Cost-Efficiency of Transferable Discharge Permits for the Control of BOD Discharges

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The cost efficiencies of four systems of transferable discharge permits (TDP's) designed for BOD control were compared to least-cost and minimum uniform treatment strategies for achieving the same water quality. One of the four policies, viz., the policy in which the permits are defined in terms of the dissolved oxygen deficit contribution (DODC) at the checkpoint, always induces a least-cost treatment strategy. Another policy, for which the permits were defined in terms of the discharge rate (load) of ultimate BOD, is almost as efficient as the least-cost strategy for the example case of the Willamette River. The requirements for the high cost efficiency of the latter policy are identified, analyzed, and discussed. The economic cost for all four policies, some of which were very conservative, was found to lie between the least cost and the cost of minimum uniform treatment.

INTRODUCTION AND BACKGROUND

A decade or more ago, during the early stages of a growing public concern over the quality of the environment, several policies were suggested which would provide economic incentives for the curtailment of waste discharges [see *Kneese and Bower,* 1968; *Bramhall and Mills,* 1966; *Baumol and Oates,* 1971]. Among these policies was an approach first advocated by *Dales* [1968] and given the name of 'pollution rights.' Dales' basic idea was to sell the right to discharge waste as a stock or bond, to the highest bidder(s). The supply of rights would be strictly controlled by the government, and once the initial issue of rights was made, they would not be reissued unless they had been previously withdrawn by governmental fiat, or had expired. The U.S. Congress discarded all such incentive-type policies in favor of more direct regulation, as embodied in PL 92-500 and its amendments.

In the past few years, a growing disenchantment with such programs of direct regulation has led to a reexamination of economic incentives as a possible replacement for, or adjunct to, current methods. For a number of reasons, Dales' pollution rights policy, or some variation thereof [see, for example, *Mar,* 1971; *Ferrar and Whinston,* 1972; *de Lucia,* 1974; *Tietenberg,* 1974], has been identified as being preferable to other incentive methods such as bribes and charges.

The author and his colleagues have worked previously on assessing the performance of this policy, hereafter referred to as transferable discharge permits (TDP's), for the control of phosphorus, which may be considered a conservative pollutant [*David et al.,* 1980; *Eheart et al.,* 1980]. The present paper is a report on preliminary work to assess the efficacy of TDP's as an instrument for the control of discharges of biochemical oxygen demand (BOD), a nonconservative pollutant.

Unlike conservative substances, oxygen-demanding organic wastes (BOD) affect water quality according to the location of their discharge, as well as by their magnitude, a fact which may frustrate attempts to control them by a program which is at once cost efficient, equitable, and simple to administer. In many cases, however, there may exist hydrologic and/or engineering characteristics which can be exploited to achieve a near-optimal compromise. The identification of these characteristics and the development of methods of tailoring TDP systems to take advantage of them are the central objectives of the research reported here.

The problem of designing a TDP system may be thought of as a multiobjective optimization problem whose objectives include those listed above and others, viz., (1) cost minimization, (2) administrative simplicity, (3) equity, (4) accommodating the lack of information, and (5) assurance of the environmental outcomes of the system, once installed. The 'design variables' in this optimization problem are such policy decisions as the basis of definition of the permits, the provisions for their issue and reissue, their duration, geographical restrictions on their transfer, etc. This paper addresses one portion of that objective-decision space. Four TDP systems with simple but salient differences in characteristics are compared on the basis of cost efficiency, administrative simplicity, and, to a lesser extent, equity, and the important properties which govern their differences are identified.

The next section of this article describes the four permit systems which were evaluated, and the section following it provides a description of the evaluation methods. Following that, results are presented, and in the final section, conclusions are drawn, and the need for further research is discussed.

DESCRIPTION OF PERMIT SYSTEMS EVALUATED

As suggested above, there are an unlimited number of possible designs for a TDP system. This study compared the bases of definition of permits and the criteria for determining the quantity issued, for four alternative policies. The following procedural and administrative characteristics were assumed common to all four.

1. There exists a state, river basin, or regional regulatory authority which decides how the permits should be defined, how many are to be issued, and how they are to be distributed. It conducts the distribution process (an auction) and monitors the permitted discharges once the distribution process is complete.

2. The sale of permits is conducted by a single-price auction, in which each bidder is required to submit a binding demand schedule; the permits are then allocated to the bidders in decreasing order of bid price, until the desired quantity have been sold. When this allocation procedure has been carried out, each bidder pays, for all permits allocated to him, the market-clearing price, i.e., the price bid for the last permit al-

Paper number 80W0819.
0043-1397/80/0080-W0819$01.00.

TABLE 1. Comparison of TDP Policies

	Policy 1	Policy 2	Policy 3	Policy 4
Permit definition basis	BOD load	BOD load	BOD load	dissolved oxygen deficit contribution
DO impact coefficient	as determined by model	maximum from model	based on zero re-aeration	as determined by model
Mathematical model needed?	yes	yes	no	yes

located. Each discharger is assumed to bid honestly, considering only the trade-off between his waste removal costs and the cost of purchasing permits.

The information requirements (on the authority's part) of the four policies are different. Three require an accurate estimate of the water quality response to BOD discharges, while one does not. Where required, this estimate was assumed to be obtained by a water quality model of the type described in the section on procedure, and it was further assumed that the results of the modeling could be expressed as a set of coefficients relating the effect of any BOD discharge on the DO at any given water quality checkpoint on the river. This coefficient, which is called the DO impact coefficient, F_{ij}, is defined as the change in DO deficit (mg/l) at checkpoint j resulting from a unit change in the BOD discharge (kg/d) by discharger i. The DO deficit, D_j, at any checkpoint j, then, is given by

$$D_j = \sum_i W_i F_{ij} + \text{background deficit}$$

where W_i is the BOD discharge (kg/d) for discharger i.

Experience in water resources management has indicated that recurrent problems with dissolved oxygen are usually limited to a handful of points on the watercourse, and that these points of low DO may not move very far up or downstream with changes in the pattern of BOD loading. It was assumed in this study that there was only one DO checkpoint, an assumption supported by the empirical data for the case described below.

The four permit policies evaluated are described as follows. Their salient characteristics are summarized in Table 1.

BOD load permits. Permits are defined as the right to discharge a certain quantity of BOD per day. The following three policies were evaluated; they differ according to the criterion used to determine the number of permits to issue.

Policy 1 (zero-reserve policy): Access to a water quality model is assumed. Following the collection of bids, the authority issues permits in the amount that will allow maximum BOD discharge while preserving water quality standards for some chosen set of critical conditions for flow, temperature, etc. Under policy 1, no additional assimilative capacity is set aside for future permit transfers (changes in the BOD loading pattern) which might occasion a violation of the DO standard. Accordingly, policy 1 is referred to as the zero reserve policy.

Policy 2 (high-impact policy): The reasoning behind policy 2 is that while an acceptably accurate water quality model may be available, the administrator may never be certain where a permit may be transferred; hence, the worst case is assumed. The maximum impact coefficient (for the same critical conditions) over all dischargers is used to determine the allowable total BOD discharge, and permits in this aggregate amount are issued. Thus if at some future time, a permit is transferred to a worse location, sufficient additional assimilative capacity will have been set aside to accommodate the increase in DO deficit.

Policy 3 (zero-aeration policy): Under policy 3, a reaeration coefficient of zero is assumed, and a DO impact coefficient reflecting this assumption is determined for each discharger. The total allowable discharge of BOD is then calculated, as for policy 2, and permits in this amount are issued. The only water quality 'model' used is a simple mass balance, requiring knowledge of only the river flow and the background DO concentration, for which critical values are chosen.

Dissolved oxygen deficit contribution (DODC) permit policy (policy 4). Under policy 4, permits are defined as the right to deplete the DO at the critical point by a specified amount (e.g., 0.1 mg/l) under certain critical conditions of flow, temperature, etc. These depletions are referred to as the dissolved oxygen deficit contribution (DODC) by each discharger and are related to the respective BOD loads by the DO impact coefficients. The advantage of this type of policy is that the water quality is assured, regardless of how the permits are transferred, no reserve assimilative capacity is needed, and the economic cost is minimized. The disadvantages of policy 4 lie in its administrative complexity and equity properties. An 'official' impact coefficient for each discharger-checkpoint combination must be disclosed (and possibly justified in court), and the market discriminates against dischargers according to the accident of their location, since the cost of a permit to discharge a kilogram of BOD may vary by orders of magnitude from one location to another.

Although policies 1, 2, and 3 are presented above as mutually exclusive discrete choices, they illustrate a continuous spectrum whose endpoints are represented by policies 1 and 3. The authority may, in fact, issue any aggregate number of permits it deems appropriate, but would not normally issue more than called for by policy 1, nor fewer than called for by policy 3. Its choice of a criterion for the number of permits to issue hinges on how conservative it wishes to be in reserving additional assimilative capacity to compensate for a lack of information or for future permit transfers. Such transfers are automatically adjusted for under the DODC policy.

The auction mechanism will normally be used by the authority to allow the periodic transfer of permits from one holder to another (or to new dischargers). In such auctions, both 'buy' and 'sell' bids are solicited from the dischargers, and the market-clearing price is that which equates their sums. Through a staggered system of permit expiration dates, under which a certain fraction of permits expire in any given time period, the authority may control the current level of aggregate discharge by issuing the proper number of new permits at each periodic auction (see *David et al.* [1980] for details of this system). Such a system may eliminate the need for the reserve assimilative capacity set aside under policies 2 and 3. Neither of these capabilities of the TDP system was included in this study however, since neither had any bearing on the research questions addressed.

The above assumption that the permits are distributed by auction sale does not preclude initial 'gratis' distribution at the discretion of the governmental authority, according to some agreed-upon equitable formula (although under policy 1 'initial' would mean after bidding but before implementation of market results). It is assumed that after such a distribution, a redistribution of permits among the dischargers by a similar auction mechanism would occur, and that the outcome of such an exchange would be the same in terms of the individual treatment decisions and the economic cost.

Evaluation Procedure

Each of the four policies was evaluated for economic efficiency according to the following procedure.

1. Data for treatment cost as a function of BOD removed were obtained for point dischargers on the Willamette River [*Liebman*, 1965].
2. River characteristic data for the same basin under critical conditions were obtained from the same source.
3. Market simulation models were developed for both BOD load and DODC permits and, using the discharger's removal cost data as input, the TDP markets were simulated. Because of the structure of the model, it was a simple matter to simulate all market equilibria over the feasible range of aggregate BOD discharge and DO depletion levels.
4. For each market equilibrium, the DO profile of the river was estimated, using a water quality model whose parameters consisted of the critical-conditions data collected in procedure 2.

The data by *Liebman* [1965] were for 11 dischargers on the lower 184 mi (296 km) of the Willamette River in Oregon. For each discharger, the feasible range of treatment levels was from 35% BOD removal or existing treatment, whichever was greatest, to 100% removal. The untreated BOD loadings (the zero-removal discharges used to determine the BOD discharge as a function of percent BOD removal) were Liebman's 1985 projections. The river characteristic data were represented by the 7-day 10-year low flow. A Streeter-Phelps model [*Streeter and Phelps*, 1925] of the type used by Liebman was used here to predict the response of the DO profile in the river to a given set of BOD discharges. The F_{ij} coefficients generated by this model ranged from 0.0000176 to 0.0000497 (mg/l)/(kg/d).

In this study (unlike Liebman's) a uniform DO standard throughout the length of the river was assumed. It was observed that the critical point for DO always occurred at the mouth of the river, regardless of the combination of treatment levels for the eleven dischargers. This led to the use of this point as the sole DO checkpoint for determining the allowable aggregate BOD discharge and the water quality results for the permit policies evaluated.

The market model was the same type used by the author in a previous study [*Eheart et al.*, 1980], and was based on the assumption that no strategic bidding takes place, i.e., that each discharger bids only according to the criterion of minimizing the sum of treatment cost and permits cost. On the basis of this assumption, it can be shown [see *Eheart et al.*, 1980] that the minimum permit price necessary to induce a discharger to go to a higher level of treatment is the minimum of all average incremental costs between his current level of treatment and all higher levels of treatment. The application of this principle to each discharger will produce a demand curve for discharge permits. The individual demand curves may be compiled into an aggregate demand curve for all dischargers, and the market equilibrium price of permits for any allowable aggregate discharge may be determined. Subsequent referral to the individual demand curves will determine the individual removal levels for this equilibrium price, and the costs of these individual removal levels may be summed to yield the aggregate economic cost for the entire system. For DODC permits, the individual discharger's cost-BOD removal curves are translated into cost-DO improvement curves by multiplying the BOD removal level by the DO impact coefficient. The market simulation then proceeds exactly as it does for BOD load permits, with the allowable dissolved oxygen deficit at the checkpoint replacing the allowable aggregate BOD discharge.

Typically, BOD removal cost curves are concave in the region of low percent removal, and are frequently discrete in nature. These two characteristics result in a certain amount of lumpiness in the permit demand curves, i.e., they exhibit regions where a differentially small change in permit price will result in a substantial change in aggregate BOD removal or DO improvement. Hence the authority may find that it is unable to achieve exactly the BOD removal or DO improvement it desires and that it is forced to accept a higher or lower level. It has been shown [*Eheart et al.*, 1980] that, except for this lumpiness phenomenon, the market equilibrium is cost efficient, i.e., the BOD removal or DO improvement that is achieved, is brought about by the least-cost combination of treatment decisions on the part of the various dischargers. In other words, all levels of BOD removal or DO improvement that can be induced by the permits market are optimal, even though not all optimal levels can be induced by the market. Policy 4 therefore results in the least-cost achievement of the DO standard at the checkpoint, i.e., the DO standard may not be realized at lower economic cost than that of the combination of treatment levels induced by the DODC market.

It should be pointed out that neither the Streeter-Phelps equations, Liebman's data, nor the market model developed by Eheart represent the most accurate or recent findings in their respective areas. The central purpose of the research reported on here was not to address the fine points in designing a TDP system, but, rather, to assess roughly the efficiency of one type of permit system against another. To this end, the work cited above was adequate to provide approximate answers to the questions addressed, and was of sufficient precision to support the results presented below.

The policy of minimum uniform treatment was chosen as a high-cost basis of comparison for the four TDP policies. This policy is essentially a regulatory approach, embodying the same philosophy as PL 92-500. In applying it to this study, a lower bound was set on the percentage BOD removal, which was then raised uniformly for all dischargers until the desired water quality was reached. Given the discrete nature of the possible treatment increments available, some dischargers were obliged to operate at a higher treatment level than this lower bound. In determining this minimum treatment level and the associated combination of percent BOD removals, the policy 1 scenario was used, i.e., it was assumed that the locations of the dischargers were fixed and that the water quality model was accurate. Other forms of the minimum uniform treatment policy, analogous to policies 2 or 3 could have been devised by assuming the higher values for the impact coeffi-

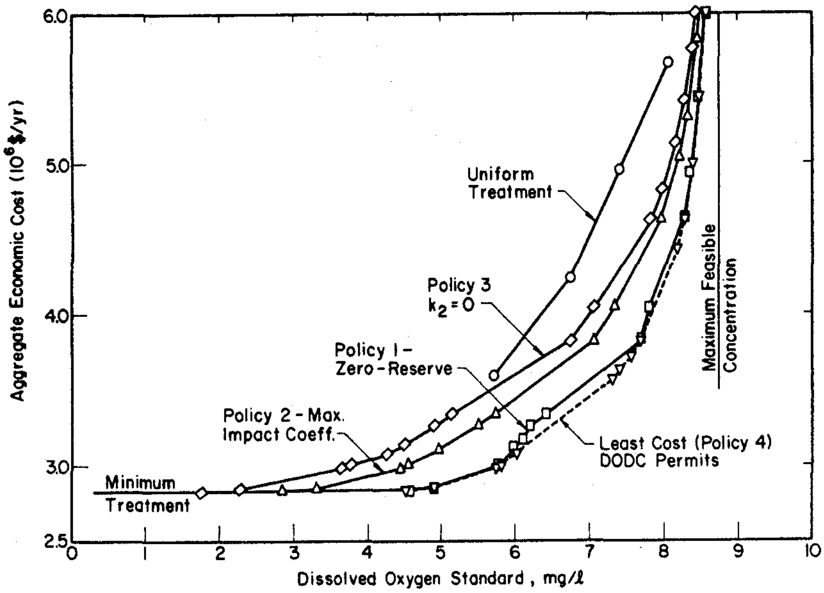

Fig. 1. Economic costs of TDP systems and minimum uniform treatment.

cients used for those policies, but these would have been less cost efficient, and, since only a comparison with TDP's was sought, they were not considered. It is worth pointing out, however, that the version of the uniform treatment policy used here was therefore the least conservative possible, and that, in comparing it to the various TDP policies, it should be borne in mind that the most efficient uniform treatment policy is being compared to some of the least efficient TDP policies.

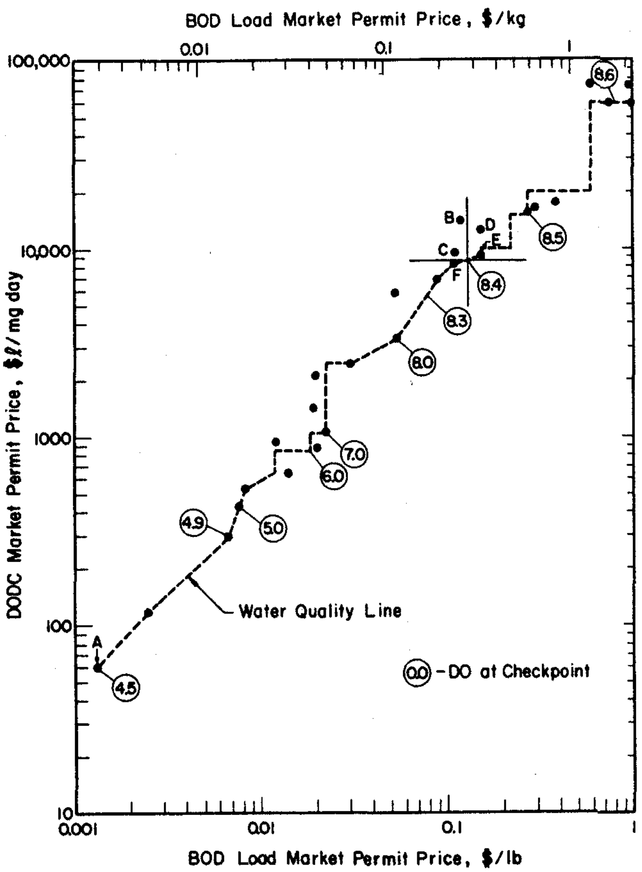

Fig. 2. Price comparison diagram.

DISCUSSION OF RESULTS

Economic Cost for the Willamette Data

Figure 1 shows the aggregate economic cost required to achieve a given DO standard under the three BOD load permit policies, the (least cost) DODC permit policy, and the minimum uniform treatment policy. For policies 2 and 3, the DO standard seen on Figure 1 is that achieved under the assumptions upon which the policy is based, i.e., either that the reaeration coefficient is equal to zero (policy 3), or that the maximum DO impact coefficient applies to all dischargers (policy 2).

It can be seen that the cost of even the most conservative TDP policies is lower than the cost of minimum uniform treatment, and that, as would be expected, the cost of achieving a given DO standard decreases as the formula for issuing BOD load permits becomes less conservative, i.e., as one goes from the zero-aeration policy (policy 3) to the high-impact policy (policy 2) to the zero-reserve policy (policy 1). What is striking, however, is the similarity between the cost curves for policies 1 and 4. Given that the DO impact coefficients (F_{ij}'s) vary over a range of nearly 3 to 1, it might be expected that the two markets would produce substantially different market equilibria. Instead, we find that the economic costs are nearly identical for all levels of required DO, and indeed that, for many levels of DO, the treatment strategies for the two systems are identical. The maximum cost difference between the data trend lines for the two curves is 3%. Hence, it appears that, in the Willamette case, BOD load permits may induce a removal strategy almost as cost efficient as that induced by DODC permits.

Extension to Other Watercourses and Multicheckpoint Systems

In order to assess the universality of these results it is first necessary to introduce a special method of viewing the permit demand schedules. Figure 2 is called a price comparison diagram, and is a plot (on log scales) of the DODC permit price necessary to invoke a certain treatment increment at a certain plant, against the BOD load permit price necessary to bring in

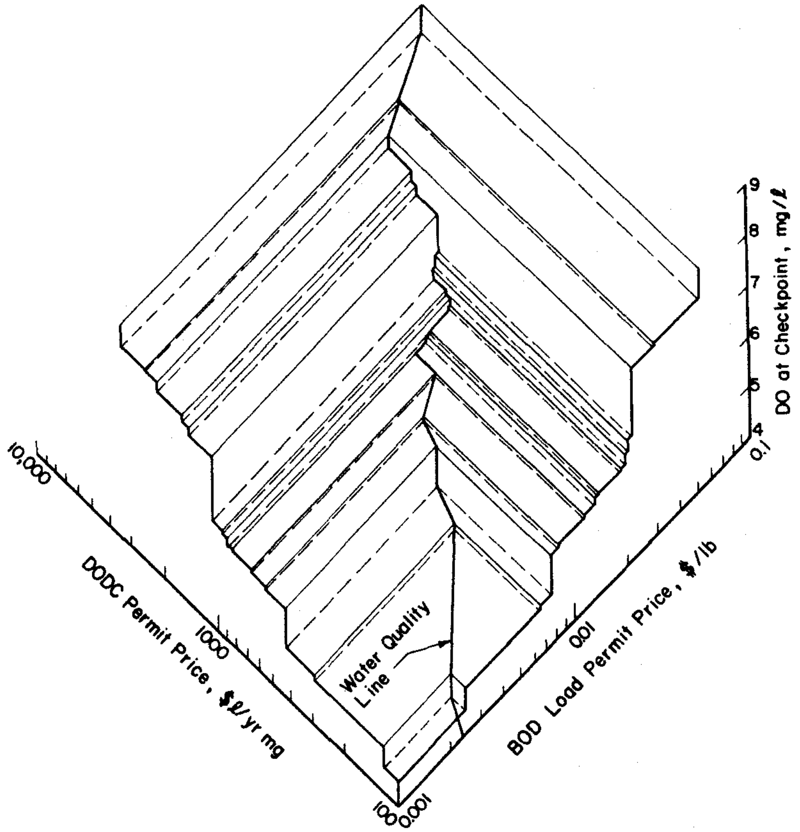

Fig. 3. Isometric view of price comparison diagram.

the same increment (ignoring, for the moment, the dashed line and the circled numbers). For example, point A on the diagram represents plant 10 adding an oxidation pond to its primary treatment (an increase in its BOD removal level from 35% to 60%). The BOD load permit and DODC permit prices necessary to induce plant 10 to increase its treatment in this manner are $0.0014/lb ($0.00308/kg) and 57 $1/mg day (i.e., ($/day)/(mg/l)), respectively. Other points on the plot represent similar increments of removal for the same discharger and other dischargers.

The relationship between water quality and the prices of the two types of permits can be represented by a line in three-space, where the third dimension is the DO at the checkpoint. Figure 3 shows the derivation of this line. The staircase-like surfaces represent the relationship between DO and TDP price for both types of permits. The intersection of these surfaces forms a line, called the water quality line, which indicates the price necessary under each permit system to achieve the desired water quality. This line, and the DO levels it intersects, may be projected onto the cost comparison diagram, as shown by the dashed line and circled numbers in Figure 2.

Figure 2 shows that in order to attain a given DO standard, the set of treatment increments which will have been invoked for both permit definitions lies in the third (lower left-hand) quadrant with respect to the point on the line which corresponds to the desired water quality. For example, achieving a DO standard of 8.4 mg/l requires invocation of the treatment increments represented by point F and all points below and to the left of it. The set of treatment increments which will have been invoked for neither definition system lies in the first (upper right) quadrant. For a DO standard of 8.4 these are represented by points D, E, and all points upward and to the right of them. The second and fourth quadrants contain points representing those treatment increments which will have been invoked for one system but not the other. For the example case, points B and C represent increments invoked for BOD load permits but not DODC permits. There are no increments invoked for the latter and not the former. The difference in aggregate economic costs between the two systems is equal to the difference between the sums of costs of treatment increments represented by points lying in the second and fourth quadrants.

Figure 2 serves to explain the small difference in economic costs between policies 1 and 4 seen in Figure 1. Very few points are in the second and fourth quadrants with respect to any point on the water quality line, and it may be shown that the difference in total cost between the second and fourth quadrant points is very small if the points lie close to the water quality line and represent increments of similar amounts of BOD removal. Thus the great similarity in costs for the two policies may be interpreted as a relatively large spread of the points of Figure 2 in the upper right, lower left direction, and a relatively small spread in the upper left, lower right direction. This spread pattern is governed by the hydrologic characteristics of the watercourse and the cost characteristics of the engineering systems used for waste removal. It is worthwhile to identify these characteristics, in order to draw conclusions about the potential cost effectiveness of policy 1 for other watercourse systems.

As noted above, each discharger has a unique demand schedule for TDP's, whether defined in terms of BOD load or DO deficit contribution. An individual discharger's demand schedule for DODC permits is the same as his schedule for

BOD load permits, except that all of his prices differ by a factor equal to his impact coefficient. It follows that on a log-log plot like Figure 2, all of the treatment increments for a given discharger lie on the same 45-degree line. The different water quality impacts of different dischargers are manifested in vertical displacements of their associated 45-degree lines by the ratio of their impact coefficients (which, in general are different). Hence the spread of the point cluster in the upper left, lower right direction varies directly as the range of average incremental removal costs, while the spread of points in the vertical direction varies according to the range of the water quality impact coefficients. If, as is the case for the Willamette, the variation of incremental treatment cost is large compared to the variation of the impact coefficients, the plot will always exhibit an elongated pattern of points such as the one seen in Figure 2. For all such cases, the aggregate economic cost for policy 1 will be very close to the least cost.

This variation may be more meaningfully and quantitatively expressed as the ratio of the weighted standard deviation of the logs of the impact coefficients to the weighted standard deviation of the logs of the incremental treatment costs. This statistic, called the impact-cost distribution coefficient (ICDC), is given by

$$\mathrm{ICDC} = \left[\left\{\sum_i\left[\sum_j W_{ij}(\ln F_i)^2\right] - \left(\sum_i\sum_j W_{ij}\right)^{-1} \cdot \left(\sum_i\sum_j W_{ij}\ln F_i\right)^2\right\}\left\{\sum_i\sum_j W_{ij}\right\}^{-1}\right]^{1/2} \cdot \left[\left\{\sum_i\sum_j [W_{ij}(\ln P_{ij})^2] - \left(\sum_i\sum_j W_{ij}\right)^{-1}\left(\sum_i\sum_j W_{ij}\ln P_{ij}\right)^2\right\} \cdot \left\{\sum_i\sum_j W_{ij}\right\}^{-1}\right]^{-1/2}$$

where W_{ij} is the BOD removal achieved by the jth treatment increment at discharger i, P_{ij} is the TDP price necessary to invoke this increment (its average incremental cost), and F_i is the DO impact coefficient for discharger i at the DO checkpoint. The weights, W_{ij}, used for the standard deviation of logs of incremental removal cost are the incremental BOD removals for each treatment increment, and the weight used for the log of each discharger's impact coefficient is the sum of W_{ij} over all removal levels, which is equal to the range of feasible BOD removal for the discharger. A high ICDC implies a large difference in economic costs between policies 1 and 4; a low ICDC implies a low difference. For the Willamette data, it is 0.230. Since it has been determined for no other data base, it is impossible to draw any firm conclusion from this value, but the fact that it is approximately 20% is consistent with the favorable spread of points shown in Figure 2.

The numerator of the ICDC reflects the hydrologic nature of the watercourse and the chemical properties of the substances being discharged, and is therefore location dependent. Watercourses with long residence times and high variations in decay coefficients, temperature, and re-aeration coefficient, will show a large variation in this parameter. For the Willamette, the numerator was 0.145 (base 10 logarithms). The denominator of the ICDC reflects the level of aggregation of the waste collection facilities (as manifested in the variation of volumetric loadings on the treatment plants), and the dependence of waste removal cost on influent concentration. The first of these is location dependent, but the latter is more likely to depend solely on contemporary engineering practice. The value of the ICDC denominator for the Willamette data was 0.628 (base 10 logarithms).

If the ICDC is large because its numerator is large, the variation of impact coefficients will be large, and some of these coefficients are likely to be insignificant. The dischargers with whom these small impact coefficients are associated may be exempted from participation in the market without causing serious water quality impacts as long as their BOD loads are not so large as to compensate for their low impact coefficient. By such an exemption strategy, which administratively lowers the ICDC, it may be possible to install a BOD load permit system without incurring high economic cost. On the other hand, if the ICDC is large because its denominator is small, it will be impossible to lower the ICDC by such a procedure, since no discharger is likely to have an insignificant impact coefficient. The authority will then have little recourse other than to adopt a DODC permit system if it wishes to achieve cost efficiency.

The exemption strategy may also be used as a means of accommodating multiple water quality checkpoints. In many instances, BOD discharges exert a significant influence only on one nearby 'problem area.' This may be expected to occur most frequently in a heavily impounded river or a chain of lakes, although some free-flowing rivers exhibit similar characteristics. In such instances, the authority may separate the TDP markets along these natural cleavages, establishing an independent market for each zone. Within each zone, the cost efficiency of policy 1 can be linked to the value of the ICDC, just as in the single-zone case.

CONCLUSIONS AND RECOMMENDATIONS

All four versions of the TDP system have been shown to possess favorable properties of cost efficiency. The economic cost of policy 1 approaches that of policy 4, which, in turn, represents the least possible cost. The reason for this similarity is the relatively large variation of incremental treatment costs compared to the variation of impact coefficients. All four TDP systems have been shown, for a realistic data set, to be more cost efficient than the policy of minimum uniform treatment, even when the most conservative assumptions were used in designing the former policy, and the least conservative assumptions were used in designing the latter.

Further research is needed to determine if the salient statistical properties of the Willamette data, on which these results are based, are typical of other rivers and other types of watercourses. Other work is needed to develop similarly efficient designs for multicheckpoint systems, and to address comprehensively the trade-offs between efficiency, equity, administrative simplicity, information requirement, and certainty of outcome. Before a practicable policy of transferable discharge permits may be implemented, its legal feasibility, procedure for enforcement, and the detailed administrative structure (which will necessarily vary from case to case), must be determined.

Acknowledgments. The research reported herein has been supported by pilot funding by the Research Board of the University of Illinois, and, subsequently, by a grant from the National Science Foundation (award PRA-79-13131). The author gratefully acknowledges the assistance of Michael L. Miller and Daniel L. Guttman, who were