POSTAL RATE AND FEE CHANGES, 2000

Docket No. R2000–1

RESPONSE OF UNITED STATES POSTAL SERVICE
WITNESS BOZZO TO INTERROGATORIES OF
THE OFFICE OF THE CONSUMER ADVOCATE
(OCA/USPS–T15–56-63)

The United States Postal Service hereby provides the responses of witness

Bozzo to the following interrogatories of the Office of the Consumer Advocate:

OCA/USPS–T15-56-63, filed on March 22, 2000.

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

Respectfully submitted,

UNITED STATES POSTAL SERVICE

By its attorneys:

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OCA/USPS-T-15-56.   Please refer to your testimony, lines 7 through 11 at 31. It is our understanding that the function being estimated is now stated to be a factor input demand function rather than a cost function. Economic textbooks indicate that inputs for a labor demand function include payments to the factors of production as well as the price of the output.

a. Does your labor factor demand equation have output price and price of capital in the equation?

b. If your answer to (a) is negative, please explain.

c. Does your labor factor demand equation have other variables that are not specified by a typical textbook exposition as enunciated in this question?

OCA/USPS–T–15–56 Response.

a. No.

b. The statement of the interrogatory appears to incorrectly identify the analytical

basis for my analysis. What is termed the "factor input demand function" in

the interrogatory—or labor demand function in the cited passage—is, to make

a finer distinction, a *conditional* labor (or, more generally, factor) demand

function. The conditional labor demand function can be derived either from

the partial equilibrium model of cost minimization (in which case my

framework is a generalized version of that described in the Docket No. R97-1

interrogatory USPS/OCA-T600-6 to Dr. Smith, Tr. 28/15909-15910; see also

USPS-T-15 at pages 42-44 and the response to OCA/USPS-T-15-59 part d),

or from a generalized non-cost minimizing model as mentioned in USPS-T-15

at page 33, footnote 8; see also the response to OCA/USPS-T-15-58(c). In

either case, it is appropriate that the output quantity (rather than output price) appear in the model specification.

With respect to the capital variable, my inclusion of the capital quantity rather than price is appropriate for a treatment of capital as a "quasi-fixed" factor. While I would expect capital costs to be volume-variable to some degree (possibly to the same degree as labor costs, as discussed in USPS-T-15 at pages 39-41), I would nevertheless expect that the nature of the Postal Service's capital planning and deployment processes is such that capital and labor are not simultaneously determined, but rather that the available capital is taken as a "given" when labor work assignments are made.

c. Yes. As I discuss in USPS-T-15 at page 45, lines 17-20, "textbook economic theory cannot specify the full set of relevant cost causing factors for any applied study. To create an adequate econometric model, it is necessary to identify the factors that sufficiently bridge the gap between generic theory and operational reality." The labor demand models I use, and the cost functions implicitly associated with them, employ additional variables for that reason. See USPS-T-15 at page 46, lines 8-10. The implicit cost functions associated with my labor demand functions are consistent with the general framework employed in the Christensen, Caves, and Tretheway paper cited in USPS-T-15 at page 46, footnote 15.

OCA/USPS-T-15-57.   Please refer to your testimony footnote, 7 at 32, wherein you indicate that R. Chambers indicates that the production function's "properties or even its existence was seriously debated".

a. Do you give any credence to the question of the existence of a production function? If so, please explain.

b. If your answer to (a) is negative, why do you raise this issue?

c. If you are concerned about the production function's properties issue mentioned by R. Chambers, please explain in detail the issues in doubt and also how you have resolved the issues.

OCA/USPS-T-15-57 Response.

a. It depends on what is meant by "existence." In one sense, I believe it should be clear that the "production function" does not *literally* exist, but rather it "is simply an analytical representation of [the firm's operating] plans and procedures," as I state in USPS-T-15 at page 32, lines 17-18. Nevertheless, I believe that the body of economic production theory derived from the concept of the production function is analytically useful and powerful.

b. I raised the issue in the context of explaining a conceptual error in Dr. Smith's statement in Docket No. R97-1 that "[operating] plans and procedures do not provide the analytical form or explanatory power found in a correctly specified translog production function as defined by economists" (Docket No. R97-1, Tr. 28/15829). Production functions (in whatever functional form) are simply an analytical representation of firms' operating plans and procedures; see my response to part (a). Therefore, I believe it follows virtually by definition that

production functions can provide no more or less explanatory power than the

operating plans and procedures they represent.

c. Not applicable.

OCA/USPS-T-15-58.   Please refer to your testimony, lines 1 through 4 at
33, and the accompanying footnote 8. You indicate that "Whether the Postal
Service's actual plans and procedures are cost minimizing is beyond the scope of
this testimony." You quote "Estimation of a Cost Function When the Cost is Not
Minimum: The Case of Soviet Manufacturing Industries, 1958-1971" by Yasushi
Toda, *The Review of Economics and Statistics*, 58 (1976) at 259-68, as the
source for information on firms which do not minimize costs.

a.   Dr. Toda indicates that the presence of a factor price disparity creates a bias
     in the index of total factor productivity. Your analysis of capital and the
     QICAP variable appears to be based to a significant degree on Total Factor
     Productivity. Accordingly, does not the assertion that Postal Service
     facilities may or may not be operated in a cost minimizing fashion limit or
     eliminate the accuracy of your QICAP variable and the associated capital
     analysis? Please explain.

b.   Dr. Toda also found that the shadow rental wage and observed rental wage
     ratios were significantly different in the case of a cost minimizing and a non-
     minimizing cost situation. Assuming that according to your testimony cost
     non-minimization behavior may be a characteristic of some Postal Service
     facilities, may we conclude that Dr. Toda's conclusions are applicable to the
     Postal Service? Please explain.

c.   In discussing cost minimization, would it be correct to assume that you are
     indicating that some sites (as identified by IDNUM) may be cost efficient,
     while other sites may be inefficient? If your answer is yes, please indicate
     factors that could cause a site to be operated in a non-cost minimizing way.
     If your answer is no, please indicate the concept you are attempting to
     convey in discussing cost non-minimization if you allege that it is not an
     issue.

d.   Assuming that cost minimization occurs at a site (or does not occur at a
     site), then is it correct that over a period of time a site could move from
     minimization to non-minimization (or the opposite)? Please explain.

OCA/USPS–T–15–58 Response.

a. I do not believe so. The statement of the interrogatory fails to make an

    important distinction. My facility-level capital variable (QICAP) does not make

use of the Postal Service's Total Factor Productivity (TFP) results (i.e., the

TFP index). Rather, it makes use of *methods* developed to measure capital

input for the TFP analysis. That is, the relationship between my analysis and

the Postal Service's TFP analysis is that they share common methods to

develop data on economic input. My interpretation of the cited discussion in

Toda's paper is that it mainly concerns the methods by which measures of

economic labor and capital input are combined to form an aggregate (labor

and capital) input index for TFP measurement. Finally, while I have no

reason to believe that the Postal Service TFP index is actually biased, the

bottom line is that I do not use it to develop QICAP.

b. I believe the statement of the interrogatory incompletely reports Toda's main

empirical result, which is that there were (statistically) significant differences

between the observed and shadow "rental-wage ratios" for three Soviet

industry sectors out of the eight studied. Toda observes that his results "[i]n

large part... fail to verify [his] expectations" that "the use of primary factors

may be in disequilibrium" in Soviet industry (Toda, op. cit., at page 263).

Nevertheless, Toda's empirical results apply to Soviet industries operating

under institutional conditions that, in my opinion, do not provide a good

characterization of the Postal Service. Thus, I would not be inclined to

generalize Toda's results to the Postal Service. Also, please note that my

citation of Toda's paper was with respect to the applicability of "neoclassical"

economic cost analysis methods in a non-cost minimizing context, and my

conclusion that cost analysis methods are applicable whether or not the

Postal Service is a cost minimizer.

c. My testimony does not indicate whether or not specific operations are

operated in a "cost efficient" manner. As I indicate in the response to part (b),

above, and in the cited portion of my testimony, the concept I am trying to

convey is the applicability of "neoclassical" economic cost analysis methods

in a non-cost minimizing context.

d. Yes. In principle, a site could move towards (or away from) the minimum cost

frontier by employing the available resources more (or less) efficiently.

OCA/USPS-T-15-59.   Please refer to your testimony, lines 13 through 15 at 42, where you state, "Therefore, estimating labor demand functions, rather than cost or production functions, to obtain the volume-variability factors is a theoretically valid modeling approach."

a.   Would this be true under all conditions, *i.e.*, both competitive and non-competitive equilibrium, non cost minimization, and cases of non-equilibrium? Pleasse explain.

b.   Do your results presuppose competitive market equilibrium? Please explain.

c.   In the case of attainment of a non-competitive market equilibrium, would your results be the same? Please explain.

d.   You reference in the accompanying footnote 13 a book by R. Chambers to substantiate the theory of the modeling approach. Recognizing that Professor Chambers' book is comprehensive and voluminous at least from the viewpoint of a cursory review effort limited by time, please specifically reference the pages that you use to substantiate your theoretical economic analysis.

OCA/USPS–T–15–59 Response.

a.   I do not believe any theory holds under "all conditions." With respect to the conditions indicated in the statement of the interrogatory, the quoted passage from USPS-T-15 is in the context of a description indicating that the modeling approach is valid under cost minimization, as well as non-cost minimization represented per the Toda article discussed in the response to OCA/USPS-T-15-58. The modeling approach does not presuppose the existence of competitive or non-competitive general equilibrium; see the response to (b), below. I am not sure what exactly is meant by "cases of non-equilibrium."

To the extent that the term refers to situations under which the relevant

theoretical conditions of the cost minimizing (or generalized non-cost

minimizing) model do not hold, my results would still represent an empirical

analysis of the Postal Service's demand for labor in mail processing

operations, but the mathematical relationship ("Shepard's lemma") between

the labor demand and cost functions would not necessarily hold.

b. I assume that by "competitive market equilibrium" you mean Walrasian

general equilibrium as described in, e.g., Chapter 5 of Varian's

Microeconomic Analysis, Second Edition (Norton, 1984). In this context, my

approach is a "partial equilibrium" model in that I do not assume that all

markets clear. My models do not presuppose the existence of general

equilibrium. See also the response to OCA/USPS-T-15-56.

c. The question appears to ask whether my results would be the same under

different economic structures—i.e., general equilibrium under perfect versus

imperfect competition. Interpreting the question this way, I would not expect

my results to necessarily be invariant with respect to the fundamental

structure of the economy. However, I would expect my (partial equilibrium)

results to embody any relevant characteristics of the structure of the economy

as a whole.

d. Please note that I cited Chambers' book in the general context of a treatment

of the "neoclassical" approach to the economics of cost and production.

However, a reader not otherwise familiar with the material might focus on

Chapters 2 ("Cost functions"), 5 ("Flexible forms and aggregation"), and 7

("Multioutput technologies").

OCA/USPS-T-15-60.   Please refer to your testimony, lines 9 through 10 and the accompanying footnote 21 at 59. You indicate that "the cost surface passing through the origin is neither necessary nor sufficient for the 100 percent volume-variability result."

a. Please provide an example plus graphical representation of a cost surface passing through the origin and possessing 100 percent variability, a cost surface passing through the origin and not possessing 100 percent variability, and a cost surface not passing through the origin and possessing 100 percent variability, and any other possible case(s) not mentioned in this section of the interrogatory.

b. Please provide the underlying mathematical proof.

OCA/USPS–T–15–60 Response.

a. Consider a cost surface with the form $C(D) = F + \alpha D^\epsilon$, where C represents

(real) cost, D represents the output or "cost driver," F represents a "fixed"

component of cost (independent of D), and α and ϵ are positive parameters.

The elasticity of cost with respect to the cost driver D, or volume-variability

factor, resulting from this specification is $\epsilon_{C,D} = \dfrac{D}{C} \cdot \dfrac{dC}{dD} = \dfrac{\epsilon \alpha D^\epsilon}{F + \alpha D^\epsilon}$.

Technically, the term "100 percent [volume-]variability" refers to the situation

where this elasticity equals one. See the Preface and Appendix H of USPS

LR-I-1.

For the cost surface specified above to "pass through the origin" (i.e.,

$C(0) = 0$), it must be that $F = 0$, in which case the elasticity formula simplifies

to $\varepsilon_{C,D} = \varepsilon$. Thus, if the cost surface passes through the origin, 100 percent

variability requires that $\varepsilon = 1$. When $\varepsilon \neq 1$, costs are 100ε percent volume-

variable. This demonstrates that the cost surface passing through the origin

is not *sufficient* for the 100 percent volume-variability result—the additional

condition $\varepsilon = 1$ is required in addition to $F = 0$.

If the cost surface does not pass through the origin (i.e., $C(0) > 0$), 100

percent volume-variability results when the equation $\dfrac{\varepsilon \alpha D^{\varepsilon}}{F + \alpha D^{\varepsilon}} = 1$ is satisfied,

with $F > 0$. Given positive values of F and α, there are three cases to

consider. First, there is no solution to the equation $\dfrac{\varepsilon \alpha D^{\varepsilon}}{F + \alpha D^{\varepsilon}} = 1$ (and the

degree of volume-variability is less than 100 percent) when $\varepsilon < 1$, since

$\varepsilon < 1 \Rightarrow \varepsilon \alpha D^{\varepsilon} < F + \alpha D^{\varepsilon}$. When $\varepsilon = 1$, the degree of volume-variability

approaches 100 percent in the limit as D tends to infinity. When $\varepsilon > 1$, solving

the equation for D indicates that the degree of volume-variability will equal

100 percent, on the margin, for $D^{*} = \exp\left(\dfrac{1}{\varepsilon} \cdot \ln\left(\dfrac{F}{\alpha(\varepsilon - 1)}\right)\right)$ (note that in this

case, the degree of volume-variability, on the margin, will be less than 100

percent at levels of output below D^{*} and greater than 100 percent above D^{*}).

This demonstrates that the cost surface passing through the origin is not

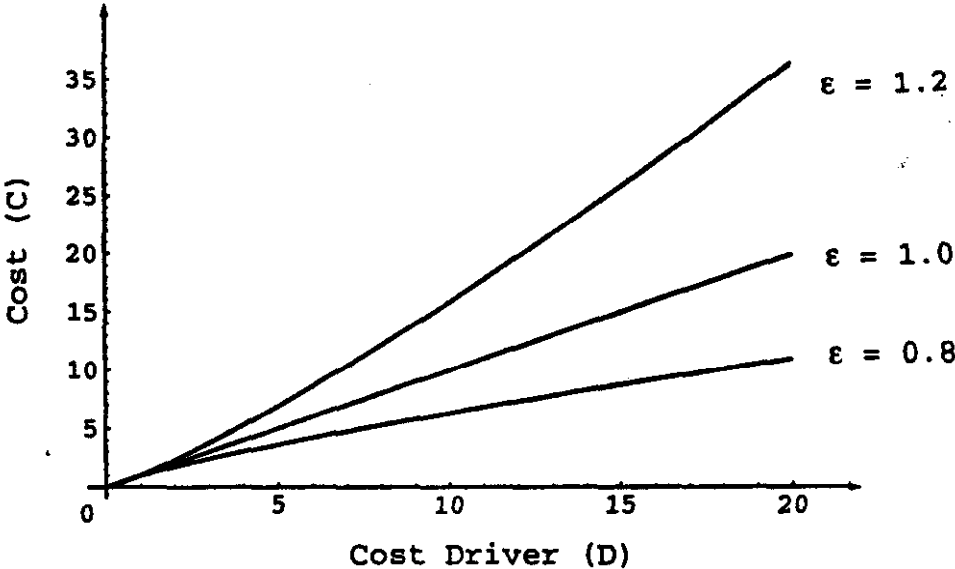*necessary* for the 100 percent volume-variability result—it is possible to

establish conditions whereby the degree of volume-variability is 100 percent

and the cost surface does not pass through the origin.

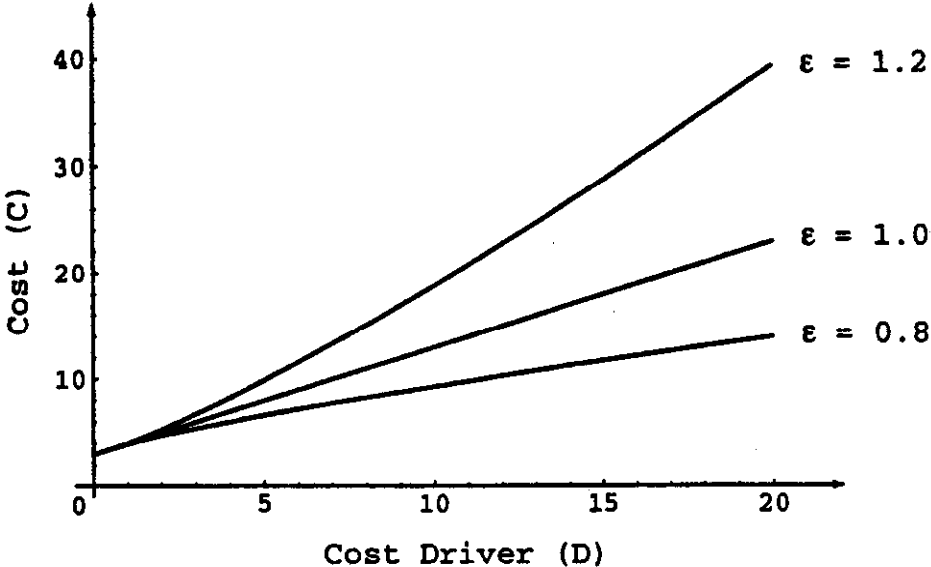The graphs attached to this response provide the requested graphical

representation.

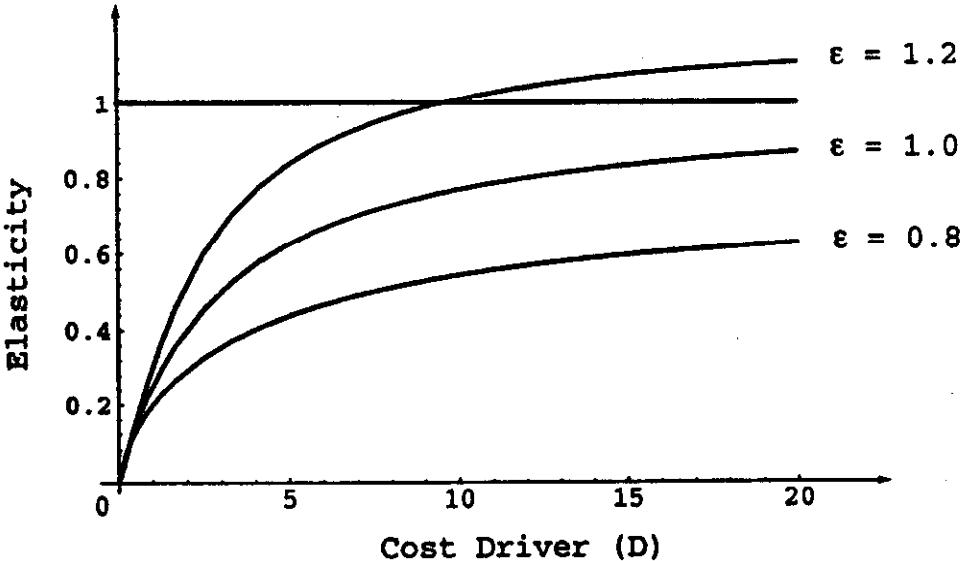b. Please see the response to part (a) for the requested proof.

Figure 1

Graphical representation of (constant variability) cost function $C = F + \alpha D^{\varepsilon}$, $F = 0$, $\alpha = 1$, various values of ε.

Figure 2

Graphical representation of (non-constant variability) cost function $C = F + \alpha D^{\varepsilon}$, $F = 3$, $\alpha = 1$, various values of ε.

Figure 3

Graphical representation of elasticity $\varepsilon_{C,D} = \dfrac{D}{C} \cdot \dfrac{dC}{dD} = \dfrac{\varepsilon \alpha D^{\varepsilon}}{F + \alpha D^{\varepsilon}}$ from cost function $C = F + \alpha D^{\varepsilon}$, $F = 3$, $\alpha = 1$, various values of ε.

OCA/USPS-T-15-61.   Please turn to your testimony, lines 8 through 12 at 72. You state, "To forge ahead and estimate a long-run cost function from cross-section data when the data are not observed in long-run equilibrium results, as Friedlaender and Spady point out, in biased estimates of the relevant economic quantities (see A. Friedlaender and R. Spady, *Freight Transport Regulation*, MIT Press 1981, p.17)." Subsequently in the text, the authors state that one should measure a short-run function in cases of long-run disequilibrium with chronic excess capacity.

a.   Is your estimated function a short-run or a long-run function?

b.   Assuming that your reply is "short-run," is this due to disequilibrium and chronic excess capacity? If so, please explain the chronic excess capacity and also the disequilibrium factors.

c.   If you reply that the function you have estimated is long run, please explain what form a short run function would take in terms of variables.

d.   The authors state that the long-run function can be derived as the envelope curve of the short-run function. Accordingly, have you derived the unobserved long-run function, as indicated by Friedlaender and Spady? If so, please provide the function.

e.   Friedlaender and Spady advocate the specification of a cost function in terms of multiple outputs; did you consider such an approach in your estimation efforts? Please explain your answer in detail.

OCA/USPS–T–15–61 Response.

a.   Since capital is treated as a quasi-fixed factor, I am estimating "short-run" functions.

b.   No, as I explain in the response to part (a), the functions are "short-run" because capital is treated as a quasi-fixed factor. This need not imply a disequilibrium condition.

c. Not applicable.

d. No. Note that it is my understanding that the "function" to which Spady and

Friedlaender refer is the total cost function. Since I estimate the labor

demand equations but not the full factor demand systems (i.e., encompassing

factors of production other than labor), my analysis does not permit the

underlying total cost function to be recovered.

e. Yes. First, to characterize the set of operations for which I report econometric

results, I employ ten equations with ten output (piece handling) variables;

additionally, each equation includes other non-volume "cost drivers" in

addition to piece handlings. Second, my analysis is an element of the Postal

Service's "distribution key" (or "volume-variability/distribution key") methods to

estimate volume-variable costs by subclass (i.e., multiple outputs). See also

Docket No. R2000-1, USPS-T-15 at pages 47-56, USPS LR-I-1, Appendix H;

Docket No. R97-1, USPS-T-11 and Tr. 34/18220-18228.

OCA/USPS-T-15-62.　　In your reply to Interrogatory OCA/USPS-T-15-20, you indicate that an updating of Dr. Bradley's models that did not require the updating of new data systems could require up to two person years of work, or more if significant changes were required.

a.　Would it be reasonable to assume that Dr. Bradley's work also required possibly five years of person effort for the initial development, similar to your efforts? If you are unable to provide this information, please refer the question to the appropriate USPS source that can reply to the question of how many person years of effort went into Dr. Bradley's work.

b.　Please provide an estimate of the amount of time required to complete your study to obtain the coverage of the functions examined in Dr. Bradley's study, but not examined in your study.

OCA/USPS–T–15–62 Response.

a.　I believe it would be reasonable to assume that Dr. Bradley's work employed

at least five person-years' work, measured comparably to the estimate I

provided in response to OCA/USPS-T-15-20(b).

b.　I provided an estimate of the time required to update Dr. Bradley's BMC

results in my response to OCA/USPS-T-15-20(a). With similar qualifications,

I believe a comparable amount of time would be required to update the

remote encoding and registry results and to complete the work on allied labor

operations reported in the response to MPA/USPS-T-15-1.

OCA/USPS-T-15-63.   These questions focus on the choice of variables for your equations on pages 117 and 118 of your testimony.

a. Are any hours of management time included in the hours variable?

b. Are any hours of plant and equipment maintenance time included in the hours variable?

c. Are any hours of other overhead types of labor included in the hours variable?

OCA/USPS–T–15–63 Response.

Please note that the hours variables are designed to include clerk and

mailhandler mail processing (Cost Segment 3.1) workhours. Workhours of

"management," maintenance personnel, and other "overhead types of labor" are

recorded and analyzed in cost segments other than 3.1. It is also my

understanding that the workhours (at MODS facilities) of employees in these

other labor categories are not available by cost pool. See, e.g., Handbook M-32

(Docket No. R97-1, USPS LR-H-147), Appendix A, at pages 18 (supervisors) and

20 (maintenance personnel).

a. See the response to OCA/USPS-T-15-52. Also please see above.

b. No. Also please see above.

c. No. Also please see above.

DECLARATION

I, A. Thomas Bozzo, declare under penalty of perjury that the foregoing answers are true and correct, to the best of my knowledge, information, and belief.

A. Thomas Bozzo

Dated: 4-5-00

CERTIFICATE OF SERVICE

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

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