

LEGISLATIVE ASSEMBLY OF THE
NORTHWEST TERRITORIES
7TH COUNCIL, 49TH SESSION

TABLED DOCUMENT NO. 6-49

TABLED ON JUNE 11, 1973

TD: 6-48

Tabled on June 11, 1973

PROPOSED
WATER AND SANITATION POLICY

For
COMMUNITIES IN THE NORTHWEST TERRITORIES

Prepared by



Department of Local Government
Government of the Northwest Territories

MARCH
1973

PROPOSED WATER AND SANITATION POLICY

INDEX

Page

SYNOPSIS

INTRODUCTION		1
PROPOSED WATER AND SANITATION POLICY	1 of 7	8
1. DEFINITIONS	1 of 7	9
2. WATER AND SANITATION PROBLEMS	2 of 7	10
3. WATER AND SANITATION SYSTEMS	3 of 7	11
4. WATER - MINIMUM SERVICE	5 of 7	13
5. SANITATION - MINIMUM SERVICE	5 of 7	13
6. RATES AND QUOTAS	5 of 7	13
7. CONTRACTING	7 of 7	15

APPENDIX A:	Inventory of Reports on Water and Sanitation Services with Examples	16
B:	Outlines of Sample Communities in the Northwest Territories	27
C:	Recommended Minimum Water and Sanitation Systems for N.W.T. Communities	45
D:	Proposed Construction Schedules	48
E:	Estimate of Costs of Complete and Partial Water and Sanitation Services	52
F:	Forecast of Capital and Operation and Maintenance Expenditures: Revenue	60

TABLES

1	Income From All Sources Sample Communities in N.W.T.	Appendix B	44
1	Community/Population Forecast 1971-1981	Appendix C	47
1	Proposed Scheduling Partial and Complete Systems N.W.T.	Appendix D	48

		Page
TABLES		
2	Proposed Scheduling Partial and Complete Systems N.W.T. - Project Completions	Appendix D 49
3	Proposed Scheduling Partial and Complete Systems	Appendix D 50
1	Cost Inflation Rates	Appendix E 54
2	Summary - Total Cost Proposed Systems (1973 Dollars)	Appendix E 55
3	Cost of Piped Systems in Settlements Proposed to Receive Complete Systems	Appendix E 56
4	Cost of Partial Systems for Settlements In Which Proposed Partial Systems will be Installed	Appendix E 57
1	Summary of Costs by Regions	Appendix F 63
2	Capital Cost For Forced Growth Expansion Tax-Based Municipalities (1973 Dollars)	Appendix F 64
3	Forecast of Expenditures	Appendix F 65
 FIGURES		
1	Communities Affected by Proposed Water and Sanitation	8
1	Sample Communities	Appendix B 27
1	Forecast of Capital, Operation and Maintenance and Revenue	Appendix F 62

SYNOPSIS

This paper presents the Proposed Policy for Water and Sanitation Services for communities in the Northwest Territories. This policy is intended to be a guide in establishing acceptable water supply, water delivery, sewage collection and sewage and garbage disposal facilities for the 60 established communities in the Northwest Territories.

The level of water and sanitation services provided in a particular community is generally based on population. However, other factors such as cost of present servicing, physical characteristics of the site and possible future growth also have considerable bearing on the type of service provided. The levels of service proposed are:

1. No Service: generally in communities with less than 50 residents.
2. Trucked Service: generally in communities from 50 to 150 residents.
3. Partial System: incorporating a water supply main, trucked water delivery and sewage pump-out and a sewage treatment facility compatible with current legislation. Generally this would be for communities from 150 to 700 residents.
4. Complete System: a conventional piped system incorporating an adequate sewage disposal facility. Generally this would be for communities with populations greater than 700 residents.

Rates and quotas are established which make adequate water supply and sewage disposal economically feasible for all residents of the Northwest Territories.

Appendices forming part of the proposed policy forecast the capital and operation and maintenance expenditures required in each community to bring the level of water and sanitation service in the Northwest territories up to levels acceptable to residents, public health officials and government agencies responsible for enforcing current Land Use and Northern Inland Waters Legislation.

INTRODUCTION

POLICY FOR THE PROVISION OF WATER AND SANITATION SERVICES IN THE NORTHWEST TERRITORIES

AIM

The aim of this paper is to present a revised policy and program for water supply and sewage and garbage disposal in the Northwest Territories, for inclusion in the Federal - Territorial Financial Agreements commencing April 1, 1973.

BACKGROUND

Throughout Canada water supply as well as sewage and garbage disposal are considered a local matter and as such a provincial matter under the BNA Act. Provinces in turn pass this responsibility on to the municipal level of local government. In many instances, however, Provinces assist by providing loan funds for major water and sewer projects.

While delegating the responsibility for water and sanitation services to local authorities, provinces retain the responsibility for related legislation in the interests of public health.

In southern Canada problems unique to the Arctic Regions such as a severe climate, permafrost, and isolation do not present a problem in the provision of adequate water and sanitation services.

Smaller southern communities (Populations up to 800) unlike their northern counterparts generally use wells to tap ground water supplies and solve their sewage disposal problems through a system of septic tanks and field tile or lagoons. This system, common throughout southern Canada, generally functions well and remains a viable solution until communities reach a substantial size. The northern or Arctic community is less fortunate. Without ground water as a convenient supply, and with permafrost precluding the use of septic tanks and field tile disposal systems, water supply and sanitation problems emerge on the northern scene at a much earlier stage of community growth. Ways do exist to overcome these problems but they are relatively expensive.

The majority of northern communities continue to operate under a primitive water and sanitation system. Water for domestic use is delivered by vehicle, waste water is allowed to drain directly on the ground adjacent to the dwellings, and sewage is picked up in plastic bags. Often the latter are deposited outside the residence to await the collection vehicle. Breakage frequently occurs, with the result that the areas adjacent to the home are usually dangerously contaminated. (See Appendix A - Department of Health and Welfare Reports.)

While recognizing this generally prevalent substandard level of water and sanitation servicing throughout the Northwest Territories, improvements and upgrading of the basic vehicle delivery and collection systems are taking place. The program of continuing improvement has resulted from a number of formal restatements of policy by the Inter-Departmental Committee on Federal-Territorial Financial Relations.

1962 Policy

The initial statement of policy by the committee took place in 1962. This provided for certain assistance to unorganized communities in the Northwest Territories. The policy made no provision for assistance to municipalities.

The policy as contained in the Committee's report of 1962 provided for the following:

- (a) The Federal Government would pay 100% of the capital and operating costs to service its own installations including Crown Owned housing.
- (b) The Federal Government would pay 50% of the capital and operating costs to service Indians and Eskimos with the balance payable by the Indians or Eskimos themselves, or from Federal Welfare funds to the extent that the people themselves were unable to pay.
- (c) The Territorial Government would pay 50% of the capital and operating costs to service everyone not covered by (a) and (b) with the balance paid by the users or from Territorial Welfare funds to the extent that the users are unable to pay.
- (d) These subsidies by the Federal and Territorial Governments would be reduced to whatever extent necessary to ensure that the annual cost to an average user of a piped water and sewerage system does not fall below \$150 per year and to an average user of a trucked or similar system below \$50. In very high cost areas the cost to the consumer could, of course, be well above \$150 and \$50, despite the application of the 50% subsidy.
- (e) Users would pay for internal plumbing systems and for connections to piped systems where necessary.

Implementation of the 1962 Policy

The basic difficulty in implementing the 1962 policy resulted from the diversity of the communities involved and from the extremely low levels of income of their inhabitants. In brief, the difficulty in distinguishing between ethnic groups, whites, Indians, Metis and Eskimos combined with the general inability of the majority of people to pay even a small part of the capital and operating costs of water and sanitation servicing, hampered the full implementation of the 1962 policy.

While the intent of the 1962 policy statement was commendable, for practical reasons it could not be implemented. Its basic principles nevertheless were used under varying circumstances. Although inadequate, the policy provided the necessary experience for the development of a revised policy statement in 1967.

1967 Policy

The policy which is presently used as a general guide was first presented in 1967 and was contained in the Report of the Inter-Departmental Committee on Federal-Territorial Financial Relations of that year. It was to have corrected the deficiencies which appeared in the 1962 policy statement.

The 1967 policy provides for the following: (quote)

- (a) The Government of the Northwest Territories shall assume the responsibility for the provision of water supply and sewage disposal services to communities below the tree line in the Northwest Territories.
- (b) The Federal Government shall assume the responsibility for the provision of water supply and sewage disposal services to communities above the tree line in the Northwest Territories, until it becomes practical to turn over this responsibility to the Northwest Territorial Government through an amendment to the 5-year agreement or through a later 5-year agreement.
- (c) In all cases, these services will be provided in the most economical manner possible and the selection of the appropriate system shall be governed by the principle that the monthly amortization of the capital cost shall not exceed the monthly operating costs.
- (d) Notwithstanding the intent to provide these services in the most economical way, the minimum system design standards shall be based on water quantities of 10 gallons per capita per day for dwellings not provided with pressure systems, and 40 gallons per capita per day for those provided with pressure systems. The minimum acceptable sewage disposal system shall consist of pick-up by plastic bag or can. These minima shall also be maxima where economics dictate.
- (e) Insofar as is possible, systems shall be operated by local authorities who shall collect all revenue and provide for the continued operation of the systems in the normal way. As soon as practicable, ownership shall be transferred to properly constituted authority for a nominal sum.

- (f) In all communities where water supply and sewage disposal services are provided under this policy, the responsible government shall provide for, and shall finance the following minimum services:
- (1) The pick-up and disposal of sewage in plastic bags or cans as a free service from all dwellings in the community requiring this service.
 - (2) The provision of water points throughout the community from which water may be drawn at no charge by community residents. Quantities drawn from water points should be limited to 10 gallons per capita per day for private use only. Water points should be so distributed within the community so that each dwelling will be within 500 feet of a point.
 - (3) The provision of a water delivery service for the delivery of minimum quantities of water at the incremental cost. "Minimum quantities" for this purpose shall be taken as 180 gallons per dwelling per week and the charge shall be \$5 per month unless the service can be provided for less. This \$5 represents simply the added cost of making the delivery and does not cover the share of total overhead costs of the system which could be attributed to such deliveries.
- (g) Apart from the above, the consumers shall pay for the operating costs of any service provided. Rates for the purpose shall be established in the normal manner all users paying their proportionate share of the costs. It may be necessary for any given system, particularly a piped system, to charge slightly less than the actual operating costs at the outset in order to encourage more consumers. Rates should be set, however, so as to balance costs at least within 5 years of start up in communities generally and within 2 to 3 years in the case of municipalities.
- (h) In circumstances where it is economic to install piped services, the responsible government shall bear the capital cost of the major facilities required, but consumers will be called upon to pay for the services fronting their property, should the 50-50 cost sharing formula outlined in paragraph (c) so demand. Extensions to existing piped systems should be treated in the same manner, the extension being paid for by those whose property is thereby served or made capable of being served. Some modification of this principle may be necessary from time to time because of local circumstances but it is suggested that a capital charge averaging not less than \$10 per foot front always be levied on fronting property for extensions, unless it can be clearly shown that the actual cost pro-rated across all the property served is less.

- (1) Services developed under this policy shall be developed for the benefit of all members of any community. Particular care must be taken to avoid the appearance of special treatment being granted to any sector of the community. (end of quote)

A program for the construction, operation, and maintenance of the facilities required in the Northwest Territories over a 5-year period, commencing April 1, 1967 with Federal and Territorial cost shares was appended to the basic policy statement.

Implementation of the 1967 Policy

The 1967 policy corrected a number of deficiencies present in the previous policy statement however it was quickly recognized that due to the rapidly evolving northern scene the policy would soon require updating.

In the years following 1967 the previous format of a 5-year Federal - Territorial Financial Agreement was dropped in favour of a 2-year agreement, and since 1969, a yearly agreement. This format shift had a tendency to cloud the status of the 1967 water and sewer policy. Also, the process of delegation of responsibility from the Federal to Territorial Governments proceeded at a rapid rate after 1967. This further invalidated basic assumptions put forward in the 1967 policy.

The Territorial Government since 1970 has assumed the total responsibility for the provision of water and sanitation services throughout the Northwest Territories. The "above" and "below" the tree line division of responsibility between the Federal and Territorial and Governments has been dropped.

The efforts of the 1967 policy to establish minimum system design standards for water and sewer services throughout the Northwest Territories was again found to be economically impossible. The goals of 10 gallons per capita per day for dwellings without pressure systems and 40 gallons per capita per day for those with pressure systems were for the most part seldom realized.

In the majority of instances inadequate supplies of water combined with inadequate vehicle delivery equipment has precluded the possibility of providing the water delivery quotas stated. The problem of inadequate water storage facilities within dwellings has been corrected to a considerable degree through the successful implementation of a program which will provide most homes with 200 or 250 gallon storage tanks by the end of 1973.

The low income level of the majority of the population was a basic difficulty encountered in implementing the 1962 policy. This has remained a major stumbling block in the 1967 (present) policy as well. The bulk of the consumers remain unable or unwilling to pay the full operating cost of the various water and sanitation systems on which they rely.

The proposed minimum service system for a community, that of constructing several water points throughout residential areas, proved to be operationally impractical and had to be abandoned as a system concept. It has been found necessary to consider the minimum system to be vehicle delivery of water to each dwelling unit. The quantity and frequency of water delivery has been dependent upon the availability of water and the capability of the delivery equipment.

While the minimum quantities, 180 gallons per dwelling per week established in the present policy (1967), in the majority of instances, have not been met, this basic objective of 800 gallons per dwelling per month is still considered to be an absolute minimum requirement under any criteria. Every effort must be made to ensure systems are developed capable of supplying these quantities.

Notwithstanding the above minimum requirements and the necessity of seeing that these are met, the problems of the diversity of communities in the N.W.T. and their own particular servicing problems, has emerged as an important factor when establishing any servicing criteria. The latter applies not only to water, but to sewage and garbage servicing as well. The new policy endeavours to accommodate this aspect.

Since the adoption of the 1967 policy, it has become increasingly evident that the previously established minimum sanitation services are now no longer satisfactory for the majority of N.W.T. communities. This applies particularly to discharge of waste water from dwellings directly on the ground adjacent to the building and to the common mishandling of bagged sewage by depositing the bags on the ground outside the dwelling to await the collection vehicle. As indicated previously, this often results in breakage and serious contamination of the ground around the homes. This situation is undoubtedly producing public health problems. Proof of this can be found by comparing public health statistics from northern communities with those of southern Canada. One of the main objectives of the proposed policy is to upgrade the minimum level of sanitation servicing for a significant percentage of N.W.T. communities. Specifically this will involve a shift from the common norm described above to a level involving individual sewage and waste water pumpout tanks for all dwellings within specified communities or, where appropriate a full piped system.

The problems or difficulties in assessing costs to be charged for services supplied from expensive systems already developed, e.g. Frobisher Bay was not resolved, as hoped, by the 1967 policy. Analysis of costs proved users could not be expected to pay their proportion of the costs associated with utilizing these systems.

With reference to circumstances where it was deemed economically feasible to install piped services to reduce overall system costs (both capital and operational) the ability to pay has often negated the possibility of recovering capital charges levied on fronting property held under title by individuals. The policy being proposed endeavours to establish criteria for resolving this question.

The criteria governing the level of servicing to be provided for each community in the N.W.T. is detailed in the body of the proposed 1973 policy and comprises factors ranging from growth potential, to present population, economic viability, availability of a water supply, and general geographic and topographic parameters.

The objectives and guidelines of this new Water and Sewer Policy for the N.W.T. are intended to reflect the growing awareness and concern of all Canadians in matters relating to pollution control and environmental management.

Specifically it is intended that this new Policy will be instrumental in providing the communities of the N.W.T. with a standard of servicing compatible with guidelines such as were contained in the Federal Cabinet's Document of June 8, 1972 approving a program of control and abatement of pollution resulting from Federal Government operations.

It is also intended that it will be a step toward insuring that the communities of the N.W.T. meet established environmental and pollution control standards as proposed by such Federal agencies as the Department of the Environment, Department of Fisheries and such Acts as the Northern Inland Waters Act, and The Territorial Lands Act.

PROPOSED
WATER AND SANITATION POLICY

MARCH 1973

NORTHWEST TERRITORIES

SHOWING COMMUNITIES AFFECTED
BY PROPOSED WATER
AND SANITATION

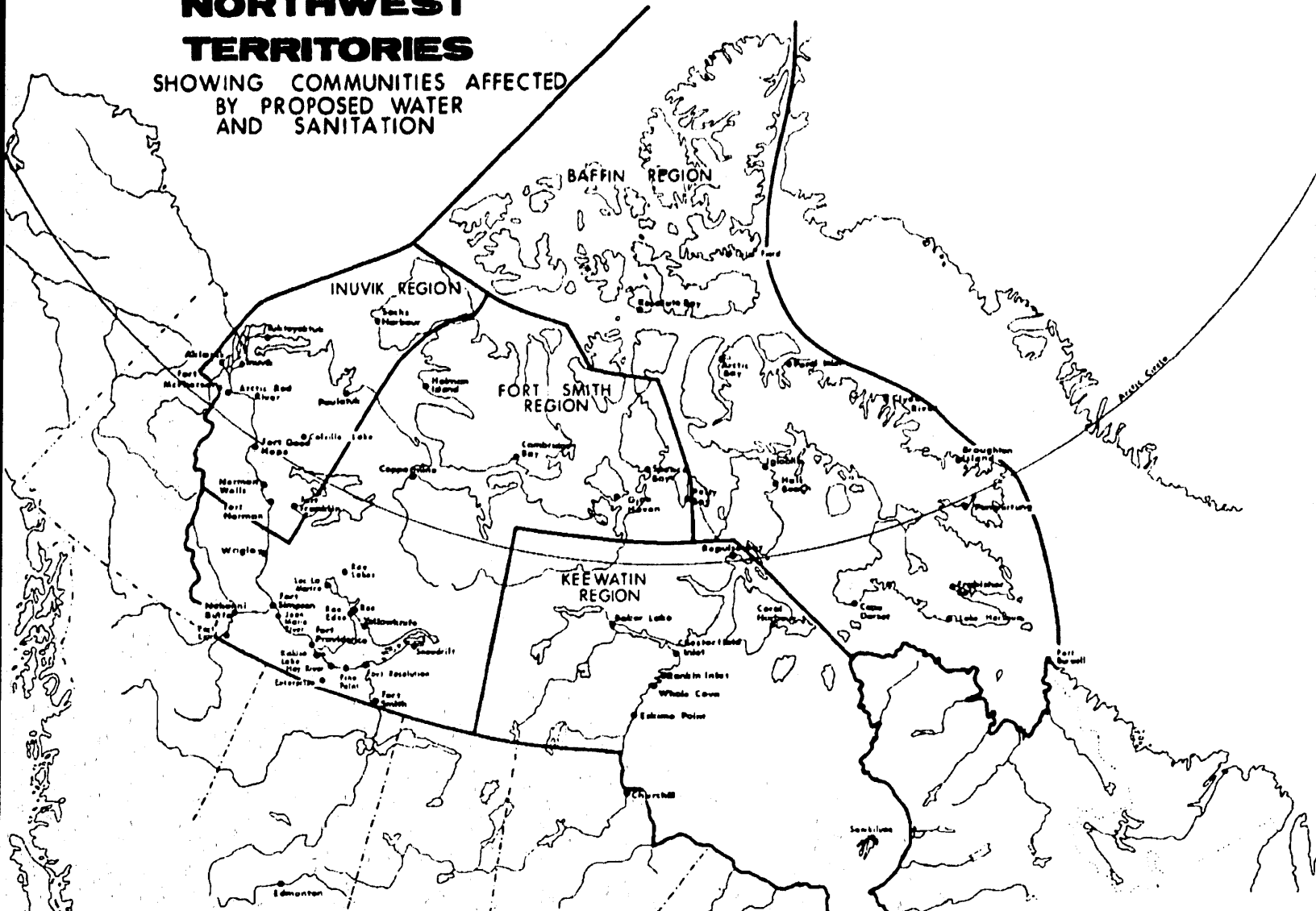


FIGURE 1

PROPOSED WATER AND SANITATION POLICY FOR THE NORTHWEST TERRITORIES (1973)1. DEFINITIONS

- 1.1 DOMESTIC RESIDENCE - a self-contained dwelling unit. This includes private residences and staff houses where the residence is operated by the owner for the housing of his employees and is not intended to be revenue-producing.
- 1.2 COMMERCIAL ESTABLISHMENT - a structure or a self-contained portion of a structure which is used for business or revenue producing purposes or by non-profit organizations that are not institutions as defined herein.
- 1.3 INSTITUTION - a hospital, school, hostel, church or religious institution other than a Government establishment.
- 1.4 GOVERNMENT ESTABLISHMENT - a structure or a self-contained portion of a structure owned, leased, or occupied by the Federal Government, the Territorial Government, a Municipal Government, or a Crown Corporation.
- 1.5 ECONOMIC RATE - the rate charged to commercial establishments, institutions and government establishments for water and sanitation services. This rate is also charged to domestic residences when the quota as established herein is exceeded. This rate is based on the actual operation and maintenance costs incurred in the distribution of water and the collection of sewage and garbage.
- 1.6 DESIGNATED SERVICE AREA - the area designated for provision of water and sanitation services. The extent of this area shall be determined by either the Territorial Government municipality owning the system with the agreement of the Territorial Government.
- 1.7 SANITATION SERVICE - the removal and disposal of garbage and sewage.
- 1.8 WATER SERVICE - the obtaining and delivery of potable water.
- 1.9 VEHICLE WATER DELIVERY - the delivery of water by means other than a piped system.
- 1.10 CONTRACTOR - for the purpose of this policy, a contractor is an individual, co-op or company that has an agreement with the Government of the Northwest Territories, or a municipality to provide water and sanitation service within a designated service area.

- 1.11 WET-BAG SEWAGE - sewage collected by means other than pump out tanks or a piped system.
- 1.12 PUMP-OUT SEWAGE - sewage collected by means of a pump and vehicle from a sewage holding tank.
- 1.13 PARTIAL SYSTEM - a piped water system from a source of water to a centrally located water treatment plant, and a sewage disposal facility compatible with current legislation. In instances where a major user such as a school or nursing station is connected to the basic partial system, it may be deemed desirable to construct a sewage outfall line or force main to the treatment facility.
- 1.14 COMPLETE SYSTEM - a system incorporating all features of a partial system, with the addition of a piped water supply and sewage collection system to individual residences, establishments and institutions.
- 1.15 MAIN WATER TRUNK LINE - a water line from the water source to the water treatment plant. Also, any main water supply line from the treatment plant to a main distribution point or points for laterals within the community. That is, a line whose main function is to transport water for further distribution and not to serve individual consumers directly.
- 1.16 MAIN SEWER TRUNK LINE - an outfall line or pressure sewer line linking a collection point or points for lateral sewers with a sewage treatment facility and on which no direct building connections are made.
- 1.17 LATERAL WATER LINE - a water line originating at a main water trunk line designed to service individual units or subdivision areas.
- 1.18 LATERAL SEWER LINE - a sewage line designed to collect sewage from a subdivision or sub-division area into which individuals may discharge sewage.
- 1.19 FORCED GROWTH - the provision to meet non-discretionary increases in the quantity of service the program properly ought to provide because of such things as the growth in size of the client "population" for the service. These increases would do no more than maintain the quality of service at present levels.

2. WATER AND SANITATION PROBLEMS

- 2.1 Few settlements have adequate systems for the supply of water and disposal of wastes. Appendix A is a list of some recent studies done by the Department of National Health and Welfare which describe in detail the hazards of present operations and the need for corrective action. Two examples of these reports are attached to Appendix A.

- 2.2 During the winters with extreme cold and high winds it is very difficult to obtain and deliver water. The choice is between wheeled vehicles which require roads and frequent snow removal, and tracked equipment which is expensive to buy, slow to operate, and difficult to maintain.
- 2.3 Depending on the size and location of the settlement, a piped water system in comparison with vehicle water delivery is relatively inexpensive to operate and reliable. On the other hand the initial capital outlay is high.
- 2.4 Without piped disposal or a system including individual sewage holding tanks and vehicle collection, waste water runs onto the ground and sewage disposal consists of plastic bag pickup. The waste water freezes under houses in the winter, pollutes the settlement in the spring and melts the permafrost during the summer.
- 2.5 Sewage and garbage decays very slowly in the Arctic. Pollution is long lasting and conventional Southern Canadian approaches to water supply and sanitation are usually not successful.
- 2.6 Brief outlines of communities representing the diversity of problems associated with the provision of water and sanitation services are presented in Appendix B. The sample communities were selected on the basis of the following criteria: population, geographic location, existing and proposed water and sanitation system.

3. WATER AND SANITATION SYSTEMS

- 3.1 Appendix C lists the proposed minimum system for each community.
- 3.2 Population is taken as a base factor in deciding the level of service and type of equipment to be provided to each community. However other factors such as cost of present servicing, physical characteristics of the size and possible growth of the community are also considered.
- 3.3 In settlements with less than 50 residents, no services will be provided. These settlements are large camps and each of the 10 or so households will be expected to provide its own services.
- 3.4 With due consideration to the other factors as outlined in Clause 3.2, in settlements with populations of 50 to 150 people, some form of household water and sanitation service will be provided. Where provided by the Government of the Northwest Territories, it will consist of a tractor and two wagons; one with a tank for water and the other for garbage and sewage bag pickup.

- 3.5 With due consideration to the other factors as outlined in Clause 3.2, in settlements with populations of 150 to 700 people, vehicles for water and sanitation services will be provided. A partial system with sewage pump-out tanks will be considered the minimum facilities in a settlement of this size. This system will be designed to be compatible with a complete system should expansion be necessary in the future. In some cases in settlements of this size, total systems may be installed depending on factors as presented in 3.2. Appendix D is a proposed construction schedule.
- 3.6 In settlements of 700 or more people, piped systems will be constructed in accordance with feasibility studies. Such feasibility studies will take into consideration both social and economic factors such as the initial capital cost of piped systems compared with the cost of non-piped services; sanitation and environmental advantages or disadvantages of a piped system as opposed to delivery services (emphasizing public health considerations) and the projected development of the community as such development relates to the need for municipal services. Such a study will be carried out two years in advance of the beginning of construction to allow for a re-alignment of priorities if necessary due to social, environmental, or forced growth situations.
- 3.7 Water and sewage holding tanks are an effective method of improving health standards. The Territorial Government will make available water tanks free of charge on application to all domestic residences located in designated service areas. In communities where sewage pump-out tanks are considered to be the minimum level of service, sewage pump-out tanks for domestic residences will also be made available free of charge on application.
- 3.8 All establishments except as provided in Clause 3.7 must be provided with water tanks and sewer pump-out tanks at the owner's or occupants expense before delivery and pickup service is provided. These tanks must be of a design approved by the Government of the Northwest Territories.
- 3.9 Appendix E indicates the cost of complete and partial systems.
- 3.10 In non-tax based communities where it is deemed desirable to install piped services, the Government of the Northwest Territories shall bear the cost of the facilities required. User rates shall be charged in accordance with Clause 6.5.
- 3.11 The Territorial Government will pay for the construction of main water and sewer trunk lines in tax-base municipalities. This includes the initial cost of a reservoir if required, a water intake line, pumphouse and treatment facilities, sewage lift station and outfall line, and sewage treatment facilities, as well as the expansion of same necessitated by forced growth.
- 3.12 In tax-based municipalities any lateral extensions are the responsibility of the City, Town or Village concerned. The Territorial Government will continue to assist in the financing of lateral extensions by providing repayable debenture loans.

- 3.13 Water and sewer systems shall be operated by the Municipalities as soon as they have developed adequate staff and abilities to handle the systems. The municipality will be expected to offset the operating costs of the system through the user rates charged.

4. WATER-MINIMUM SERVICE

- 4.1 Notwithstanding the minimum service levels established in clauses 3.1, 3.2, 3.3, 3.4 and 3.5 for various categories of settlements, a minimum level of water delivery service will be 800 gallons per dwelling per month.
- 4.2 Due to the location of some settlements and their lack of a year-round water supply source, it may be economically and physically impractical to have water delivery service during certain periods of the year. In these settlements ice delivery shall be provided free of charge to domestic residences by the Government of the Northwest Territories.

5. SANITATION - MINIMUM SERVICE

- 5.1 Notwithstanding the minimum service levels established in clauses 3.1, 3.2, 3.3, 3.4 and 3.5 it is the policy of the Territorial Government to have wet bag sewage pickup 4 times per week, weekly pump-out of sewage tanks from all domestic residences in a community and weekly dry garbage pickup, in non-tax based communities.
- 5.2 In tax-based communities, the frequency of sanitation service shall be at the discretion of the local municipal authorities.

6. RATES AND QUOTAS

- 6.1 It is the policy of the Territorial Government to provide minimum water, sewer and garbage services within designated service areas at an equalized rate throughout the Territories to the residents for their household use, and to assist institutions in this regard. To this end, for water delivery service and sewer and garbage services in non tax-base communities the Territorial Government will pay the difference between the economic rate and the rate set in Clauses 6.3, 6.4 and 6.5 directly to the contractor. All other establishments will pay the economic rate for water delivery and sewer and garbage services.
- 6.2 In tax-based communities, the Territorial Government will pay in the form of a grant, the difference between the economic rate and the rates set in clause 6.3, 6.4 and 6.5 for vehicle water delivery service and sewage pumpout service only.

- 6.3 Vehicle water delivery service to domestic residences and institutions will be provided on the basis of:
- 1) \$5.00 per month for 800 gallons or any portion thereof; plus
 - ii) \$5.00 per month for any portion of 400 gallons in excess of 800 gallons; plus
 - iii) the economic rate for any amount in excess of 1200 gallons per month. Water provided in excess of 1200 gallons per month will be subject to community needs, the available supply of water, and the capacity of the delivery service.
- 6.4 Sewage pump-out service will be provided to domestic residences and institutions on the basis of:
- 1) \$5.00 per month for 800 gallons or any portion thereof; plus
 - ii) \$5.00 per month for any portion of 400 gallons in excess of 800 gallons; plus
 - iii) the economic rate for any amount in excess of 1200 gallons per month. Sewage pump-out service in excess of 1200 gallons per month will be subject to community needs and existing capacity of facilities.
- 6.5 Where piped water and sewage services have not been turned over to a municipality by the Government of the Northwest Territories, the piped water and sewer service shall be provided to domestic residences and institutions on the basis of:
- 1) a maximum charge of \$15.00 per unit per month based on a quota of 40 gallons per person per day.
 - ii) if this quota is exceeded, the economic rate will be charged.
- 6.6 All water delivery systems shall be metered in order that a complete record of water consumption may be obtained, and charges may be levied for consumption above the quotas established in clauses 6.3 and 6.5 or for buildings other than those specified in Clause 6.1.
- 6.7 Garbage and wet-bag sewage from domestic residences and institutions in non-tax based communities shall be paid for by the Government of the Northwest Territories and services shall be provided in accordance with the schedule in Clause 5.1. All other establishments will pay the economic rate. In tax-based communities these services will be a financial responsibility of the municipality.
- 6.8 In settlements where water and sewer service is the direct responsibility of the Territorial Government, the contractor shall invoice domestic residences and institutions which have exceeded the quota as established in Clauses 6.3, 6.4, 6.5 and commercial and government establishments directly for their share, and will invoice the Government of the Northwest Territories for the balance in accordance with Clause 7.2.

7. CONTRACTING - WATER SANITATION AND SEWAGE PUMP-OUT SERVICES IN SETTLEMENTS OTHER THAN TAX-BASED COMMUNITIES

- 7.1 It is the policy of the Territorial Government to contract for the provision of water delivery, sewage pump-out services, wet-bag sewage pickup, and garbage collection. This is done to encourage the growth of local business.
- 7.2 For invoicing purposes the Contractor will keep a list of water quantities delivered, sewage quantities pumped out, and wet bag sewage and garbage pickup for each building. This list and the invoice for the balance due as outlined in Clause 6.8 duly certified by the Contractor and approved by the Settlement or Hamlet Council must be submitted to the Government of the Northwest Territories for payment.

APPENDIX A

Inventory of Reports on Water and
Sanitation Services with Examples

APPENDIX A

INVENTORY OF REPORTS ON WATER SUPPLIES, SEWAGE AND GARBAGE DISPOSAL IN N.W.T.

Prepared by National Department of Health and Welfare

<u>TITLE OF REPORT</u>	<u>DATE OF REPORT</u>
Environmental Sanitation Survey of the Community of Rankin Inlet	September 1969
Memorandum Concerning Environmental Engineering and Water Pollution Survey, Frobisher Bay, N.W.T.	November 1969
Sewage Disposal and River Pollution, Norman Wells	January 1970
Sanitation - Norman Wells	January 1970
Sewage Disposal, Holman, N.W.T.	February 1970
Sewage Disposal, Pelly Bay, N.W.T.	February 1970
Sewage Disposal, Spence Bay	February 1970
Sewage Disposal, Cambridge Bay, N.W.T.	April 1970
Sewage Disposal, Resolute Bay, N.W.T.	April 1970
Sewage and Garbage Disposal, Fort Franklin	April 1970
Water Supply, Fort Franklin	April 1970
Sewage and Garbage Disposal, Inuvik, N.W.T.	April 1970
Water Supply, Inuvik	April 1970
Sewage and Garbage Disposal, Fort Good Hope, N.W.T.	April 1970
Water Supply, Fort Good Hope	April 1970
Sewage and Garbage Disposal, Aklavik	April 1970
Water Supply, Aklavik, N.W.T.	April 1970
Sewage and Garbage Disposal, Tuktoyaktuk, N.W.T.	April 1970
Sanitation - Tuktoyaktuk, N.W.T.	April 1970
Outbreak of Gastroenteritis, Rae, N.W.T.	May 1970
Sewage Disposal, Yellowknife, N.W.T.	May 1970
Water Supply, Yellowknife, N.W.T.	May 1970
Preliminary Report re Sewage Disposal - Vale Island Site, Hay River, N.W.T.	June 1970
Supplementary Report Environmental Sanitation Survey of Community of Rankin Inlet	July 1970
Report on Environmental Sanitation Survey of the Community of Baker Lake	July 1970

<u>TITLE OF REPORT</u>	<u>DATE OF REPORT</u>
Report on Environmental Sanitation Survey of Eskimo Point	July 1970
Report on Environmental Sanitation Survey - Chenterfield Inlet Nuisance Grounds, Hay River, N.W.T.	August 1970
Sanitation Pine Point, N.W.T.	August 1970
Preliminary Report re Water Supply Pine Point Mines Ltd., Pine Point, N.W.T.	August 1970
Town of Fort Smith Sewage Lagoon	September 1970
Turbidity - Color Study of Water, Hay River, N.W.T.	October 1970
Sanitation, Cambridge Bay, N.W.T.	October 1970
Report re Water Source - Sachs Harbour	November 1970
Yellowknife Correctional Camp Sewage Treatment Plant	February 1971
Hamlet of Pine Point Sewage Lagoon System	March 1971
Rankin Inlet - Community Planning (Rough Draft)	November 1972

TYPICAL REPORTS

Water Supplies, Sewage and Garbage Disposal

As Prepared by
National Department of Health and Welfare

CANADA

Public Health Engineering Division
257 Federal Public Building
Edmonton 2, Alberta

February 17, 1970

REPORT RE SEWAGE DISPOSALPELLY BAY, N.W.T.SUMMARY

Pelly Bay is a community of 230 people located on a rocky location on the shore of the Arctic Ocean. The people are relatively industrious and are employed gainfully in hunting, trapping, fishing and Eskimo handicrafts. The main objection to the site is the fact that it cannot be supplied by ships or barges, and air freight from Yellowknife is expensive (17c/lb).

As with the other small arctic communities, the problems associated with the safe disposal of sewage are very difficult. In this settlement, this will be especially difficult if residences surround and then pollute the lake which is located in the middle of the community.

Suggestions for the preparation of a plan for a settlement, which allows for the eventual construction of a gravity system of sewers, was made in our report of May 18, 1966. In addition, suggestions were made for the location of the Health Center, Department of National Health and Welfare, in order to prevent sewage from this building becoming a problem. It is apparent that these suggestions are not being followed.

INTRODUCTION

Pelly Bay is a small settlement located in the east shore of Pelly Bay, which is on the Atlantic side of Boothia Peninsula. It is 120 miles east of Spence Bay, 390 miles east of Cambridge Bay and 220 miles northeast of Yellowknife. It is a very old settlement visited by early explorers. The first mission was built there in 1937 by Rev. Father Henry.

The population consists of 167 Eskimo and five people from "outside", two teachers (one a lay sister of the mission), two missionaries (the priest is an advisor and secretary-treasurer of the Eskimo Cooperative), and a lay dispenser of medicine (a lay sister of the mission).

There is a two-classroom school with grades one to six, a health station, an Eskimo cooperative which operates a store, trading post, post office, and water, sewage and garbage hauling services. The N.W.T. Administration operate a power plant with three 40 KVA GAC, diesel-electric generators (one in warehouse and two in powerhouse).

The settlement is served by scheduled weekly flights from Cambridge Bay of a twin-engine Otter, which lands on a nearby air strip. It is served by Hercules freight flights from Churchill and/or Yellowknife.

The Eskimo are very industrious. They hunt caribou inland and southwest, polar bear fifty miles northeast, and seals. They net arctic char and whitefish in the Kujaardjuk River and in nearby lakes. They derive much income from native handicraft, mainly ivory and bone carvings and seal skin work.

FEDERAL INVOLVEMENT

health center, D.N.W. & W., occupied approximately once per month by nurses from Spence Bay and doctors from Cambridge Bay during day clinics.

TERRITORIAL INVOLVEMENT

1. Two-classroom school, which building contains a teacher's residence and a janitor's residence.
2. Residence which is occupied by a teacher and a lay dispenser of medicine.
3. Twenty-two single-family frame houses which were constructed by the Department of Indian Affairs and Northern Development, and turned over to the Northwest Territories for rental to Eskimo.

OTHER

The mission owns a church in which there is living quarters for two people, and three duplex, two-bedroom housing units.

CURRENT SEWAGE DISPOSAL PRACTICE

There are bucket toilets in all buildings, the contents of which are hauled away together with the garbage. The vehicles used are flatbed trailers (farm wagons) hauled by a "Massey" tractor (J5 or Marksill).

The disposal point, not so far, is said to be two miles away. In winter, there is some disposal to the ocean on the ice.

Wet wastes from the school, health center and all residences spill on the soil in the immediate vicinity. In the case of the school, the solids will be removed in a septic tank, but this provides negligible improvement.

CONCLUSIONS

1. The wastes from the federal health center and the territorial school and territorial residence are discharging wet wastes in the vicinity of these buildings, thereby polluting the ground, and Lake A, in which the children will play. This is contrary to the provisions of the Federal Water Pollution Control and Abatement Program.

Sewage treatment and pollution control by these buildings could be best controlled by a sewer. If the three buildings, school, residence and health center had been located close together and served by a septic tank, the effluent could be discharged into a suitable small lagoon over the height of land 200 ft northwest of the school. The drainage in this vicinity is to the Kujaardjuk River near the mouth. The river is not used for water or any other purpose which will be affected seriously by this method of disposal. There is fishing occasionally.

The fact that this location is near the powerhouse should not be significant, because the noise from the diesel engines is well muffled. It cannot be heard within the school and the noise immediately outside the powerhouse is not objectionable. Alternatively, the sewage may be hauled away from these buildings, but this would be very expensive in view of the high cost of fuel oil, the need for a haulage truck, garage, etc. Fuel oil and gas cost approximately \$1.50 per gal, and freight costs 17c per lb.

2. The sewage from all residences is polluting the ground in their nearby vicinity.

3. The existing plan for the settlement does not consider the need eventually for an economical gravity sewer system. However, this could be accomplished with very few changes in the location of existing buildings.

Much of the rocky land can be included in the plan, because it can be made suitable by graveling it.

-4-

4. In the eventual sewerage system, sewage treatment could be provided in a septic tank and discharged by gravity either to Lake F, the small one 500 ft south of Lake A, or to the drainage course from Lake F to the ocean.

5. Aeration and chlorination treatments of sewage are impractical in view of the remoteness of this settlement and the consequent lack of supervision of these operations. The high, real cost of power is also significant with respect to aeration.

RECOMMENDATIONS

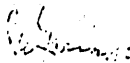
1. The plan for the community should be revised so that an economical gravity system of sewers may be constructed eventually.

2. A study should be made to determine the best and least expensive long-range solution to the problem created by the soil and lake pollution by sewage from the health center, school and teacherage building, and the teacher's and lay dispenser's residence. The following alternatives are possible with preference in order named.

(i) Move the health station and teacher's and lay dispenser's residence to locations close to the school, preferably on the flat land of the drainage divide which is 250 ft northwest of the school. An economical and safe sewerage system may be constructed on the Kujaardjuk River side of the divide. If the health station and the residence building were located on the divide, effluent from the sewerage system of these buildings could flow by gravity, however, effluent from the school septic tank would require pumping to this system.

(ii) Construct a sewerage system to serve these buildings in their existing locations.

(iii) Make provisions for hauling all sewage from these buildings.


J.W. Croft, P. Eng.
Regional Engineer

CANADA

Public Health Engineering Division
257 Federal Public Building
Edmonton 2, Alberta

February 16, 1970

REPORT RE SEWAGE DISPOSALSPENCE BAY, N.W.T.SUMMARY

Spence Bay is a small settlement on the west shore of Boothia Peninsula. Sewage disposal from the federal and territorial establishments, with the exception of the nursing station, cause pollution of the ground in the vicinity. This is a serious public health hazard because people walk through this pollution and children play in it.

An inexpensive gravity sewer system for this settlement is possible and the plans for the settlement should be revised so that this construction is taken into consideration. The need for this and the economic savings which would result if systems of water mains and sewers were constructed in a common boxing are contained in reports by this office dated May 22, 1963 and May 30, 1966. The most recent plan of the townsite does not incorporate these suggestions.

INTRODUCTION

Spence Bay is located on the west shore of Boothia Peninsula, 313 miles east of Cambridge Bay and 762 miles northeast of Yellowknife. The population is 370, of which 345 are Eskimo. Most of the buildings have been constructed since 1963. See Photo No. 1 of our report dated May 22, 1963.

There is a power plant with three 40 KVA GMC diesel-electric generators as well as a 15 KVA unit. There are two 1,500 barrel and one 3,000-barrel oil storage tanks.

The settlement is served by scheduled flights of a twin-engine Otter. Supplies are shipped down the Mackenzie River by barges from Hay River and then by ocean-going barges and ships from Tuktoyaktuk. Building materials are trucked to Yellowknife and from there they are transported by Hercules aircraft in winter.

-2-

Until the last five years, the natives lived in igloos or half tents and shacks made from packing cases and scrap lumber, which were packed around with snow in winter. However, in recent years they have been supplied with fifty small one- and two-bedroom houses. Fuel oil is supplied also.

FEDERAL INVOLVEMENT

D.N.H. & W. Nursing Station - A four-bed and one-crib establishment with two nurses in residence and a day staff consisting of a housekeeper, caretaker and community health worker.

R.C.M.P. Office - An office with a corporal and two constables, who live in separate family residences (three altogether), and a special constable (local Eskimo).

TERRITORIAL INVOLVEMENT

A two-classroom school and administration office.

Eight individual family residences to serve an administrator, clerk, two teachers, a social development officer, an industrial development officer, and a power plant operator.

Fifty small, one- and two-bedroom residences which are rented to natives and their families. These were supplied by the D.I.A. & N.D., and turned over to the N.W.T. administration.

OTHER

The Hudson's Bay Co. operates a store and fur trading post. There is a one-family residence for the employees. The R.C. mission maintains a small church-residence approximately 1,000 ft south of the settlement. The Anglican mission maintains church and residence buildings, which have been vacant in recent years.

CURRENT PRACTICE

Nursing Station

The best sewerage system in the settlement serves the nursing station, which has a piped water supply system. The building contains a flush toilet, bath, two wash basins, and a janitor's sink in the dispensary section, and a kitchen sink, flush toilet, bath and wash basin in the residential section.

-3-

The sewerage system consists of a 900 imp gal aluminum septic tank and a 350 imp gal effluent tank and a drain to the ocean. The effluent is emptied automatically by the opening of an electrically-operated, spring-loaded, butterfly valve. The valve is actuated by an Aquastat pressure control, which is set to discharge 200 gal at a time. The drain consists of a 250 ft long, 2 in copper pipe, which discharges directly into the bay. The pipe is contained in a 6 in X 6 in wood boxing with Styrofoam insulation. When the effluent is discharged, the pipe is heated with a Pyrotenax heating cable, 3.5 watts per ft.

In winter, the effluent discharges to the ice surface in an untravelled location. A heavy drift of snow had accumulated near the outlet as a result of some packing boxes which had been piled nearby. The effluent disappears unnoticed into the snowdrift, which also serves to protect the end of the pipe from the effects of the freezing winds. No odor was noticeable at the time of inspection, and local people stated that there had been no problem for several years.

Up until May, 1966 the odor from the effluent and its spread on the ice for some distance around was a difficult problem. However, this difficulty has been solved by (1) maintaining the septic tank at room temperature, and (2) restricting the effluent flow by snow blocks originally, and by a snow drift at the present time.

GOVERNMENTAL OFFICES AND RESIDENCES (federal and territorial)

There is a standard type of sewerage system for the eight governmental offices and employees' residences, which have internal plumbing systems. Toilet sewage is collected in bags and hauled to the nuisance grounds together with the garbage. Wet wastes are collected in single-compartment, 250 imp gal steel tanks* and the effluent is disposed of to the ground in the immediate vicinity.

The four governmental employees' residences, which do not have internal plumbing systems, and the rental housing for natives, which is owned by the N.W.T., contains a kitchen sink, the wastes from which flow either under or beside the buildings. Toilet sewage is collected in plastic bags and hauled away.

The nuisance ground is approximately 1 1/2 miles to the north of the settlement.

* - 6 ft X 4 ft X 2 ft steel oil tanks.

OTHER RESIDENCES

Sewage from other residences (missions and H.B.C.) is handled much as is the case with the native housing, however the wet wastes from the H.B.C. residence seep away through the sand soil to the sea without surfacing on the ground.

TOILET SEWAGE

Toilet sewage from all buildings except the nursing station is contained in plastic bags. These are laid outside for removal together with the garbage collection. The bags are subject to breakage as a result of a variety of circumstances including freezing to the ground, tearing by dogs and ravens, ripping on sharp objects, etc. As a result, there is gross pollution of the ground in the settlement such as on the roads, pathways, and children's playgrounds.

CONCLUSIONS

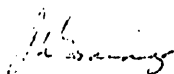
1. The soil in the vicinity of all buildings, except the nursing station, is being polluted by the discharge of wet wastes from kitchens and bathrooms, not including toilet wastes. In the case of the governmental offices and employees' residences, this is particularly serious because there is so much water used. The soil is also contaminated by toilet wastes when the bags in which they are contained break.
2. A system of gravity sewers serving all governmental offices and employees' residences would be inexpensive and very simple to construct and operate. The sewage could be collected at the lowest building along the line (R.C.M.P.) in a septic tank, and the effluent piped to the sea, which is approximately 50 ft distant.
3. The septic tank would provide primary treatment (removal of solids and scum), which would be adequate. This would not preclude additional treatment at a future date if this is considered to be necessary.
4. If a system of water mains were contained in the boxing, together with the sewers, then water could be piped throughout the settlement with considerable financial savings being effected. The water system of the nursing station could be used to supply water for the whole system. The piped water would be subject to less contamination than the present hauled water supply. A sum of \$25,000 has been budgetted for a water supply system for the year 1970-71, although the proposed system has not been planned as yet.

-5-

5. An additional benefit to be obtained by having a system of water mains is the ready availability of water for fire fighting. The existing system of hauling water requires so much time during the early phases of fire that it would be useless for stopping a fire in any of the buildings in this community.
6. The community plan does not take into account the need for adequate drainage of spilled wet wastes and runoff water, and the need for a system of gravity sewers to serve the community eventually.
7. The settlement location will need to be improved by hauling in gravel fill to even out the rock ground. Otherwise, consideration should be given to how the settlement might grow, or else be relocated. The economics of the area for a settlement of this size is another matter for consideration.
8. There is inadequate protection of the ground, shore, etc. from the possible effects of spillage of oil from the oil tanks.

RECOMMENDATIONS

1. The community plan should be reconsidered taking into account the need to serve the whole community with a sewerage system. This should include a long-range plan.
2. A sewerage system to serve all governmental office and employees' residences should be constructed as soon as it can be designed and constructed. It should serve the nursing station, and the nursing station system should be retained in case of a breakdown.
3. In order to effect economy and supply safer water, a system of water mains extending from the nursing station system should be enclosed in the boxing together with the sewers.
4. Oil storage tanks should be surrounded with oil-tight reservoirs so that 100% of the contents would be retained in the event of spillage. It is likely that these will need to be concrete.



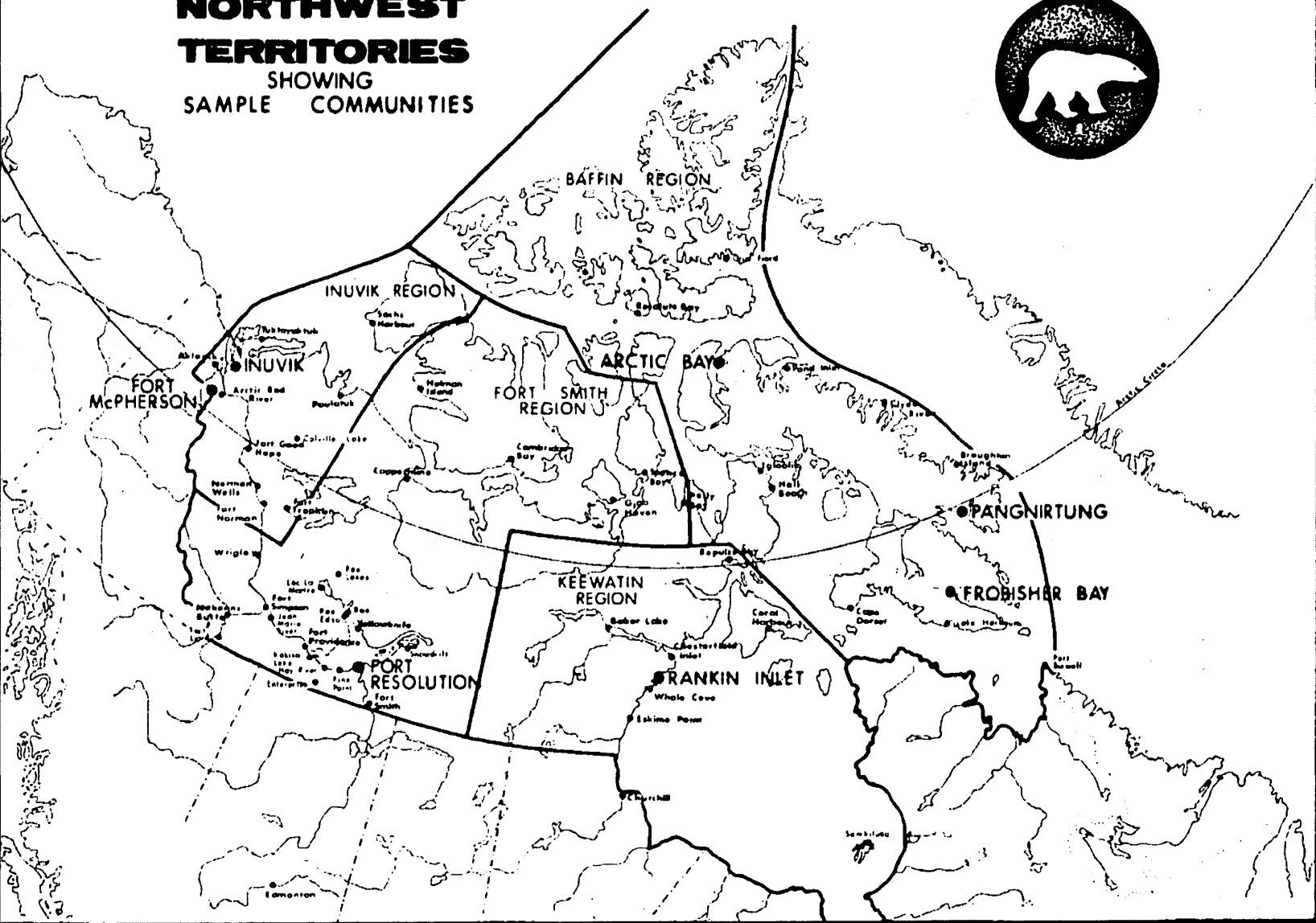
J.W. Grainge, P. Eng.
Regional Engineer

APPENDIX B

**Outlines of Sample Communities
In the Northwest Territories**

NORTHWEST TERRITORIES

SHOWING
SAMPLE COMMUNITIES



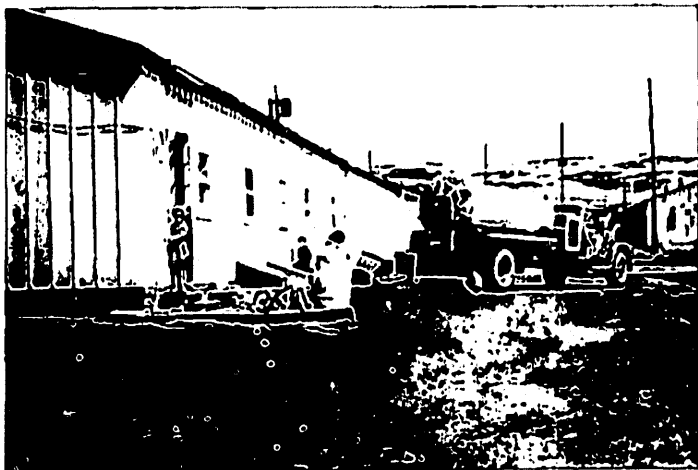
1. View of Frobisher Bay depicting eastern Arctic terrain.



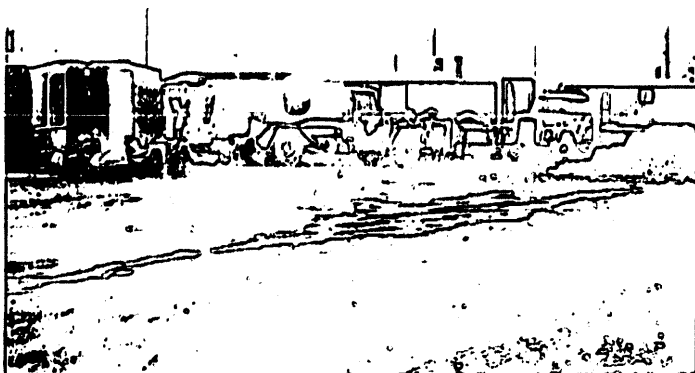
2. Section of utilidor - Inuvik.



3. Vehicle collecting sewage - Frobisher Bay.



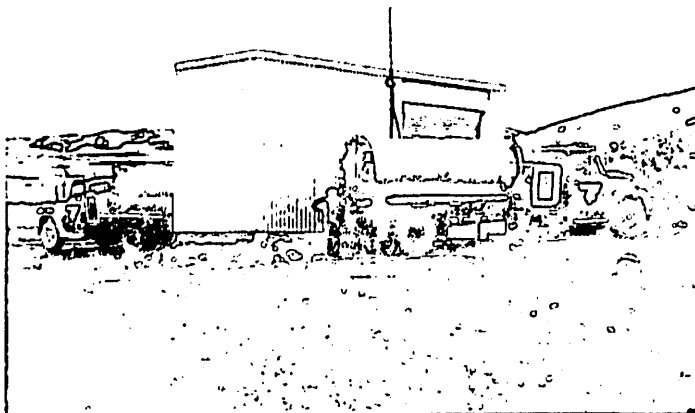
4. Water delivery -
Frobisher Bay.



5. Children playing
near sewage - Arctic
Bay.



6. Sewage trucks dis-
charging sewage at
commuter station
Frobisher Bay.



INUVIK

INUVIK REGION

POPULATION

Historical				Projected*	
1956	1961	1966	1971	1976	1981
Town Under Construction	1248	2040	2672	3400	4050

*Based on projections of Statistics Canada Data.

Note: These projections do not account for possible 'boom' growth due to resource, pipeline or highway activities. Recent reports indicate the possibility of a population boom growth to 10,000 by 1976.

DESCRIPTION OF COMMUNITY

Inuvik is located on the northern most reaches of the tree line on the east side of the Mackenzie River Delta, 125 miles north of the Arctic Circle. The Town was built between 1955 and 1961 as the worlds first truely modern Arctic Town. It was designed not only as a base for development and administration but as a center to bring education, medical care and new opportunity to the people of the western Arctic.

The town has retail outlets one would expect to find in any southern community of comparable size. Prices are somewhat higher particularly for fresh produce which must be flown in from Whitehorse or Edmonton.

The only regular year-round transportation to Inuvik is by air. A round trip from Edmonton costs \$300. During the brief summer shipping season (2 1/2 months) barges supply Inuvik with the bulk of its staple supplies. The recent construction activity on the Dempster Highway will provide access to Inuvik through the Yukon--probably in the next year or two.

Inuvik is mainly a government service center. Employment is, therefore, largely in the health, education, welfare and administrative fields and the necessary service industries. Recent oil and gas activity in the area has led to substantial growth in the resource service industries based in Inuvik.

The Town is located in the continuous permafrost zone with soils varying from clean gravel to fine-grained silts with a high ice content making it necessary to place all buildings on piles.

INCOME

The average per capita income in Inuvik according to a survey conducted for the period October 1, 1969 to September 30, 1970 was \$1498 per capita. Table 1 attached to this appendix gives a breakdown of incomes.

EXISTING MUNICIPAL SERVICES

Power is supplied by Northern Canada Power Commission diesel generating units at the following rates: 1 - 10 kwh \$3.00 (minimum), 21 - 100 kwh \$0.071/kwh, over 100 kwh \$0.045/kwh.

Water supply to the town is from a small lake augmented by water from the east channel of the Mackenzie River. Distribution to most of the residents is by utilidors (above ground insulated boxes containing water and sewer mains). Water is supplied to the consumers at a flat rate of \$10 per month with the Territorial Government subsidy to the operators (N.C.P.C.) making up the balance of the operating costs. Trucked delivery of water is provided for \$5 per month.

Sewage disposal is in a lagoon located adjacent to the residential area of town. The present lagoon is overloaded and needs to be moved further from the residential areas.

Garbage collection and disposal is presently costing the Town \$43,500 per year. Disposal is in an open pit northwest of Town.

PROPOSED MUNICIPAL SERVICES

The existing water supply, water and sewage piped systems and sewage lagoon are overloaded and require immediate upgrading. Two recent reports by an engineering consultant on various aspects of the system estimate that the immediate costs would be in the order of 2 million dollars. If future growth occurs (as expected), an additional 2.8 million dollars will be required to provide adequate service to a population of 7,500 to 10,000 people.

PUBLISHED STUDIES

Inuvik has been the subject of hundreds of studies from its inception as a new Town. However, studies completed recently sum up and update the reports insofar as the Proposed Water and Sanitation Policy is concerned.

Water and Sewage System Analysis, Town of Inuvik prepared for the Northern Canada Power Commission, January 1973, by Associated Engineering Services Ltd.

Field Survey and Report on Sewerage; Inuvik, N.W.T. prepared for Environment Canada, January 1973, by Associated Engineering Services Ltd.

FORT McPHERSON

INUVIK REGION

POPULATION

Historical				Projected*	
1956	1961	1966	1971	1976	1981
129	509	654	679	933*	1074*

*Based on projections of Statistics Canada Data

Note: In 1971, 68% were below 21 years of age.

DESCRIPTION OF COMMUNITY

Fort McPherson is located on the east bank of the Peel River about 30 miles from the junction of the Peel and Mackenzie Rivers, about 80 miles south-west of Inuvik.

The community is served by light aircraft on a year round basis and by river barge during the shipping season. Fort McPherson will have highway access when the Dempster highway is completed.

Employment within the community is mainly restricted to government agency employment such as power utility operation, water and sewage service, and garbage pickup. There is a local craft shop that provides some commercial income plus some trapping in the area. Social assistance is required in the community.

The soils in the area are composed of 0 to 3 feet of silty clays underlain with shale bedrock. Continuous permafrost conditions prevail 1 to 4 feet below the ground surface.

SETTLEMENT INCOME

Average per capita income in Fort McPherson for the 12-month period, October 1969 to September 1970 was \$635/capita. A breakdown of incomes for persons 14 years of age and over is given in Table 1 attached to this appendix. More recent statistics are not yet available, however indications are that this low level of per capita income has not changed significantly.

EXISTING MUNICIPAL SERVICES

Electricity is supplied to the community by the Northern Canada Power Commission by means of local diesel powered generators. Power rates are 12 cents per kwh.

The water source for this community is a lake located 1/2 mile from the built up area. Water is pumped via a utilidor to a treatment plant (presently undersized) and storage facility within the settlement. Water is distributed via utilidor to the limited serviced area of the settlement and via tank truck to the unserviced area.

Sewage is collected via utilidor in the limited serviced area and piped to a small lake adjacent to the settlement that acts quite effectively as a sewage lagoon.

Dry garbage and wet bag sewage (from unserviced area) is picked up by truck on a regular basis and taken to a dump located about 1/2 mile from the built up area. This dump will soon be abandoned and a highway borrow pit 2 miles from Fort McPherson will be used as the new dump.

The water and sewer systems are presently operating at or beyond their capacities and will require significant expansion to accommodate any extension of the system.

PROPOSED MUNICIPAL SERVICES

Under the proposed Water and Sanitation Policy municipal services in Fort McPherson will be upgraded to meet current demands and the utilidor system will be expanded into the large unserviced area of the community. A recent 1972 joint report by an engineering consulting firm and a Town planning firm* estimated that expenditures in Fort McPherson would be approximately \$1,400,000 (including engineering and contingencies) to provide the required level of service.

*Utility Study: Settlement of Fort McPherson, Prepared for the Department of Public Works, Government of the Northwest Territories, March 1972; Associated Engineering Services Ltd., Makale Holloway and Associates Ltd.

FORT RESOLUTION

FORT SMITH REGION

POPULATION

Historical				Projected*	
1956	1961	1966	1971	1976	1981
586	485	677	623	675	750

*Based on projections of Statistics Canada Data and projections of Town Planning Consultant.

DESCRIPTION OF THE COMMUNITY

Fort Resolution was established in 1786 and is one of the oldest established communities in Northwest Territories. It is located on a peninsula on the south shore of Great Slave Lake. The community is presently served by an all weather road from Hay River and Pine Point and by weekly flights from Hay River and Fort Smith.

Employment within the community is available on a limited scale in lumbering trapping, hunting and fishing. Some handicraft work is done. In 1966 there were 72 people employed out of a total population of 628.

The soils in the area are organic silts and sands underlain with limestone. Discontinuous permafrost exists in the area with an active layer of about 4 feet.

SETTLEMENT INCOME

The average per capita income in Fort Resolution for the 12 month period, October 1969 to September 1970, was \$1005 per capita. A breakdown of incomes for all residents 14 years of age and over is given in Table 1 attached to this appendix.

EXISTING MUNICIPAL SERVICES

Hydro electric power is supplied by the Northern Canada Power Commission to Fort Resolution by a line from Pine Point. Rates are 22 cents per kwh for low consumption and 5 cents per kwh for large users.

Water is supplied from Great Slave Lake via a recently completed water intake line to a pumphouse and storage tanks from whence it is distributed by truck to consumers. Water quality is very poor in the summer months due to the

silty nature of the lake adjacent to the mouth of the Slave River. A water treatment plant is required.

Since the community is located in the southern most part of the Territories, limited sewage disposal by outdoor privies and septic tanks is common. There is some wet bag sewage pick-up by truck and a limited number of pumpout tanks are also in use. Garbage is collected by truck and dumped along with sewage in an old gravel pit approximately one mile from Town.

PROPOSED MUNICIPAL SERVICES

Under the Proposed Water and Sanitation Policy, Fort Resolution would be provided with a partial piped water and sewage system and a sewage treatment facility (probably a lagoon) to meet the requirements of the Northern Inland Waters Act. An update of costs presented in a feasibility study done by a consulting firm indicates the cost of such a program to be in the order of \$820,000.

RANKIN INLET

KEEWATIN REGION

POPULATION

Historical				Projected*	
1956	1961	1966	1971	1976	1981
111	94	429	566	780	1000

*Based on projections of Statistics Canada Data

DESCRIPTION OF COMMUNITY

Rankin Inlet is in the Keewatin District of the Northwest Territories. It is located on a bay on the West Coast of Hudsons Bay 280 miles north of Churchill Manitoba and 680 miles east of Yellowknife.

The community has an airstrip adequate for DC3's and uses an ice airstrip in the winter that can accommodate Hercules aircraft. The shipping season is from August to October. During this time regular shipments are received from Churchill and Montreal. A well developed road system exists within the community and extends beyond the built up area to local gravel pits and lakes.

Employment in the community is predominantly government oriented. A number of local people are also employed in the fish cannery and the arts and crafts centre.

Soil in the area is reworked ground moraine with much exposed bedrock. Soil cover is variable in depth ranging from nil to depths in excess of 10 feet. Soil texture ranges from a fine to a medium granular till with organic material mixed in. Numerous eskers in the area provide excellent sources of granular construction material for roads and fills. Permafrost conditions prevail throughout the area.

SETTLEMENT INCOME

Average per capita income is estimated as \$604 per capita for the 12-month period July 1967 to June 1968. A breakdown of incomes for persons 14 years of age and over is included in Table 1 following this appendix.

Rankin Inlet is being proposed as the Northwest Territories Government District Service Center to replace the Governments facilities presently located at Churchill, Manitoba. Should this proposal be accepted, it will experience substantial growth.

EXISTING MUNICIPAL SERVICES

Power is supplied by the Northern Canada Power Commission's 4 diesel units at a cost of 12 cents per k.w.h.

Water is supplied to the settlement by pump and "summer only" pipeline from Lake Nippissar and stored in a reservoir (Williamson Lake) adjacent to the built-up area. The water is treated with chlorine and pumped to the limited serviced area by utilidor and delivered to the unserviced area by means of a Bombardier tracked vehicle and water tank.

Dry garbage and wet bag sewage is picked up on a regular basis and trucked to a dump located in a ravine about 1/2 mile from the settlement.

Sewage within the serviced area is piped, via utilidor, to septic tanks. The effluent from these tanks runs by gravity to Rankin Inlet.

A sewage lagoon has been proposed for the community utilizing one of the old mine pits. This proposal, if implemented would provide a good level of sewage treatment for the community.

One severe problem that this community shares with many other Arctic communities is the disposal of wash water from sinks in the unserviced areas. This water simply runs out of a pipe in the side of a house where it freezes in the winter, lies in pools and creates odour and health problems in the spring, summer and fall, and creates excessive thawing of the permafrost in the summer. This problem can only be solved by extending services to these areas.

PROPOSED MUNICIPAL SERVICES

Under the proposed Water and Sanitation Policy, Rankin Inlet's development would take place in accordance with the Rankin Inlet General Development Plan as prepared in 1972 by Underwood and McLellan and Associates Ltd. The recommended development of water and sanitation services will cost an additional \$1,641,000 and consists of a full piped system servicing all buildings within the community.

ARCTIC BAY

BAFFIN REGION

POPULATION

Historical			Projected	
1961	1966	1971	1976	1981
Not Available	123	269	410*	560*

*Projections based on Statistics Canada Data.

Note: These population projections are probably high.

DESCRIPTION OF COMMUNITY

Arctic Bay is located on the northern most end of Baffin Island.

The community has an airstrip adequate for Twin Otter type aircraft and uses an ice airstrip in the winter. During the shipping season (August and September) freight is delivered by sea from Montreal. The settlement has a developed road system and an acceptable road exists around the bay providing access to the community's garbage and sewage disposal area.

Employment within the community is quite restricted and consists of community utility operation, an arts and crafts shop, and some trapping in the area. Some also find employment with oil exploration firms operating in the high Arctic.

The settlement is sited mainly on a gravel bed, which provides good drainage. However, the western portion of the site is rather rough and has poor drainage.

SETTLEMENT INCOME

Average per capita income in Arctic Bay was \$440 per capita for 1969. A breakdown of incomes for persons 14 years of age and over is given in Table 1, attached to this appendix.

EXISTING MUNICIPAL SERVICE

Northern Canada Power Commission maintains four diesel units in the settlement. The cost for power is 12 cents per kwh.

Water is supplied from a lake adjacent to the settlement. In summer a plastic delivery line is used to bring the water to a central point from whence it is distributed by a tracked vehicle. In winter the tracked vehicle operates from the lake itself. All sewage is 'wet-bag'. It is collected regularly by vehicle and disposed of along with garbage about one mile from the settlement.

PROPOSED MUNICIPAL SERVICES

Under the Proposed Water and Sanitation Policy, Arctic Bay will be provided with a partial system incorporating a year-round water supply line to the settlement, vehicle water delivery and sewage/garbage collection vehicles, pump out tanks in residential buildings and a sewage disposal facility which will meet the requirements of the Northern Inland Waters Act. This will cost approximately \$740,000.

PANGNIRTUNG

BAFFIN REGION

POPULATION

<u>Historical</u>				<u>Projected</u>	
1956	1961	1966	1971	1976	1981
110	114	376	690	990*	1260*

*Based on projections of Statistics Canada Data

DESCRIPTION OF COMMUNITY

Pangnirtung is located on Cumberland Sound on the east side of Baffin Island some 200 miles north of Frobisher Bay.

The community is served by aircraft from Frobisher Bay on a year round basis and by ship from Montreal during the short summer shipping season.

Employment opportunities within Pangnirtung are better than in most Arctic communities. There is an active Co-Op, knitwear factory and carving industry. Also, the development of the new National Park nearby will undoubtedly result in additional job opportunities for the local people.

The settlement is located on a gently sloping area of glacial and deltaic deposits composed mainly of sandy gravel with inclusions of silt lenses, cobbles and boulders. This is within the zone of continuous permafrost.

Pangnirtung is the second settlement in the Eastern Arctic to achieve Hamlet status.

SETTLEMENT INCOME

Average per capita income in Pangnirtung during 1969 was \$505 per capita. A breakdown of income for persons 14 years of age and over is given in Table 1 attached to this appendix.

EXISTING MUNICIPAL SERVICES

Water supply is the major servicing problem in Pangnirtung. During the summer the Duval River, located 1/2 mile from the settlement, serves as a good source. However, in the winter the river freezes to the bottom and the residents then must either: (a) chip ice from this river or; (b) after the river freezes, cross over and try to obtain water from some intermittent springs on the far bank; (c) wait until the fjord freezes over and haul water from a large river located on the far side.

Water (or ice) is picked up by truck from one of the four sources noted above and distributed to the houses within the community.

Dry garbage and wet bag sewage are collected on a regular basis by truck and dumped beside the Duval River. This procedure poses a health hazard to the community.

PROPOSED MUNICIPAL SERVICES

Under this Proposed Water and Sanitation Policy, Pagnirtung would receive a partial system. Water supply will be a major engineering problem. The estimated cost of a partial system including resolving the water supply problem, is approximately 1.8 million dollars.

FROBISHER BAY

BAFFIN REGION

POPULATION

Historical				Projected	
1956	1961	1966	1971	1976	1981
351	512	1630	2014	2600	3000

*Based on projections of Statistics Canada Data

DESCRIPTION OF COMMUNITY

The Hamlet of Frobisher Bay is located on the south-east end of Baffin Island at the head of Frobisher Bay.

The community has a 9000 foot asphalt runway. It is served by a variety of aircraft and has a daily scheduled airline flight to Montreal. During the shipping season Frobisher Bay is served by sea from Montreal.

Frobisher Bay offers a variety of employment opportunities. As the administrative centre for the Eastern Arctic there are many government and government agency employees. There are, as well, several private commercial establishments that provide a source of employment for the residents.

The Hamlet is in typical Canadian Shield country with exposed bedrock and poorly drained depressions.

HAMLET INCOME

Average per capita income for Frobisher Bay for 1969 was \$550. A breakdown of income for persons over 14 years of age is given in Table 1 attached to this report.

EXISTING MUNICIPAL SERVICES

Power is supplied to the Hamlet by the Northern Canada Power Commission. On site diesel powered generators are used. Power costs are approximately 7¢ per kwh.

The water source for this community is Lake Geraldine located 1/2 mile from the Hamlet. Water is piped by gravity to the treatment plant where it is processed and pumped through the utilidor to serviced areas. Unserviced areas have water trucked to each building.

Sewage disposal, in serviced areas, is by means of a utilidor system with the raw sewage dumped directly into Frobisher Bay. In unserviced areas, wet bag sewage is collected by truck and is disposed of at a dump located on the shore of the Bay. This creates an undesirable situation from a public health and environmental point of view.

Dry garbage is picked up once a week by truck and hauled to a dump some 3 miles from the Hamlet and 1000 feet away from the satellite community of Apex. The dump is well managed but suffers from a lack of material with which to cover the dumped refuse.

The annual cost of operation of the vehicle water, sewage and garbage system which serves a portion of the community is in excess of \$650,000.

PROPOSED MUNICIPAL SERVICES

Under the Proposed Water and Sanitation Policy the community utilidor services will be upgraded and expanded in accordance with the 1972 Planning and Engineering Report as prepared by Reid, Crowther & Partners Ltd. Consulting Engineers and Planners. The complete system thus proposed is estimated to cost approximately 6.3 million dollars.

TABLE 1
APPENDIX B

INCOME FROM ALL SOURCES
SAMPLE COMMUNITIES IN N.W.T.

TAKEN FROM N.W.T. MANPOWER SURVEY, PREPARED BY ECONOMIC STAFF GROUP,
DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT, OTTAWA, DECEMBER 1972

Annual Income	Baffin Region ¹			Keewatin Region ²		Inuvik Region ³		Ft. Smith Region ³
	Arctic Bay	Frobisher Bay	Pangnirtung	Eskimo Point	Rankin Inlet	Inuvik	Fort McPherson	Fort Resolution
No Income	29	96	61	31	28	355	404	460
0	27	86	66	59	25	8	16	3
\$200	7	24	8	18	17	6	3	2
\$300	6	10	10	21	16	6	3	5
\$400	3	8	11	16	9	6	1	1
\$500	1	12	2	11	8	8	0	4
\$600	1	4	3	11	8	8	2	2
\$700	3	10	3	8	8	6	3	2
\$800	3	5	4	6	5	5	5	3
\$900	3	5	9	26	3	2	6	2
\$1000	24	55	70	41	39	49	66	29
\$2000	11	29	27	8	23	26	25	11
\$3000	2	26	18	5	14	36	12	3
\$4000	2	41	5	4	4	43	4	1
\$5000	1	35	5	3	3	27	5	0
\$6000	1	59	4	4	14	257	22	55
\$10000	0	1*	0	0	1	118	5	15
Plus								
Unknown	2	22	4					
TOTAL	126	528	310	274	255	1466	582	598

1. For Eskimos 14 yrs plus (Jan. 1/69 to Dec. 31/69)
 2. For Eskimos 14 yrs plus (July 67 to June 68)
 3. For all residents over 14 yrs. (Oct. 1/69 to Sept. 30/70)

*Survey data for Frobisher Bay in 10,000 plus range appears to be in error. Possibly some of 'Unknown' category are in this range.

APPENDIX C

Recommended Minimum Water & Sanitation
Systems for N.W.T. Communities

APPENDIX C

RECOMMENDED MINIMUM WATER AND SANITATION SYSTEMS

The main basis of establishing a minimum level of water and sanitation service was by analysis of population. However, other factors have considerable bearing. These involve community characteristics such as the cost of the present and any other proposed system, physical characteristics of the site and general engineering feasibility.

Population histories for each of the communities in the Northwest Territories have been developed from census data taken every 5 years by the Federal Government. Population projections were arrived at by two methods:

1. Where published reports indicate that a community has been studied in detail and a population projection has been made based on either natural increases or artificially stimulated growth (where this growth is judged to be a certainty), the projections so developed have been used.
2. Where no studies exist or where studies exist that were either 'casually' done or whose existence is not known to the authors of this policy, an examination of historical growth of each community was undertaken and growth estimates were based on this history modified where necessary, by knowledge of imminent growth stimuli that are certain.

The community/population forecast for 1976 and 1981 is shown in Table 1 of this Appendix.

The following levels of water and sanitation service were established in accordance with clauses 3.3, 3.4, 3.5 and 3.6 of the Proposed Policy.

1. No system provided at the present time (generally less than 50 residents).

Fort Smith Region

Enterprise	Jean Marie River
Bathurst Inlet	Trout Lake
Kakisa Lake	Snare Lake
	Rae Lakes

2. Tractor and wagon water and sanitation service (generally 51 to 150 residents).

Fort Smith Region

Detah
Nahanni Butte

Baffin Region

Grise Fiord
Port Burwell

Inuvik Region

Colville Lake	Paulatuk
---------------	----------

3. Partial system (generally 151 to 700 residents).

Fort Smith Region

Fort Liard
Gjoa Haven
Holman Island
Lac La Martre
Pelly Bay
Spence Bay
Snowdrift
Wrigley
Fort Resolution
Fort Providence
Coppermine

Baffin Region

Arctic Bay
Broughton Island
Clyde River
Cape Dorset
Hall Beach
Igloolik
Lake Harbour
Pond Inlet
Pangnirtung

Inuvik Region

Fort Franklin
Fort Good Hope
Fort Norman
Tuktoyaktuk
Aklavik
Sachs Harbour
Arctic Red River

Keewatin Region

Sanikiluaq Harbour
Chesterfield Inlet
Coral Harbour
Eskimo Point
Repulse Bay
Whale Cove
Baker Lake

4. Complete system (generally over 700 residents).

Fort Smith Region

Cambridge Bay
Fort Simpson
Fort Smith
Hay River
Pine Point
Rae Edzo
Yellowknife

Baffin Region

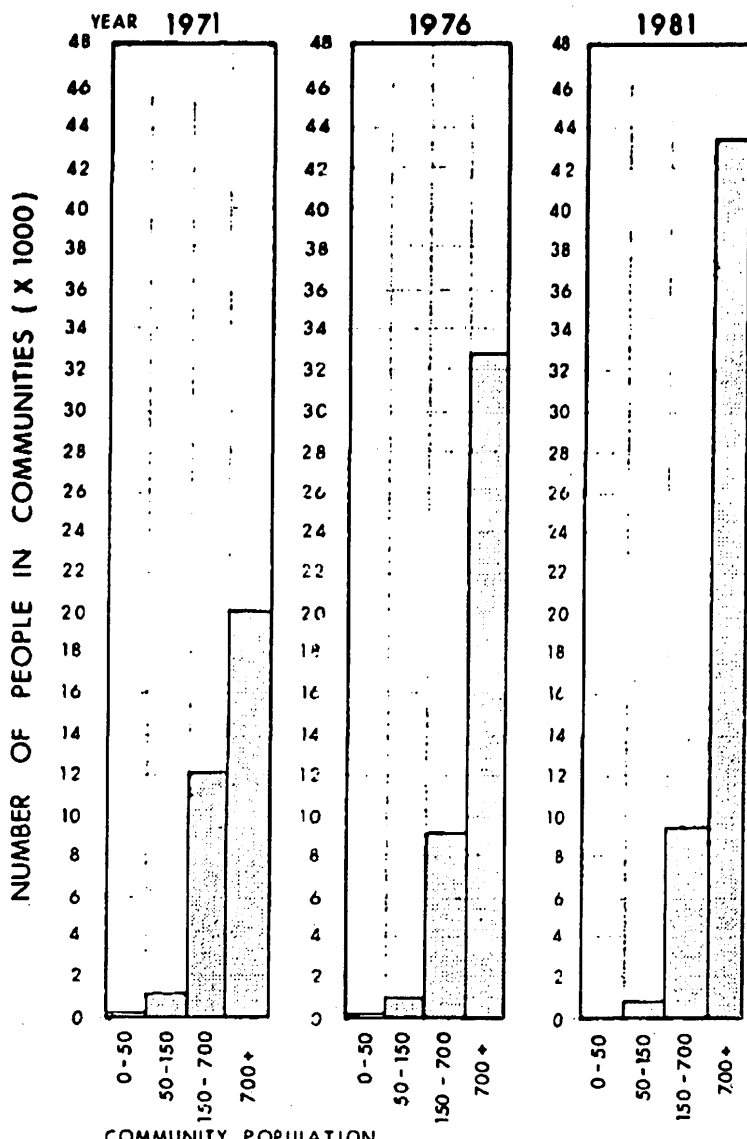
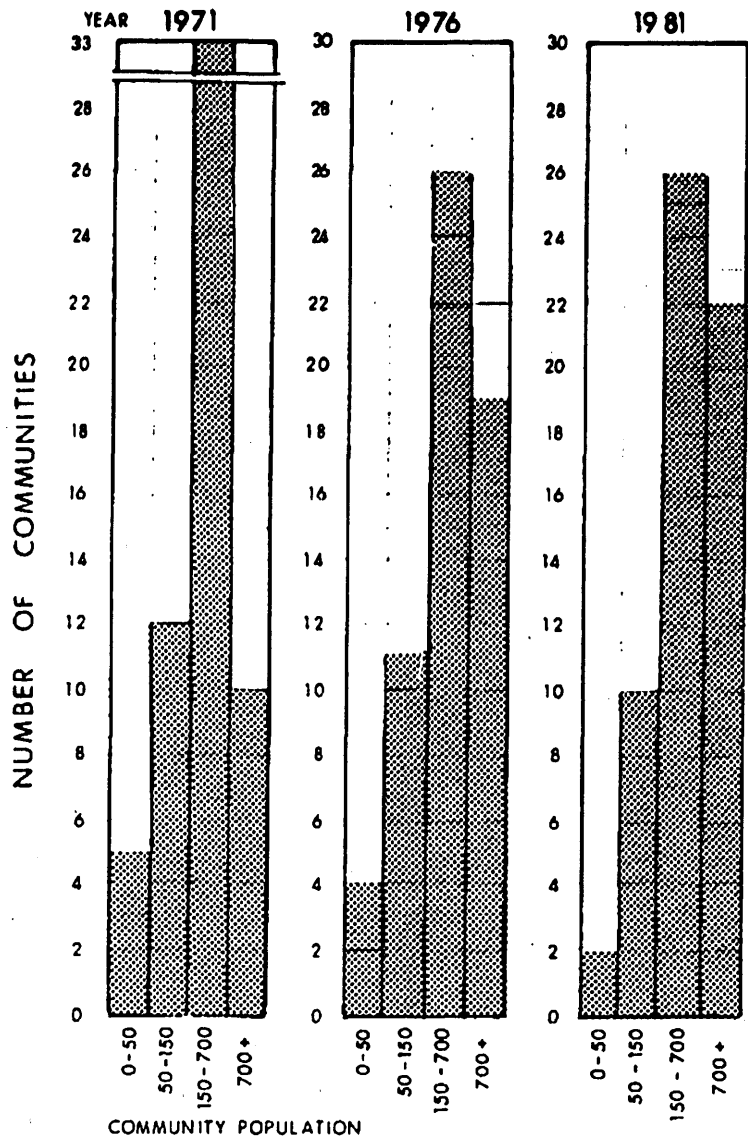
Frobisher Bay
Resolute Bay

Inuvik Region

Inuvik
Fort McPherson
Norman Wells

Keewatin Region

Rankin Inlet



COMMUNITY/POPULATION FORECAST 1971 - 1981

TABLE 1
APPENDIX C

APPENDIX D

Proposed Construction Schedules

TABLE 1

APPENDIX D
SUMMARY SHEET

PROPOSED SCHEDULING PARTIAL AND COMPLETE SYSTEMS N.W.T.

PROJECT STARTS

YEAR	SETTLEMENT
1973	Cape Dorset Pangnirtung Eskimo Point Baker Lake Spence Bay Probisher Bay* Rankin Inlet* Rae Edzo* Norman Wells*
1974	Igloolik Tuktoyaktuk Fort Good Hope Fort Norman Akalavik Fort Resolution Fort Providence Coppermine Fort McPherson * Cambridge Bay* Resolute Bay*
1975	Pond Inlet Coral Harbour Fort Franklin

YEAR	SETTLEMENT
1976	Nil
1977	Arctic Bay Repulse Bay Chesterfield Inlet Fort Liard Holman Island
1978	Whale Cove Sanikiluaq Harbour Arctic Red River Sachs Harbour Pelly Bay Wrigley Snowdrift Gjoa Haven
1979	Nil
1980	Broughton Island Clyde River
1981	Hall Beach Lake Harbour Lac La Martre

* Complete Systems.

TABLE 2

APPENDIX D
SUMMARY SHEET

PROPOSED SCHEDULING PARTIAL AND COMPLETE SYSTEMS N.W.T.

PROJECT COMPLETIONS

YEAR	SETTLEMENT	YEAR	SETTLEMENT
1976	Tuktoyaktuk Spence Bay	1981	Snowdrift Fort Liard Holman Island Gjoa Haven Arctic Bay Sanikiluaq Harbour
1977	Fort Resolution Baker Lake	1982	Repulse Bay
1978	Resolute Bay* Rae Edzo* Fort Franklin Fort Norman Akalavik Fort Providence Coppermine Eskimo Point Fort McPherson*	1983	Pelly Bay Lac La Martre Broughton Island Hall Beach Lake Harbour Clyde River Cambridge Bay* Frobisher Bay*
1979	Fort Good Hope Cape Dorset Norman Wells* Rankin Inlet*	1984	Igloodik
1980	Arctic Red River Sachs Harbour Wrigley Pond Inlet Pangnirtung Chesterfield Inlet Coral Harbour Whale Cove		

* Complete Systems.

TABLE 3

APPENDIX D

PROPOSED SCHEDULING PARTIAL AND COMPLETE SYSTEMS

SETTLEMENT	YEAR
<u>INUVIK REGION</u>	
Tuktoyaktuk	1974 to 1976
Fort Good Hope	1974 to 1979
Fort Franklin	1975 to 1978
Fort Norman	1974 to 1978
Arctic Red River	1978 to 1980
Sachs Harbour	1978 to 1980
Aklavik	1974 to 1978
Norman Wells *	1973 to 1979
<u>FORT SMITH REGION</u>	
Spence Bay	1973 to 1976
Pelly Bay	1978 to 1983
Lac La Martre	1981 to 1983
Wrigley	1978 to 1980
Snowdrift	1978 to 1981
Fort Resolution	1974 to 1977
Fort Providence	1974 to 1978
Fort Liard	1977 to 1981
Holman Island	1977 to 1981
Gjoa Haven	1978 to 1981
Coppermine	1974 to 1978
Rae Edzo *	1973 to 1977
Cambridge Bay *	1974 to 1983
<u>BAFFIN REGION</u>	
Cape Dorset	1973 to 1979
Broughton Island	1980 to 1983
Arctic Bay	1977 to 1981
Hall Beach	1981 to 1983
Lake Harbour	1981 to 1983
Pond Inlet	1975 to 1980
Clyde River	1980 to 1983
Pangnirtung	1973 to 1980
Igloolik	1974 to 1984
Frobisher Bay *	1973 to 1983
Resolute Bay *	1974 to 1977

Table 3, contd.

SETTLEMENT	YEAR
<u>KEEWATIN REGION</u>	
Chesterfield Inlet	1977 to 1980
Sanikiluaq Harbour	1978 to 1981
Coral Harbour	1975 to 1980
Eskimo Point	1973 to 1978
Repulse Bay	1977 to 1982
Whale Cove	1978 to 1980
Baker Lake	1973 to 1977
Rankin Inlet *	1973 to 1979

* Complete Systems

APPENDIX E

Estimate of Costs of Complete and
Partial Water and Sanitation Services

APPENDIX E

ESTIMATED COSTS OF COMPLETE AND PARTIAL PIPED SYSTEMS
FOR COMMUNITIES IN THE NORTHWEST TERRITORIES

The cost figures in Appendix E are based on representative estimates reported by Consulting Engineers for several communities in the Eastern and in the Western Arctic, and on estimates made by the Town Planning and Lands and Development Divisions of the Department of Local Government. The following explanations indicate how these costs were calculated.

The estimates of utilidor costs are based on an actual total price paid in Inuvik in 1972, of \$115. per lineal foot. This price applies to a utilidor containing one water and one sewer line. Corresponding prices for a single 6-inch diameter water supply line and a single 8-inch diameter sewer outfall line were \$49. and \$61. respectively. These 1972 prices were adjusted by a calculated inflation rate, applicable to utilidors, of 6.5% to arrive at 1973 prices which are shown in Appendix C. For Inuvik these prices are \$122.50 for water and sewer utilidor, \$52.20 for a water supply line, and \$65.00 for a sewer outfall line.

The rate of inflation of 6.5% per year on utilidor costs is based on projection of materials cost indices and wage and salary surveys for the last 10 years. Available data indicates that during this period utilidor materials have risen at an average rate of 3.7% per year, engineering costs at 6.0% per year and labour costs applicable to utilidors at 8.2% per year. The overall rate of 6.5% was arrived at by considering the proportions each item contributes to the total cost, which are: materials 33%, labour 50%, engineering 17%. These proportions are actual figures recorded on one recent utilidor extension project in Inuvik.

Having arrived at 1973 prices for Inuvik, estimates were made for other communities, by taking into account variations in transportation rates. Transportation costs influence material costs to a greater extent and engineering and labour costs to a lesser extent. It has been estimated that in Inuvik on utilidor construction 12% of the total cost (including materials, labour and engineering) is attributable to transportation. In other communities this percentage is either greater or smaller depending on the transportation costs. For example the freight rate to Cambridge Bay is approximately twice that to Inuvik, and in this case the cost attributable to transportation would be about twice as much. Per foot of utilidor the cost attributable to transportation in Inuvik is \$14.70 (12% of \$122.50) and at Cambridge Bay it is calculated to be about double (\$30.50) giving the 1973 utilidor cost of \$138.30 per foot. Therefore, the case of utilidors built in Cambridge Bay, transportation accounts for about 22% of the total cost. In a similar manner the various utilidor costs were calculated for all communities covered by these estimates.

The prices for provision of plumbing in individual houses are based on adjusted estimates made by consulting engineers for Cape Dorset and Fort McPherson. The actual estimated price at Cape Dorset was reduced by about 10% to account for the fact that the consultants estimates allowed for work to be done only at very few houses at one time. Estimates made for Fort McPherson were for already partly installed systems and they had to be substantially increased to arrive at all-inclusive prices. Calculations for other communities consider inflation and transportation factors in a similar proportion as those applied to utilidors.

Allowances for water treatment plants and for sewage lagoons have mainly been made on the basis of information provided by consulting engineers engaged in this type of work. In this case, also, the basic prices have been adjusted to reflect difficulties of access and variation of transportation costs.

In estimating the cost of a partial system we considered that a water supply line to a central treatment plant, and sewage outfall line to a disposal compatible with existing legislation would comprise a partial system. This system would be planned to be compatible with a complete system should expansion be necessary in the future.

Sewage treatment plants have been given consideration but in most instances they were not considered as the most suitable means of sewage disposal. The high capital costs and high operation and maintenance cost are the main reasons for rejection of full treatment plants. It is considered that with few exceptions it will be possible to construct and operate sewage lagoons which will meet the Federal Government objectives and the stipulations of the Northern Inland Waters Act.

It should be noted that the cost estimates are based on prices calculated in 1973 dollars. This fact is very pertinent when calculating funds to be expended during future years. From statistical data used it is estimated that a rate of inflation on utilidor costs is currently 6.5%. Other annual estimated rates of inflation on particular cost components of construction and operation of water and sewer systems, are as follows: purchase of vehicles 1.8%, materials 3.7%, engineering 6.0% and labour 8.2%. On the basis of these rates multiplying factors have been calculated which allow estimating of costs for any future year on the basis of 1973 costs. For example to estimate the cost of utilidor in Inuvik in 1979 the price of \$122.50 should be multiplied by 1.459, giving a 1979 price of \$177.50 per lineal foot, and in Cambridge Bay this cost would be \$202.00 per lineal foot. The multiplying factors should be used with caution when estimating future expenditures, since they are based on past statistical rates which might undergo considerable changes in the future.

TABLE 1
APPENDIX E

COST INFLATION RATES
(Based on Statistics & Salary Surveys Assuming 1973 = 1.000)

	Vehicles Capital Costs	Labour	Engineering	Materials	Utilidor (Complete)
1973	1.000	1.000	1.000	1.000	1.000
1974	1.018	1.082	1.060	1.037	1.065
1975	1.036	1.171	1.124	1.075	1.134
1976	1.054	1.267	1.191	1.115	1.208
1977	1.073	1.371	1.262	1.156	1.286
1978	1.093	1.483	1.338	1.199	1.370
1979	1.113	1.605	1.418	1.243	1.459
1980	1.133	1.737	1.503	1.289	1.554
1981	1.153	1.879	1.593	1.337	1.655
1982	1.174	2.033	1.688	1.386	1.763
1983	1.195	2.200	1.789	1.437	1.877
Annual Increase	1.8%	8.2%	6.0%	3.7%	6.5%
Expected Increase in 10 Years	20%	120%	80%	45%	85%

TABLE 2
APPENDIX E

SUMMARY
TOTAL COST PROPOSED SYSTEMS
(1973 Dollars)

	Fort Smith	INUVIK	KEEWATIN	BAFFIN	TOTALS
Cost of Complete Systems in Settlements and Hamlets	4,580,000	2,500,000	1,641,000	7,410,000	16,531,000
Cost of Partial Systems in Settlements and Hamlets	8,670,000	5,020,000	8,170,000	12,180,000	34,040,000
Total Cost of Proposed Systems	13,250,000	7,920,000	9,811,000	19,590,000	50,571,000
Estimated Cost of Forced Growth Expansion in Villages, Towns and Cities	5-YEAR PROGRAM ONLY				10,809,000
Total Cost of Complete and Partial Systems in all Communities					61,380,000

TABLE 3
APPENDIX E

COST OF PIPED SYSTEMS IN SETTLEMENTS PROPOSED
TO RECEIVE COMPLETE SYSTEMS *

Settlement	Cost of Complete System - Piped or Utilidor (1973 Dollars)
<u>Inuvik Region</u>	
Norman Wells	1,500,000
Fort McPherson	<u>1,400,000</u>
Total in Region	2,900,000
<u>Fort Smith Region</u>	
Cambridge Bay	3,830,000
Rae-Edzo	<u>750,000</u>
Total in Region	4,580,000
<u>Baffin Region</u>	
Frobisher Bay	6,260,000
Resolute Bay	<u>1,150,000</u>
Total in Region	7,410,000
<u>Keewatin Region</u>	
Rankin Inlet	<u>1,641,000</u>
Total in Region	1,641,000

*This table does not include tax-base communities

TABLE 4
APPENDIX E
COST OF PARTIAL SYSTEMS FOR SETTLEMENTS IN WHICH
PROPOSED PARTIAL SYSTEMS WILL BE INSTALLED

Settlement	Cost of Complete System if Required (Piped or Utilidor) (1973 Dollars)	Cost of Proposed Partial System (1973 Dollars)
<u>Inuvik Region</u>		
Arctic Red River	1,082,000	420,000
Aklavik	2,000,000	750,000
Franklin	1,641,000	690,000
Good Hope	1,946,000	880,000
Norman	1,828,000	750,000
Sachs Harbour	1,713,000	730,000
Tuktoyaktuk	<u>2,380,000</u>	<u>800,000</u>
Total in Region	12,590,000	5,020,000
<u>Fort Smith Region</u>		
Coppermine	2,937,000	1,290,000
Gjoa Haven	1,677,000	830,000
Holman Island	1,741,000	1,020,000
Lac La Martre	683,000	350,000
Liard	1,405,000	530,000
Pelly Bay	2,061,000	1,330,000
Providence	1,655,000	980,000
Resolution	2,214,000	820,000
Spence Bay	1,306,000	500,000

Contd.

Table 4, contd.

Settlement	Cost of Complete System if Required (Piped or Utilidor) (1973 Dollars)	Cost of Proposed Partial System (1973 Dollars)
Snowdrift	1,141,000	580,000
Wrigley	<u>963,000</u>	<u>440,000</u>
Total in Region	17,783,000	8,670,000
<u>Baffin Region</u>		
Arctic Bay	1,751,000	740,000
Broughton Island	2,166,000	910,000
Cape Dorset	3,806,000	1,800,000
Clyde River	1,345,000	870,000
Hall Beach	1,376,000	700,000
Igloolik	5,713,000	3,450,000
Lake Harbour	1,266,000	770,000
Pond Inlet	2,621,000	1,150,000
Pangnirtung	<u>3,631,000</u>	<u>1,790,000</u>
Total in Region	23,675,000	12,180,000
<u>Keewatin Region</u>		
Sanikiluaq	1,319,000	840,000
Chesterfield Inlet	1,329,000	640,000
Coral Harbour	2,372,000	1,370,000

Contd.

Table 4, contd.

Settlement	Cost of Complete System if Required (Piped or Utilidor) (1973 Dollars)	Cost of Proposed Partial System (1973 Dollars)
Eskimo Point	3,016,100	1,480,000
Baker Lake	3,000,000	1,900,000
Repulse Bay	1,812,000	1,120,000
Whale Cove	<u>1,767,000</u>	<u>820,000</u>
Total in Region	14,615,000	8,170,000

APPENDIX F

Forecast of; Capital, Operation and
Maintenance Expenditures, Revenue

APPENDIX F

FORECAST OF; CAPITAL, OPERATION AND
MAINTENANCE EXPENDITURES, REVENUE

The method of arriving at capital costs of the system proposed under this policy (see Appendix C) is described in Appendix E. The proposed construction schedule is given in Appendix D. The data from these appendices is summarized on the attached tables for each community on a yearly basis. Capital and operation and maintenance costs (in 1973 dollars) are forecast.

Operation and maintenance figures were established using historical data provided by the Territorial Department of Public Works for water and sanitation vehicles and systems. Where partial or completely trucked systems existed, the current labour contract cost was established.

For water and sanitation vehicles the operation and maintenance cost is 35% of the capital replacement value of the vehicle. For communities utilizing partial or complete systems the operation and maintenance is 4% of the capital replacement value of the particular system.

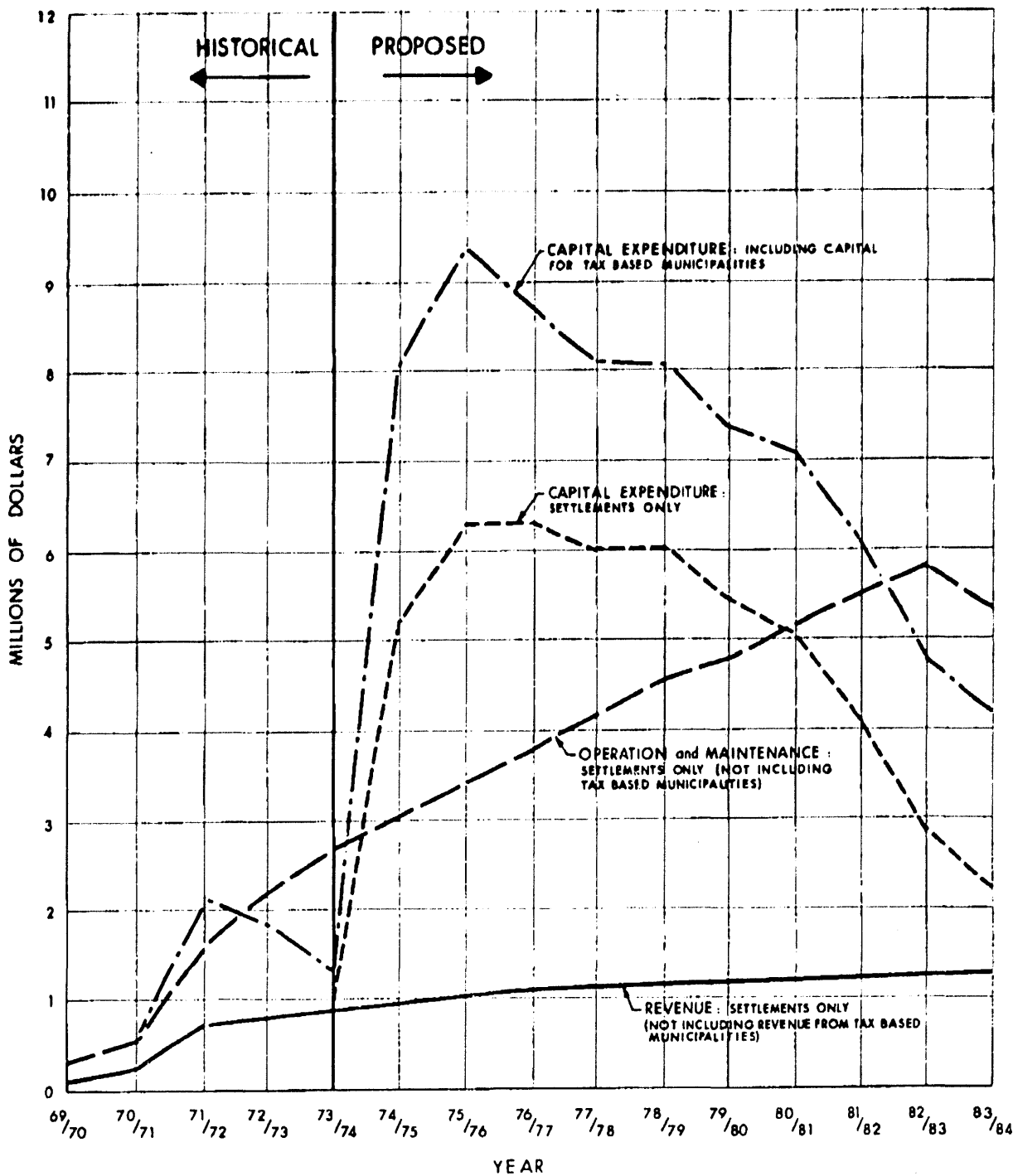
Each community was assessed on the basis of the present capital replacement value of its water and sanitation physical plant. The appropriate operation and maintenance factors were applied and added to the labour contract value to arrive at the 1973-74 operation and maintenance figures as shown. This base figure was then projected on the following basis:

1. Where labour contracts were involved, they were increased by a percentage to account for the anticipated population growth which was established using techniques outlined in Appendix C.
2. Where a capital expenditure was proposed in any given year the operation and maintenance cost was increased by 4% of the value of the proposed capital expenditure. This was to account for the additional expense involved in operating and maintaining the newly constructed system.
3. Where the newly constructed system substantially reduced the labour contract or vehicle operation and maintenance (i.e., a piped system replacing a truck haul system), the anticipated net O & M saving was deducted from the contract or vehicle related expense.

Revenue as plotted on the attached graph was calculated on the basis of population and water consumption projections for each community from the years 1976 to 1981. Communities were divided into the level of services as outlined in Appendix C. Using projected populations, the number of residential units and anticipated consumption were established. The consumption expected from each of the commercial establishments paying the domestic rate was also projected. Economic rates as established by the Territorial Government Regional Superintendents and the rates and quotas as established by this policy were then applied to obtain the total revenue as shown on Figure 1 of this Appendix.

An analysis of the users of municipal services within communities of the Northwest Territories with particular emphasis on non-tax based communities reveals that approximately 70% of the demand can be attributed to Federally funded residences and facilities. The majority of the demand is attributed to the Federal Northern Rental Housing Program. However, federal agencies such as the Royal Canadian Mounted Police, Ministry of Transport and National Health and Welfare contribute significantly to the above percentage. If the Northwest Territories funded residences and buildings are grouped with the Federal facilities, the percentage rises to approximately 90%.

As indicated in the introduction to this policy, the Federal Government intends to demonstrate leadership in environmental protection by ensuring that their facilities meet current pollution control legislation. Based on the high percentage of involvement of the Federal Government in the Northwest Territories, it is apparent that a considerable portion of the proposed Water and Sanitation Program would compliment the Federal Governments efforts to upgrade its own facilities. A significant portion of the program funding outlined in this appendix will in fact be expended to improve water and sanitation for Federally owned buildings and installations.



FORECAST OF CAPITAL, OPERATION and MAINTENANCE AND REVENUE

SUMMARY OF COST BY REGIONS
 (1973 DOLLARS)

	1973-1974		1974-1975		1975-1976		1976-1977		1977-1978		1978-1979		1979-1980		1980-1981		1981-1982		1982-1983		1983-1984		TOTALS		
	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	
BAFFIN	130,000	1,321,000	1,500,000	1,434,000	2,000,000	1,567,000	2,000,000	1,708,000	2,000,000	1,808,000	2,000,000	1,950,000	2,000,000	2,099,000	2,000,000	2,253,000	2,000,000	2,403,000	2,000,000	2,559,000	1,960,000	2,067,000	19,590,000	21,169,000	
KEENUN	616,000	620,000	1,295,000	691,000	1,250,000	778,000	1,300,000	868,000	1,000,000	962,000	950,000	1,053,000	1,240,000	1,061,000	1,500,000	1,160,000	660,000	1,228,000		1,273,000		1,318,000	79,811,000	11,012,000	
PORT SMITH	260,000	533,000	1,100,000	601,000	1,540,000	688,000	1,500,000	777,000	1,500,000	834,000	1,600,000	922,000	1,600,000	1,014,000	1,600,000	1,112,000	1,470,000	1,208,000	850,000	1,291,000	280,000	1,237,000	13,250,000	10,217,000	
IMUVIK		256,400	1,300,000	318,600	1,500,000	390,800	1,500,000	479,000	1,500,000	559,200	1,500,000	598,400	670,000	675,600		642,800		661,000		678,200		696,400	7,920,000	5,904,400	
TOTAL-	1,006,000	2,730,400	5,195,000	3,044,600	6,290,000*	3,423,800	6,300,000	3,832,000	6,000,000	4,163,200	6,050,000	4,521,400	5,460,000	4,799,600	5,100,000	5,167,800	4,080,000	5,500,000	2,850,000	5,801,200	2,240,000	5,318,400	50,571,000	48,302,400	
MUNICIPAL CAPITAL EXPANSION	340,000		2,864,000		3,091,000		2,302,000		2,100,000		2,000,000*		2,000,000*		2,000,000*		2,000,000*		2,000,000*		2,000,000*		2,000,000*	22,697,000	
GRANDE TOTAL	1,346,000	2,730,400	8,059,000	3,044,600	9,381,000	3,423,800	8,602,000	3,832,000	8,100,000	4,163,200	8,050,000	4,521,400	7,460,000	4,799,600	7,100,000	5,167,800	6,080,000	5,500,000	4,850,000	5,801,200	4,240,000	5,318,400	73,268,000	48,302,400	
YEARLY TOTAL EXPENDITURE	4,076,400		11,103,600		12,804,800		12,434,000		12,263,200		12,571,400		12,259,600		12,267,800		11,580,000		10,651,200		9,558,400		121,570,400		
ANTICIPATED REVENUE	900,000		950,000		1,000,000		1,100,000		1,150,000		1,175,000		1,185,000		1,200,000		1,225,000		1,250,000		1,275,000		12,410,000		
NET EXPENDITURE	3,176,400		10,153,600		11,804,800		11,334,000		11,113,200		11,396,400		11,074,600		11,067,800		10,355,000		9,401,200		8,283,400		109,160,400		

* Capital expenditures projections for period 1978-79 to 1983-84 not available from municipalities
 Probable requirements are \$2,000,000 per year.

TABLE I, APPENDIX F

TABLE 2
 APPENDIX F
 CAPITAL COST FOR FORCED GROWTH EXPANSION
 TAX-BASED MUNICIPALITIES (1973 DOLLARS) *

<u>Municipality</u>	<u>Year</u>				
	1973-74 Capital	1974-75 Capital	1975-76 Capital	1976-77 Capital	1977-78 Capital
Yellowknife		1,000,000	1,000,000		500,000
Hay River		450,000	351,000	1,125,000	500,000
Fort Smith		40,000			200,000
Inuvik	80,000	1,034,000	1,370,000	977,000	500,000
Fort Simpson	200,000	275,000	350,000	200,000	200,000
Pine Point	<u>60,000</u>	<u>65,000</u>	<u>20,000</u>		<u>200,000</u>
TOTAL	<u>340,000</u>	<u>2,874,000</u>	<u>3,091,000</u>	<u>2,302,000</u>	<u>2,100,000</u>

* 5-year program only projections 1978-1984 not available from Municipalities. Best estimates indicate total capital required 1978 to 1982 will be approximately \$2 million per year.

TABLE 2

APPENDIX F
 CAPITAL COST FOR FORCED GROWTH EXPANSION
 TAX-BASED MUNICIPALITIES (1973 DOLLARS) *

Municipality	Year				
	1973-74 Capital	1974-75 Capital	1975-76 Capital	1976-77 Capital	1977-78 Capital
Yellowknife		1,000,000	1,000,000		500,000
Hay River		450,000	351,000	1,125,000	500,000
Fort Smith		40,000			200,000
Inuvik	80,000	1,034,000	1,370,000	977,000	500,000
Fort Simpson	200,000	275,000	350,000	200,000	200,000
Pine Point	<u>60,000</u>	<u>65,000</u>	<u>20,000</u>	<u> </u>	<u>200,000</u>
TOTAL	<u>340,000</u>	<u>2,874,000</u>	<u>3,091,000</u>	<u>2,302,000</u>	<u>2,100,000</u>

* 5-year program only projections 1978-1984 not available from Municipalities. Best estimates indicate total capital required 1978 to 1982 will be approximately \$2 million per year.

FORECAST OF EXPENDITURES
(1973 DOLLARS)
BAFFIN REGION

	1973 - 1974		1974 - 1975		1975 - 1976		1976 - 1977		1977 - 1978		1978 - 1979		1979 - 1980		1980 - 1981		1981 - 1982		1982 - 1983		1983 - 1984	
	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M
Cape Dorset	110,000	149,000	150,000	161,000	250,000	177,000	250,000	194,000	350,000	216,000	350,000	231,000	340,000	253,000		255,000		256,000		257,000		258,000
Broughton Is.		31,000		32,000		33,000		34,000		35,000		36,000		37,000	130,000	44,000	250,000	56,000	300,000	70,000	230,000	82,000
Arctic Bay		31,000		32,000		33,000		34,000	100,000	39,000	150,000	47,000	160,000	55,000	250,000	67,000	80,000	73,000		76,000		79,000
Hall Beach		30,000		31,000		32,000		33,000		34,000		35,000		35,000		36,000	70,000	40,000	140,000	47,000	490,000	66,000
Resolute Bay		40,000	500,000	61,000	350,000	77,000	300,000	92,000		53,000		54,000		55,000		56,000		57,000		58,000		59,000
Lake Harbour		32,000		33,000		34,000		35,000		36,000		37,000		38,000		39,000	150,000	47,000	200,000	57,000	420,000	76,000
Pond Inlet		70,000		75,000	150,000	82,000	200,000	93,000	200,000	101,000	200,000	113,000	200,000	126,000	200,000	139,000		140,000		141,000		142,000
Clyde River		40,000		42,000		44,000		46,000		48,000		50,000		52,000	100,000	58,000	350,000	74,000	350,000	91,000	70,000	97,000
Pangnirtung	20,000	68,000	150,000	76,000	250,000	89,000	250,000	102,000	300,000	118,000	300,000	135,000	300,000	148,000	220,000	163,000		165,000		167,000		169,000
Iqloolik		101,000	100,000	109,000	250,000	123,000	250,000	138,000	300,000	155,000	300,000	173,000	300,000	192,000	400,000	216,000	400,000	240,000	400,000	266,000	750,000	298,000
Grise Fjord		23,000		24,000		25,000		26,000		27,000		28,000		29,000		30,000		31,000		32,000		33,000
Fort Burwell		24,000		25,000		26,000		27,000		28,000		29,000		30,000		31,000		32,000		33,000		34,000
Frobisher Bay		682,000	600,000	733,000	750,000	792,000	750,000	854,000	750,000	918,000	700,000	982,000	700,000	1,049,000	700,000	1,119,000	700,000	1,192,000	610,000	1,264,000		674,000
TOTAL	130,000	1,321,000	1,500,000	1,634,000	2,000,000	1,567,000	2,000,000	1,708,000	2,000,000	1,808,000	2,000,000	1,950,000	2,000,000	2,099,000	2,000,000	2,253,000	2,000,000	2,403,000	2,000,000	2,559,000	1,960,000	2,067,000

TABLE 3, APPENDIX F

FORECAST OF EXPENDITURES
(1973 DOLLARS)
KEEWATIN REGION

	1973 - 1974		1974 - 1975		1975 - 1976		1976 - 1977		1977 - 1978		1978 - 1979		1979 - 1980		1980 - 1981		1981 - 1982		1982 - 1983		1983 - 1984	
	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M
Chesterfield Inlet		55,000		57,000		59,000		61,000	100,000	67,000	200,000	73,000	250,000	91,000	90,000	98,000		102,000		106,000		110,000
Sanikiluaq		46,000		48,000		50,000		52,000		54,000	90,000	60,000	150,000	68,000	300,000	83,000	300,000	98,000		102,000		106,000
Coral Harbour		67,000		69,000	150,000	78,000	150,000	87,000	150,000	97,000	250,000	111,000	300,000	127,000	370,000	147,000		153,000		159,000		165,000
Esimo Point	20,000	137,000	300,000	154,000	300,000	172,000	350,000	193,000	350,000	215,000	160,000	230,000		239,000		249,000		259,000		269,000		279,000
Rankin Inlet	446,000	76,000	595,000	99,000	300,000	125,000	300,000	150,000		176,000		198,000		123,000		124,000		125,000		126,000		127,000
Repulse Bay		52,000		54,000		56,000		58,000	50,000	62,000	100,000	68,000	240,000	80,000	370,000	98,000	360,000	116,000		121,000		126,000
Whale Cove		52,000		54,000		56,000		58,000		60,000	150,000	68,000	300,000	83,000	370,000	101,000		105,000		109,000		113,000
Baker Lake	150,000	135,000	400,000	156,000	500,000	182,000	500,000	209,000	350,000	231,000		240,000		250,000		260,000		270,000		281,000		292,000
TOTAL	616,000	620,000	1,295,000	691,000	1,250,000	778,000	1,300,000	868,000	1,000,000	962,000	950,000	1,053,000	1,240,000	1,061,000	1,500,000	1,160,000	660,000	1,228,000		1,273,000		1,318,000

TABLE 3, APPENDIX F, cont'd.

FORECAST OF EXPENDITURES
(1973 DOLLARS)
FORT SMITH REGION

	1973 - 1974		1974 - 1975		1975 - 1976		1976 - 1977		1977 - 1978		1978 - 1979		1979 - 1980		1980 - 1981		1981 - 1982		1982 - 1983		1983 - 1984	
	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M
Rae Edzo	200,000	110,000	280,000	126,000	200,000	139,000	70,000	147,000		117,000		118,000		119,000		120,000		121,000		122,000		123,000
Spence Bay	60,000	59,000	200,000	69,000	240,000	81,000		84,000		88,000		91,000		94,000		97,000		100,000		104,000		108,000
Pelly Bay		28,000		29,000		30,000		31,000		33,000	100,000	38,000	100,000	43,000	100,000	49,000	380,000	64,000	370,000	83,000	280,000	98,000
Lac La Martre		16,000		17,000		18,000		19,000		20,000		21,000		22,000		23,000	100,000	28,000	250,000	39,000		41,000
Wrigley		10,000		11,000		12,000		13,000		14,000	150,000	20,000	150,000	27,000	140,000	34,000		36,000		38,000		40,000
Snowdrift		16,000		17,000		18,000		19,000		20,000	140,000	26,000	150,000	33,000	150,000	40,000	140,000	47,000		51,000		53,000
Fort Resolution		30,000	140,000	37,000	150,000	44,000	360,000	58,000	230,000	70,000	73,000		76,000		80,000		84,000		88,000		92,000	
Fort Providence		36,000	100,000	41,000	250,000	53,000	380,000	70,000	250,000	83,000		87,000		91,000		95,000		99,000		103,000		107,000
Fort Liard		3,000		4,000		5,000		6,000	70,000	9,000	100,000	13,000	100,000	17,000	130,000	23,000	130,000	29,000		30,000		31,000
Holman Island		20,000		21,000		22,000		23,000	100,000	26,000	250,000	37,000	250,000	48,000	250,000	60,000	170,000	69,000		72,000		75,000
Gjoa Haven		25,000		26,000		27,000		28,000		30,000	200,000	35,000	300,000	44,000	330,000	55,000		57,000		59,000		61,000
Coppermine		67,000	230,000	74,000	303,000	89,000	350,000	107,000	300,000	123,000	110,000	132,000		138,000		143,000		149,000		153,000		159,000
Cambridge Bay		102,000	150,000	112,000	400,000	132,000	400,000	153,000	550,000	181,000	550,000	210,000	550,000	240,000	500,000	270,000	500,000	301,000	230,000	322,000		222,000
Nahanni Butte																						
Rae Lakes																						
Kakisa Lake																						
Jean Marie River																						
Detah		16,000		17,000		18,000		19,000		20,000		21,000		22,000		23,000		24,000		25,000		27,000
Enterprise																						
TOTAL	260,000	533,000	1,100,000	601,000	1,540,000	688,000	1,500,000	777,000	1,500,000	834,000	1,600,000	922,000	1,600,000	1,014,000	1,600,000	1,112,000	1,420,000	1,208,000	850,000	1,291,000	280,000	1,237,000

TABLE 3, APPENDIX F, contd.

FORECAST OF EXPENDITURES
(1973 DOLLARS)
INUVIK REGION

	1973 - 1974		1974 - 1975		1975 - 1976		1976 - 1977		1977 - 1978		1978 - 1979		1979 - 1980		1980 - 1981		1981 - 1982		1982 - 1983		1983 - 1984	
	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M	CAPITAL	O & M
Tuktoyaktuk		18,000	250,000	28,050	300,000	41,000	250,000	53,000		55,000		57,000		59,000		61,000		63,000		65,000		67,000
Fort Good Hope		32,000	100,000	37,000	100,000	42,000	100,000	48,000	200,000	58,000	300,000	72,000	80,000	78,000	81,000	84,000		87,000		90,000		90,000
Fort Franklin		13,000		14,000	50,000	17,000	100,000	22,000	250,000	33,000	290,000	45,000		48,000		50,000		52,000		53,000		54,000
Fort Norman		32,000	100,000	37,000	150,000	44,000	150,000	52,000	150,000	60,000	200,000	73,000		73,000		75,000		78,000		81,000		84,000
Arctic Red River		11,000		12,000		13,000		14,000		15,000	250,000	26,000	170,000	34,000		35,000		36,000		37,000		39,000
Sachs Harbour		21,000		22,000		23,000		24,000		25,000	360,000	43,000	370,000	56,000		58,000		60,000		62,000		64,000
Aklavik		32,000	100,000	37,000	150,000	44,000	200,000	54,000	300,000	68,000		73,000		73,000		76,000		79,000		82,000		85,000
Paulatuk		1,200		1,300		1,400		1,500		1,600		1,700		1,800		1,900		2,000		2,100		2,200
Fort McPherson		56,000	250,000	72,000	450,000	93,000	400,000	113,000	200,000	125,000		87,000		88,000		89,000		90,000		91,000		92,000
Coville Lake		200		300		400		500		600		700		800		900		1,000		1,100		1,200
Norman Wells		40,000	400,000	58,000	300,000	72,000	300,000	97,000	400,000	117,000	100,000	125,000		114,000		115,000		116,000		117,000		118,000
TOTAL		256,400	1,300,000	318,000	1,500,000	390,800	1,500,000	479,000	1,500,000	559,200	1,500,000	596,000	620,000	625,600		642,800		661,000		678,200		696,400

TABLE 3, APPENDIX F, cont'd.