other zones, a distinction is made for local zone intra-BMC. First, the cubic feet in the local zone and the cubic feet in all other zones are listed separately in column 1 of page 7. The cubic foot estimates come from Appendix II. Next, column 2 lists the average number of local and intermediate transportation legs traveled by the two different types of intra-BMC parcel post. Local zone parcels travel an average of one local and intermediate leg of transportation based on the assumption that half of the local zone

parcels are held out at the origin post office. Intra-BMC parcels in non-local zones will travel an average of two local and intermediate legs. Cubic feet are multiplied by average number of legs to yield an estimate of average cubic foot legs traveled by parcels in the local and non-local zones. Based on the percent of cubic foot legs traveled by local and non-local zone parcels (column 4), the local and intermediate transportation costs are divided between local and non-local zone parcels. One additional adjustment is made to the local transportation costs. A certain portion of local transportation costs will be incurred by local zone parcels even if they are held out at the AO. This portion reflects transportation that is incurred below the level of the AO (intra-city and box route transportation). This cost (row 5) is allocated to both local and non-local zone intra-BMC parcels.

Unit costs by zone for intra-BMC parcel post are calculated as follows. Local costs for local zone intra-BMC parcels are calculated by dividing the local transportation costs incurred by local zone parcels by the number of local zone cubic feet. Then the intra-city and box route unit costs are added. Non-local zone unit costs are calculated by dividing the local transportation costs incurred by non-local zone parcels by the number of non-local zone cubic feet. Again the unit cost for intra-city and box route transportation is added. Intermediate costs for local zone parcels are calculated by dividing the intermediate costs incurred by local zone parcels by the number of local zone cubic feet. Similarly, the intermediate costs for non-local zone parcels are intermediate transportation costs incurred by non-local zone parcels divided by the number of non-local cubic feet. Column 9 shows the total unit transportation costs for each zone of intra-BMC parcel post. Finally, the total intra-BMC unit costs by zone are reconciled to total intra-BMC transportation costs. This reconciliation is accomplished by multiplying the total intra-BMC unit costs by total intra-BMC cubic feet by zone. As expected, the sum of column 10 is equal to total intra-BMC transportation costs (row 4).

IV. DBMC TRANSPORTATION COSTS

DBMC unit transportation costs by zone are calculated in a similar manner as inter-BMC unit transportation costs. First, total DBMC transportation costs by function are listed (rows 1 and 2 on page 8). Next, the local costs are distributed to zone based on the percentage of total DBMC cubic feet in each zone because DBMC local costs are non-distance related.[2] Local costs are distributed based on total DBMC cubic feet also because the local leg is incurred by all DBMC parcels (those entered at the DBMC and those entered at the destination P&DC). The percentage of DBMC cubic feet by zone is shown in column 1 and the resulting local costs by zone are shown in column 3. The intermediate costs are distributed to zone based on the percentage of DBMC cubic foot miles in each zone because DBMC intermediate costs are distance related.[3] The percentage of DBMC cubic foot miles in each zone is shown in column 2 and the resulting intermediate costs by zone are shown in column 4.

Local unit costs are calculated by dividing the costs shown in column 3 by total DBMC cubic feet by zone. These local unit costs represent the local costs incurred by DBMC entered at a destination BMC as well as all of the transportation costs incurred by DBMC entered at a destination P&DC. Intermediate unit costs are only incurred by DBMC entered at a BMC; therefore, they are calculated by dividing the costs in column 4 by regular DBMC cubic feet by zone. Regular DBMC unit transportation costs (column 7) and destination P&DC entered DBMC transportation costs (column 5) are reconciled to total DBMC transportation costs (row 3) in the following manner. Regular DBMC unit costs were multiplied by regular DBMC cubic feet in each zone and destination P&DC entered DBMC unit costs were multiplied by destination P&DC entered DBMC cubic feet. Column 8 shows the sum of the unit costs multiplied by cubic feet. As expected, the sum of column 8 is equal to row 3.

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[2] See pages 4-11 of this testimony for a discussion of the relationship between cost pools and GCD distance for each rate category of parcel post.
[3] Ibid.

V. DDU TRANSPORTATION COST AVOIDANCE

Parcel post entered at the destination delivery unit can be expected to avoid all but a small portion of purchased transportation costs. At most, DDU parcel post will incur the same purchased transportation costs as DMBC entered at the destination P&DC. The purchased transportation costs associated with DBMC entered at the destination P&DC have three components: postal owned vehicle service, intra-SCF highway transportation, and inland water. Using information from witness Bradley's testimony (USPS-T-13), it is possible to identify certain portions of local transportation costs which would be avoided by DDU parcel post. Specifically, Exhibit USPS-13B contains a breakdown of intra-SCF highway transportation costs into its component parts by contract. The intra-SCF highway transportation account includes the following types of contracts: intra-SCF van, intra-SCF trailer, intra-city, and box route.

Of the four components of intra-SCF highway transportation listed above, two will be avoided by DDU parcel post: intra-SCF van and intra-SCF trailer contracts. These two types of contracts are primarily for transportation between P&DCs and AOs. Intra-city and box route contracts often account for transportation below the level of the delivery unit and therefore are not included in the avoided cost calculation.

Using the intra-SCF highway transportation cost breakdown, the percentage of intra-SCF costs potentially avoided by DDU parcel post in the base year is calculated. This percentage is applied to test year local parcel post highway transportation and postal owned vehicle costs to yield the DDU avoided transportation costs. All of the calculations described above are shown on page 9 of this appendix.

Parcel Post Transportation Costs By Rate Category and Zone

Calculation of Inter-BMC Transportation Costs per Cubic Foot by Zone

Inter-BMC parcel transportation costs by function and distance relation	
Local costs incurred by inter-BMC parcels (non-distance related)	$26,934 1/
Intermediate costs incurred by inter-BMC parcels (non-distance related)	$32,263 2/
Long distance costs incurred by inter-BMC parcels (distance related)	$88,617 3/
Long distance costs incurred by inter-BMC parcels (non-distance related)	$2,148 4/
Total inter-BMC parcel costs	**$149,962 5/**

Zone	[1] Percentage of inter-BMC cubic feet	[2] Percentage of inter-BMC cubic foot miles	[3] Local costs (000)	[4] Intermediate costs (000)	[5] Long distance costs - DR (000)	[6] Long distance costs - NDR (000)
Local	0.00%	0.00%	$0	$0	$0	$0
1-2	7.72%	0.83%	$2,080	$2,491	$734	$166
3	16.37%	4.62%	$4,408	$5,281	$4,096	$352
4	25.78%	14.74%	$6,943	$8,317	$13,065	$554
5	23.53%	23.50%	$6,337	$7,590	$20,827	$505
6	11.08%	17.07%	$2,985	$3,575	$15,127	$238
7	6.41%	14.15%	$1,728	$2,069	$12,543	$138
8	9.11%	25.08%	$2,454	$2,939	$22,226	$196
Total	**100.00%**	**100.00%**	**$26,934**	**$32,263**	**$88,617**	**$2,148**

Zone	[7] Local unit costs ($/CF)	[8] Intermediate unit costs ($/CF)	[9] Long distance - DR unit costs ($/CF)	[10] Long distance - NDR unit costs ($/CF)	[11] Total unit costs ($/CF)	[12] Reconcile to total costs (000)
Local	N/A	N/A	N/A	N/A	N/A	N/A
1-2	$0.7815	$0.9361	$0.2759	$0.0623	$2.0558	$5,471
3	$0.7815	$0.9361	$0.7261	$0.0623	$2.5060	$14,136
4	$0.7815	$0.9361	$1.4704	$0.0623	$3.2502	$28,879
5	$0.7815	$0.9361	$2.5684	$0.0623	$4.3483	$35,259
6	$0.7815	$0.9361	$3.9607	$0.0623	$5.7406	$21,924
7	$0.7815	$0.9361	$5.6738	$0.0623	$7.4536	$16,477
8	$0.7815	$0.9361	$7.0779	$0.0623	$8.8578	$27,815
Total						**$149,962**

Row 1/: Appendix I, page 13, row 20.
Row 2/: Appendix I, page 13, row 20.
Row 3/: Appendix I, page 12, row 13.
Row 4/: Appendix I, page 12, row 14.
Row 5/: Row 1 + row 2 + row 3 + row 4.
Column [1]: Appendix II, page 9, column 1, inter-BMC cubic feet in the given zone divided by total inter-BMC cubic feet.
Column [2]: Appendix II, page 9, column 5, inter-BMC cubic foot miles in the given zone divided by total inter-BMC cubic foot miles.
Column [3]: Row 1 * column 1.
Column [4]: Row 2 * column 1.
Column [5]: Row 3 * column 2.
Column [6]: Row 4 * column 1.
Column [7]: Column 3 * 1000 / Appendix II, page 9, column 1 (inter-BMC cubic feet by zone).
Column [8]: Column 4 * 1000 / Appendix II, page 9, column 1 (inter-BMC cubic feet by zone).
Column [9]: Column 5 * 1000 / Appendix II, page 9, column 1 (inter-BMC cubic feet by zone).
Column [10]: Column 6 * 1000 / Appendix II, page 9, column 1 (inter-BMC cubic feet by zone).
Column [11]: Column 7 + column 8 + column 9 + column 10.
Column [12]: Column 11 * Appendix II, page 9, column 1 (inter-BMC cubic feet by zone).

Parcel Post Transportation Costs By Rate Category and Zone

Calculation of Intra-BMC Rated Parcel Costs per Cubic Foot by Zone

Intra-BMC parcel transportation costs by function and distance relation

Local costs incurred by intra-BMC parcels (non-distance related)	$17,828 1/
Intermediate costs incurred by intra-BMC parcels (non-distance related)	$21,355 2/
Long distance costs incurred by intra-BMC parcels	$0 3/
Total intra-BMC parcel costs	**$39,183 4/**

	[1] Cubic feet	[2] Average Local / Intermediate Legs	[3] Average Cubic foot-legs	[4] Percent	[5] Local Transportation Costs	[6] Intermediate Transportation Costs
Local zone	1,460,249	1	1,460,249	3.27%	$487	$699
Non-local zone	21,572,869	2	43,145,739	96.73%	$14,398	$20,656
Intra-city / box route adjustment 5/					$2,942	
Total	**23,033,118**		**44,605,987**	**100.00%**	**$17,828**	**$21,355**

Zone	[7] Local unit costs ($/CF)	[8] Intermediate unit costs ($/CF)	[9] Total unit costs ($/CF)	[10] Reconcile to total costs (000)
Local	$0.4615	$0.4788	$0.9402	$1,373
1-2	$0.7952	$0.9575	$1.7527	$32,750
3	$0.7952	$0.9575	$1.7527	$4,178
4	$0.7952	$0.9575	$1.7527	$846
5	$0.7952	$0.9575	$1.7527	$37
6	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A
Total				**$39,183**

Row 1/: Appendix I, page 13, row 19.
Row 2/: Appendix I, page 13, row 19.
Row 3/: Appendix I, page 13, row 19.
Row 4/: Row 1 + row 2 + row 3.
Row 5/: Row 1 * Appendix III, page 9, row 10.
Column [1]: Appendix II, page 9, column 2, intra-BMC cubic feet in the local zone and in all other zones.
Column [2]: Local zone legs reflect half of the local parcels being held out at the AO. Non-local zone legs reflect typical intra-BMC parcel.
Column [3]: Column 1 * column 2.
Column [4]: Percentage of cubic foot legs from column 3.
Column [5]: (Row 1 - row 5) * column 4.
Column [6]: Row 2 * column 4.
Column [7]: Local zone unit cost = (local zone costs from column 4 / local zone cubic feet from column 1) + row 5 / total cubic feet.
Non-local zone unit cost = (non-local zone costs from column 4 / non-local zone cubic feet from column 1) + row 5 / total cubic feet.
Column [8]: Local zone unit cost = local zone costs from column 5 / local zone cubic feet from column 1.
Non-local zone unit cost = non-local zone costs from column 5 / non-local zone cubic feet from column 1.
Column [9]: Column 5 + column 6.
Column [10]: Column 7 * Appendix II, page 9, column 2 (intra-BMC cubic feet by zone).

Parcel Post Transportation Costs By Rate Category and Zone

Calculation of DBMC Rated Parcel Costs per Cubic Foot by Zone

DBMC parcel transportation costs by distance relation	
Local costs incurred by DBMC parcels (non-distance related)	$39,739 1/
Intermediate costs incurred by DBMC parcels (distance related)	$44,219 2/
Long distance costs incurred by DBMC parcels	$0 3/
Total DBMC parcel costs	**$83,959 4/**

Zone	[1] Percentage of DBMC cubic feet	[2] Percentage of DBMC cubic foot miles	[3] Local costs (000)	[4] Intermediate costs (000)
Local	0.00%	0.00%	$0	$0
1-2	83.48%	51.68%	$33,173	$22,853
3	14.17%	36.13%	$5,631	$15,978
4	2.34%	12.09%	$932	$5,348
5	0.01%	0.09%	$4	$40
6	0.00%	0.00%	$0	$0
7	0.00%	0.00%	$0	$0
	0.00%	0.00%	$0	$0
Total	**100.00%**	**100.00%**	**$39,739**	**$44,219**

Zone	[5] Local / DSCF Unit Costs ($/CF)	[6] Intermediate Unit Costs ($/CF)	[7] Total DBMC Unit Costs ($/CF)	[8] Reconcile to Total Costs (000)
Local	N/A	N/A	N/A	N/A
1-2	$0.3997	$0.3010	$0.7006	$56,026
3	$0.3997	$1.1340	$1.5337	$21,609
4	$0.3997	$2.2947	$2.6943	$6,280
5	$0.3997	$4.1378	$4.5374	$44
6	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A
Total				**$83,959**

Row 1/: Appendix I, page 13, row 18.
Row 2/: Appendix I, page 13, row 18.
Row 3/: Appendix I, page 13, row 18.
Row 4/: Row 1 + row 2 + row 3.
Column [1]: Appendix II, page 9, column 3, DBMC cubic feet in the given zone divided by total DBMC cubic feet.
Column [2]: Appendix II, page 9, column 7, DBMC cubic foot miles in the given zone divided by total DBMC cubic foot miles.
Column [3]: Row 1 * column 1.
Column [4]: Row 2 * column 2.
Column [5]: Column 3 / Appendix II, page 9, column 3 (DBMC cubic feet by zone).
Column [6]: Column 4 / Appendix II, page 9, column 11 (regular DBMC cubic feet by zone).
Column [7]: Column 5 + column 6.
Column [8]: (Column 5 * Appendix II, page 9, column 10) + (column 7 * Appendix II, page 9, column 11).

Parcel Post Transportation Costs By Rate Category and Zone

Calculation of DDU Avoided Costs per Cubic Foot

Test year local parcel post transportation costs		
Highway and POV	$84,367	1/
Water	$134	2/
Total	**$84,501**	3/
Total intra-SCF highway transportation costs by contract type		
Intra-SCF vans	$190,832	4/
Intra-SCF trailers	$83,552	5/
Intra-city	$16,298	6/
Box-route	$37,419	7/
Total	**$328,101**	8/
Percentage of intra-SCF highway and POV costs avoided by DDU parcels	**83.63%**	9/
Percentage of local transportation costs avoided by DDU parcels	**83.50%**	10/
DSCF transportation cost per cubic foot ($/cf)	**$0.3997**	11/
DSCF - DDU transportation cost difference ($/cf)	**$0.3337**	12/

Row 1/: Appendix I, page 11, total local highway service costs.
Row 2/: Appendix I, page 11, total local domestic water costs.
Row 3/: Row 1 + row 2.
Row 4/: Exhibit USPS-13B.
Row 5/: Exhibit USPS-13B.
Row 6/: Exhibit USPS-13B.
Row 7/: Exhibit USPS-13B.
Row 8/: Row 4 + row 5 + row 6 + row 7.
Row 9/: (Row 4 + row 5) / row 8.
Row 10/: (Row 9 * row 1) / row 3.
Row 11/: Appendix III, page 8, column 5.
Row 12/: Row 10 * row 11.

USPS-T-16
Appendix IV

Parcel Post Cube-Weight Relationship

Pages 1-4: Description of Cube-Weight Relationship Estimation

I. INTRODUCTION

The purpose of Appendix IV of this testimony is to show how the estimated cubic feet per piece by weight increment (cube-weight relationships) are calculated for each rate category of parcel post. Using data from USPS LR-H-135, showing the total cubic feet and volume by weight increment for each rate category and the econometric model described by the Commission in its R94-1 Decision,[1] the cubic feet per piece by weight increment for each rate category were estimated using the weighted least squares method of estimation.

II. INPUTS

The only input data necessary to estimate the cube-weight relationship for each rate category are the total cubic feet and total volume by each weight increment for each rate category of parcel post. Again, the input data was obtained from USPS LR-H-135. A complete listing of the input data can be found in USPS LR-H-176 at 8-10. Using these data, several calculations are made to develop the variables that are used in the estimation. Table IV-1 describes each of the variables in the input data sets and their source:

TABLE IV-1
CUBE-WEIGHT RELATIONSHIP INPUT VARIABLES

Variable Name	Description	Source
LBS	Weight increment.	N/A.
CF	Total cubic feet in the given weight increment.	All data are from USPS LR-H-135.
PCS	Total volume in the given weight increment.	All data are from USPS LR-H-135
CFPERPC	Cubic feet per piece in the g iven weight increment.	CF / PCS.

[1] PRC Op., Docket No. R94-1, page V-116.

LNLBS	The natural log of the weight increment.	LN(LBS).
LNLBS2	The natural log of the weight increment, squared.	LN(LBS)^2.
LNCFPPC	The natural log of cubic feet per piece.	LN(CFPERPC).

All of the above data serve as inputs into the estimation of the cube-weight relationship and are shown on pages 12 and 13 (inter-BMC), pages 18 and 19 (intra-BMC), and pages 24 and 25 (DBMC) of USPS LR-H-176.

III. ESTIMATION

As discussed in Section III of this testimony, three separate cube-weight relationships are estimated; one for each rate category of parcel post.[2] The model used to estimate each relationship is the same as the model recommended by the Commission in Docket No. R94-1.[3] The model is a translog model with the dependent variable being LNCFPPC and the independent variables being LNLBS and LNLBS2. Thus the model has the form:

$$\ln(cf / pc_i) = a + b[\ln(lbs_i)] + c[\ln(lbs_i)]^2 \quad (1)$$

Where the "*i*" subscript represents the weight increment (2 through 70). Because the dependent variable represents the average cubic feet per piece for a given weight increment, "*cf/pc$_i$*" can be written as:

$$cf / pc_i = \frac{\sum_{j=1}^{j=pcs_i} cf_j}{pcs_i} \quad (2)$$

[2] For a discussion of why three separate relationships were estimated, see USPS-T-16 at 12-14.
[3] PRC Op., Docket No. R94-1, page V-116.

Where "pcs_i" is the total number of pieces in weight increment "i", "cf_j" is the number of cubic feet for the "j^{th}" parcel in weight increment "i". Therefore, the average cubic feet per piece in weight increment "i" is the sum of the cubic feet of all the parcels in weight increment "i" divided by the number of pieces in weight increment "i".

When estimating a relationship where each observation of the dependent variable represents an average of data (in this case pieces in each weight increment), the proper estimation technique is a form of weighted least squares using volume (pcs_i) as the weighting variable.[4] For example, the average cubic feet per piece for a parcel in the two-pound weight increment is determined by taking the average of millions of parcels. The average cubic feet per piece for a parcel in the 70-pound weight increment is the average of only thousands of parcels. The relative number of pieces from which each average is calculated needs to be accounted for in the model.

Using weighted least squares is relatively straightforward. First, the regression equation must be weighted using the appropriate variable. Then, ordinary least squares (OLS) can be used to estimate the weighted model. In estimating the cube-weight relationship in parcel post using weighted least squares, Equation 1 is transformed to the following:

$$\ln(cf / pc_i)\sqrt{pcs_i} = a\sqrt{pcs_i} + b\left[\ln(lbs_i)\right]\sqrt{pcs_i} + c\left[\ln(lbs_i)\right]^2\sqrt{pcs_i} \qquad (3)$$

The parameter estimates for the inter-BMC, intra-BMC, and DBMC regressions are shown on pages 14, 20, and 26 of USPS LR-H-176 respectively. In all three relationships, all of the dependent variables, including the intercepts, were significant at the 99 percent level.

[4] For a discussion of why weighted least squares is appropriate when dealing with pooled data, please see J. Johnston, *Econometric Methods* 293-296 (McGraw-Hill 1984).

Pages 15-16, 21-22, and 27-28 of USPS LR-H-176 show the results of the inter-BMC, intra-BMC, and DBMC regressions for all observations respectively. Pages 17, 23, and 39 of USPS LR-H-176 show a plot of the actual values of cubic feet per piece by weight increment and the predicted values of cubic feet per piece by weight increment for inter-BMC, intra-BMC and DBMC respectively.

Finally, pages 30-31 of USPS LR-H-176 show a summary of the estimated cubic feet per piece for all three rate categories. The SAS program code and log file that were used to produce the estimates of the cube-weight relationships for each rate category are included in pages 32-39 of USPS LR-H-176. All input data, programs, and output are available on diskette in USPS LR-H-176.