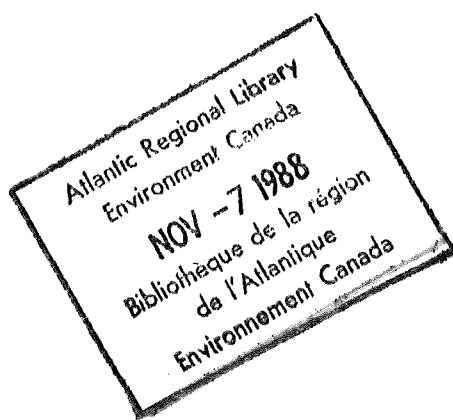


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FINANCING MUNICIPAL SEWAGE DISPOSAL :

An Approach to Cost-Sharing and
Construction Priorities

Prepared by

Inland Water Directorate
Water Planning and Management
Branch

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With an example based upon present
conditions in the Saint John River
Basin, New Brunswick,

PREFACE AND ACKNOWLEDGEMENTS

This paper examines some issues of municipal waste treatment system financing using the Saint John River basin as an example. The project was initiated at the request of the Saint John River Basin Board, although the conclusions are those of the author alone. Two concepts are introduced, cost sharing over a basin's total population and allocation of available funds on a priority basis, designed to attain maximum waste reduction per dollar spent. These form central arguments, for the proposed financing plan. To avoid, at this stage, a lengthy debate on precise priorities for the construction of new treatment plants, the municipalities in the basin have been assigned fictitious names. In spite of this provision, all data used in the report were derived from actual reports on waste treatment in the basin's municipalities.

Several persons have provided assistance in the completion of this project. Messers R. Daigle, T. Andrew, and B. Barnes of the New Brunswick Department of Fisheries and Environment supplied the basic data for the analysis, as well as expert technical advice. Messers N. Campbell and C. Marks of the New Brunswick Office of the Premier provided the analysis of economic impacts resulting from future expenditure on waste treatment systems. Mr. J. Henderson Planning Director in the Saint John Basin, both assisted in the collection of data and provided advice during the analysis. Overall guidance was provided by Mr. R.C. Hodges, Co-chairman, Saint John River Basin Board. Messers H.B. Rosenberg and P.J. Reynolds, my immediate superiors have provided advice and support throughout this project. Finally, I have benefited from the support and advice of Mr. R. Robichaud, my former colleague. I acknowledge with appreciation all of this assistance. Of course, I alone am responsible for any errors in the final product.

D.M. Tate

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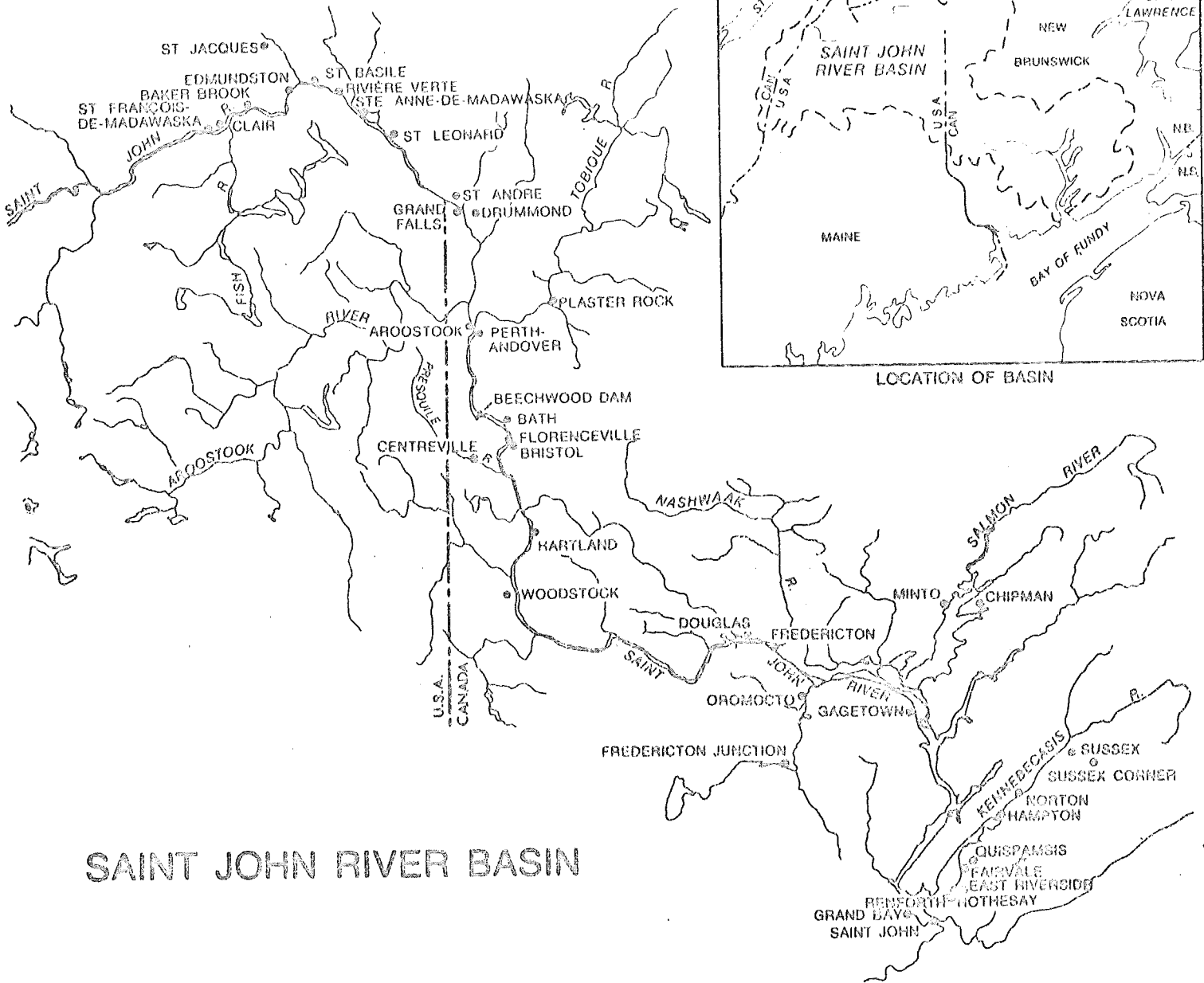
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1. INTRODUCTION

The Saint John River Basin Board has identified water quality as the basin's most serious water resource problem. To achieve acceptable water quality levels, the Board has recommended that pollution abatement, by waste treatment plant installation, be undertaken at various locations throughout the basin; however, the additional expenditures entailed may be difficult for the population to assume in view of the area's economic problems.

The provision of effective financing arrangements for waste treatment projects is one key to the solution of this dilemma. This report, which has been authorized by the Board, explores the nature of the financing problem, and suggests some alternatives for meeting it.

According to the Board's Interim Water Quality Plan, the major sources of water pollution are untreated wastes from the basin's municipalities and industries. Untreated municipal wastes cause danger to public health and public water supplies, and restrict certain forms of recreation such as swimming. In contrast, untreated industrial discharges are more related to diminishing the oxygen content of the river, and thus to the maintenance of aquatic life. Industrial wastes may cause unique problems which must be dealt with on a case-by-case basis. This paper deals only with the problem of municipal waste treatment. Since the discharge from the typical small industrial plants can be treated in municipal treatment facilities, these waste sources are covered in this paper. Problems created by large industrial operations are not included within the proposals made herein.

Current Financial Arrangements

Current financial arrangements for municipal waste treatment in the basin involve all three levels of government. The federal government, through Central Mortgage and Housing Corporation (CMHC), provides a system of low-interest loans and partial forgiveness of loans and interest for approved construction projects. The New Brunswick government makes annual grants to offset interest payable on loans for the same projects. The individual municipality assumes the remainder of the capital costs of the treatment system, which, because some elements of completed systems do not qualify for assistance, often comprise the largest portion of the total, as shown in Table A-2, Appendix 1. In combination with annual operating and maintenance (O & M) costs, the outlays for waste treatment required of the municipal taxpayer can be substantial, and even prohibitively expensive.

In addition to the possibility of high municipal costs, another difficulty with existing financial arrangements arises because the onus is usually on the municipality to initiate construction of treatment systems. This has meant that some communities have delayed installation of treatment facilities, and that available funds have been spent with little planning for overall water quality improvements. In the Saint John basin, this problem has resulted in expenditures on waste treatment in some of the villages, while some of the larger municipalities continue to pour untreated waste into the river.

Two Basic Concepts

To ameliorate these difficulties, this paper proposes a new

financing method founded upon two basic concepts. The first concept, a re-examination of cost sharing, is based upon the distribution of benefits from municipal waste treatment. For example, one benefit of treatment is the protection of local water supplies. Clearly, residents of the treated municipality benefit through assured water supplies, prevention of disease, etc. It should also be clear that residents outside the treated community, but living within the basin also benefit through these same factors. The general provincial and national populations benefit, for example, by not having to finance fights against water-borne disease. In a similar way, other benefits of waste treatment are shared among these four groups of people.

It has been noted that the federal, provincial, and municipal governments currently share in waste treatment financing. However, the basin population living outside the treated municipality currently contributes to the costs of treatment only through the portions of their federal and provincial taxes which finds their way into CMHC loans and provincial annual grants. The first concept is based upon cost sharing to involve this group more directly.

The second concept calls for the allocation of available funds for waste treatment in a manner designed to have maximum impact on municipal waste abatement. The next section suggests a means of putting these concepts into practice, while succeeding sections examine the impact of the proposed financing system on the basin's population and on water quality improvement.

2. THE PROPOSED FINANCING SYSTEM

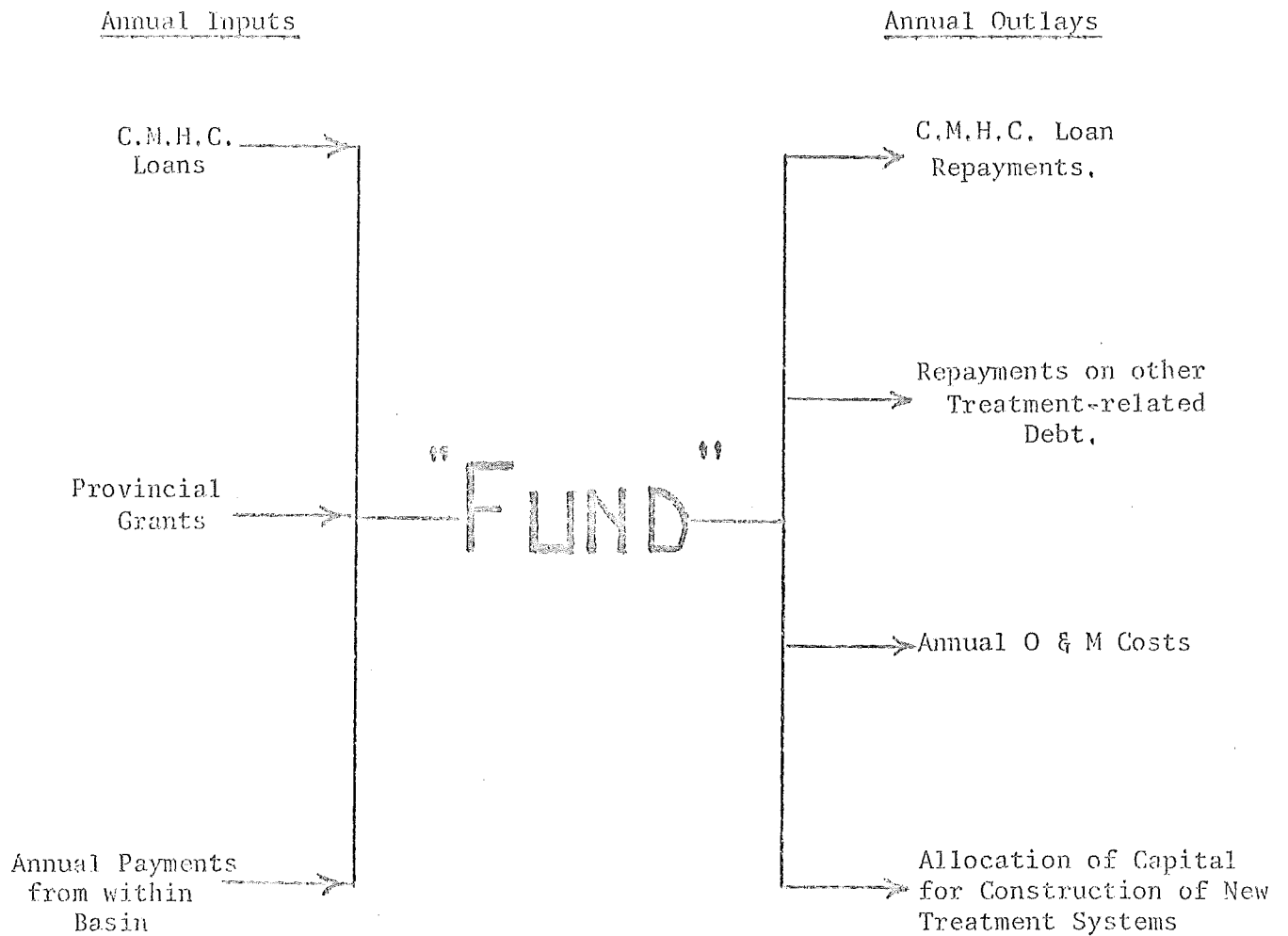
The system proposed here incorporates the two concepts discussed in the previous section and assumes the continuance of existing federal and provincial assistance.

A revolving "Fund" is proposed for the collection and dispersal of money to meet municipal waste treatment expenses. Annual financial inputs would consist of available federal and provincial assistance plus an annual levy collected from within the basin. From this pool of money, the "Fund" would assume all waste treatment expenses, including capital costs of new treatment systems, payments for all outstanding debts on existing facilities, and annual O & M expenses. The last item is included to assure that existing treatment plants would be operated to their intended efficiency¹, and would enable the training of skilled operators, and the establishment of a monitoring program. While the last item is included for analysis in this paper, it is not essential to the proposed scheme, if effective operation of the plants can be assured by other arrangements. In selecting areas for annual allocations of capital for new treatment systems a priority list of municipalities would be used. This list would be compiled with the aim of obtaining maximum abatement of wastes for each monetary outlay, thereby assuring effective use of limited funds. Figure 1 depicts the annual operation of the propose "Fund",

¹ According to a report, Domestic Waste Treatment Plant Efficiency Study, (New Brunswick Department of Fisheries and Environment, 1972), existing plants are inefficiently operated. "... the main problem is lack of concern or understanding of the process and the inability of untrained operators to adjust various components of the treatment plant to attain maximum efficiency".

Figure 1

SCHEMATIC DIAGRAM OF PROPOSED "FUND".



Definition of Terms

As outlined in the Introduction, the municipalities are currently responsible for those treatment costs which remain after federal and provincial assistance. These are referred to as net municipal waste treatment costs in this paper. Three classes of costs comprise municipal waste treatment costs: the capital costs of new systems to achieve adequate treatment, payments on existing systems, and O & M costs. Adequate waste treatment, as used in this paper, is defined as secondary treatment in all basin municipalities with populations greater than 500 persons, plus adequate sewer facilities to conduct the wastes to the treatment plant. This definition includes both facilities for which public assistance is available and those for which it is not. Capital costs are those which will be incurred to construct new facilities to meet the standard stated above.

Municipal Waste Treatment Costs¹

Annual net municipal waste treatment costs are estimated as follows:

	<u>Cost (\$'000)</u>
(1) New waste treatment systems	922
(2) Payments on existing systems	1,278
(3) Operating and maintenance	<u>518</u>
TOTAL	2,718

¹ This section is a very brief summary of longer section on cost calculation contained in Appendix 1. For a full understanding of the inclusions in total annual cost, the reader is referred to that Appendix. Capital costs were amortized over 20 years.

The trial run outlined in section 3 is based upon this total annual cost.

Annual Inputs to the "Fund"

Financial inputs to the "Fund" would be derived from 3 sources: CMHC loans, provincial grants, and annual payments collected from within the basin. No change in the levels of the first two inputs is proposed, but monies from these sources would enter the "Fund" instead of being paid directly to municipalities. Calculations presented herein assume that these amounts would be made available at the same relative times during the construction period as they are at present.

The third input, annual payments collected within the basin could be used to spread what are now municipal costs among a wider segment of those who would receive benefits. Five alternative methods were tested in spreading the \$2.7 million required annual input (i.e. the annual municipal cost) among various segments of the basin population. These alternatives ranged from continuance of the present financing system to cost sharing over the entire population of the basin. Precise descriptions of each alternative are given in section 3, along with an analysis of the outlays per average taxpayer required under each.

Priorities and Annual Outlays of the "Fund"

Each year, the "Fund" will re-direct its available money into treatment related expenses. First of all, from the total amount in the "Fund," all payments on treatment-related loans will be made, and an amount will be set aside to cover the O & M costs of the treatment facilities which are in place. After these two cost items have been met, the remainder of the amount in the

"Fund" would be allocated for the construction of new treatment facilities. These allocations would be made on the basis of a priority list.

According to the second basic concept outlined in the Introduction, available capital for the construction of new treatment systems should be allocated to areas where it will have maximum impact on pollution abatement. Using this concept, a priority list based upon potential waste reduction was compiled for analytical purposes in this paper. This list is only an assumed one, and not necessarily related to any final recommendations of the Board.

The amount of money left in the "Fund" each year after loan repayments and allowance for annual O & M costs will govern the speed with which new systems could be constructed. This residual amount may permit financing of more than one plant in a given year. Conversely, if the plant heading the priority list were an expensive one, the "Fund" could probably not bear the full allocation in one year, in which case that plant would continue to head the list for the following year's allocation. Instances of both multiple allocations and allocation to one municipality over two or more years can be found in Appendix 2, Table A-6. To allow for annual inflation, an annual 4% cost escalation is built into the allocation program displayed in the Appendix.

3. ANALYSIS OF PROPOSED FINANCING ARRANGEMENTS ¹

This section outlines the results obtained in a trial run using the proposed financing arrangements. Table 1 and Figure 2, which show data on net municipal waste treatment costs, are given in terms of outlays/per average household of 3, and outlays per capita. Assuming one taxpayer per average household and that the average household is composed of 3 persons,

¹ The reader will recall that fictitious names for municipalities are used throughout this paper.

TABLE 1 COSTS OF TREATMENT PER HOUSEHOLD (PER CAPITA)

Municipality	Alternatives 1 or 2 Present System or Fund Without New Cost Sharing Arrangements.		Alternative 3 Cost Sharing over Towns Requiring or Possessing Treat- ment.	Alternative 4 Cost Sharing Over Total Basin Population.
Clearview	129.15	(43.05)	44.88 (14.96)	27.24 (9.03)
Parkville	69.51	(23.17)		
Birchtown	112.38	(37.46)		
St. Christopher	89.73	(29.91)		
Happy Valley	147.06	(49.02)		
Owl's Creek	84.15	(28.05)		
Deep River *	16.59	(5.53)		
Evansville	-----	-----		
Lawson Village *	23.61	(7.87)		
Cypress Lake *	25.14	(8.38)		
Appletown	56.31	(18.77)		
Carron *	14.49	(4.83)		
Blackfield	130.44	(43.48)		
Lion's Head **	18.63	(6.21)		
Crabtree	130.92	(43.64)		
Mapleville	194.82	(64.94)		
Wellington	118.80	(39.60)		
Peertown *	23.76	(7.92)		
Spring Hill *	10.77	(3.59)		
Windville	59.07	(19.69)		
St. Albert	131.37	(43.79)		
Long Lake *	-----	-----		
Powell Creek	83.64	(27.88)		
St. Flavien *	-----	-----		
Frontier Valley	72.15	(24.05)		
Waterville *	15.96	(5.32)		
Richard	202.86	(67.62)		
Vincent *	7.71	(2.57)		
Elmdale *	7.71	(2.57)		
Moose *	37.02	(12.34)		
Pine Valley	98.94	(32.98)		
Red Lake *	9.63	(3.21)		
Belltown *	1.98	(.66)		
Fort McGee *	35.10	(11.70)		
Hemlock *	10.56	(3.52)		
Wendover **	31.68	(10.09)		
Yellowcliff *	14.19	(4.73)		
Bedrock *	13.23	(4.41)		
Oscar's Point *	13.35	(4.45)		
Hometown *	29.55	(9.85)		
Rossland	243.72	(81.24)		
Elmerborough *	2.67	(.89)		

* Municipalities currently possessing full treatment facilities.

** Municipalities which have varying degrees of treatment, but which require further capital investment.

the outlays per household is the more meaningful measure of the impact of treatment costs on local taxes. Tables 2 and 3 pertain to the use of the "Fund" to allocate monies for new construction and for annual O & M expenses.

Alternative Cost Sharing Arrangements and Their Effects

Alternative 1 assumes that the current financial arrangements will remain in force and that each municipality will independently finance its own treatment requirements. In other words, alternative 1 uses neither the proposed cost sharing concept nor the "Fund" for collection and allocation of waste treatment monies. Under alternative 2, current cost sharing arrangements continue, but the proposed "Fund" is established to expedite the financing of waste treatment facilities.

The annual costs per household will be exactly the same for each of alternatives 1 and 2; these costs are shown in the first column of Table 1. The range of estimated costs is between \$1.98 in Belltown to \$243.72 in Rossland. The average outlays in most of the municipalities with existing waste treatment facilities appear very low in comparison to those in communities still requiring treatment. This is largely due to the following facts:

- (1) existing plants have been financed over 30 to 40 years, whereas the amortization period, assumed in this paper, for required systems is 20 years; this will make the annual costs of existing systems appear low; and
- (2) the payments being made for components of existing systems which were not assisted through the CMHC loan program are uncertain and are not included in column 1; thus, column 1 does not record the full cost of existing systems.

The effect of "Fund" utilization for allocation purposes will be outlined

later in the paper. Clearly, the costs of treatment in many of the municipalities are very high, and would entail heavy burdens on taxpayers.

Alternative 3 spreads the municipal treatment costs across the population benefiting directly from waste treatment (i.e. across the municipalities requiring or possessing treatment). The annual cost per household under this alternative is \$44.88. This cost includes payment for all system components, and thus cannot be compared with the costs of Column 1, which, as noted above, do not include payments being made on system components not financed via public assistance.

Alternative 4 uses the total basin population as a basis of sharing net municipal treatment costs. Using this alternative, annual outlays per household required for the full cost of adequate treatment are \$27.24.

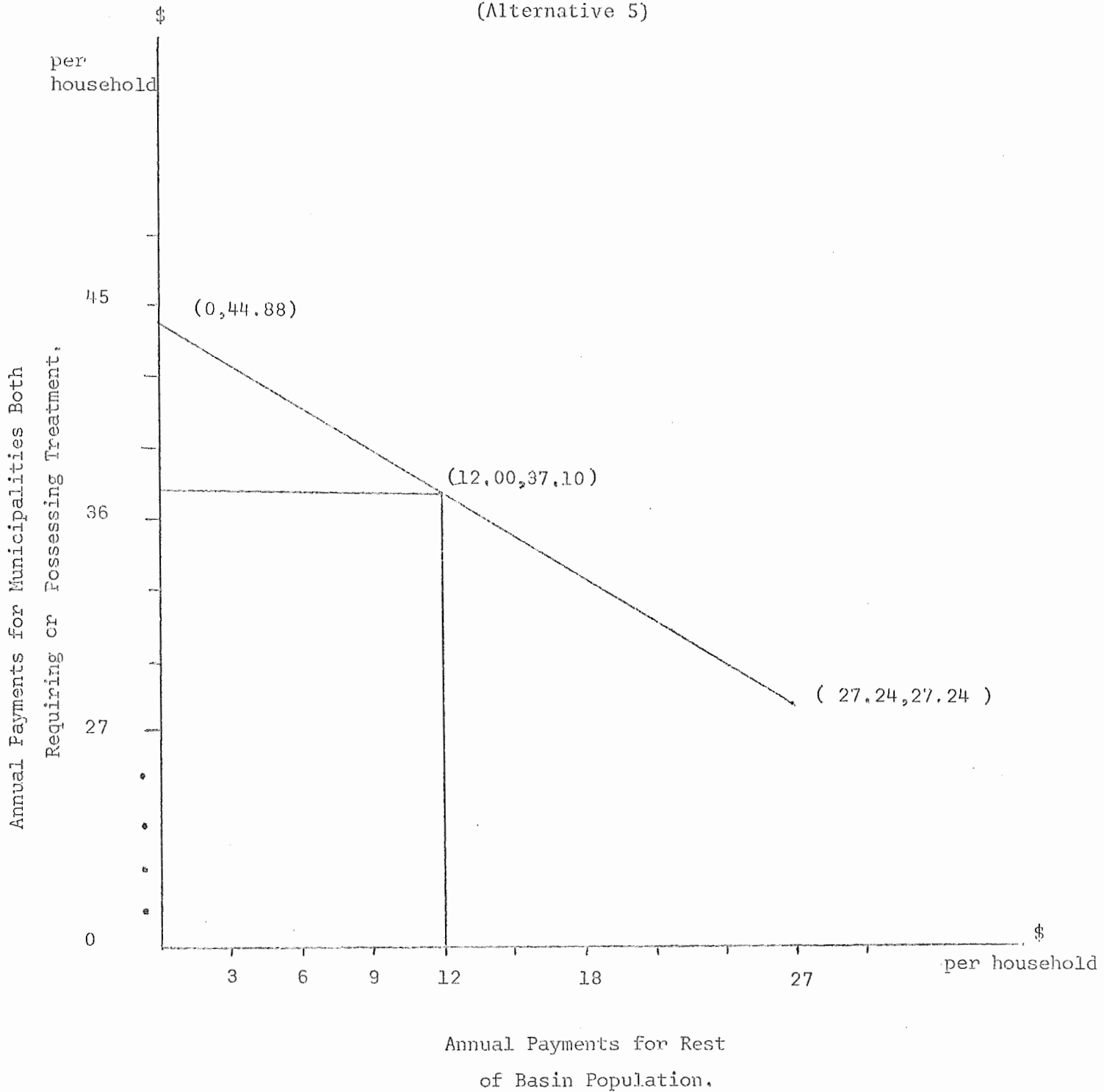
Alternative 5 is based upon a basic per capita flat rate charge for that part of the population residing in areas not requiring treatment, plus a higher charge in the municipalities requiring or possessing treatment. The rationale here is that everyone benefits from pollution control and should contribute to its cost. The extra charge in municipalities requiring or possessing treatment is in recognition of local benefits of pollution control such as protection of local water supplies, increased local recreational benefits, etc. Since the funding arrangements put forth in this paper depend on the availability of about \$2.7 million per year for the construction of treatment plants, the amount derived from the flat rate charges will determine the annual amount payable in the treated municipalities.

Figure 2 summarizes this relationship. It shows that the higher

Figure 2

DIFFERENTIAL COST SHARING

(Alternative 5)



the annual flat rate per household in those municipalities not requiring treatment, the lower the annual per household outlays in municipalities requiring or possessing treatment. For example, a flat rate of \$12.00 per household in the former will bring the cost in the latter from an average of \$44.88 to about \$37.10.

Effects of the "Fund" in Assuming Treatment Expenses

Under the current financing arrangements, there is no effective control over the construction of new treatment plants, and existing treatment plants are often operated inefficiently. In addition, annual payments are made by the municipalities over a long-run period, usually 30 to 40 years. Use of the Fund to assist financing will:

- (1) decrease the number of annual payments required for new treatment plants to 14. After this period, annual payments collected from within the basin will fall substantially. This decrease in annual payments will be discussed below.
- (2) enable allocation of available capital for waste treatment in a manner designed to have maximum impact on pollution abatement.

An allocation program for new construction is developed fully in Appendix 2. Table 2 shows a summary of annual allocations as a result of this program. The period of new construction, as displayed in this table, runs for a 14-year period, from 1974 when the system in Wendover is begun, to 1987, when the last allocations are made at Parkville and Pine Valley. If an average 2-year construction period is allowed, all required facilities will be completed near the end of the fifteenth year after the inception of the "Fund." Note that the total amount to be spent, about \$19 million, is

TABLE 2

TIMETABLE OF ANNUAL ALLOCATION OF MONEY FOR NEW TREATMENT PLANT CONSTRUCTION¹

(costs in dollars)

Municipality	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	TOTAL
Clearview	-	-	-	-	-	-	-	-	-	-	-	-	374691	-	374691
Parkville	-	-	-	-	-	-	-	-	-	-	-	-	73450	193842	267292
Birchtown	-	-	-	-	-	-	-	-	480515	69588	-	-	-	-	550103
St. Christopher	-	-	-	-	-	-	-	-	-	-	306324	104772	-	-	411096
Happy Valley	-	-	-	-	-	-	-	-	-	-	-	422595	-	-	422595
Owl's Creek	-	-	-	-	-	-	611362	43635	-	-	-	-	-	-	654997
Evansville	-	-	-	-	-	-	-	-	-	-	-	-	259751	-	259751
Appletown	-	-	1815844	830816	150917	-	-	-	-	-	-	-	-	-	2797577
Blackfield	-	-	-	-	-	-	-	-	-	-	-	129294	266711	-	396005
Crabtree	-	-	-	-	-	-	-	-	-	-	-	412795	-	-	412795
Mapleville	-	-	-	-	-	-	-	-	-	-	521154	-	-	-	521154
Wellington	-	-	-	-	-	-	-	771349	-	-	-	-	-	-	771349
Windville	-	-	-	-	-	-	-	-	-	480524	-	-	-	-	480524
St. Albert	-	-	-	-	-	-	-	-	-	389503	177691	-	-	-	567194
Powell Creek	-	-	-	-	-	-	-	-	-	454907	-	-	-	-	454907
Frontier Valley	-	-	-	-	-	431119	318034	-	-	-	-	-	-	-	749153
Richard	-	-	-	-	1137039	676590	-	-	-	-	-	-	-	-	1813429
Pine Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	173167	173167
Mendover	4822356	822356	418489	-	-	-	-	-	-	-	-	-	-	-	6063201
Rossland	-	-	-	-	-	-	-	338617	491845	-	-	-	-	-	830460
TOTAL	4822356	822356	2234333	830816	1287956	1107509	929396	1153601	972358	1394522	1005149	1069456	974603	367009	18971420

¹ Based upon Appendix 2

greater than the cost of construction, \$15.9 million, outlined in the previous section. The difference of \$3.1 million occurs because of an assumed 4% inflationary factor built into the allocation program. Thus, while annual payments to the "Fund" have been calculated on the 1974 cost of facilities, annual allocations are in terms of inflated dollars. Use of the "Fund," therefore, will offset the effects of the assumed 4% inflation rate.

The allocation program is such that residents of the smaller municipalities will be paying for their treatment systems prior to installation. This means that, in the earlier years of the "Fund", there will be some re-direction of money from the smaller to the larger municipalities, although this will be reversed in later years. This re-direction of money is necessary to ensure maximum impact of expenditures on pollution abatement.

Table 3 shows annual "Fund" outlays for O & M expenses. The cost of O & M for existing plants is about \$160 thousand annually. It remains constant from 1974 through 1976, and begins to increase in 1977 when the first new treatment system commences operation. In calculating annual inputs to the "Fund", an O & M figure of \$518 thousand was used. Thus in the earlier years there will be a significant residual amount in this component of the "Fund". It is suggested that this residual be used to establish a comprehensive operator training course, and to install proper plant and stream monitoring equipment to assure maximum efficiency of existing plants. The amount remaining, if any, could be used for additional expenditure on new treatment plants.

Discussion of Annual Outlays and Their Effects on Local Taxes

Alternatives 4 and 5 best embody the new financing arrangements

TABLE 3

TIMETABLE OF ANNUAL O & M PAYMENTS
(costs in dollars)

Municipality	1974-5-6	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Clearview	-	-	-	-	-	-	-	-	-	-	-	3335	3335
Parkville	-	-	-	-	-	-	-	-	-	-	-	-	1000
Birchtown	-	-	-	-	-	-	-	-	3000	3000	3000	3000	3000
St. Christopher	-	-	-	-	-	-	-	-	-	-	3000	3000	3000
Happy Valley	-	-	-	-	-	-	-	-	-	-	3900	3900	3900
Owl's Creek	-	-	-	-	-	9000	9000	9000	9000	9000	9000	9000	9000
Evansville	-	-	-	-	-	-	-	-	-	-	-	-	-
Appletown	-	-	103025	103025	103025	103025	103025	103025	103025	103025	103025	103025	103025
Blackfield	-	-	-	-	-	-	-	-	-	-	-	3565	3565
Crabtree	-	-	-	-	-	-	-	-	-	-	5000	5000	5000
Mapleville	-	-	-	-	-	-	-	-	-	5675	5675	5675	5675
Wellington	-	-	-	-	-	-	4833	4833	4833	4833	4833	4833	4833
Windville	-	-	-	-	-	-	-	-	8466	8466	8466	8466	8466
St. Albert	-	-	-	-	-	-	-	-	-	8000	8000	8000	8000
Powell Creek	-	-	-	-	-	-	-	-	2634	2634	2634	2634	2634
Frontier Valley	-	-	-	-	-	11000	11000	11000	11000	11000	11000	11000	11000
Richard	-	-	-	-	25000	25000	25000	25000	25000	25000	25000	25000	25000
Pine Valley	-	-	-	-	-	-	-	-	-	-	-	-	3000
Wendover	-	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000
Rossland	-	-	-	-	-	-	-	5190	5190	5190	5190	5190	5190
Municipalities with existing treatment systems	159725	159725	159725	159725	159725	159725	159725	159725	159725	159725	159725	159725	159725
TOTAL	159725	309725	412750	412750	437750	457750	462583	467773	481873	495548	507448	514348	518348

proposed in this paper. Let us focus upon alternative 4 for a further discussion of costs per household for adequate waste treatment. Under this alternative, it may be recalled, the annual cost of adequate waste treatment in the basin is estimated at \$27.24 per household. Allowance for administrative costs and contingencies might bring this estimate to \$30.00 per year.

Experience in the basin has shown that between 25% and 33% of waste treatment costs are borne by commercial, public, or light industrial establishments. Using these percentages to cover part of the annual amount payable to the "Fund", the net annual cost per household would be between \$20.00 and \$22.50. It was shown that only 14 annual payments would be needed to fulfil the new construction program required to achieve adequate municipal waste treatment in the basin. After this 14-year period, annual costs per household would fall substantially to between \$10.80 and \$13.23, assuming the same range of percentage contributions to treatment costs by non-residential users. This annual payment would cover O & M costs plus loan repayments on all treatment facilities.

To assess what the required annual payments under alternative 4 would mean for tax rates in the basin, some representative data on municipal taxes (see Appendix 3) were compiled. Annual provincial and local taxes paid within the basin average \$389.00 per household¹. If it is assumed that

¹ This figure is somewhat higher than the province-wide average of \$252.00, as developed by the Task Force on Municipal Financial Structure and Financing in 1972. However, this difference could be expected, since the Saint John basin contains the largest part of the province's assessed property value.

commercial and small industrial enterprises pay 25% of provincial and local taxes, annual taxes per household average \$291.75. The average cost per household of adequate waste treatment of \$22.50 during the "Fund's" first 14 years of operation is 7.7% of current average local and provincial tax payments.

Indirect Economic Effect of New Construction

In addition to the assurance of cleaner water because of adequate waste treatment, the construction of required treatment systems will have substantial indirect economic effects. Estimated effects on increased household income, and employment are given in Appendix 4.

4. SUMMARY AND GENERAL OBSERVATIONS

This paper has shown that outlays per taxpayer for adequate waste treatment can be brought to a modest level through a pooling of finances from several sources, particularly those from local sources. Treatment costs under present financing arrangements are highly variable and, in many cases, could prove prohibitively expensive. Costs per household under proposed cost sharing arrangements are estimated at \$22.50 annually, an outlay which would probably impose little burden on the taxpayer.

The principle underlying the inclusion of local contributions to the "Fund" from the entire basin population views pollution abatement as a public good, similar in some respects to education, and the administration of justice. In New Brunswick, education and justice are paid for from

provincial funds, with the province taxing its residents to finance them. The proposal concerning cost sharing suggests that waste treatment be dealt with in a similar manner, and that its costs be spread over a wide population base. Unlike education and justice, which are province-wide in their cost sharing base, waste treatment financing as developed in this paper applies only to the Saint John basin. While this area constraint was imposed on the project, the proposed system could be extended easily to cover the entire province.

Another critical element in the proposal is the centralization of all phases of waste treatment. Use of the "Fund" as a vehicle to finance all phases would have several important effects; an acceleration of required waste treatment system construction, a staged construction program designed to have maximum impact on waste abatement, a lower number of annual payments for new facilities than is the case under current financing arrangements, an allowance for an assumed rate of annual inflation in the future, and the provision of trained personnel to perform O & M duties. The "Fund" would impose some administrative costs, but these would probably be low since the administrative functions could be fitted into existing bureaucratic organization.

The plan builds upon current financing arrangements for waste treatment system construction. Future financial aid from the federal and provincial governments would be exactly the same as under these arrangements. The "Fund" would require a "commitment" of money from CMHC, to ensure that its construction program could be carried out as planned. There is a precedent for such "commitment" in the Canada-Ontario Great Lakes agreement.

Under this agreement, the federal government, through CMHC has "committed" about \$167 million for waste treatment in the Great Lakes area over the next 10 years. The proposals set forth in this paper could be treated in a similar manner. They would, in other words, require no significant change in CMHC policy.

The most controversial point of the proposal relates to its cost sharing arrangements. Total equalization of treatment costs across the basin means that some taxpayers will only derive indirect benefits from their outlays. However, these indirect benefits are substantial and broadening of the cost sharing base is certainly justified if waste treatment is visualized as a public good. This is especially the case if the payments are shown to be moderate, as they are in this paper. The parallel with education is obvious; while everyone pays for education expenses, only those persons with children benefit directly. However, society as a whole ultimately reaps the benefit of education.

The second controversial point relates to the re-direction of money into priority areas. This means that some persons will pay before they receive treatment. The second concept, to maximize the effect of expenditures on pollution abatement, justifies this advance payment. Despite the obligation of some to pay for systems which will be build during later stages of the construction period, they will pay ultimately the same amount as those who will receive treatment in the initial phases of the "Fund's" operations.

This paper takes the view that water quality improvements pervade an entire river basin, and also have important benefits for the provincial and national populations. It was shown that concepts based upon this view

can be used in financing adequate municipal waste treatment for the Saint John River Basin. The financing proposals which result from use of these concepts demonstrate that waste treatment costs can be brought within reach for the majority of the basin's taxpayers. This is contrasted with the current situation wherein waste treatment is prohibitively expensive in some localities. In view of the attractive economic and financial results of the analysis, the proposals contained in this paper deserve careful study by those responsible for waste treatment planning and implementation in the basin. Such study would include analyses of public reaction to the proposal, examination of legal aspects involved in implementing it, and the implications of the plan for existing administrative structures.

APPENDICES

APPENDIX 1 DEVELOPMENT OF COSTS OF ADEQUATE WASTE TREATMENT

New Treatment Plant Requirements¹ and their Capital Costs

The determination of requirements for new treatment plants is a function of the planning studies being conducted under the SJRBB. These studies were unavailable when this report was written, necessitating the assumption of a set of treatment requirements for the basin. On the basis of information available at the time of analysis, not only about treatment required to maintain a good standard of receiving water quality, but also about the protection of local water supplies and public health, treatment was assumed to be required in municipalities over 500 persons.² This assumption implies nothing about the final water quality plan, and in fact, probably "overtreats" the basin. Nevertheless it enables detailed analysis of the proposed funding arrangement.

Consultant reports and interviews with New Brunswick officials provided the costs of these treatment requirements. In all cases, the costs used in this paper are complete system costs (i.e. treatment plus sewer),

¹ The population growth rates used by the various consultants to determine each municipality's treatment system requirements are implicit in the treatment costs used throughout the paper.

² See Table A-2 for complete development of these costs.

and not just those covered by the CMHC loan program. Application of amortization factors to the total system costs gave the annualized capital costs of treatment. The factors used were $7\frac{1}{2}\%$ for 20 years for the part of the system covered by CMHC loans and provincial grants, and $8\frac{1}{2}\%$ over the same period for those costs ineligible for assistance.

Table A-1 summarizes the estimated total and annualized capital costs of new treatment systems after making allowance for currently available federal and provincial assistance, that is the costs which the basin's municipalities must bear for required treatment. As outlined in the main paper, the annual capital cost of treatment is estimated at \$922 thousand. This cost is in terms of 1974 dollars to allow some lead time for implementation of the proposed financing scheme.

Table A-2 develops this annual cost in detail. Column 1 shows, for all municipalities requiring treatment, the proportion of the total cost (i.e. the sum of columns 1 and 2) eligible for public financing under present programs. Columns 3, 4, and 5 relate to the financing provisions of the CMHC program, in other words the amount of the loan, the amount of forgiveness, and the net loan respectively. The part of the eligible amount not covered by CMHC (i.e. $1/3$) plus the ineligible amount (column 2) must be financed under current programs at higher rates of interest on the open market. This amount is shown in column 6 and is annualized at $8\frac{1}{2}\%$ for

TABLE A-1

COSTS OF PROPOSED WASTE TREATMENT SYSTEMS

(dollars)

<u>Municipality</u>	<u>Total Project Cost</u>	<u>Annual Construction Cost</u>
Clearview	234,031	20,343
Parkville	162,294	12,002
Birchtown	400,000	31,468
St. Christopher	275,000	20,063
Happy Valley	274,510	23,871
Owl's Creek	516,328	46,466
Evansville	162,240	17,133
Appletown	2,546,447	129,113
Blackfield	250,574	21,832
Crabtree	268,144	21,841
Mapleville	352,060	33,879
Wellington	586,162	54,406
Windville	337,610	11,405
St. Albert	393,702	27,911
Powell Creek	319,612	29,401
Frontier Valley	605,696	39,726
Richard	1,527,889	124,802
Pine Valley	104,000	7,391
Wendover	6,000,000	202,740
Rossland	616,706	46,563
 TOTAL	 15,933,005	 922,356

TABLE A - 2

DETERMINATION OF ANNUAL COSTS

Municipality	1		2		5		4		5	
	Amount Eligible for Financing		Amount Not Eligible for Financing		C.M.H.C. Loan		Forgiveness		Actual Loan	
Clearview	\$	60,862	\$	173,169	\$	40,575	\$	11,665	\$	28,910
Parkville		67,113		95,181		44,742		12,867		31,879
Birchtown		150,000		250,000		100,000		28,750		71,250
St. Christopher		125,000		150,000		83,333		23,958		59,375
Happy Valley		71,256		203,254		47,504		15,657		33,847
Owl's Creek		112,189		404,139		74,793		21,503		53,290
Evansville		-----		162,240		-----		-----		-----
Appletown		1,946,447		500,000		1,297,631		375,069		924,562
Blackfield		64,458		185,116		42,972		12,354		50,618
Crabtree		90,151		177,993		60,100		17,279		42,821
Mapleville		45,935		306,125		30,623		8,804		21,819
Wellington		104,331		481,831		69,554		19,997		49,537
Windville		337,610		-----		225,073		54,708		160,365
St. Albert		190,253		203,449		126,835		36,465		90,370
Powell Creek		60,569		259,043		40,379		11,609		28,770
Frontier Valley		337,459		268,237		224,973		64,680		150,293
Richard		582,328		945,561		588,219		111,613		276,606
Pine Valley		50,000		54,000		33,333		9,583		23,750
Wendover		6,000,000		-----		4,000,000		1,150,000		2,850,000
Rossland		258,448		358,258		172,299		49,536		122,763

	6	7	8	9	10
Municipality	Amount Eligible for Financing	Amount Not Eligible for Financing	C.M.H.C. Loan	Forgiveness	Actual Loan
Clearview	\$ 193,456	\$ 20,429	\$ 2,835	\$ 2,919	\$ 20,543
Parkville	114,552	12,097	3,124	3,219	12,002
Birchtown	500,000	51,680	6,982	7,194	51,468
St. Christopher	191,667	20,240	3,111	5,995	20,063
Happy Valley	227,006	25,972	3,871	3,418	23,871
Omni's Creek	441,535	46,626	5,222	5,582	46,466
Evansville	162,240	17,133	-----	-----	17,133
Appletown	1,248,816	151,874	90,607	95,568	129,113
Blackfield	207,602	21,923	3,001	3,092	21,832
Crabtree	208,044	21,969	4,196	4,524	21,841
Napleville	321,437	53,944	2,138	2,205	53,879
Wellington	516,608	54,554	4,857	5,005	54,406
Windville	112,537	11,884	15,716	16,195	11,405
St. Albert	266,867	28,181	8,856	9,126	27,911
Powell Creek	279,233	29,487	2,819	2,905	29,401
Frontier Valley	380,723	40,204	15,709	16,187	59,726
Richard	1,189,670	125,629	27,107	27,934	124,802
Pine Valley	70,667	7,462	2,327	2,398	7,391
Wendover	2,000,000	211,200	279,500	287,760	202,740
Rossland	444,407	46,929	12,031	12,397	46,563

20 years in column 7. Column 8 gives the annual cost of the CMHC loan obtained by annualizing the amounts shown in column 3 at $7\frac{1}{2}\%$ for 20 years. The amount of the New Brunswick annual grant is given in column 9. Column 10, obtained by adding columns 7 and 8 and deducting column 9 gives the total net annual capital cost in each municipality requiring treatment. The sum of the elements in this column is \$922,356.

Outstanding Debts for Existing Treatment Systems

In addition to financing new treatment systems, the "Fund" will assume payments on all outstanding debts for existing treatment systems. There are some difficulties involved in determining the exact levels of these payments.

For those components of existing systems financed with public assistance, records exist from which current payments on loans may be determined. These payments total just under \$278 thousand per year for the basin, as shown in Table A-3.

In contrast, components of existing systems which were ineligible for public assistance were financed through general municipal bonds and debentures. For the purposes of bond issue, the cost of these components were added to any other capital needs of the municipality. Therefore, without a detailed study of each municipality's finances, the costs of the system components not publicly assisted are indeterminate. Such a detailed study was not carried out in this project. To allow for this data deficiency, an estimate of \$1 million annually was used to approximate these non-assisted

TABLE A- 3 ANNUAL COST OF FINANCIALLY ASSISTED TREATMENT SYSTEMS

MUNICIPALITY	ANNUAL COST
Deep River	902
Lawson Village	2,021
Cypress Lake	4,157
Carron	6,918
Lion's Head	107,707
Peertown	23,818
Spring Hill	4,286
Long Lake	-----
St. Flavien	-----
Waterville	4,093
Vincent	1,122
Elmdale	1,282
Moose	6,823
Red Lake	1,029
Belltown	1,056
Fort McGee	234
Hemlock	810
Wendover	89,337
Yellowcliff	1,375
Bedrock	1,145
Oscar's Point	14,561
Hometown	3,910
Elmerborough	1,365
TOTAL	277,951

costs. The "Fund" would use this money to assume payments on existing systems not covered in the previous section. The onus would be upon the individual municipalities to prove that the money was required for payments on waste treatment systems. This component of the proposed scheme is by far the least solid in terms of available data. The one million dollars required annually is an "educated guess" and probably over-estimates real requirements. Prior to implementation, this is the economic component which would require most careful study.

Annual O & M Costs

O & M costs for existing plants were derived from records of past expenditures. For required new systems, they were estimated in consultation with a responsible New Brunswick official. As shown in Table A-4, total O & M costs for all systems (existing and required) is estimated at just over \$518 thousand.

In summary, the total annual cost of adequate treatment to the municipalities in the Saint John basin is estimated at just over \$2.7 million, broken down as in Table A-5.

TABLE A-4

ANNUAL OPERATING AND MAINTENANCE COSTS OF EXISTING AND REQUIRED FACILITIES

<u>Municipality</u>	<u>Annual Operating and Maintenance Cost (\$)¹</u>	
	<u>Total</u>	<u>Per Capita</u>
Clearview	3,335	6.06
Parkville	1,000	1.78
Birchtown	3,000	3.26
St. Christopher	3,000	3.89
Happy Valley	3,900	6.89
Owl's Creek	9,000	4.55
Deep River	3,000	4.26
Evansville	-----	-----
Lawson Village	3,000	4.71
Cypress Lake	3,000	3.52
Appletown	103,025	8.33
Carron	3,000	1.46
Blackfield	3,565	6.10
Lion's Head	42,000	1.77
Crabtree	5,000	8.13
Mapleville	5,675	9.31
Wellington	4,833	8.86
Pecertown	12,000	2.66
Spring Hill	2,000	1.14
Windville	8,466	8.39
St. Albert	8,000	9.31 ²
Long Lake	3,000	.77
Powell Creek	2,634	2.29
St. Flavien	-----	-----
FrontierValley	11,000	5.22
Waterville	3,000	2.25
Richard	25,000	11.29
Vincent	3,000	1.87
Elmdale	3,000	1.81
Moose	6,000	5.78
Pine Valley	3,000	9.52
Red Lake	3,000	2.39
Belltown	1,000	.32
Fort McGee	1,100	2.15
Hemlock	3,000	2.80
Wendover	200,000	2.24
Yellowcliff	5,625	3.81
Bedrock	3,000	3.21
Oscar's Point	3,000	.76
Hometown	1,000	1.43
Rossland	5,190	11.26
Elmerborough	3,000	.62
	<u>518,348</u>	<u>2.72 Average</u>

¹ Calculations based on 1971 Population statistics, except where indicated.

² Calculations based on 1966 Population.

TABLE A-5

TOTAL COST SUMMARY

	<u>Component of System</u>	<u>Total Annual Cost</u>
I	New Construction	922,356
II	Debt Assumption (Assisted Components)	277,951
III	Debt Assumption (Non-assisted Components)	1,000,000
IV	Operating and Maintenance	518,348
	TOTAL	<u>2,718,655</u>

APPENDIX 2 DETAILED OPERATION OF THE FUND FOR NEW CONSTRUCTION

In order to explain fully the operation of the proposed funding arrangement, the following example is given. It is stressed that this is only an example, and is open to modification if such modification is necessary. This Appendix applies only to new construction,

Annual Payments

As identified in Tables A-1 and A-2, the total net annualized cost of treatment to the municipalities will be just over \$922,000. The allocation program worked out here for the proposed "Fund" is based on the assumption that this amount will be contributed annually to the "Fund" by the population paying the effluent charge. Table A-2 detailed the derivation of this figure.

Procurement of CMHC loans and New Brunswick grants

The allocation program given in the next section for annual "Fund" dispersal assumes the availability of funds from CMHC as soon as the municipality becomes next on the priority list. The actual mechanics of loan procurement have not been worked out, but are relatively minor detail at this stage in the development of the proposal. It will be noticed in Table A-6, which details the year-by-year allocation, that the amount of the CMHC loan differs from that shown in Table A-2. This results from an inflationary factor of 4% built into the "Fund".

The New Brunswick annual grants are calculated on the basis of the same reasoning as outlined for the loans. The grants are calculated

on a 20-year basis, the most common experienced in the past.

Dispersal of the "Fund"

The allocation of the "Fund" is on an annual basis. An amount of \$100,000 is allowed for annual "Fund" operation. This covers the cost of administering the allocation program. The second element in annual "Fund" dispersal is loan repayments to CMHC. Loans are repaid from the "Fund" commencing two years after they are received to allow for the completion of treatment system construction. In all cases the repayment period is 20 years.

The annual allocation of money for treatment plant construction is the third element in the dispersal of the "Fund". As stressed in the paper, these allocations are made such that the most serious pollution sources will be dealt with first. Alteration of the priorities will not affect the efficiency of the proposed "Fund".

A complete allocation program is given in Table A-6. The first four years of this program are outlined in detail here to promote further understanding of the proposal contained in this paper.

In the first year of operation, assumed to be 1974, the input to the "Fund" is comprised of the annual payments of \$922,356 made by the basin's population, and a CMHC loan to begin construction of required facilities in Wendover, for a total input of \$4,922,356 to Wendover, the first municipality on the priority list. By comparing this allocation with the total cost of the treatment system required at Wendover, it is clear that not enough money can be allocated to that municipality in the

TABLE A-6

DETAILED ANNUAL INPUTS AND DISPERSALS OF THE FUND

YEAR: 1974 (1)

	<u>IN</u>		<u>OUT</u>
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$ 0	C.M.H.C. REPAYMENTS:	\$ 0
C.M.H.C. LOAN:	\$4,000,000	ALLOCATION:	\$4,822,356 (Wendover)
TOTAL IN:	\$4,922,356	TOTAL OUT:	\$4,922,356

BALANCE: \$ 0

YEAR: 1975 (2)

<u>IN</u>		<u>OUT</u>	
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$ 0	C.M.H.C. REPAYMENTS	\$ 0
C.M.H.C. LOAN	\$ 0	ALLOCATION	\$822,356 (Wendover)
TOTAL IN:	\$922,356	TOTAL OUT:	\$922,356

BALANCE: \$ 0

YEAR: 1976 (5)

	<u>IN</u>		<u>OUT</u>
FROM MUNICIPALITIES:	\$922,256	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$287,760	C.M.H.C. REPAYMENTS:	\$279,500
C.M.H.C. LOAN:	\$1,403,517	ALLOCATION:	\$418,489 (Rest of Wendover) \$1,815,844 (Appletown)
TOTAL IN:	\$2,613,633	TOTAL OUT:	\$2,613,633

BALANCE: \$ 0

Plants operating: Wendover.

1
36
1

YEAR: 1977 (4)

	<u>IN</u>		<u>OUT</u>
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$287,760	C.M.H.C. REPAYMENTS:	\$279,300
C.M.H.C. LOAN:	\$ 0	ALLOCATION:	\$830,816 (Appletown)
TOTAL IN:	\$1,210,116	TOTAL OUT:	\$1,210,116

BALANCE: \$ 0

Plants operating: Wendover

YEAR: 1978 (5)

	<u>IN</u>		<u>OUT</u>
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$388,739	C.N.H.C. REPAYMENTS:	\$377,300
C.M.H.C. LOAN:	\$454,161	ALLOCATION:	\$150,917 (Appletown) \$1,137,039 (Richard)
TOTAL IN:	\$1,765,256	TOTAL OUT:	\$1,765,256

BALANCE: \$ 0

Plants operating: Wendover ,Appletown.

YEAR: 1979 (6)

<u>IN</u>		<u>OUT</u>	
FROM MUNICIPALITIES:	\$922,556	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$388,739	C.M.H.C. REPAYMENTS:	\$377,300
C.M.H.C. LOAN:	\$273,714	ALLOCATION:	\$676,390 (Richard) 431,119 (Frontier Valley)
TOTAL IN:	\$1,584,809	TOTAL OUT:	\$1,584,809

BALANCE: \$ 0

Plants operating: Wendover, Appletown

YEAR: 1980 (7)

	<u>IN</u>		<u>OUT</u>
FROM MUNICIPALITIES:	\$922,556	OPERATING COST:	\$100,000
N.E.W.A. GRANTS:	\$421,414	C.M.H.C. REPAYMENTS:	\$409,011
C.M.H.C. LOAN:	\$ 94,637	ALLOCATION:	\$518,034 (Frontier Valley) 611,362 (Owl's Creek)
TOTAL IN:	\$1,438,407	TOTAL OUT:	\$1,438,407

BALANCE: \$ 0

Plants operating: Wendover, Appletown, Richard

YEAR: 1981 (8)

<u>IN</u>		<u>OUT</u>	
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$411,107	C.M.H.C. REPAYMENTS:	\$428,123
C.M.H.C. LOAN:	\$ 91,528 \$226,753	ALLOCATION:	\$ 43,635 (Owl's Creek) \$771,349 (Wellington) \$338,617 (Rossland)
TOTAL IN:	\$1,681,724	TOTAL OUT:	\$1,681,724

BALANCE: \$ 0

Plants operating: Wendover, Appletown, Richard, Frontier Valley.

YEAR: 1982 (9)

IN

OUT

FROM MUNICIPALITIES: \$922,356

N.B.W.A. GRANTS: \$446,611

C.M.H.C. LOAN: \$136,856

TOTAL IN: \$1,505,823

OPERATING COST: \$100,000

C.M.H.C. REPAYMENTS: \$433,465

ALLOCATION: \$491,843 (Rossland)
\$480,515 (Birchtown)

TOTAL OUT: \$1,505,823

BALANCE: \$ 0

Plants operating : Wendover ,Appletown, Richard, Frontier Valley, Owl's Creek.

YEAR: 1983 (10)

	<u>IN</u>		<u>OUT</u>
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$469,508	C.M.H.C. REPAYMENTS:	\$455,687
C.M.H.C. LOAN:	\$ 57,471	ALLOCATION:	\$ 69,588 (Birchtown)
	320,349		454,907 (Powell Creek)
	180,525		480,524 (Windville)
			389,503 (St. Albert)
TOTAL IN:	\$1,950,209	TOTAL OUT:	\$1,950,209

BALANCE: \$ 0

Plants operating: Wendover, Appletown, Richard, Frontier Valley, Owl's Creek
Wellington, Rossland.

YEAR: 1984 (11)

<u>IN</u>		<u>OUT</u>	
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$479,353	C.M.H.C. REPAYMENTS:	\$465,242
C.M.H.C. LOAN:	\$ 45,329 123,353	ALLOCATION:	\$177,691 (ST. Albert) \$521,134 (Mapleville) \$306,324 (ST. Christopher)
TOTAL IN:	\$1,570,391	TOTAL OUT:	\$1,570,391

BALANCE: \$ 0

Plants operating: Wendover, Appletown, Richard, Frontier Valley, Owl's Creek, Wellington
Rossland, Birchtown.

YEAR: 1985 (12)

<u>IN</u>		<u>OUT</u>	
FROM MUNICIPALITIES:	\$922,522	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$519,522	C.M.H.C. REPAYMENTS:	\$504,226
C.M.H.C. LOAN:	\$ 92,521 73,150 66,153	ALLOCATION:	\$104,722 (St. Christopher) \$412,795 (Crabtree) \$422,595 (Happy Valley) \$129,294 (Blackfield)
TOTAL IN:	\$1,673,682	TOTAL OUT:	\$1,673,682
BALANCE: \$ 0			

Plants operating: Wendover, Appletown, Richard, Frontier Valley, Owl's Creek, Wellington, Rossland,
Birchtown, Powell Creek, Windville, St. Albert.

YEAR: 1936 (13)

	<u>IN</u>		<u>OUT</u>
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$531,655	C.M.H.C. REPAYMENTS:	\$516,002
C.M.H.C. LOAN:	\$ 64,961 71,633	ALLOCATION:	\$266,711 (Blackfield) 374,691 (Clearview) 259,751 (Evansville) 73,450 (Parkville)
TOTAL IN:	\$1,590,605	TOTAL OUT:	\$1,590,605

BALANCE: \$ 0

Plants operating: Wendover, Appletown, Richard, Frontier Valley, Owl's Creek
Wellington, Rossland, Birchtown, Powell Creek,
Windville, St. Albert, St. Christopher

YEAR: 1987 (14)

<u>IN</u>		<u>OUT</u>	
FROM MUNICIPALITIES:	\$922,356	OPERATING COST:	\$100,000
N.B.W.A. GRANTS:	\$548,330	C.M.H.C. REPAYMENTS:	\$532,186
C.M.H.C. LOAN:	\$ 55,501	ALLOCATION:	\$193,842 (Parkville) \$173,167 (Pine Valley)
TOTAL IN:	\$1,526,187	TOTAL OUT:	\$999,195

BALANCE: \$ 526,992

Plants operating: Wendover, Appletown, Richard, Frontier Valley, Owl's Creek, Wellington,
Rossland, Birchtown, Powell Creek, Windville, St. Albert, St. Christopher, Blackfield
Crabtree, Happy Valley.

first year of "Fund" operation. Thus, Wendover remains at the top of the priority list for 1975.

In 1975, the only "Fund" input is the annual payments made by the basin's population. Note that no CMHC loan is given in this year, as the full amount of the loan was received in 1974. Therefore, the "Fund's" total receipts in 1974 would be \$922,356. After allowance for the \$100,000 operating cost, the remainder of \$822,356 is allocated to Wendover. This allocation is still not enough, leaving Wendover at the top of the priority list for 1976.

In 1976, total "Fund" inputs are \$2,613,633. This total is comprised of \$922,356 in annual payments, a \$1,403,517 CMHC loan for the treatment plant at Appletown, and the first New Brunswick annual grant of \$287,760 for the system constructed in Wendover. This system is considered to be operating in 1976, as two years have passed since the initial allocation. New Brunswick annual grants are given upon completion of projects. The "Fund" outlays are composed of the operating cost of \$100,000, the first CMHC loan repayment (for Wendover) of \$279,300 the remainder of the money required at Wendover of \$418,489, and an initial allocation of \$1,815,844 to commence construction at Appletown. It will be noted that, with the 1974, 1975, and 1976 allocations to Wendover, total funding here has been \$6,063,201, that is greater than the \$6 million total cost shown in Table A-1. This is an example of the built-in factor of the "Fund" to cover annual inflation.

Annual inputs to the "Fund" for 1977 are the regular annual payments from the basin's population, and the New Brunswick annual grant

of \$287,760, for a total of \$1,210,116. Outlays are the regular annual operating cost, a CMHC loan repayment of \$279,300, and an allocation of \$830,816 to Appletown, which remained atop the priority list from 1976.

In a similar manner the reader can trace through the annual allocations of the "Fund" to 1987, the last year for which municipal payments for new construction are made, and in which the last allocation for treatment plant construction is made. All required municipal plants have been constructed by 1988. Transfers of money from the province to CMHC will continue for 20 years to liquidate the federal loans. These liquidation transactions are detailed in Table A-7. It will be seen that, at their peak amount, the New Brunswick annual grants will reach \$562,146 and will begin to decline in 1994, at which time the Appletown plant will be paid for. The largest annual amount payable to CMHC will be \$545,596. Because the New Brunswick annual grants and the amount remaining in the fund will always be sufficient to make the loan repayments to CMHC, the municipal payments are not collected after 14 years.

LIQUIDATION OF THE FUND

TABLE A-7

Year	Input from Previous Year	N.E.W.A. Grants	C.M.H.C. Loan Repayment	Balance
1988 (15)	\$ 526,992	\$ 558,155	\$ 541,722	\$ 543,425
1989 (16)	543,425	562,146	545,596	559,975
1990 (17)	559,975	562,146	545,596	576,525
1991 (18)	576,525	562,146	545,596	593,075
1992 (19)	593,075	562,146	545,596	609,625
1993 (20)	609,625	562,146	545,596	626,175
1994 (21)	626,175	562,146	545,596	642,725
1995 (22)	642,725	562,146	545,596	659,275
1996 (23)	659,275	562,146	266,296	667,365
1997 (24)	667,365	274,386	266,296	675,455
1998 (25)	675,455	274,386	168,296	680,566
1999 (26)	680,566	173,407	168,296	685,677
2000 (27)	685,677	173,407	136,535	689,824
2001 (28)	689,824	140,752	117,473	693,390
2002 (29)	693,390	121,039	112,151	696,794
2003 (30)	696,794	115,535	89,909	699,525
2004 (31)	699,525	92,638	80,554	701,962
2005 (32)	701,962	82,793	41,370	703,216
2006 (33)	703,216	42,624	29,584	704,115
2007 (34)	704,115	50,491	15,410	704,519
2008 (35)	704,519	13,816	3,874	704,636
2009 (36)	704,636	3,991	0	704,636

Amount left upon liquidation: \$ 704,636

APPENDIX 3 DATA ON MUNICIPAL TAXATION

Table A-8 summarizes the municipal tax structure of the basin, and is based upon Table A-9.

Table A-8

PARAMETERS OF MUNICIPAL TAXATION

Population (1971)	190,638
Net Municipal Budget (\$000's)	18,886
Municipal Tax Base (\$000's)	1,045,429
Revenue Raised by Local Property Taxes (\$000's)	9,041
Average Local Tax Rate per \$100 of Tax Base	.8647
Average Local Taxes per Capita (\$)	47.42
Average Local Taxes per Household (\$)	142.26
Amount Payable to Province for Education, Health and Welfare, and Justice Administration (\$000's)	15,648
Amount Payable to Province per Capita	82.26
Amount Payable to Province per Household	246.77
Total Local plus Provincial Taxes per Household (\$)	389.03

According to Table A-8, total local and provincial taxes average \$389.03 per year. Provincial taxes levied against municipalities are based upon \$1.50 per \$100 of assessed property value.¹ If commercial, public, and industrial establishments are assumed to pay 25% of provincial and local taxes, annual taxes per capita average \$291.77. As indicated in Table A-8, there is a wide variation around this average. This figure is somewhat higher than the average provincial plus local taxes of \$222 per year

¹ Province of New Brunswick, Report of the Task Force on Municipal Structure and Financing, 1972, p. 28.

reported for the rest of the province. However, the difference can be expected since the Saint John basin contains the largest part of the province's assessed value.

TABLE A - 9 CHARACTERISTICS OF THE MUNICIPAL TAX BASE

MUNICIPALITY	NET BUDGET	TAX BASE	LOCAL WARRANT	TAX RATE	LOCAL WARRANT PER CAPITA	TAXES PER HOUSEHOLD OF 3	PAID TO PROVINCE	PROVINCIAL TAX PER CAPITA	TOTAL LOCAL AND PROVINCIAL TAX PER CAPITA	TOTAL LOCAL AND PROVINCIAL TAX PER HOUSEHOLD OF 3
Clearview	4,970	858,750	2,734	.3260	4.97	14.91	12,581.25	22.83	27.85	83.55
Parkville	7,900	732,230	4,545	.5934	7.74	23.22	10,983.45	19.58	27.32	81.96
Birchtown	9,530	2,735,170	5,242	.1916	5.70	17.10	41,027.55	44.60	50.30	150.89
St. Christopher	14,815	2,312,110	8,148	.3524	10.57	31.71	34,681.65	44.98	55.55	166.66
Happy Valley	11,297	2,803,670	6,213	.2216	10.98	32.94	42,055.05	74.30	85.28	255.85
Owl's Creek	29,087	3,643,425	15,998	.4391	8.09	24.27	54,651.38	27.64	35.73	107.20
Deep River	21,556	1,721,560	11,856	.6887	16.84	50.52	25,823.40	36.68	55.52	160.56
Evansville	5,500	1,269,110	5,025	.2385	4.75	14.25	19,036.65	29.88	34.63	103.90
Lawson Village	17,494	1,663,090	9,622	.5786	15.10	45.30	24,946.35	39.16	54.26	162.79
Cypress Lake	30,961	5,942,710	17,029	.2866	19.99	59.97	89,140.65	104.63	124.62	375.85
Appletown	1,313,983	67,637,410	716,956	1.0600	57.98	173.94	1,014,561.15	82.05	140.05	420.09
Carron	7,330	6,325,450	4,031	.0637	1.97	5.91	94,881.75	46.28	48.25	144.76
Blackfield	30,560	8,905,050	16,808	.1886	28.78	86.34	135,575.75	228.73	257.51	772.52
Lion's Head	2,622,622	224,025,100	1,615,453	.7211	66.62	199.86	3,360,376.50	138.85	205.17	615.51
Crabtree	6,552	1,128,090	3,604	.3194	5.86	17.58	16,921.35	27.51	33.37	100.12
Mapleville	4,074	1,113,330	2,241	.2013	3.67	11.01	16,669.85	27.42	31.09	93.26

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MUNICIPALITY	NET BUDGET	TAX BASE	LOCAL WARRANT	TAX RATE	LOCAL WARRANT PER CAPITA	TAXES PER HOUSEHOLD OF 3	PAID TO PROVINCE	PROVINCIAL TAX PER CAPITA	TOTAL LOCAL AND PROVINCIAL TAX PER CAPITA	TOTAL LOCAL AND PROVINCIAL TAX PER HOUSEHOLD OF 3
Peartown	327,946	20,897,780	165,089	.7900	36.56	109.68	313,466.70	69.41	105.97	317.92
Spring Hill	15,577	6,780,000	8,567	.1263	4.90	14.70	101,700.00	58.18	63.08	
Windville	101,404	4,041,390	53,330	1.3195	51.58	154.14	60,620.85	58.40	109.78	319.34
St. Albert	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Long Lake	42,264	5,842,593	23,245	.3979	5.99	17.97	87,638.90	22.59	28.58	85.73
Powell Creek	5,223	1,919,740	2,873	.1477	2.50	7.50	28,796.10	25.06	27.56	82.69
St. Flavien	1,034,837	70,386,140	314,623	.4470	27.32	81.96	1,055,792.10	91.66	118.98	356.95
Frontier Valley	51,282	6,881,445	28,205	.4089	13.38	40.14	103,221.68	48.97	62.35	197.04
Waterville	17,689	5,918,010	9,729	.2483	7.31	21.93	58,770.15	44.15	51.46	154.39
Richard	5,436	4,530,860	2,990	.0660	1.35	4.05	67,962.90	30.68	32.03	96.10
Vincent	24,679	8,059,400	13,573	.1684	8.45	25.35	120,891.00	75.27	83.72	251.17
Elmdale	10,785	3,014,970	5,932	.1968	3.58	10.74	45,224.55	27.29	30.87	92.62
Moose	88,764	8,689,940	60,003	.7250	60.70	182.10	130,349.10	125.58	186.28	553.85
Pine Valley	3,151	765,830	1,733	.2263	5.50	16.40	11,487.45	36.47	41.97	125.90
Red Lake	21,539	1,973,960	11,846	.6001	9.45	28.35	29,609.40	23.63	33.08	99.24
Bellevue	34,851	7,298,650	19,168	.2629	6.21	18.63	109,344.75	35.44	41.65	124.96

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MUNICIPALITY	NET BUDGET	TAX BASE	LOCAL WARRANT	TAX RATE	LOCAL WARRANT PER CAPITA	TAXES PER HOUSEHOLD OF 3	PAID TO PROVINCE	PROVINCIAL TAX PER CAPITA	TOTAL LOCAL AND PROVINCIAL TAX PER CAPITA	TOTAL LOCAL AND PROVINCIAL TAX PER HOUSEHOLD OF 3
Hamlock	18,162	1,649,220	9,989	.6057	9.32	27.96	24,738.30	25.08	32.40	97.19
Wendover	11,974,400	496,176,550	5,461,252	1.1006	61.34	184.02	7,442,648	83.58	144.93	454.79
Yellowcliff	112,207	3,392,340	33,662	.9923	22.78	68.34	40,885	34.43	57.21	171.62
Bedrock	20,123	3,747,290	11,068	.2953	11.84	35.52	56,209	60.12	71.96	215.87
Oscar's Point	277,689	19,851,140	147,708	.7441	37.47	112.41	297,767	75.54	113.01	359.02
Moncton	1,989	1,829,990	1,094	.0597	1.56	4.63	27,449	39.21	40.77	122.32
Rossland	5,455	2,569,620	1,900	.0739	4.12	12.36	38,544	83.61	87.73	263.19
Elmerborough	334,607	26,077,795	195,479	.7496	40.34	121.02	391,166	80.72	121.06	263.18
Total	18,886,001	1,045,429,178	9,040,504	.8647	47.42	142.26	15,681,437	82.26	129.63	389.03

Source: New Brunswick Department of Municipal Affairs, 1972.

APPENDIX 4 REGIONAL IMPACTS OF EXPENDITURES ON NEW TREATMENT PLANTS

The expenditure of approximately \$16 million on new treatment system construction in the Saint John basin will filter through various parts of the regional economy, ultimately having a much greater dollar effect than the initial expenditure. Economists have called this the multiplier effect. The multiplier effect is difficult to determine in precise, quantitative terms, but can be approximated using regional input-output tables and techniques. We were fortunate for this study to have access to such information,¹ enabling the approximation of the effect of new construction on the New Brunswick economy.

The analysis of regional impacts was done on a "one-shot" as opposed to a dynamic basis. The fundamental question asked was, "What are the effects of a \$16 million expenditure on the regional economy?" In other words, no effort was made to examine the effects of a year-by-year expenditure program like that outlined in Table A-6 of Appendix 2. Since the effects are different for treatment plants than for sewer construction, the analysis was organized to deal with these two items separately. Table A-10 shows the breakdown of costs for each component.² These are

¹ A preliminary paper was written by Messrs. Marks and Campbell of the New Brunswick Office of the Premier for this study; this paper, entitled The Economic Effects of Sewer and Treatment Plant Construction in New Brunswick, is available upon request.

² Ibid, p. 10.

called the "first round" effect of expenditure and are the inputs to the analysis. In addition to the assumed breakdown in costs of Table A-10, four additional assumptions are necessary; all contractors are located in New Brunswick; most contractors are small firms; all labour and distributed profits accrues to New Brunswick residents, and all inputs are supplied locally if possible. Violation of any of these assumptions will necessitate adjustment of the results.

Table A-10

<u>ESTIMATED COST DATA</u>					
Component	Treatment	Per	Sewers	Per	Total
	<u>Plants</u>	<u>Cent</u>		<u>Cent</u>	
Material	2,996,950	54.49	3,729,600	35.53	6,726,550
Labour	1,393,150	25.33	1,940,400	18.48	3,333,550
Contractors Plant*	354,750	6.45	3,286,500	31.30	3,641,250
Overhead and Profit	775,150	13.73	1,543,500	14.70	2,298,650
TOTAL	5,500,000	100.00	10,500,000	100.00	16,000,000

* This is defined to include rental charges depreciation, taxes, finance, planning, engineering, administrative and other similar costs.

The results of the input-output analysis are shown in Table A-11. The direct effects on household income, employment, gross domestic product, and government revenue were calculated from the data of Table A-10, and demonstrate the initial effects of spending money for required treatment

Table A-11

SUMMARY OF REGIONAL IMPACTS OVER 14 YEARS¹

	Direct Effects (Initial Costs)	Total Economic Impact	Multipliers
A. Sewer Construction			
Household Income	4,215,435	11,739,957	2.78
Employment (Man-Years)))	(527)	(2206)	4.19
Gross Domestic Product	4,327,827	17,037,402	3.94
Government Revenue	273,305	3,551,091	N/A
B. Treatment Plants			
Household Income	1,959,513	5,366,433	2.74
Employment (Man-years)	(245)	(1003)	4.09
Gross Domestic Product	2,266,957	7,905,205	3.49
Government Revenue	143,000	1,573,685	N/A
C. Total Construction Project			
Household Income	6,174,948	17,106,390	2.77
Employment (Man-Years)	((772)	(3209)	4.15
Gross Domestic Product	6,594,784	24,942,607	3.78
Government Revenue	416,305	5,124,676	N/A

¹ Source : Ibid, p.6.

system construction. The total economic effect includes the direct, plus the indirect effects as the expenditures flow through the province's economy.

Another way of viewing economic impacts is by examining the effects of anticipated expenditures on different industry groups. These are shown in Table A-12. In terms of industrial output, the major effects are felt by the suppliers of initial inputs such as concrete, transportation, etc. Other industrial impacts result mainly from indirect, re-spending effects, principally in the food and service categories. The reader is cautioned that the figures in Table A-12 are not additive, for they are gross output levels; to add them would involve a large degree of double counting.

Throughout this impact analysis a number of assumptions have been made. A few of these have been outlined here; all of them are outlined in the paper by Marks and Campbell. Because of the assumptions, the data presented on impacts must be interpreted as best available estimates, not exact predictions of economic effects. In fact, it is suggested that they be viewed as possible, not probable impacts.

INDUSTRY OUTPUT LEVELS CREATED BY \$16,000,000 EXPENDITURE
ON SEWER SYSTEMS AND TREATMENT PLANTS ¹

	(\$)
Agriculture	826,167
Non-Metals, Quarries	209,906
Meat, Dairy and Fruit	707,706
Miscellaneous Foods	480,371
Beverages	258,218
Metal Fabrication	324,155
Non-Metallic Mineral Products (Concrete)	3,279,581
Petroleum Products	758,699
Other Construction	1,080,658
Transportation, Travel and Entertainment	3,009,767
Radio, Telephone and Telegraph	658,262
Electric Power, Water and Gas	537,425
Distribution	4,151,625
Auto Operation	1,110,050
Finance and Real Estate	1,551,242
Dwelling Services	1,340,084
Hotels and Restaurants	382,178
Personnel Services	936,641
Business Services	570,377
Household Industry	17,106,390
Other	1,537,537

¹ Source: Ibid, p.7.