WATER QUALITY MANAGEMENT IN BRITISH COLUMBIA: POLLUTION CONTROL IN THE PULP AND PAPER INDUSTRY

by

Michael William McPhee
B.A., Simon Fraser University, 1973

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS
in the Department
of
Geography

SIMON FRASER UNIVERSITY

September 1978

APPROVAL

Name: Michael William McPhee

Degree: Master of Arts

Title of thesis: WATER QUALITY MANAGEMENT IN BRITISH COLUMBIA: POLLUTION CONTROL IN THE PULP AND PAPER INDUSTRY

Examining Committee:

Chairman: Philip L. Wagner

Mary L. Barker
Senior Supervisor

Robert B. Horsfall

Andrew R. Thompson
Professor of Law
Director, Westwater Research Centre
University of British Columbia

W.R. Derrick Sewell
External Examiner
Professor, Department of Geography
University of Victoria

Date Approved: September 27, 1978

ABSTRACT

The management of water quality in British Columbia is a regulatory process involving interaction between water managers (regulators) and effluent dischargers (regulated). The thesis examines the regulatory process for controlling water pollution in the pulp and paper industry of British Columbia. The study investigates four areas of concern:

(1) Water quality goals and management strategies. It is suggested that broad goals for water quality management have been interpreted as narrow technical pollution control standards.

(2) Policies for controlling pollution in the pulp and paper industry. The legal framework for water quality management is discussed, providing a basis for investigating the pollution control policies of the federal and provincial governments. Federal and provincial pollution control strategies for the pulp and paper industry are compared. The effects of pulp mill effluent on water quality are discussed. Measures taken by the industry to abate pollution and the success of these measures are reviewed.

(3) An examination of the level of agreement/disagreement between the regulatory agencies and the regulated pulp and paper industry toward pollution control policies is conducted.

(4) The study attempts to determine the avenues for public participation in pollution control decision-making in the pulp and paper industry of British Columbia.

The research included a review of government documents (transcripts of public hearings, appeals, annual reports and policy documents), and briefs presented to public inquiries. The relevant legislation is examined to gain an understanding of the legal framework for pollution control. A case study, involving the setting and enforcing of pollution control standards for a coastal pulp mill, is documented. A questionnaire study and personal interviews involving key government and industry officials were conducted to determine the areas of agreement and disagreement toward pollution control policies in the pulp and paper industry.

In order for regulating agencies to carry out their mandate of regulating waste dischargers, they must have the cooperation of industry. The pollution control strategy used by government agencies in British Columbia is to negotiate and bargain directly with individual companies. This has led to a two-party relationship between the regulators and the regulated.

It is concluded that both the regulators and the regulated view the present regulatory system as adequately serving their respective interests. There is some indication that the industry perceives the federal government as "enforcers" of pollution control requirements, while the provincial agencies are seen as "negotiators". It is demonstrated that means for public participation in pollution control decision-making are limited, primarily because legal access is restricted and because pollution control in British Columbia has been interpreted as a technical problem with technical solutions.

To my family

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to the following individuals who assisted in the research and preparation of the thesis: to my senior supervisor, Mary Barker, for her interest, advice, and constructive criticism throughout the course of the study; to Bob Horsfall, not only for his interest, advice, and review of the thesis, but for also initially providing the opportunity to live and work in Port Alice; to Dr. Andrew Thompson of the University of British Columbia, for his review of the thesis, especially his valuable comments on the legal sections of the study; to Professor A.R. Lucas, Faculty of Law, University of Calgary, who initially encouraged me to pursue and undertake an examination of the Port Alice pollution control controversy; to Warren Gill, Department of Geography, Simon Fraser University, for his friendly and welcomed advice in unravelling some of the mysteries of MTS and SPSS; to the government and industry officials who gave of their time to participate in the questionnaire study and interviews; finally, to my family, for their continual interest and support of my graduate work and especially to my wife Lesley, for her many hours of typing, proofreading and much needed moral support.

TABLE OF CONTENTS

PAGE

LIST OF TABLES

PAGE

PAGE

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

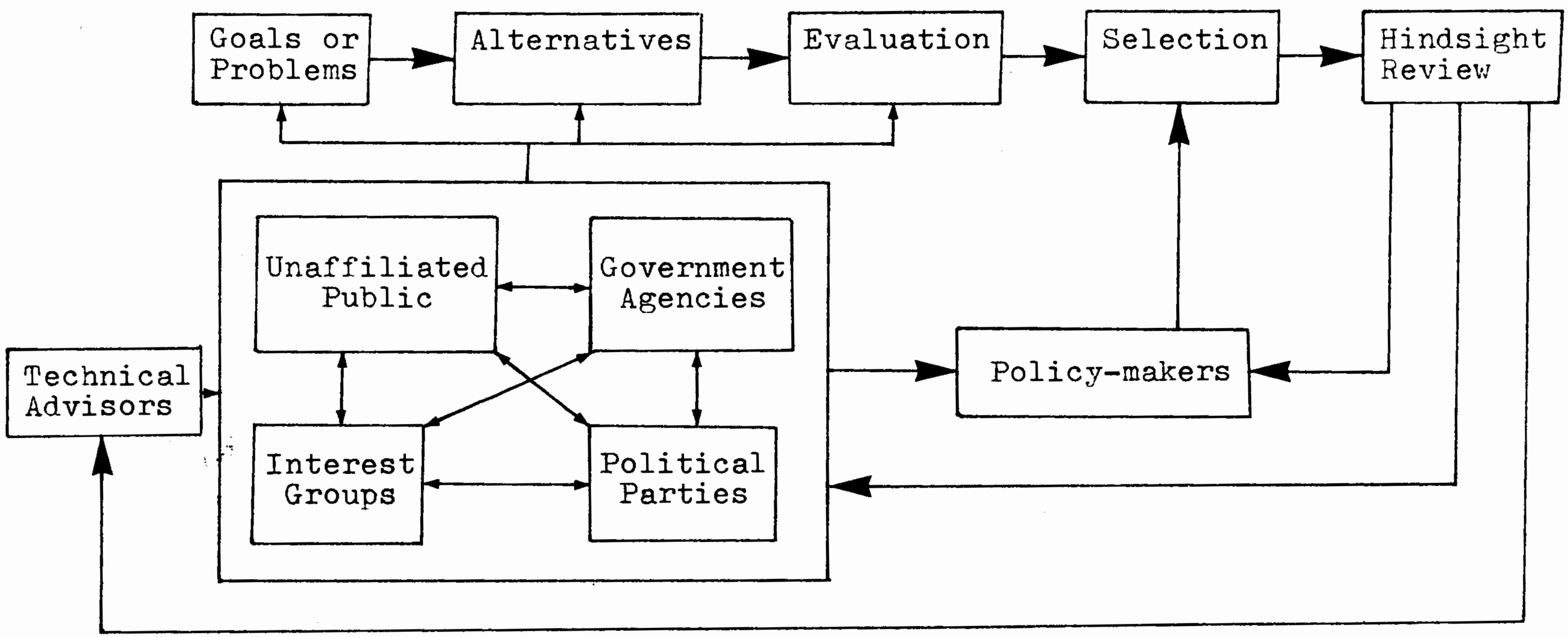
In response to the growing concern for environmental quality, governments in many jurisdictions have passed or amended a number of laws designed primarily to protect or improve the environment. As a means for achieving desired levels of environmental quality, many laws include provisions for establishing environmental quality criteria and standards. It is generally accepted that policy-making in environmental quality usually involves relatively few individuals or small, specialized groups.[1] For example, in water quality management, decisions regarding which information is relevant in establishing standards often become the responsibility of technical experts.[2] This delegation of responsibility has important implications as one author notes,

> "...a problem arises the moment one concedes that producing technical information, pursuing analytic effort, is anything but a 'value free' effort. Technical specialists inevitably, and properly, have their own views as to what the problems are and where the most likely roads to their solutions lie. Their perceptions have a major impact in determining the kinds of data produced, the alternative forms of action or behaviour assessed, the quantum of resources allocated to this assessment, and the division of the resources between the assessments".[3]

Water quality standards are administered through a complex process involving the interaction of government agencies, industries, interested groups and individuals (Figure 1). In regulating pollution from industrial sources, government agencies must enlist the cooperation of the regulated industries. In reality, there is negotiation between the regulators and the regulated as to what level of standard shall be met and when. [4]

The notion that pollution control standard setting and enforcement is characterized by a process of bargaining and negotiation has been documented by a few authors. [5] Regulatory agencies responsible for pollution control must establish standards which will afford some compliance by polluters and at the same time appease environmental groups. Matthew Holden, in a pioneer work, proposed that decisions affecting the strength or type of standard, the length of time for compliance, and the amount of deviation from the compliance schedule will depend upon: 1) the economic importance of the polluter to the community; 2) technological innovation in abatement equipment; 3) social values associated with different types of pollution; 4) the degree of economic adjustment by the polluter to achieve "reasonable" compliance; and 5) the cooperation between the regulator and the regulated. [6] As a result of the bargaining process, standard setting and implementation often become inseparable,

THE PROCESS OF POLICY-MAKING AND THE ROLES OF ACTORS



The decision-making process is conditioned by the perceptions of actors as to problems, solutions and responsibilities as well as by the institutional framework.

Source: W.R. Derrick Sewell, 1974, "Perceptions, Attitudes and Public Participation in Countryside Management in Scotland" JOURNAL OF ENVIRONMENTAL MANAGEMENT, Volume 2, p. 242.

FIGURE 1

> "...standard setting and implementation tends to become a cycle. In the first phase the standard becomes the end and the political forces battle over what standards should be established. At the second stage quieter negotiations take place over their implementation, particularly between the regulatory agency and the producer, which often means that the levels achieved are more 'realistic' than those required by the standard." [7]

Rather than viewing the bargaining process as a constraint on decision-making, it can be thought of as a viable means for airing opinions, values, and preferences. [8] This is certainly important in water quality management in which a high degree of uncertainty characterizes the standard setting process. The bargaining process can facilitate the exchange of information and elucidate the assumptions upon which standards are based,

> "The policy process involves the striking of balances and the making of compromises more often than the finding of correct policies or the choice between 'right' and 'wrong' in any absolute sense. Given the suggested importance of bargaining in the decision making process, bargaining should no longer be viewed as a constraint within which one attempts to optimize." [9]

However, the ability to bargain presumes that interested and affected parties are informed and have access to necessary information. In many regulatory processes, only the regulator and the regulated have access to the required information. Third parties may be effectively excluded.

The present study examines the regulatory process for controlling water pollution in the pulp and paper industry of British Columbia. The major problem is to examine the processes involved in establishing and administering water quality standards in the pulp and paper industry.

The pulp and paper industry was chosen for a number of reasons. The industry is the largest industrial user of water in Canada. Pulp and paper mills in British Columbia consume and discharge up to seventy million gallons of water per day. The discharge of untreated effluent has a major impact on water quality.[10] The pulp and paper industry is a major component of the forest industry in British Columbia. In 1976, employment in the pulp and paper industry totalled 18,400 or 22 percent of the total forest industry employment.[11] British Columbia pulp production of 5.75 million tons in 1976 represented 27 percent of total Canadian production.[12]

Pollution control standards for this industry have been established both federally and provincially, providing a basis for comparison. Two public inquiries have been held in British Columbia to establish pollution control standards for this industry. These provided the basis for a comparison of interest group positions toward pollution control standards in the industry.

In order to more fully understand the complex nature of bargaining and its impact on pollution control decision-making, four key elements are examined. First, the legislative framework is outlined in order to establish the formal guidelines within which pollution control policies are formulated and implemented.

Secondly, pollution control in the pulp and paper industry of British Columbia provides a specific context for examining the bargaining process. Thirdly, the attitudes and preferences of the actors involved in pollution control decision-making are examined on the premise that the views of key individuals affect the manner in which policies are developed and instituted. Fourthly, in view of the fact that bargaining occurs between the regulators and the regulated, the opportunities for third parties to participate in the bargaining process are explored.

Specifically, the study investigates four principal areas of concern:

(1) Within water quality legislation broad goals for water quality are often included. It is suggested that these goals have been interpreted and defined in terms of narrow technical pollution control standards. Specific effluent discharge standards often become the goals for water quality management programs. Limited attention has been given to how a desired level of water quality is determined, and the importance of this process for management strategies.

> "In assessing the performance of present water quality management strategies and the alternatives to them, it is of crucial importance to recognize the interdependence between how the decision is made as to what quality objective to pursue and what policy mechanism is used to pursue that objective. Frequently much of the ineffectiveness attributed to the policy mechanism has its root cause in deficiencies in the process whereby quality objectives are set."[13]

The traditional effluent and ambient standard approaches to pollution control are reviewed and a number of alternative approaches are discussed. Four regional approaches to water quality management are discussed in order to determine the processes used to establish and implement water quality standards.

(2) The legal framework for water quality management is discussed and provides a basis for investigating and comparing the pollution control strategies of the federal and provincial governments. Federal and provincial pollution control standards for the pulp and paper industry are compared. The industry's success in meeting pollution control standards is examined. Enforcement procedures of the provincial and federal governments are reviewed.

(3) The study examines the preferences and degree of consensus between the regulators (government agencies) and the regulated (pulp and paper industry) in three major aspects of pollution control policy: a) jurisdictional and administrative arrangements for pollution control in the pulp and paper industry; b) the importance of various water quality parameters for effluent discharge and receiving water standards; and c) the importance of socio-economic factors in setting and enforcing pollution control standards for the pulp and paper industry.

(4) The study attempts to determine the avenues for public participation in pollution control decision-making in the pulp and paper industry.

The methods used in conducting the above investigations include a review of unpublished government documents (transcripts of public hearings, appeal transcripts, legal documents), published documents (annual reports, policy statements, reported legal cases), briefs presented to public inquiries, trade and technical journals, and newspapers. The relevant legislation is examined in order to understand the legal framework for pollution control. A case study is documented to determine the nature of the issues involved in regulating pollution in the pulp and paper industry of British Columbia. A review of policy documents and the case study investigation aided in the development of a questionnaire study to identify the preferences and perceptions of key government and industry officials toward important aspects of pollution control policy. Personal interviews were also conducted with senior officials.

Within the field of water quality management, the present study focuses on the processes involved in establishing and administering pollution control standards in British Columbia. While other research has concentrated on selected water quality management issues in British Columbia (e.g. the legal framework, public participation, regulatory practices, applications of economic incentives, attitudes and perceptions of professionals, regional studies: the lower Fraser River and Okanagan River Basins), this study attempts to incorporate a number of these issues within the context of pollution control in the pulp and paper industry of British Columbia.[14]

FOOTNOTES TO CHAPTER ONE

1. For example, see I.K. Fox, 1970, "The Use of Standards in Achieving Appropriate Levels of Tolerance" PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES Volume 67, No. 2, pp.877-886; Mancur Olson, 1965 THE LOGIC OF COLLECTIVE ACTION, Harvard University press; and T. O'Riordan, 1976 "Policy Making and Environmental Management: Some Thoughts on Processes and Research Ideas" NATURAL RESOURCES JOURNAL Volume 16, No. 1, pp.55-72.

2. I.K. Fox and L.F. Wible, 1973 "Information Generation and Communication to Establish Environmental Quality Objectives" NATURAL RESOURCES JOURNAL Volume 13, pp.134-149.

3. Neil A. Swainson, 1976 "Defining the Problem: The Institutional Arrangements for Water Quality Management" in N.A. Swainson (ed.) 1976, MANAGING THE WATER ENVIRONMENT, University of British Columbia Press, Vancouver, p.15.

4. Matthew Holden, Jr., 1966 POLLUTION CONTROL AS A BARGAINING PROCESS, Cornell University Water Resources Center, Publication No.9, Ithaca, New York.

5. P. Althoff and W.H. Grieg, 1974 "Environmental Pollution Control Policy-Making: An Analysis of Elite Perceptions and Preferences" ENVIRONMENT AND BEHAVIOR, Volume 6, No.3, pp.259-288; M. Chevalier and T.J. Cartwright, 1966 "Towards an action framework for the control of of pollution" in Canadian Council of Resource Ministers, 1966 PROCEEDINGS OF THE NATIONAL CONFERENCE ON POLLUTION AND OUR ENVIRONMENT, Montreal; George Hagevik, 1968 "Legislating for Air Quality Management: Reducing Theory to Practice" LAW AND CONTEMPORY PROBLEMS, Volume 33, No.2, pp.369-398; M. Holden, Jr., op. cit.; and R.E. Rickson, 1977 "Dimensions of Environmental Management: Legitimation of Government Regulation by Industrial Managers" ENVIRONMENT AND BEHAVIOR, Volume 9, No.1, pp.15-40.

6. T. O'Riordan, 1971 PERSPECTIVES ON RESOURCE MANAGEMENT Pion Limited, London, after M. Holden, Jr., op. cit.

7. I.K. Fox (1970) op. cit. p.882.

8. P. Althoff and W.H. Grieg, op. cit.; G. Hagevik, op. cit.; and R.E. Rickson, op. cit.

9. G. Hagevik, op. cit. p.326.

10. J.R. Marier, 1973 "The Effects of Pulp and Paper Wastes on Aquatic Life with Particular Attention to Fish and BioAssay Procedures For Assessment of Harmful Effects" Technical Report for the National Research Council's Associate Committee on Scientific Criteria for Environmental Quality.

11. Province of British Columbia, Ministry of Economic Development, BRITISH COLUMBIA ECONOMIC ACTIVITY 1976 REVIEW AND OUTLOOK, Volume XXVIII, April 1977, p.38.

12. Ibid. p.37.

13. A.H.J. Dorcey, 1977 "Policy Mechanisms for Water Quality Management in a Metropolitan Area: Greater Vancouver and the Fraser Estuary" in J.B. Stephenson (ed.) 1977 THE PRACTICAL APPLICATION OF ECONOMIC INCENTIVES TO THE CONTROL OF POLLUTION: THE CASE OF BRITISH COLUMBIA, University of British Columbia Press, Vancouver, p.301.

14. Key studies include: A.H.J. Dorcey (ed.) 1976, THE UNCERTAIN FUTURE OF THE LOWER FRASER, Westwater Research Centre, University of British Columbia Press; A.R. Lucas, 1971 "Legal Techniques For Pollution Control: The Role of the Public" U.B.C. LAW REVIEW, Volume 6, pp.167-191; A.R. Lucas and P.A. Moore, 1973 "The Utah Controversy: A Case Study of Public Participation in Pollution Control" NATURAL RESOURCES JOURNAL, Volume 13, No. 1, pp.36-75; W.R.D. Sewell, 1971 "Environmental Perceptions and Attitudes of Engineers and Public Health Officials" ENVIRONMENT AND BEHAVIOR, Volume 3, No. 1, pp.23-59; J.B. Stephenson (ed.) 1977, THE PRACTICAL APPLICATION OF ECONOMIC INCENTIVES TO THE CONTROL OF POLLUTION: THE CASE OF BRITISH COLUMBIA, British Columbia Institute For Economic Policy Analysis, University of British Columbia Press, Vancouver; T. O'Riordan and J. O'Riordan, 1972, OKANAGAN WATER DECISIONS, Western Geographical Series, Volume 4, Department of Geography, University of Victoria.

CHAPTER TWO

WATER QUALITY GOALS AND MANAGEMENT STRATEGIES

The concern for water quality has developed to an extent which now includes a range of activities that affect our quality of living. In earlier years water quality was dealt with as a public health problem, concerned with controlling water related diseases such as typhoid, cholera and dysentry.[1] While the public health issue of water quality is no less important today, especially in developing countries, our water quality interests include recreation, aquatic life production, and aesthetics. With increasing industrialization, competition between the use of water for waste disposal and other water-based services was evident. In the late 1960's and early 1970's public concern brought pressure upon governments to control the deterioration of water quality and to regulate waste disposal. As part of the overall interest in environmental quality, water quality became a national and international concern.[2] Governments passed legislation designed to protect or enhance water quality both nationally and regionally.[3] Water quality became a matter of national concern in Canada:

> "...pollution of the water resources of Canada is a signficant and rapidly increasing threat to the health, well-being and prosperity of the people of Canada and to the quality of the Canadian environment at large and as a result it has become a matter of urgent national

> concern that measures be taken to provide for water quality management in those areas of Canada most critically affected."[4]

Regional priorities for improving water quality were also established. In the late 1960's in Canada and the United States, eutrophication in the Great Lakes received considerable attention.[5] Regional water quality problems were recognized in the Okanagan River basin[6] and the lower Fraser River in British Columbia.[7] In these regions, the decisions to tackle water quality problems usually originated from the desire to achieve multi-purpose goals such as protection of fisheries, recreational use, clean water supply, and aesthetic enjoyment. In essence, water quality became one aspect of a complex system of water resources management. Policies and institutional arrangements for water quality management based upon a region (which is usually defined as a river basin, a watershed, or a coastal zone) have gained popularity in the research literature.[8]

Water quality legislation often contained a definition of "pollution". Criteria were established as a means of identifying pollution and determining socially desirable levels of water quality. If not explicitly stated within the legislation, provision was usually included for the establishment of water quality standards as a means for achieving desired goals.

WATER QUALITY STANDARDS

The most common policy mechanism for managing water quality in North America has been the development and enforcement of effluent discharge standards. Standards may take one of two forms, ambient or effluent discharge standards.*Ambient standards are based upon the biological, chemical and physical properties of the receiving waters. The assimilative capacity of the receiving waters is often used as a guide for specifying the amount of waste which can be discharged without harmfully damaging some level of quality. An effluent discharge standard specifies the type and amount of waste which can be discharged into a water environment.

While effluent discharge standards have been widely used on the basis of fairness and equity to prevent the discharge of

----

* For clarity, it is useful to distinguish between water quality criteria, standards, and objectives, as defined by the Canadian government:

Criteria: scientific requirements upon which a decision or judgment may be based concerning the suitability of water quality for the preservation of the aquatic environment and/or to support designated use(s). Criteria are descriptive expressions of the effects that are known or expected to occur whenever or wherever a detrimental factor and/or pollutant reaches or exceeds a specific level for a specific time.

Standards: Standards are legally prescribed limits of pollution and/or deterioration which are established under statutory authority.

Objectives: Objectives are desirable levels of water quality to be attained in either short-term or long-term water resource management programs.[9]

specifically harmful or dangerous wastes, they have also come into disrepute among economists. Economic approaches to water quality management are concerned with the common pool characteristic of water and the concepts of public goods and externalities. The provision of a desirable standard of water quality is considered to be a public good. Pollution or impairment of water quality, in essence, is a social welfare problem. The polluter usually does not bear the costs which are transferred to society in the form of degradation of water quality. One of the more difficult problems arises in attempting to balance the costs of pollution against the production costs to determine an economically optimum level of discharge or quality. An effluent discharge standard provides no incentive to abate pollution beyond the given standard. In reality, most waste dischargers will pollute to the maximum allowable amount. There is no inherent mechanism which allows only those who can make the most efficient use of waste discharge capacity to discharge waste. The success of an effluent standards approach depends to a large degree on the success of the enforcement process.

An ambient standard approach requires accurate information about the receiving environment and the impact of discharges. Ambient standards are often set in terms of broad guidelines specifying a range of desirable environmental quality standards. The amount of abatement required depends upon the assimilative capacity of the receiving waters. Once an ambient standard is set, there is no incentive to clean up beyond the required standard . If ambient standards are set uniformly, some dischargers will be able to make reductions in pollution more cheaply than others. Under this type of policy mechanism, society bears the cost of pollution up to the specified standard. One attractive feature of the ambient standard approach is that, theoretically, it can reflect the requirements and conditions of the particular local or regional receiving environment. However, important data are necessary on the conditions of the receiving waters and the effects of proposed discharges on water quality.

One of the most important aspects of water quality management is often overlooked in the literature. The processes involved in establishing and enforcing water quality standards have received little attention. Much of the work directed toward water quality control has concentrated on efficiently attaining a given level of water quality (e.g. an optimal pollution level occurs when marginal benefits equal marginal costs of pollution control).[10]

Three interrelated elements are involved in setting and enforcing standards: (1) the physical-technical aspects of determining the effects of pollutants on water quality and aquatic life forms; (2) the economic evaluation of the benefits and costs associated with maintaining certain standards of water quality; and (3) the political process of incorporating knowledge of the physical-technical and economic aspects of water quality into water quality standards which reflect society's values.

In essence, the political process can operate at the first two levels, specifically in determining what information should be collected and analyzed, and in making crucial judgments about risk factors. For instance, water quality standards may be based on a limited number of criteria which might preclude collection and assessment of information on other factors (e.g. biological-chemical parameters versus aesthetic qualities).

The designation of a level of water quality is relative, depending upon the use for which the water is assigned. Therefore, it is necessary to know the values which society places upon various uses of water, the biological, ecological, and physical characteristics of a particular water body, and the effects of a variety of uses on these characteristics. Desired levels of water quality are often based on a combination of ambient quality criteria and effluent discharge criteria.

In Canada, standards have been designed to safeguard the health of human and aquatic life. It is assumed that,

> "...waters which are of a quality conducive to healthy fish populations are also suitable for most other legitimate water uses."[11]

What constitutes a "legitimate" water use is unclear. Most water quality management programs operate on the basis of a range of acceptable-permissible limits. Acceptable or permissible standards are usually minimum standards of quality. In reality these standards are usually based as much on the technological and economic resources available as on the health aspects of pollution control. Most minimum standards which have been established are based on short-term scientific studies. The effects of small exposure doses to organisms over longer terms are relatively unknown. Information on synergistic actions of various pollutants is also limited.[12]

Another difficult task in setting standards is the necessity to translate causal relationships, threshold ranges of pollutants, and other impacts, into precise quantitative terms which form the basis for legislating prescribed uses of water. Determination of these critical values is often the subject of scientific argument. Debating these values can be beneficial, leading to more refined standards. However, standards based on technical criteria tend to dominate policy discussions. Less emphasis is placed on identifying socially acceptable levels of quality or environmental quality goals.

Some authors have pointed to the need to communicate standards more effectively and meaningfully to the public.[13] Inherent in standards are estimates of risks and value judgments. The basis upon which water quality standards are determined should be made in clear, uncomplicated terms for the general public. However, original water quality goals often become couched in terms of narrow technical standards of environmental quality. As a result, original goals lose their perspective and what are termed minimal standards become the actual objectives for a desired level of water quality. Since the arguments over scientific information require a certain amount of technical expertise, one implication for decision-making is that only those with the required technical (or scientific) qualifications become centrally involved in deciding what standards of water quality should exist.

In an effort to disseminate information about the quality of the environment in a form that is comprehensible by the general public, broad environmental indices are being developed.[14] The ultimate aim of the trend toward improving environmental indices is to establish a national index equivalent to the Gross National Product scale or to the consumer price index. An index is constructed by taking a measure of a concentration of a pollutant and comparing it to its ambient standard. In this way a variety of pollutants can be measured and reduced to a single index (e.g. air or water quality index).

There are both positive and negative features associated with the development and use of such indices. On the positive side, environmental indices can be used as general indicators of the quality of the environment. They provide a means for continued monitoring of long term trends in the environment and may be used as a source of information for planning of environmental control programs.[15] They could indicate the extent to which national or regional environmental quality objectives are being met. They may serve a useful function in communicating knowledge to the general public as well as environmental interest groups. If indices follow a role similar to those of economic indices in spawning discussion and debate at political levels, they would serve an educational function.

A number of limitations exist which have hampered the implementation of environmental quality indices. The first is a problem of measurement. In order for proper comparisons to be made between actual concentrations of pollutants and the ambient level of quality, a standard must be established. Attempts to establish national or uniform standards become almost meaningless because of the wide variety of regional environmental differences. The spatial concentration of polluters can also vary, placing different demands on local and regional assimilative capacities. Different measurement and monitoring techniques have made comparisons of data difficult. The majority of research papers on the subject of environmental quality indices usually conclude with a plea for more reliable data. A second limitation is one of assigning weights to particular pollutants or parameters when devising an environmental quality index. This process is still one of judgment, no matter how expert the opinion may be. The problem is further complicated because of the lack of information on synergistic effects.

The formulation of an index for water quality is complicated when quality is related to use.[16] More factors have to be measured and weights, scales, and parameters, attached for each water use. Recent research has attempted to examine the relationship between a general water quality index, perception of water quality and use of a water body.[17] Some significant correlations were found between perception of water quality and water use activities. However, the study cautioned that,

> "...the Water Quality Index falls short of acting as a general indicator of water quality which provides explanation of most of the variables concerning perception and use of streams."[18]

Nevertheless, by relating water use to a given water quality index, a ratio could be computed between increased stream use and improved water quality (increments in pollution abatement) which would be valuable in assessing intangible benfits from pollution control. Continued research efforts may help in overcoming the problems of translating attitudes and perceptions toward water quality into a meaningful form which can become a basis for environmental decision-making.

While broad environmental quality indices have merit for nationally based environmental control programs, they cannot be viewed as substitutes for regional environmental quality standards. Regional water quality standards, in theory, can reflect local and regional water uses and water quality requirements. Regional indices may have more meaning for local citizens and serve to indicate particular sources and areas of concern.

ALTERNATIVES TO A REGULATORY STANDARDS APPROACH

A number of alternatives to a traditional pollution control approach based on regulating the behaviour of individual waste dischargers have been proposed in the literature. An overview of five approaches is presented: (1) the Coase Theorem; (2) Least-cost sharing approach; (3) Effluent charges; (4) Property rights approach; and (5) Subsidies for pollution control inputs.

COASE THEOREM

Perhaps the most well known economic approach to pollution control was that advocated by Ronald Coase.[19] The Coase Theorem proposes that under perfect market conditions (i.e. liability rules are irrelevant, transactions are costless, and participants are "rational") waste dischargers and those affected by pollution will bargain to arrive at a mutually acceptable agreement. For example, if the pollution costs from an industry were greater than the treatment costs, those suffering damage from the pollution would organize to bargain and pay off the industry so that pollution did not exceed an acceptable level. It is generally accepted that such a theoretical situation is far from reality. Immense problems are encountered in arriving at mutually acceptable agreements, especially in situations in which property rights are involved. High transaction costs often preclude certain individuals and groups from participating in a bargaining situation. M. Roberts, in an excellent review article, argues that the large number of persons who are usually affected by pollution externalities greatly increases the difficulty of reaching an agreement.[20] The large and complex number of various uncertainties raises the cost of bargaining. The amount of benefit to any one person in the process may be small and insignificant. A free-rider situation, whereby those who do not bargain directly gain benefits from the agreement, may also be encountered.

LEAST-COST SHARING APPROACH

A least-cost sharing approach is based on achieving a given ambient standard at the lowest possible cost. Each waste discharger's abatement costs are considered in relation to the system's treatment costs (e.g. a regional treatment centre). Pollution abatement is undertaken through joint treatment facilities and/or by those who can achieve a greater reduction in waste discharge at a lower cost.

This approach requires detailed information on the type and amount of waste discharged by each discharger and the percent or increment of a region's total assimilative capacity which he utilizes. Abatement cost information is also required for each discharger. New entries into the system must also be dealt with in some way. Such a system provides no explicit mechanism for this, and the pricing and waste allocation among dischargers would have to be adjusted to accomodate new entries. This approach is only practical where the quality of the receiving waters is considered a scarce resource. If the assimilative capacity is not threatened, then no incentive exists to make efficient use of it.

EFFLUENT CHARGE APPROACH

This approach, and modifications of it, have gained popularity among economists since its basic aim is to internalize externality costs imposed by waste dischargers.[21] This is done by charging a fee or tax to the polluter equal to the marginal cost of the damages created. In theory, this will result in minimum abatement costs for each waste discharger as he seeks to reduce the pollution, and hence, the tax. There are three varieties of the effluent charge strategy. First, an optimal standard of pollution control is achieved when the marginal costs of control are equal to the marginal benefits of abatement. This optimal level is achieved by levying the proper discharge fee. No other standard setting procedure is necessary. Importantly, the costs of abatement are borne by the polluter. There are a number of limitations to this approach. Accurate information is very difficult and costly to obtain on the costs and benefits of pollution control. Identification of the beneficiaries is not easy, especially when there are many non-revealed preferences which cannot be readily translated into monetary values. Such a scheme contains no mechanism for handling or preventing the deposit of highly dangerous wastes.

A second type of effluent charge is one where an ambient standard is first established and a charge is than levied upon waste producers to induce a least-cost compliance measure. This approach avoids the need for identifying accurately all the damage costs associated with discharges and abatement costs. Its application is usually through iterative adjustment upwards of the charge, as responses to the fee become apparent. Should the tax be set too low, environmental costs will not be borne by the polluters. This mechanism allows those polluters who can make best use of the waste capacity of the receiving waters to do so. However, while not requiring great accuracy in benefit and cost estimates, this scheme still relies on accurate information regarding the assimilative capacity of the receiving waters.

A third modification of the effluent charge scheme is one in which the fee is used to meet a given effluent standard. The fee is used as an incentive to meet the standard by investing in new technology or production processes. This approach is favoured where waste discharges may be very harmful and/or in situations in which information on ambient conditions and cost functions is too difficult or costly to obtain. It also appeals as an equity measure since the standard is usually a uniform one. However, like other standard setting approaches, it does not encourage abatement past the given standard.

PROPERTY RIGHTS APPROACH

The property rights approach, as advocated by Dales, utilizes the market for tranferring pollution rights.[22] This approach operates on the principle that waste discharge capacity is a scarce resource and seeks to allocate that capacity by means of a limited number of pollution rights sold competitively by the government. This mechanism normally relies on the setting of an ambient standard which reflects the waste disposal capacity of the receiving waters. The pollution rights permits would specify allowable amounts of discharge. This system depends a great deal upon the setting of the standard and the number of pollution rights allowed.

Under the approach, the polluter faces the choice of either limiting his discharges or competing to buy up pollution rights. In this way, the waste disposal capacity is efficiently allocated among those who can gain the most benefit from it. The property rights approach becomes much more difficult to implement where all polluters are not identifiable or in areas in which receiving waters do not constitute neatly delineated ecosystems. It has been argued that the marketing of tranferable pollution rights may lead to consolidation of property rights by a few to the exclusion of smaller firms or conservationists. The length of a permit must be carefully considered. Long term permits could create inflexibility in adjusting ambient standards over time.

SUBSIDIES FOR POLLUTION CONTROL INPUTS

Subsidies have been an integral part of most government pollution control programs. They have included special tax treatment for capital investments in pollution control technology, research and development, and grants and loans to municipalities for sewage treatment facilities. Most of these programs have been justified on the basis that forcing the private sector to invest in pollution control could have negative effects on economic growth and income distribution. It is often held that industry contributes to the net benefits of the regional economy, hence pollution control is the responsibility of all taxpayers.

Economists have largely taken a dim view of this approach since it may be inefficient in encouraging over-capitalization in technology which is tacked on to existing waste producing processes. There is no incentive to search for production/process changes to reduce waste discharges. Futhermore, there are some doubts as to just how much tax incentives would lower pollution control costs or inspire polluters to comply with standards,

> "In the standards context, it seems unlikely that such a programme would push any substantial fraction of the heterogeneous waste sources in an area over the dividing line into choosing compliance over noncompliance. Futhermore, any input subsidy would alter both the total and the marginal costs of all control efforts-which could in turn serve to distort whatever response waste sources do make by encouraging them to use more of the subsidized input."[23]

Under a subsidy approach, there is no incentive for waste dischargers to clean up pollution beyond the level of subsidies. A subsidy approach to pollution control tends to be linked closely with the notion of best practicable technology. If information about pollution damages to individuals and receiving waters is scarce and costly to obtain, the level of investment in pollution control technology becomes a convenient substitute for an ambient standard.

In contrast to much of the criticism directed toward a subsidy approach, Brown noted several positive features of this approach in Sweden, France, the Netherlands, and Germany.[24] He concluded that a system of subsidies need not be static. Subsidies to dischargers were used as incentives, paid to firms with good compliance records. The amount of the subsidy also depended on the potential impact of the pollution. In areas where the assimilative capacity was threatened and where a number of other water uses were affected, subsidies were given more freely. Subsidies were also limited to a firm's financial capability to invest in pollution control facilities or to undertake process changes. The proportion of subsidies given to firms located in regions of high unemployment were higher than in areas in which unemployment was not a critical issue.

In conclusion it would seem that criteria should be established to ensure that where subsidies are given, there is an accountability on the part of the company to show that the subsidy is justified in terms of environmental requirements and/or socio-economic priorities in the region.

Among the five approaches discussed, three might be considered attempts to internalize pollution control costs: the Coase Theorem, effluent charges, and the property rights approach. The Coase Theorem proposes a bargaining arrangement between polluters and those affected by the pollution. The groups would negotiate a mutually acceptable condition. However, the difficulties associated with identifying and measuring pollution damages and pollution control benefits, make such an approach impractical. It may offer some potential in situations where the number of interests affected are small and easily identified.

The effluent charges approach and modifications of it, have been widely proposed by economists. The appeal of such an approach is that, theoretically, externality costs of pollution can be accounted for by the waste discharger. An optimal level of pollution control is said to be achieved when the marginal costs of control equal the marginal benefits of control.

However, data limitations on pollution control benefits and costs present obstacles to implementing this scheme. Modifications of this basic theoretical approach have been advocated and applied. The modifications stem from a traditional standards approach. Either an ambient or effluent discharge standard is determined and a charge is used to induce a least-cost compliance measure. Such an approach avoids the data requirements on pollution control benefits and costs. Some experimentation is usually necessary to find an appropriate tax level. The approach still relies on the setting of an appropriate standard of quality.

The property rights approach operates on the assumption that the assimilative capacity of a water body is a scarce resource. The resource is allocated by means of a limited number of pollution rights sold competitively, usually by the government. An ambient standard reflects the waste disposal capacity. The polluter faces the decision of either abating his discharges or competing to buy up additional pollution rights. It was pointed out that a property rights approach is only practical where all polluters can be identified and where receiving waters constitute a clearly delineated ecosystem. Over time the marketing of transferable pollution rights could lead to consolidation of property rights by a few to the exclusion of smaller firms or other interests. Some mechanism is also needed to control the length of a permit in accordance with the demands placed upon the assimilative capacity of the receiving waters.

A least-cost sharing approach seeks to achieve a given ambient standard at the lowest possible cost. Each polluter's abatement costs are considered in relation to a region's treatment costs. The impact of each discharger's wastes on the total assimilative capacity of a region must be calculated. Where the assimilative capacity of the receiving waters is not threatened there is no incentive to make efficient use of it. Whereas this approach attempts to determine the least expensive or most efficient means to abate pollution, an ambient standard which reflects the assimilative capacity of the receiving waters must be established.

A variety of subsidies have been used in pollution control programs. The most common include tax advantages for capital investments, and grants and loans for abatement facilities. Critics of subsidies have stated that subsidies encourage over-capitalization in technology which is added to existing waste producing processes. Subsidies do not encourage production or process changes to reduce pollution and provide no incentive to control pollution beyond the level of subsidies. It was noted, however, that several European countries employ a subsidies approach based on a number of criteria, including the abatement performance of a firm, the regional economy in which the firm is located, and the impact of the discharge on the receiving waters.

APPLICATIONS OF REGIONAL WATER QUALITY MANAGEMENT

While many regions of North America have relied on a traditional 'standards-enforcement' approach based on controlling waste discharge at its source, various regions of the world have adopted water quality management programs based on a regional assessment of water quality needs. A number of regional approaches are reviewed to provide a comparative insight into water quality management schemes. It is difficult to assess effectively the success of these programs. However, many of the programs are interesting for the approaches taken to establish and implement water quality goals. Two questions provide the basis for the following review of selected regional examples:

1. How are water quality goals determined?
2. How are water quality goals achieved?

RUHR RIVER BASIN

The Ruhr River Basin of West Germany has one of the oldest and best known regional water quality management systems. Industrialization and population growth in the late nineteenth century created pressure on the use of water resources in the region. Waste discharge from industrial sources led to public health problems. Water resource associations were created in the early 1900's to tackle water quality and water supply problems in the Ruhr area. These associations, known as Genossenschaften, are now organized to plan and implement multi-purpose goals for water resource management (waste disposal, water supply, flood protection and land drainage).[25]

The main water quality objective in the Ruhr River Basin is to maintain water quality suitable for domestic and industrial water supplies. An effluent discharge standard based on the protection of fish has been set for the Ruhr Basin. A variety of methods have been used to meet the standard, including regional waste treatment plants, regulation of river flows, aeration of lakes and streams, and biological treatment of industrial and municipal wastes. An effluent charge scheme has been implemented to meet the costs of pollution control and to induce dischargers to recover materials and undertake process changes. The charges are based on the quantity and quality of the effluent and are calculated from a dilution factor which is necessary to maintain fish life. A complex formula is used which reduces all types of effluent to a single, common index. The assumption underlying use of this index is that other goals such as public health, recreation and aesthetics will also be met. The dilution factor also is dependent on the assimilative capacity of a water body. The charges are placed primarily on those discharging wastes and those who benefit from waste treatment may pay a form of tax toward the cost of regional treatment facilities or other alternatives.

Kneese points out some basic objections to the system of effluent charges as they are employed in the Ruhr.[26] They are based on a dilution factor or physical equivalence concept and not on marginal cost pricing in which the fee imposed upon each discharger is equal to the incremental cost which he places on the system. It is doubtful whether this information is possible to obtain. The ambient conditions of the receiving waters must also be considered in fee calculations since costs imposed will differ along a stream. However, the charging scheme in the Ruhr Basin does provide an economic incentive to make efficient use of the waste discharge capacity.

Institutional arrangements in the Ruhr Basin have been conducive to an integrated water resources planning approach in which water is managed for supply and waste discharge. A monitoring program takes into account seasonal and regional variations in stream flow and quality. Land use planning is an integral part of water quality management in the Ruhr Basin. The governing assembly for water management is comprised of political interests, business and industrial interests, community interests and technical personnel. By law, these interests must be represented on a board of directors. Elected by the assembly, the board calculates the exact charge which dischargers must pay. The charge can be appealed to a commission or finally to the courts.

While France and Holland also employ effluent charges, the Ruhr River Basin is the most well documented case of an effluent charge use. From a management point of view it may be desirable to reduce a variety of pollutants to a single index for easy measurement in computing an effluent fee. However, in reality there are toxic elements which should be kept to a minimum in effluent discharge (e.g. phenols, heavy metals). Whether a standard based on maintaining fish populations is sufficient to meet public health, recreational, and aesthetic goals for water quality is questionable. The needs of water users vary regionally as do receiving water conditions. Priorities among and within regions, according to public preferences may vary considerably. Formal recognition of the polluter pay principle is provided in the institutional framework. While the approach taken in the Ruhr Basin is not ideal in economic terms it does provide the opportunity for waste dischagers to be conscious of the costs placed on other water uses. The management scheme has also considered a number of alternatives for achieving water quality objectives.

DELAWARE RIVER BASIN

Water quality management in the Delaware River Basin is an example of an innovative approach to establishing water quality objectives.[27] The standard setting process involved the collaboration of a number of committees representing various levels of government (local, state and federal), technical experts, industry, interest groups (recreation and conservation), and the general public. The various viewpoints held by these groups toward local water quality problems were used as inputs into planning a strategy for abating water pollution. The administrative organization allowed competing water users to become aware of each other's interests in maintaining certain standards of water quality. The institutional arrangements permitted flexibility in seeking methods of abating pollution. The broad terms of reference given the Delaware Estuary Comprehensive Study group were to:

> "Prepare or develop comprehensive programs for eliminating or reducing the pollution (in the Delaware Estuary) and improving the sanitary condition of surface and underground waters".[28]

The Policy Advisory Committee which was the central policy-making body of the study was comprised of representatives of public agencies with the legal power to control water pollution and implement plans for water quality management.

Desired levels of water quality were arrived at through means of bargaining in which each interest group or water user based its water quality goals on a particular water use. Efforts were made to translate the technical language of industrial concerns into terms which were comprehendable to non-technical experts. Five levels of "water use/quality objective sets" were derived from a synthesis of disparate interests. Costs and benefits for each objective were computed and made public. After a long process of bargaining one overall objective was agreed upon, the middle standard. As might have been expected, industrial concerns desired the lowest standard, government agencies the middle standard, and public interest groups, the highest standard.

The method of implementing standards was based on regional waste treatment facilities, rather than regulation of point source discharges. A river basin association comprised of industry and local government was established to implement water quality standards. A non-political federation of interest group organizations and individuals in the river basin serves in a watch-dog role to inform the public of pollution abatement progress. One overriding assumption in the study plan was that desired levels of water quality were technically attainable.

Whether the water quality goals will be achieved is open to speculation. A recent Resources for the Future Inc. study identified several water quality problems in the Lower Delaware River Valley.[29] The Delaware case, however, provides a potential model for identifying and reconciling a variety of interests in establishing water quality standards. It is an example of bargaining between interested parties, where, it would appear, equal access was given to all in the process. Providing an opportunity for the public to be involved in the implementation of a pollution control program was also a key feature. It will be interesting to see if the public will maintain its interest over the long term.

POTOMAC RIVER BASIN

Water quality management in the Potomac River Basin of the United States is an example of minimal public input in the standard setting process and a narrow evaluation of possible alternatives for meeting water quality objectives. In 1962, the U.S. Army Corps of Engineers had completed a study of water quality in the Potomac River Basin. Since then the Corps have been involved in on-going studies of the Potomac. In the earlier study, low dissolved oxygen levels were identified as the most significant water quality problem in the Basin. The U.S. Corps of Engineers had assumed that a water quality objective of 4 ppm of dissolved oxygen was required to maintain desired levels of water quality, primarily for fish maintenance. This value was based on projected waste loads in the estuary to the year 2010.[30] It was assumed that the application of secondary treatment at point source discharges would result in a 90% reduction in biological oxygen demand loads. Other water resource goals were also established for the Basin: increasing municipal and industrial water supplies, flood damage protection, and water-based recreational opportunities. Realizing that point source treatment would not meet expected levels of water quality, the Corps of Engineers proposed the construction of a series of reservoirs to achieve these multiple goals, including water quality objectives. A number of reservoirs were designed to augment natural water flows in the Basin to maintain a 4 ppm dissolved oxygen level. Two pollution control strategies emerged: (1) treatment of waste by individual dischargers, and (2) increasing the assimilative capacity of the receiving waters. A benefit-cost analysis was undertaken by the Corps which demonstrated that the benefits from flow augmentation exceeded the costs.

A study conducted by Resources for the Future Inc., examined a range of alternative schemes for improving low dissolved oxygen levels in the Potomac Estuary.[31] The study demonstrated that through stream reoxygenation, effluent distribution and a variety of waste treatment methods, the desired goal of 4 ppm of dissolved oxygen could be obtained at a cost lower than that obtained through low flow augmentation. The study also attempted to measure the costs of obtaining a range of dissolved oxygen levels. The study was critical of the planning process undertaken by the U.S. Corps of Engineers in not considering a range of alternatives, and a least-cost method for meeting desired levels of water quality. Another criticism focused upon the arbitrary nature of the process of establishing a water quality objective.

The main difference between the Potomac and Delaware experiences lay in the institutional arrangements available for establishing water quality goals. The Delaware planning authority had the responsibility of implementing programs and encouraging a wide representation of affected interests. Institutional arrangements for the Potomac River Basin lacked a centralized agency with the necessary powers to establish and implement water quality plans. Low flow augmentation was a scheme for which federal subsidies were available. As a result, local political support for a range of alternative water quality management plans was not available.

OKANAGAN RIVER BASIN

In British Columbia, there have been few attempts at regional water quality management. The Okanagan River Basin case represents one attempt at regional water resources planning in the province.

In October 1969 the federal and provincial governments signed an agreement to undertake a comprehensive framework plan for developing and managing water resources in the Okanagan Basin. The agreement marked the beginning of a four year study to identify and assess goals for water resource development.

Increased economic activity, population growth, and an expanding tourist industry in the 1960's accentuated water resource problems in the Okanagan Valley Basin. Discharge from domestic sewage and runoff from agricultural land uses increased the eutrophication process in the shallow parts of the major lakes in the Basin. There was concern that water supplies would be scarce in the future because of increased economic and agricultural activity. This condition would adversely affect uses of water for fisheries, recreation, and wildlife. The major purpose of the study was to plan a framework for the management of water quantity, water quality, water-based recreation and sport fishery resources to the year 2020.[32]

The study also called for a public involvement program to identify the goals of the residents of the Basin toward water management. The process of involving the public was innovative for British Columbia.[33] Through a variety of public participation techniques (e.g. questionnaire surveys, public meetings, interest-based planning approaches, open-line radio and public television programs), alternative development plans for the Okanagan Basin were formulated and evaluated. There was a public desire for a low economic growth rate in the Basin and improvement of water quality in the lakes of the region. Okanagan Valley residents rejected plans for large scale water diversion projects.[34]

One key in assisting the public in analyzing technical information was that technical staff prepared data and information in a form that was understandable to the general public. Since the study was concerned with future development plans, there were no immediate or threatening issues. Overall, community groups did not perceive a major need to take direct politically-based action.

Three goals were identified in the study for water quality management:

(1) to protect the health of Okanagan residents;

(2) to provide water quality compatible with agricultural, municipal, domestic and industrial uses; and

(3) to provide the highest possible water quality for water-based recreation, sport fisheries and other non-consumptive uses of water.

A five year implementation and cost-sharing agreement was signed in February 1976 between the federal and provincial governments to implement socio-economic and water quality goals in the Okanangan Basin. The strategy proposes a reduction in phosphorous loadings to control aquatic plant and algae growth in the main valley lakes. This is to be accomplished through the construction of eleven sewage treatment facilities throughout the Basin prior to 1980.[35] Three other treatment facilities are to be built after 1980. The provincial government has adopted a policy of removing all municipal waste discharges from the mainstem lake system in the Basin and to discharge to land. This is likely to increase costs for treatment facilities at Penticton, Oliver, Armstrong and Kelowna. Water quality monitoring began in 1976 to provide comparative data on water quality after treatment facilities are operating. According to government authorities, the waste management program will not likely meet the 1980 implementation schedule. Lack of adequate financing, especially at the local level was cited as the major problem.[36] The study report also noted that water management is very dependent on land use planning in the Basin. Future growth will have to be planned in relation to water resource needs.

An important feature of the program was that it placed water quality goals within the context of broader goals for economic and social welfare. Though the experience was apparently successful in identifying public preferences, as one author noted, it was designed for a specific purpose and for a well-defined community.[37] Whether public interest can be maintained throughout the implementation process remains to be seen. However, it does appear that issue orientation may replace a broader concern toward overall water management in the Basin. Public attention has recently focused on the controversy over the use of 2,4-D in controlling Eurasian milfoil weed in the main lakes of the Basin.[38] Responding to water quality goals in a response-to-issue manner may adversely affect the implementation of an overall water resource management scheme.

Many of the differences in the approaches and philosophies of the four regional examples are attributable to unique environmental and political circumstances which exist within each region. Attempts to involve the public in identifying goals and evaluating alternative strategies for water quality received more attention in the Delaware and Okanagan River Basins. The public involvement programs in these two regions might be considered ad hoc in nature. Unlike the Ruhr River Basin, where established institutional arrangements have permitted interest group representation in water resources management, public participation programs in the Delaware and Okanagan River Basins were organized in response to specific water quality issues.

Public involvement occured at a different stage in each region. Interest groups in the Ruhr River Basin are given political power in the administrative structure for water resource management.[39] Community and industrial interests are represented. The community interests supposedly reflect the broader public concern for water quality issues. It is difficult to assess to what extent individual views are expressed toward various water management issues.

In the Delaware River Basin, interest group representation was used to identify water use goals and needs and to develop water quality objectives for the Basin. A variety of interest-based committees were formed to serve these functions. The public interest groups held no direct political power in the administration for water quality management. In addition to their role of identifying water quality requirements, they were also organized to act as a watch-dog during the implementation of water quality standards.

In the Okanagan River Basin water quality management was considered within the context of economic and social development in the region. This was a broader approach than the Delaware case, in which only water use and water quality relationships were considered. A variety of techniques was employed to determine public preferences toward water resource and socio-economic development in the Okanagan Basin: questionnaire surveys, public hearings and meetings, task force and committee representation, and radio and television programs. Interest group representation provided a useful means for organizing public involvement and evaluating alternative strategies for water resource development. However, the public has no direct political representation in the process of implementing water quality management programs.

Originally in the Potomac River Basin there was no public involvement program. River basin authorities identified water quality goals and means of implementation. However, an Inter-Agency Commission was established for specifically consulting the public.[40]

CHAPTER SUMMARY

In recent decades emphasis on water quality has broadened to include a range of water-based activities. Goals for maintaining and improving water quality have been institutionalized in government legislation. The primary means for achieving broad goals have been the establishment of water quality standards. Standards have taken two forms: effluent discharge standards and receiving water (ambient) standards. Effluent discharge standards place restrictions on the amount and type of waste discharged, while ambient standards are based on the ability of the receiving waters to assimilate waste.

The most common water quality management strategy has been the regulation of point source discharges based on effluent discharge standards. Water quality legislation usually provides a system of fines and penalties for enforcing compliance with regulations. Individual waste dischargers are persuaded to install facilities for treating effluent. Many economists have taken a critical view towards this type of policy mechanism for controlling pollution. They have argued for a variety of alternatives to the standards approach. Their major criticism is that a regulatory approach based on effluent and ambient standards does not attempt to internalize the external costs associated with pollution. There is no incentive to abate pollution beyond a given standard. A number of alternative approaches were reviewed which attempt to allocate water quality as a scarce resource.

It was argued that the standard setting process has been overlooked in the research literature. Emphasis has been placed on achieving a given standard in an efficient manner. Reliance on technical standards as a means of achieving water quality goals has been the focus of many water quality management programs. As a result, the originally broad goals of water quality have been replaced by technical "minimum" standards. Inherent in standards are assumptions of public preferences and estimates of environmental risk. However, technical standards may not be easily communicated to the general public. As a result, only those with the necessary qualifications may become actively involved in establishing water quality standards.

Four examples of regional water quality management were reviewed in order to ascertain how water quality goals were determined and through what mechanisms goals were achieved. While most management strategies in the regions encompass multi-purpose goals for water resource development (water quality, water quantity, flood protection, recreation), institutional arrangements may constrain a comprehensive approach. The range of alternatives used to meet water quality goals varied considerably among the case studies.

The Ruhr River Basin is unique among the four examples in adopting a polluter-pay strategy. The water quality standard in this region was based on the ability of the water to support fish life. This criterion was assumed to meet the needs of other water uses. No attempts have been made in the Ruhr to assess recreational water needs of the general public.

In the Delaware River Basin, an open bargaining arrangement based on an interest-based planning approach, was used to identify desired levels of water quality. The water use/water quality requirements of various interests were identified. Regional waste treatment facilities, as opposed to regulation of point source discharges, were built to meet desired water quality objectives. Water quality objectives were based on agreements among water users in the regions.[41]

In the Potomac River Basin, a water quality goal of 4 ppm of dissolved oxygen was established with no public consultation. Construction of waste treatment facilities and augmentation of stream flows in the area were used to attain the water quality objective. An RFF study of the water management approach in the Potomac Basin revealed that this narrow range of choice in alternatives severely limited consideration of lower cost alternatives for meeting water quality goals.

In the Okanagan Basin of British Columbia, a unique planning approach was used to identify and weigh alternative goals for water resource development in the region. A variety of public involvement techniques were employed to solicit public preferences toward socio-economic and water resource objectives.

community interests were identified and provided a basis for an interest-based planning approach. Questionnaire surveys, public meetings, task forces, and radio and television programs were used in the process. Community residents favoured a low economic and population growth rate in the region and desired high levels of water quality for consumptive, recreation, and aesthetic purposes. The control of Eurasian milfoil weed was identified as a major water quality problem. The steps taken to control this weed however, have met with public opposition, perhaps signifying a partial breakdown in the public education and participation program for water resource planning in the Basin.

The river basin has received favourable attention as a unit for the management of water resources. Management approaches based on the river basin region offer the potential for a comprehensive planning strategy. Water uses can be coordinated, scale economies can be gained in construction of treatment facilities and savings in administrative costs can be achieved. The regional approach offers the opportunity for cost accounting. Polluters can be more easily identified as can those who benefit from water quality control. The effective implementation of regional plans requires an administrative arrangement which can resolve political jurisdictional differences. Most importantly, when most of the water users are located in the basin, there is potential for organizing the residents in the planning, evaluation and implementation of water quality goals.

The regional management approach should not be seen as a panacea for solving water quality problems. Water is not a static resource and often transcends regional boundaries. Upstream water uses can affect downstream water quality. It must also be realized that goals for water quality cannot be considered in isolation from other goals for economic and social welfare. Maintaining desired levels of water quality requires a comprehensive approach to land use planning within a region.

FOOTNOTES TO CHAPTER TWO

1. In B.C. the early Health Act of 1888 and subsequent revisions was the major instrument of environmental protection until pollution control was officially recognized in the first Pollution Control Act of 1956.

2. For example, U.N. Conference on the Environment, Stockholm 1972; U.N. Water Conference 1977, Buenos Aires; Habitat, Vancouver 1976; Canadian Council of Resource Ministers, National Conference on "Pollution and our Environment" Montreal 1966.

3. In Canada, stautes such as the FISHERIES ACT, R.S.C. 1970; The CANADA WATER ACT, R.S.C. 1970; NORTHERN INLAND WATERS ACT R.S.C. 1970 ; ARCTIC WATERS POLLUTION PREVENTION ACT R.S.C. 1970. In the U.S., WATER POLLUTION CONTROL ACT, 1948; the WATER POLLUTION CONTROL ACT Amendments, 1956; the WATER QUALITY ACT of 1965; and the 1972 WATER POLLUTION CONTROL ACT Amendments. Such statutes are testimony to the importance given to water quality control by federal governments.

4. CANADA WATER ACT R.S.C. 1970 c. 5 (1st Supplement) as amended.

5. T.R. Lee, 1974 "The Decision to Control Eutrophication" in F.M. Leversedge (ed.) 1974, PRIORITIES IN WATER MANAGEMENT, Western Geographical Series, Volume 8, Department of Geography, University of Victoria, pp.79-97.

6. T. O'Riordan and J. O'Riordan, 1972 OKANAGAN WATER DECISIONS, Western Geographical Series, Volume 4, Department of Geography, University of Victoria.

7. A. Dorcey (ed.) 1976, THE UNCERTAIN FUTURE OF THE LOWER FRASER, Westwater Research Centre, University of British Columbia.

8. Much of the research emphasis on regional water quality management was spawned by A.V. Kneese, 1964 THE ECONOMICS OF REGIONAL WATER QUALITY MANAGEMENT, Johns Hopkins Press, Baltimore; and its revision, A.V. Kneese and B.T. Bower, 1968 MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY , INSTITUTIONS, Johns Hopkins Press, Baltimore.

9. GUIDELINES FOR WATER QUALITY OBJECTIVES AND STANDARDS, Inland Waters Branch, Department of the Environment, Ottawa, 1972.

10. For example, see A.M. Freeman and R.H. Haveman, 1972 "Residual Charges for Pollution Control: A Policy Evaluation" SCIENCE, Volume 174, pp.322-329; L.E. Ruff, 1970 "The Economic Common Sense of Pollution" THE PUBLIC INTEREST, Spring 1970, pp.69-85; A.V. Kneese and C.C. Schultze, 1975 POLLUTION, PRICES, AND PUBLIC POLICY, Washington, The Brookings Institution; W.J. Baumol and W.E. Oates, 1971 "The Use of Standards and Prices for Protection of the Environment" in P. Bohm and A.V. Kneese (eds.), THE ECONOMICS OF ENVIRONMENT, London, MacMillan; S. Rose-Ackerman, 1973 "Effluent Charges: A Critique" CANADIAN JOURNAL OF ECONOMICS, Volume 6, pp.512-528; for British Columbia applications see, J.B. Stephenson (ed.), 1977 THE PRACTICAL APPLICATION OF ECONOMIC INCENTIVES TO THE CONTROL OF POLLUTION: THE CASE OF BRITISH COLUMBIA, B.C. Institute for Economic Policy Analysis, University of British Columbia Press, Vancouver.

11. CANADA WATER YEAR BOOK 1975, Inland Waters Branch, Department of the Environment, Ottawa, p.185.

12. Many government reports make these cautionary points with regard to limited information. See for example, World Health Organization 1974, HEALTH ASPECTS OF ENVIRONMENTAL POLLUTION CONTROL, PLANNING AND IMPLEMENTATION OF NATIONAL PROGRAMMES, Technical Report Series No. 554, Geneva; and International Council For the Exploration of the Sea, "Report of the Sub-Group on the Feasibility of Effects Monitoring, unpublished report, 1976.

13. I.K. Fox, 1970 "The Use of Standards in Achieving Appropriate Levels of Tolerance" PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, Volume 67, No. 2, pp.877-886; and I.K. Fox and L.F. Wible, 1973 "Information Generation and Communication to Establish Environmental Quality Objectives" NATURAL RESOURCES JOURNAL, Volume 13, pp.134-149.

14. K.H. Craik and E.H. Zube (eds.), 1976 PERCEIVING ENVIRONMENTAL QUALITY: RESEARCH AND APPLICATIONS, Plenum Press, New York; H. Inhaber, 1974 "Environmental Quality: Outline for a National Index for Canada" SCIENCE, Volume 186, pp.798-805; H. Inhaber, 1976 ENVIRONMENTAL INDICES, John Wiley; National Academy of Sciences, PLANNING FOR ENVIRONMENTAL INDICES, Preliminary Final Report 1974, Washington, D.C.; W.A. Thomas (ed.), 1972 INDICATORS OF

ENVIRONMENTAL QUALITY, Plenum Press, New York.

15. K.H. Craik and E.H. Zube, op. cit.

16. See R.M. Brown, N.I. McClelland, R.A. Deininger and M. O'Connor, 1972 "A Water Quality Index-Crashing the Psychological Barrier" in W.A. Thomas, op. cit. pp.173-182. The authors argue that the extra cost and time and data gathering involved in developing a water-use related index is not worth the effort. Their study attempted to demonstrate that a general water quality index was closely correlated to a water use index.

17. R.E. Coughlin, 1976 "The Perception and Valuation of Water Quality: A Review of Research Methods and Findings" in K.H. Craik and E.H. Zube, op. cit. pp.205-227.

18. R.E. Coughlin, op. cit., p.221.

19. Ronald Coase, 1960 "The Problems of Social Cost" THE JOURNAL OF LAW AND ECONOMICS, Volume 3, pp.1-44.

20. Marc J. Roberts, 1976 "Environmental Protection: The Complexities of Real Policy Choice" in Neil Swainson (ed.), 1976 MANAGING THE WATER ENVIRONMENT, University of British Columbia Press, Vancouver, pp.157-235.

21. See A.V. Kneese, 1964 op.cit.; and A.V. Kneese and B.T. Bower, 1968 op. cit.; and see A.M. Freeman and R.H. Haveman, op. cit. for a review of economic techniques for pollution control.

22. J.H. Dales, 1968 POLLUTION, PROPERTY AND PRICES: AN ESSAY IN POLICYMAKING AND ECONOMICS, University of Toronto Press.

23. M.J. Roberts, op. cit. p.204.

24. Gardner Brown, Jr. 1977 "Charge and Subsidy Programmes of Several European Countries" in J.B. Stephenson, op. cit. pp.409-422.

25. The information presented here is taken in large part from A.V. Kneese and B.T. Bower, op. cit., (Chapters 7 and 12 respectively).

26. A.V. Kneese and B.T. Bower, op. cit., p.251.

27. M. Chevalier and T.J. Cartwright, 1971 "Public Involvement in Planning: The Delaware River Case" in W.R.D. Sewell and

I. Burton (eds.) 1971, PERCEPTIONS AND ATTITUDES IN RESOURCES MANAGEMENT, Resource Paper No. 2, Policy Research and Coordination Branch, Department of Energy, Mines, and Resources, Ottawa, pp.111-120.

28. Ibid, p.115.

29. W.O. Spofford Jr., C.S. Russell, R.A. Kelly, 1976 ENVIRONMENTAL QUALITY MANAGEMENT-AN APPLICATION TO THE LOWER DELAWARE VALLEY, Resources For the Future, Inc., Washington, D.C.

30. R.K. Davis, 1968 THE RANGE OF CHOICE IN WATER MANAGEMENT: A STUDY OF DISSOLVED OXYGEN IN THE POTOMAC ESTUARY, Resources For the Future, Inc., Johns Hopkins Press, Baltimore.

31. Ibid.

32. Jon O'Riordan, 1976 "The Public Involvement Program in the Okanagan Basin Study" NATURAL RESOURCES JOURNAL, Volume 16, No. 1, pp.177-196.

33. Ibid. p.179.

34. Ibid. p.192.

35. T.A.J. Leach "The Okanagan Basin Implementation Agreement-An Audit of the Steps Leading Up to the Agreement and Progress to date (April 1978)" Paper presented at the U.B.C. Seminar on Managing Water Resources for Human Settlements, April 23-25, 1978.

36. Ibid.

37. J. O'Riordan, op. cit.

38. The VANCOUVER SUN, July 18, 1978, p.1.

39. Public interests are also represented in France through water parliaments and in the United Kingdom through the Regional Water Authorities. See Johnson, R.W. and Brown, G.M., 1976, CLEANING UP EUROPE'S WATERS: ECONOMICS, MANAGEMENT AND POLICIES, Praeger Publishers, New York.

40. Consultation with Dr. W.R.D. Sewell, University of Victoria.

41. M. Chevalier and T.J. Cartwright, op. cit.

CHAPTER THREE

POLICIES FOR CONTROLLING WATER POLLUTION IN THE PULP AND PAPER INDUSTRY OF BRITISH COLUMBIA

This chapter focuses on pollution control in the pulp and paper industry of British Columbia. An overview of the legal and administrative structure for water quality management in the province is presented. This provides a basis for an examination of the regulatory system for controlling water pollution in the pulp and paper industry. Four themes are developed:

(1) The legal framework for water quality management in British Columbia provides the background to the federal-provincial jurisdictional division of water resource management responsibilities.

(2) The administrative structure for controlling water pollution in British Columbia is discussed. The federal FISHERIES ACT and the provincial POLLUTION CONTROL ACT are outlined.

(3) Pollution generation in the pulp and paper industry is reviewed. Major pollutants created during pulping processes, the effects of effluent on water quality and waste treatment technology are discussed.

(4) Regulation of pollution in the pulp and paper industry of British Columbia is examined. This section focuses on the setting and enforcement of pollution control standards. Federal and provincial standards are compared and regional differences in the setting and application of standards are noted. A comparison of federal and provincial legal enforcement practices demonstrates notable differences between the two levels of government.

THE LEGAL FRAMEWORK FOR WATER QUALITY MANAGEMENT IN BRITISH COLUMBIA

The key document of the Canadian Constitution, the BRITISH NORTH AMERICAN ACT, 1867, provides the legal basis for federal-provincial division of authority. Sections 91 and 92 of the Act outline those subjects which come under federal and provincial jurisdiction, respectively. There is no specific provision for water quality management by either level of government. The Act provides for federal authority over navigation and shipping, the sea coast, international and interprovincial rivers, and fisheries. The provinces are generally responsible for the allocation of water uses within their boundaries. Provincial ownership of resources also extends to the forests, minerals, and oil and gas.

The unclear division of proprietary rights and regulatory powers often creates overlapping jurisdiction, especially in environmental matters. In its efforts to protect the fisheries of Canada, the federal FISHERIES ACT places restrictions on logging and forestry practices in the provinces. This is an example of a federal jurisditional concern extending into an area of provincial regulatory authority. In constructing a dam, a province must have federal approval, since the obstruction of a river could interfere with navigation and fisheries. If the river crosses an interprovincial or international boundary, then the development is considered in the national interest and the federal government is centrally involved. In legislating within its power, the federal government has paramount authority.[1] This means that a province which extends its regulatory authority in a certain situation, must meet the requirements of federal legislation. Under section 91 of the BRITISH NORTH AMERICA ACT, 1867, the federal government also has the authority, "to make laws for the peace, order and good government of Canada". This section could ultimately be used to support any federal statute which deals with a "national concern".

It is clear that under the present constitutional arrangements, acheiving goals for water quality management must involve cooperation between the federal and provincial governments. This occurs to some extent in the area of water pollution control. The provincial and federal agencies often exchange information on pollution sources and tend to cooperate in regulating waste dischargers. However, the British Columbia government has felt that the federal government extends its influence beyond its delegated authority in the amended FISHERIES ACT.[2]

FEDERAL LEGISLATION

In response to increased concern over environmental deterioration and to establish national autonomy over water resource management, the federal government passed new legislation and revised existing legislation in 1970-71. A

Department of the Environment was also created to consolidate the federal role in water management.

The CANADA WATER ACT R.S.C. 1970 c. 5, would enable the federal government in agreements with the provinces, to create water quality management areas in Canada and to develop national environmental quality standards. The Act provided a mechanism for federal-provincial cooperation in water quality management. Under the Act, Phosphorous Concentration Control Regulations (SOR/70-354 as amended) have been developed to control eutrophication in lakes and rivers in Canada. The CANADA WATER ACT has the potential for being the most important legislation in Canada for water quality management. However, it has not been a strong instrument for controlling water pollution. The constitutional position of the Act is presently unclear. The Act may not allow the federal government to act unilaterally in water resource management, since it would interfere with provincial regulatory authority. To be effective the Act requires cooperation between the federal and provincial governments. The federal government has relied on the FISHERIES ACT, R.S.C. 1970 c. 14, to control water pollution, especially from industrial sources. Under the FISHERIES ACT, the federal government has established authority. The federal government amended the FISHERIES ACT in 1977 in order to take stronger action against water pollution.

The FISHERIES ACT, R.S.C. 1970 c. 14, which will be discussed in detail in the next section, is the most important statute for controlling water pollution in Canada. The Act was revised in 1970 to increase federal government control over fisheries management in Canada, particularly offshore fishing territories. The Act also gives the federal government the power to prohibit pollution of waters frequented by fish.

Amendments to the CANADA SHIPPING ACT, 1970 allowed the federal government to pass regulations prohibiting the discharge of effluent and other substances from ships. The Act is aimed primarily at oil spills from ships in Canadian waters. The Oil Pollution Prevention Regulations prohibit discharges of oil substances and provide a maximum fine of $100,000.

The NAVIGABLE WATERS PROTECTION ACT, R.S.C. 1970, applies to all navigable waters in Canada and is intended to prevent interference with navigation. Although the Act is not directly concerned with water pollution, it does prohibit the deposit of materials which could interfere with navigation (section 19). Maximum fines under this section are $5,000 for each offense.

The MIGRATORY BIRDS CONVENTION ACT, R.S.C. 1970, is designed to protect waters which are used by migratory birds. Section 35(1) of the Migratory Bird Regulations prohibits the deposit of oil, oily materials, or other substances in waters frequented by migratory birds. Exemptions from this section are provided if persons are allowed to deposit substances under other federal regulations. The Act provides for fines up to $300 and/or six months imprisonment.

The OCEAN DUMPING CONTROL ACT, S.C. 1974-75 c. 55, is aimed at controlling indiscriminate disposal of materials from ships, aircraft, or platforms in marine waters of Canada. The Act only applies to "deliberate" dumping and does not affect accidental deposits. A permit is required from the Minister of the Environment to dump materials. However, permits cannot be issued if the dumping contravenes the provisions of another Act. The Minister of the Environment is required to consider the impact on water quality and marine life and to review alternative means of disposal before granting a permit. The applicant for a permit may object to the terms of the permit as can a member of the public. Persons found guilty of dumping dangerous substances without a permit are liable to a maximum fine of $100,000. The Act also provides for the federal government to recover damage and cleanup costs incurred from the dumping of materials.

PROVINCIAL LEGISLATION

The earliest legislation in British Columbia expressly concerned with water quality was the HEALTH ACT of 1893.[3] Water quality remained primarily a health matter, until the WATER COURSES OBSTRUCTION ACT, 1903, and subsequently, the WATER ACT, 1911, prohibited persons from throwing into any lake, river, stream or watercourse, "slabs, bark, sawdust, waste stuff or other refuse of any sawmill, or driftwood, wastewood or leached ashes."[4] It was not until 1956, that an act was passed for the expressed purpose of controlling water pollution. The 1956 POLLUTION CONTROL ACT established a Pollution Control Board to set effluent standards and to determine what constituted a polluted condition. The Act made it illegal to discharge waste without a permit obtained from the Board. The Board could attach terms and conditions to the permit for dealing with discharges. The Act, designed primarily to regulate municipal waste discharges from those communities located along the lower Fraser River, was originally under the jurisdiction of the Minister of Municipal Affairs.

The 1956 Act was replaced by the POLLUTION CONTROL ACT, 1967, designed to regulate all waste discharges in the province. In addition to the Pollution Control Board, the Act created the Director of the Pollution Control Branch. The Director is responsible for the administration of the Act, including the issuing of permits and the enforcement of the Act. This Act is the key provincial statute for controlling water pollution in British Columbia. The Act will be considered in more detail in the following discussion.

The provincial WATER ACT, R.S.B.C. 1960, is another key act for water resource management in British Columbia. However, the Act is concerned primarily with water consumption and supply and not water quality. The Act declares the property right in and right to use water to the Crown. The Comptroller of Water Rights is responsible for issuing licenses for the use of water in all lakes, rivers, and streams in the province. Licenses are given for water diversion, use or storage of water, construction of works for water diversion, or storage or other alterations. Section 41(k) of the Act, makes it an offence to put "into any stream any sawdust, timber, tailings, gravel, refuse, carcass or other thing or substance after having been ordered by the Engineer or Water Recorder not to do so."[5]

In practice, the Comptroller of Water rights is consulted on applications for pollution conrol permits by the Director of the Pollution Control Branch. This procedure generally avoids the potential for conflict between a holder of a water license and a pollution control permit. However, a holder of a license under the WATER ACT is legally entitled to object to the application for a pollution control permit (Section 13(2) POLLUTION CONTROL ACT). In the event that a conflict remains unresolved, Section 5B(1) of the POLLUTION CONTROL ACT states,

> "If there is a conflict between the provisions of this Act, or the regulations, orders, approvals, or permits made under this Act, and the provisions of any other Act, regulation, order, or permit, the provisions of this Act, regulation, order, approval, or permit shall prevail."

Under Section 6(h) of the HEALTH ACT, R.S.B.C. 1960, action can be taken to prevent water pollution which presents a health risk. The Sanitary Regulations established under the Act prohibit the deposit of refuse in any lake, pond, harbour, river, stream or water. This section does not apply to municipalities. Because of staff limitations and the regulation of water pollution under the POLLUTION CONTROL ACT, the HEALTH ACT is used to a very limited extent for controlling pollution. The maximum fine for a violation of the regulations is $100 and/or six months imprisonment.

The LITTER ACT S.B.C. 1970, prohibits the discharge or deposit of litter in fresh water or ice except if the discharge has been authorized by a pollution control permit or HEALTH ACT permit. Litter is defined as "rubbish, garbage, or waste materials, and any abandoned or discarded article or product of manufacture, excluding primary processing wastes of the mining, logging, sawmilling, or manufacturing industries" (Section 2). The maximum fine for contravention of the Act is $500 and/or six months imprisonment.

The provincial FISHERIES ACT R.S.B.C. 1960, is designed to protect the province's proprietary right to the fishery beds in freshwaters. Section 34(2) orders those persons who are using or diverting, or changing the flow of a stream or river to submit plans for approval to the Minister of Recreation and Conservation. Proceeding without Ministerial approval can result in a fine ranging from $100 to $10,000. The use of the Act is limited because of the federal jurisdiction under the federal FISHERIES ACT.

The importance of the LAND ACT S.B.C. 1970, is that it gives the Crown the right to lake and stream beds on Crown land, removing the common law rights from land holders. It also allows provincial agencies, subject to federal legislation, the right to construct works on or over the beds.

Under the MUNICIPAL ACT R.S.B.C. 1960, local municipalities have wide powers to deal with water pollution. Section 519(a) gives Councils power to prohibit substances from "fouling, obstructing, or impeding the flow of any stream, creek, waterway, or watercourse." Under these powers, the city of Vancouver has passed a bylaw (Health By-law no. 4387, s. 97) prohibiting the deposit of refuse, organic, or inorganic waste or noxious substances in any waters within the city. The provincial POLLUTION CONTROL ACT expressly permits municipalities to enact their own regulations or orders to prevent pollution, providing they do not conflict with the provisions of the POLLUTION CONTROL ACT (Section 5B(2), (3), (4)). However, the municipalities in general have only taken limited action in controlling water pollution, probably because of manpower constraints. They have tended to rely on the Pollution Control Branch to regulate waste discharges.

While not dealing directly with water pollution, the ENVIRONMENT AND LAND USE ACT S.B.C. 1971, has the most potential for environmental protection in British Columbia. The Act established the Environment and Land Use Committee comprised of members of the Cabinet, with extensive powers to make orders and regulations dealing with any environmental issues within its legal jurisdiction, in the province. The Environment and Land Use Secretariat was established to make policy recommendations on environmental issues to the Committee. The Secretariat may also undertake environmental impact assessments prior to major resource development schemes in the province. The Act has not been used extensively for regulating environmental quality, leaving specific issues to be regulated by the respective statutes in the province. It has been indirectly used to influence regulation, particularly in evaluating B.C. Hydro impact studies.

THE ADMINISTRATIVE STRUCTURE FOR CONTROLLING WATER POLLUTION IN BRITISH COLUMBIA

Two key acts provide the administrative basis for controlling water pollution in British Columbia: the federal FISHERIES ACT and the provincial POLLUTION CONTROL ACT.

The FISHERIES ACT is administered by the Department of the Environment. For organizational purposes, the Department of the Environment is divided into (1) the Fisheries and Marine Service which is administered by the Minister of Fisheries and, (2) the Environmental Management Services which are administered by the Minister of the Environment. Two agencies are directly responsible for administering the provisions of the FISHERIES ACT: the Fisheries and Marine Service which is primarily responsible for fisheries management, including scientific research on the effects of effluent on fish and fish habitats. The Environmental Protection Service enforces environmental regulations which have been made under the Act. The agency is primarily a regulatory agency responsible for implementing national effluent discharge regulations for various industries.[6]

The FISHERIES ACT was amended in July 1977 to strengthen the federal jurisdiction over fisheries protection. The major amendments which have implications for pollution control are summarized in Table 1. In most cases a strengthening of fines was a result of the amended Act, as was the extension of the Act

TABLE 1

AMENDMENTS TO THE FISHERIES ACT

Section	Previous Penalty	Revised Penalty
31(1) Harmful alteration or destruction of fish habitat	New Provision	Max. $5,000 first offence Max. $10,000 subsequent or 2 years max. imprisonment
33(3) Throw overboard deleterious substances	Max. $5,000	Max. $5,000 first offence Max. $10,000 subsequent
33(2) Deposit of deleterious substances into waters frequented by fish	Max. $5,000	Max. $50,000 first offence Max. $100,000 subsequent
33(3) Deposit of slash, stumps, or other debris	Max. $5,000	Max. $5,000 first offence Max. $10,000 subsequent
33.1(1) Failure to provide plans to Minister	Max. $5,000	Max. $5,000 first offence Max. $10,000 subsequent
33.2(4) Failure to report spill of deleterious substance	New Provision	Max. $5,000 first offence Max. $10,000 subsequent
33.3 Obstruct or give false information to an officer	Max. $1,000 and/or 6 months imprisonment	Max. $25,000 first offence Max. $50,000 subsequent

to protect fish habitats as well as waters frequented by fish. The main sections of the Act for controlling water pollution are:

<u>Section 31(1):</u> prohibits any work which results in the harmful alteration, disruption or destruction of fish habitats. Fish habitats include,

> "spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes."

Fish are now defined in the amended Act to include "shellfish, crustaceans, marine animals and the eggs, spawn, spat and juvenile stages of fish, shellfish, crustaceans, and marine animals." In the previous Act, eggs were not included, which became a critical issue in court cases involving destruction of spawning grounds. This a new provision in the amended Act and carries a $5,000 fine for a first offence and a $10,000 fine for each subsequent offence or 2 years imprisonment.

<u>Section 33(2):</u> is the section most often used for enforcement of pollution control. The section prohibits the deposit of any deleterious substance into waters frequented by fish, or in any place where the substance could enter such waters. A deleterious substance is defined (Section 33(11)) as,

> "any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water",

and,

> "any water that contains a substance in such quantity or concentration or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water",

A contravention of Section 33(2) is liable to a fine not exceeding $50,000 for a first offence, and not exceeding $100,000 for each subsequent offence. The penalties are a substantial increase above the $5,000 fine which existed under the previous Act.

Section 33(3): is designed to protect fish streams in logging areas. The Act states,

> "No person engaging in logging, lumbering, land clearing or other operations, shall put or knowingly permit to be put, any slash, stumps or other debris into any water frequented by fish or that flows into such water..."

This section carries a maximum fine of $5,000 for a first offence and $10,000 for each subsequent offence.

Section 33.1(1): provides that anyone undertaking an action which might result in the deposit of a deleterious substance or alteration or destruction of a fish habitat, shall on the request of the Minister, submit plans and evidence of the action to aid the Minister in assessing whether the action could violate the Act. Failure to submit such information can result in a maximum fine of $5,000 for a first offence and $10,000 for each subsequent offence.

<u>Section 33.1(2):</u> allows the Minister to order those persons who are violating Sections 31 or 33 to undertake action to correct the situation. With the approval of the Governor in Council (federal Cabinet), the Minister can order the closure or stoppage of an action which violates the above sections. This is potentially a very powerful Section. It could be used to force industries, such as pulp mills, to comply with pollution control requirements.

<u>Section 33.2(4):</u> requires that a deposit, such as a spill, of a deleterious substance must be reported to a fisheries official, by the person who owns, controls, or has management of the action which caused the deposit. Failure to report can result in a maximum $5,000 fine for a first offence and up to $10,000 for each subsequent offence.

<u>Section 33(10):</u> provides that those persons responsible for a deposit of a deleterious substance are liable for clean-up costs. The Section gives the right to commercial fishermen to take court action to recover income losses incurred from the deposit of a deleterious substance (other than from a ship).

<u>Sections 33(12) and 33(13):</u> give the federal government the power to make regulations which authorize the deposit of deleterious substances in specified types and quantities. Regulations have been established for the following industries: Pulp and Paper Effluent Regulations (November 2, 1971),

Chlor Alkali Mercury Regulations (March 28, 1972),
Petroleum Refinery Liquid Effluent Regulations (October 30, 1973),
Metal Mining Liquid Effluent Regulations (February 24, 1977),
Meat and Poultry Liquid Effluent Regulations (March 30, 1977).

If an industry is discharging wastes in accordance with the terms and conditions of a set of Regulations, then it is exempt from contravening Section 33(2) of the FISHERIES ACT. Therefore, an industry could be discharging waste which is harmful to fish, but cannot be charged because it is complying with the required Regulations.

The enforcement of the FISHERIES ACT in British Columbia's inland waters (non-anadromous fish) has been the responsibility of the Provincial Fish and Wildlife Branch under a 1901 agreement with the federal government. [7]

The British Columbia POLLUTION CONTROL ACT S.B.C. 1967, is the major provincial act for controlling pollution. It is under the jurisdiction of the Minister of Environment. The Act established the Pollution Control Board and the Pollution Control Branch. The Board is comprised of eight members appointed by the Cabinet for two year terms. The Board's primary functions are: 1) to act as an appeal body to hear objections over the application for, or granting of, a pollution control permit; and 2) the development of pollution control standards.

The Pollution Control Branch is responsible for the daily administration of the POLLUTION CONTROL ACT. The Director of the Branch, a civil servant, occupies the most important position in the administration of pollution control. His primary duty is to regulate the discharge of pollution through the granting of pollution control permits. In addition the Act (Section 10(a)) gives him the expressed power "...to determine what constitutes a polluted condition" and Section 10(b), "to prescribe standards regarding the quality and character of effluent", and Section 10(h), "to determine his own procedure in carrying out his duties". Section 5 of the Act requires dischargers after January 1970 to notify the Director as to the extent of discharge and to apply for a pollution control permit. Pollution is defined as,

> "the introduction into a body of water, or storage upon, in, or under land or dischaging or emitting into the air such substances or contaminants of such character as to substantially alter or impair the usefulness of the land, water, or air."

It is unlawful to discharge such substances without a permit from the Director. A person found in contravention of the Act is subject to a maximum $10,000 fine or imprisonment not exceeding one year. There is also a fine of $500 per day for a continuing offence. Section 10(g) of the Act also allows the Director to order a polluter to stop discharging effluent if, in the discretion of the Director, a polluted condition exists.

A recent amendment to the POLLUTION CONTROL ACT in April 1977, gives extensive powers to the Minister of Environment to intervene in a pollution emergency. The person(s) liable for the pollution is liable for damage and clean-up costs. This power is potentially useful for spills of polychlorinated biphenols and oil.

Section 5 B(1) of the Act states that should a conflict arise over jurisdiction between the POLLUTION CONTROL ACT and any other provincial statute, the former shall apply. Therefore, if a person or company is meeting the terms of a permit, but still causes pollution, no other provincial statute is violated.

In issuing permits the Director is guided by effluent discharge objectives which have been developed for major industrial groups in the province. Pollution Control Objectives have been established for : (1) the Forest Products Industry; (2) the Food-processing, Agriculturally oriented, and Other Miscellaneous Industries; (3) the Chemical and Petroleum Industries; (4) the Mining, Mine-milling, and Smelting Industries; and (5) Municipal Type Waste Discharges. These Objectives are not legally binding, but are intended to serve as the basis for specifying the terms of pollution control permits. Copies of applications for permits are sent to the provincial Ministries of Health, Recreation and Conservation, Agriculture, and the Comptroller of Water Rights. Copies are also sent to the Environmental Protection Service and the Fisheries and Marine Service of the federal government, and to the International Pacific Salmon Fisheries Commission. A copy is also published in the B.C. GAZETTE.

Section 13 of the Act provides an objection procedure for those persons objecting to the terms of a permit, or who may be affected by the granting of a permit. Under this section, only those persons with a proprietary interest, or holders of, or applicants for, a permit, either under the POLLUTION CONTROL ACT or the WATER ACT, may officially launch an objection. Persons not qualified to object under these categories may file an objection with the Pollution Control Board, which decides whether the Director should hear the objection. Under Section 13(4) of the Act, the Director has sole discretion in deciding whether or not an objection will require a hearing.

A complicated appeals procedure is also outlined in the Act. Section 12(1) allows appeals from the orders of the Director and from the Board. Appeals of orders of the Director are first heard by the Pollution Control Board. A further appeal of the Board's decision is available to the Supreme Court of British Columbia or to the provincial Cabinet.

The Act is administered on a regional, industrial and municipal sector basis by the Pollution Control Branch. Six regions are defined, headed by a regional manager and a support staff who process applications for permits and do some monitoring of effluent discharges: namely Coast Region, Kootenay Region, Lower Mainland Region, North Region, Okanagan Region, and the South Central Region. The industrial division includes Forestry, Mining, and a general section. There is also a municipal division. These divisions have staff which are acquainted with pollution control problems in these fields. The majority of staff in the Branch are civil or sanitary engineers. Their prime function is to bring all waste dischargers in the province under permit. A pollution control permit specifies the allowable quantity and quality of the effluent discharged and may contain requirements and a time schedule for installation of pollution control equipment.

Often a discharger may be faced with meeting pollution control requirements of both the provincial Pollution Control Branch and the Environmental Protection Service. In practice, both agencies consult one another. In the event that a permit does not meet the requirements of the FISHERIES ACT, the Environmental Protection Service will negotiate directly with the discharger.[8]

In the major industries of British Columbia the federal and provincial regulatory agencies negotiate the requirements for a permit and compliance schedules on the basis of the federal Effluent Regulations and the provincial Pollution Control Objectives. In the following sections the discussion will focus on the pulp and paper industry of British Columbia and examine the administration of pollution control standards.

POLLUTION GENERATION IN THE PULP AND PAPER INDUSTRY

The forest industry of British Columbia is the primary resource industry in the province. Forest products accounted for 40-50 percent by value of total British Columbia manufacturing shipments in 1976.[9] Between 1970 and 1975 the average annual pulp production was 5 million tons, or about 27 percent of the total Canadian pulp production. The United States, Great Britain, Japan and the European Economic Community are the major importers of British Columbian pulp. Paper production averaged 2 million tons per year for 1970-1975, 15 percent of the Canadian total.[10] About 50% of all manufacturing employment in the province is directly attributable to the forest industry.[11]

There are twenty-five pulp and paper mills in the province (Figure 2). Of these, four are specialty mills, producing fine papers, paperboards, etc. The pulp and paper industry was traditionally tied to the coastal region of the province, with a number of mills being constructed in the early 1900's. During the 1960's, as competition for timber resources increased, mills were constructed in the interior of British Columbia. Kraft pulp dominates, with only one sulphite pulp mill remaining in the province. Table 2 lists the major pulp and paper mills and their average daily production. Bleached kraft pulp is produced by seventeen of twenty-one mills. Only six mills produce paper and four of these are integrated with pulp production. Five mills

1. Belkin Paperboard Limited, Burnaby
2. British Columbia Forest Products Limited, Crofton
3. British Columbia Forest Products Limited, Mackenzie
4. Canadian Cellulose Limited, Castlegar
5. Canadian Cellulose Limited, Prince Rupert
6. Canadian Cellulose Limited, Prince Rupert
7. Canadian Forest Products Limited, Port Mellon
8. Cariboo Pulp and Paper Ltd., Quesnel
9. Crestbrook Pulp and Paper Ltd., Skookumchuk
10. Crown Zellerbach Canada Ltd., Duncan Bay
11. Eurocan Pulp and Paper Co. Ltd., Kitimat
12. Finlay Forest Industries Ltd., Mackenzie
13. Intercontinental Pulp Ltd., Prince George
14. MacMillan Bloedel Limited, Annacis Island
15. MacMillan Bloedel Limited, Harmac
16. MacMillan Bloedel Limited, Port Alberni
17. MacMillan Bloedel Limited, Powell River
18. Northwood Pulp and Timber Ltd., Prince George
19. Ocean Falls Corporation, Ocean Falls
20. Prince George Pulp and Paper Limited, Prince George
21. Rayonier Canada (B.C.) Limited, Port Alice
22. Rayonier Canada (B.C.) Limited, Woodfibre
23. Scott Paper Ltd., New Westminster
24. Tahsis Company Limited, Gold River
25. Weyerhaeuser Canada Ltd., Kamloops

Source: British Columbia Manual of Resources, Department of Economic Development, Government of British Columbia, November, 1974.

DISTRIBUTION OF PULP AND PAPER MILLS IN B.C.

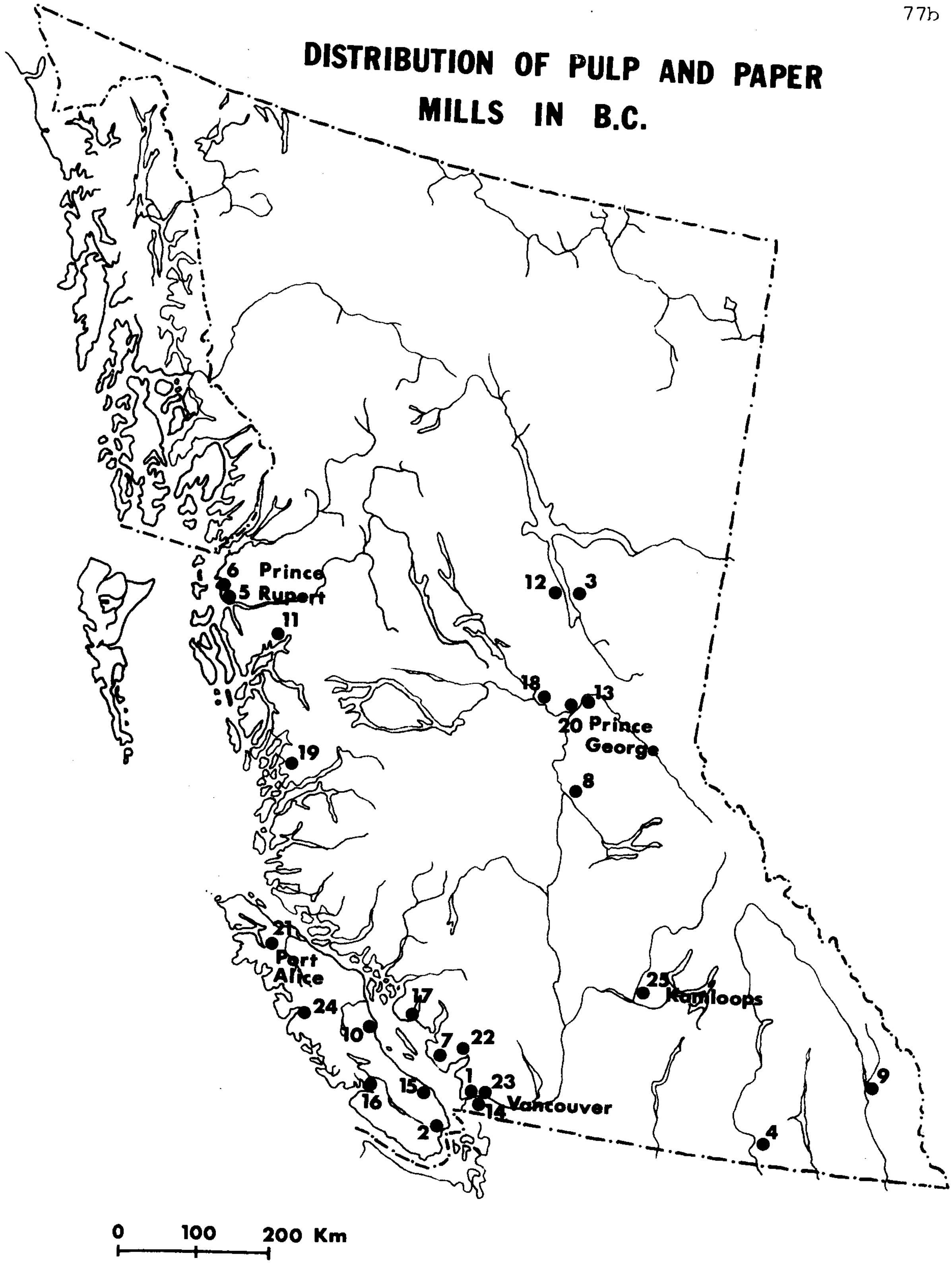


FIGURE 2

TABLE 2

LIST OF B. C. PULP AND PAPER MILLS, PRODUCTION, VOLUME AND TYPE OF PRODUCTS
(Alphabetical Order by Location)
Products (TPD) 1974

	Kraft Pulp				Groundwood Pulp				Paper			Sulphite	
Forest Company & Location	Total Kraft	Bleached Kraft	Unbleached Kraft	Market Kraft	Total Groundwood	Bleached Groundwood	Unbleached Groundwood	Market Groundwood	News-Print	Kraft Bag Wrapping	Liner Board	Total Sulphite	Market Sulphite
Canadian Cellulose Co. Ltd., Interior Pulp Operations, Castlegar.	575	575		575									
B.C. Forest Products Ltd., Crofton Pulp & Paper Div., Crofton.	1000	1000		800	550		550		750				
Crown Zellerbach Canada Ltd., Elk Falls Mill, Elk Falls.	1084	664	359	561					677	256			
Tahsis Company Ltd., Gold River.	750	750		750									
MacMillan Bloedel Ltd. Harmac Pulp Division, Harmac.	1350	1350		1350									
Weyerhaeuser Canada Ltd., Kamloops.	983	983		983									

TABLE 2 (continued)

Eurocan Pulp & Paper Co. Ltd., Kitimat	915		915	915							
B.C. Forest Products Ltd., Mackenzie Div., Mackenzie.	525	525		525							
Finlay Forest Industries, Mackenzie.					135	135	135				
Ocean Falls Corporation, Ocean Falls.								300			
MacMillan Bloedel Ltd. Alberni Pulp & Paper Div., Port Alberni.	800	200	600	300	1000			1200	300		
Rayonier Canada Ltd., Port Alice.										450	450
Canadian Forest Prod. Ltd., Howe Sound Pulp Div., Port Mellon.	525	525		525							
MacMillan Bloedel Ltd. Powell River Div., Powell River.	550	550		150	1500	1500		1900			
Intercontinental Pulp Co. Ltd., Prince George.	690	690		690							
Northwood Pulp & Timber Ltd., Prince George.	675	675		675							

TABLE 2 (continued)

Prince George Pulp & Paper Ltd., Prince George.	730	415	315	415	315		
Canadian Cellulose Co. Ltd., Prince Rupert.	800	800		800		500	500
Cariboo Pulp & Paper Co., Quesnel.	750	750		750			
Crestbrook Pulp & Paper Co., Skookumchuck.	400	400		400			
Rayonier Canada Ltd., Woodfibre.	523	523		523			

Source: Council of Forest Industries of British Columbia, Brief presented to the Public Inquiry for Pollution Control Objectives in the Forest Products Industry of British Columbia, March 1976.

produce newsprint. There have been no new mills built in the province since 1973.

PULPING PROCESSES AND WATER QUALITY

The adverse effects of pulp mill wastes upon water quality are due to the nature of the pulping processes. The pulping process requires enormous amounts of water, up to 70 million gallons per day for some mills. This figure is equal to the daily amount of sewage discharged from Vancouver's Iona sewage treatment plant.[12] Seventy-eight percent of the water intake of pulp mills is used for processing puposes and all but 3.6 percent of the intake is discharged.[13] Table 3 which shows water consumption and waste water discharge for pulp and paper mills in British Columbia would support this claim. Fifteen of twenty-one mills discharge to freshwaters, which places pressure on the assimilative capacity of the streams especially at low flow periods. The major rivers, Columbia, Fraser and Thompson all have a great range in seasonal flows. These rivers are also prime rivers for fish spawning and migration. Potential for water use conflict is evident when low seasonal flows and high effluent loads occur at the same time.

Pulping is the process used to reduce raw wood into a fibre form suitable for the manufacture of a variety of products including newsprint, tissue paper, packaging materials, writing papers, films, etc. British Columbia mills utilize three common

TABLE 3

PULP AND PAPER MILLS: WATER USE AND WATER DISCHARGE, 1972

		Water use (MGPD)	Waste water (MGPD)	Disposal Location	River flow ('000 cfs)	River System
M.B.	Annacis Is.	1.50	1.28	Fraser R.	25.6-507	Fraser R.*
Belkin	Burnaby	2.60	2.50	North Arm Fraser R.	25.6-507	Fraser R.*
C.Z.	Elk Falls	60.00	56.00	Discovery Passage	n/a	
Can.Cel.	Castlegar	42.00	30.00(e)	ColumbiaR.	5.1-157	Columbia R.
B.C.F.P.	Crofton	55.00	54.00		n/a	
Tahsis	Gold River	25.00	34.00?	Muchalat Inlet	n/a	
Weyerhauser	Kamloops	48.00	40.00	ThompsonR.	5.3 (e) - 148.8	Fraser R.
Eurocan	Kitimat	20.00	17.40	Kitimat R.	1.7-59.4■	Kitimat R.
B.C.F.P.	Mackenzie		15.30	WillistonL.	n/a	Peace R.
F.F.I.	Mackenzie	.50	.96	WillistonL.	n/a	Peace R.
M.B.	Harmac	69.00	58.00	Northum-berland Channel	n/a	
C.F.P.	New West.		1.50	Fraser R.	25.6-507	Fraser R.*
Scott Paper	New West.	2.25?	2.63	North Arm Fraser R.	25.6-507	Fraser R.*
Ocean Falls	Ocean Falls	13.00	25.00?	Cousins Inlet	n/a	
M.B.	P.Alberni	41.00	41.20	Alberni Inlet	n/a	

TABLE 3 (continued)

Rayonier	P.Alice	40.00	35.00	Neroutsos Inlet	n/a	
C.F.P.	P.Mellon	30.00	22.80	Howe Sound	n/a	
M.B.	Powell R.	85.00	75.17	Malaspina Strait	n/a	
Intercont P.	Prince G.	29.00	23.40	Fraser R.	9.9 $\underset{-}{(e)}$ 203	Fraser R.
Northwood P.	Prince G.	25.00	24.00	Fraser R.	9.9 $\underset{-}{(e)}$ 203	Fraser R.
P.G. Pulp	Prince G.	32.00	27.60	Fraser R.	9.9 $\underset{-}{(e)}$ 203	Fraser R.
Can.Cel.	P. Rupert		65.30?	Porpoise Harbour	n/a	
Cariboo P. & P.	Quesnel	31.50	25.36	Quesnel R. Fraser R.	 1.6-25.4■	Fraser R. Fraser R.
Crestbrook	Skookum-chuck	14.00	15.00?	KootenayR.	.8-25.8■	Columbia R.
Rayonier	Woodfibre	40.00	31.50	Howe Sound	n/a	

■= 1966; * Fraser R. at Mission.

Source: Peter N. Nemetz, 1977 "Pollution Generation and Abatement in the British Columbia Pulp and Paper Industry" in J. B. Stephenson (ed.) The Practical Application of Economic Incentives to the Control of Pollution: The Case of British Columbia, U.B.C. Press, Vancouver.

types of pulping processes.

Groundwood pulping: is a mechanical form of grinding the wood into fibres. This pulp is not considered to be of high quality and is used mainly for newsprint or in conjunction with other pulp for corrugated paper and packaging materials. Groundwood pulping produces the least waste per ton of product. No chemicals are discharged, but a considerable number of small suspended fibres can be released.

Kraft (or sulphate) pulping: is the predominant form of pulping in British Columbia. Kraft pulp is stronger than sulphite pulp and is used in most paper packagings, heavy cardboards, paper bags, and boxes. Bleached kraft pulp is used for fine white papers and food packagings. The pulping process involves the digesting of wood in an alkaline mixture of sodium salts. About fifty percent of the original wood is yielded as pulp.[14] The process requires the recovery of heat and chemicals for economic viability and, therefore, produces about one twentieth of the pulp waste of sulphite pulping.[15] This process produces an average biological oxygen demand (BOD) level of 65 pounds per ton of bleached kraft and 35 to 45 pounds per ton for unbleached pulp.[16] Kraft pulp effluent may contain sulphides, mercaptans, lignin derivatives, resin acids and fatty acids.[17] Coniferous woods used in the process help contribute to the foaming problems in the effluent. Many kraft pulp mills create air quality problems, emitting chemical dust, mists, and odourous gases (hydrogen sulphide).

Sulphite pulping: usually involves chemical digestion of the wood in a strong acidic bisulphite cooking liquor. While groundwood pulping yields 93-95% of the weight of the original material, sulphite pulping yields only about 50% of the weight. As a result, more waste is likely to be discharged. Compared to groundwood pulp effluent, which has a BOD load of thirty to sixty pounds per ton of pulp, untreated sulphite effluent has a BOD level of 500 to 1200 pounds per ton of pulp.[18] Sulphite pulping processes which utilize calcium as a cooking base are the worst polluters because calcium cannot be easily recovered. Most sulphite mills have converted to ammonia, sodium, or manganese, which offer better recovery possibilities. Two pulp mills in British Columbia have used a sulphite process, the Rayonier mill at Port Alice and the Canadian Cellulose mill at Prince Rupert. The Prince Rupert mill is now being converted to kraft pulp.

Effluent from sulphite mills can cause discolouration of the water, accumulation of sludge deposits, and at times, critical depletion of oxygen in the water. The "spent" sulphite liquor contains sulphur compounds, sugars, lignin residues, alcohols, acetone, and volatile acids.

EFFECTS ON WATER QUALITY

Reference has been made in the preceeding section to the quality and quantity of effluent produced by various pulping processes. This section will briefly discuss a number of specific effects of pulp mill wastes on water quality: biological oxygen demand, pH of water, settleable solids, suspended solids, toxicity of pulp mill effluent, and aesthetic effects.

Biological oxygen demand: is the most common measure for the amount of waste discharged by a pulp mill. The biological oxygen demand (BOD) is the amount of oxygen needed by micro-organisms to degrade and stabilize wastes in a water body. Since pulping produces variable amounts of BOD, the effect on water quality can vary. High levels of BOD reduce the amount of oxygen available to support fish life and other aquatic organisms. The effect of BOD on water quality can also be affected by the physical characteristics of a water body, such as volume and rate of flow. Generally, water quality standards for BOD are usually more stringent in smaller, slower flowing streams or lakes than in ocean bodies. The main source of BOD loads from pulp mills are carbohydrates which are dissolved from wood in the cooking process. Often the decomposition process is further affected by chemicals deposited in the water. Chemicals react directly with oxygen in the water, reducing the amount of oxygen available for bacterial breakdown of organic mill wastes. The amount of oxygen consumed by chemical reactions is called the chemical oxygen demand (COD).

Acidity (pH) of water: can be a critical factor in aquatic life protection. Pulp mill effluent, especially from kraft mills, can vary greatly. It has been found that seawater acts as a buffering agent to the alkalies in kraft wastes. pH is considered less critical as a measure for water quality in seawater than in estuaries or freshwater.[19] A pH range of 6.5 to 8.0 is usually considered acceptable for effluent discharges.

Settleable solids: occur when solid wastes sink to the bottom of a water body, often in the vicinity of a pulp mill outfall. These solids can cover the natural bottom habitat of fish and aquatic life. As these solids decay, they consume the available oxygen and release toxic gases, usually hydrogen sulphide. The build-up of settleable solids is affected by the flow rate of a body of water (flushing action). In marine areas where flushing is minimal, solids consisting of bark and pulp fibres can completely cover the bottom, with virtually no life present.

Suspended solids: are those wastes which are either in the process of settling or are not settleable. They are comprised of very fine wood fibres and particles which are not filtered out by primary treatment. Chemical and biological agents which are used for ~~secondary~~ waste treatment may also be suspended when they are released into water. Suspended solids can plug fish gills and lead to fish death. Suspended solids can also increase the turbidity of receiving waters, leading to reduced light penetration and reducing phytoplankton growth.

<u>Toxicity of pulp mill effluent:</u> results from a variety of substances used in the pulping process. Various resin acids produce approximately eighty percent of the toxicity from pulp mill effluent while unsaturated fatty acids make up the remainder.[20] Mercaptans and sulphides in pulp mill effluent are considered to be very toxic to fish. Two types of toxicity are usually referred to in discussing the effects of pulp mill effluent: acute toxicity and sublethal toxicity.

Acute toxicity measures the lethality of effluent to fish. This is normally carried out by subjecting fish to a specific concentration of effluent over a ninety-six hour period, or to evaluate what percentage of effluent concentration will kill fifty percent of the test fish. These tests are called bioassays.

Sublethal toxicity is more difficult to measure. Tests are usually carried out on fish and other aquatic organisms to determine the relationship between levels of effluent concentrations and a range of biological responses. Whereas acute toxicity tests are concerned with the effects of effluent on survival rates of fish, sublethal tests examine more discreet biological changes in aquatic organisms.

Colour, Turbidity, Taste and Odour:

Much of the dark colour associated with kraft mill effluent is created in bleaching operations. Colouring of receiving waters can produce aesthetic problems, especially in waters which are low in turbidity or silt. The colouring of water by pulp mill effluent can also interfere with the photosynthesis of phytoplankton by reducing the available light in the surface layer of water.

Certain toxic elements have also been know to taint fish and oysters.[21] This could potentially affect the marketing of fish products and sport fishing. Little is known of how to identify and fully eliminate the elements responsible for tainting, and therefore there are no criteria for setting standards of quality. Similarly, odour is primarily an aesthetic problem with virtually no data on acceptable levels.

WASTE TREATMENT TECHNOLOGY

The establishment and enforcement of pollution control standards for the pulp and paper industry are dependent on the availability of pollution control technology. Public supported programs in Canada have encouraged the development and application of abatement technology. The Cooperative Pollution Abatement Research (CPAR) program was initiated in 1970 to study pollution problems in the pulp and paper industry. Environment Canada and the Canadian Pulp and Paper Association have cooperated in the research. Another program, the Development and Demonstration of Pollution Abatement Technology (DPAT), sponsored by Environment Canada, began in March 1975. This program is designed to assist industry in developing new pollution control technology and in financing a substantial proportion of the costs involved in installing and operating equipment.

According to the British Columbia Council of Forest Industries, almost $40 million was spent in the period 1972-1974 on water pollution abatement in the pulp and paper sector.[22] It is difficult to estimate to what extent this figure represents process improvement expenditures as opposed to actual abatement equipment expenses. The total represents forty-six percent of the total Canadian capital expenditure in this industry. The planned expenditures for 1977-78 pollution abatement in air and water are $148,019,000 for all of Canada. Planned expenditures in British Columbia for this time period are $45,161,000 or thirty percent of the Canadian total.[23]

The Canadian pulp and paper industry is encouraged to install pollution control technology with the aid of the Accelerated Capital Cost Allowance, under the federal INCOME TAX ACT, which allows for an initial fifty percent tax write-off on the capital cost of pollution control equipment. Tax advantages through depreciation and credit are also available.

Primary Waste Treatment

Primary waste treatment can remove 75 to 95 percent of the settleable solids in pulp mill waste effluent.[24] Clarifiers and settling ponds are used to allow the solid wastes to sink to the bottom, with lighter materials scraped off the top and recycled in the pulping process. Clarifiers and settling ponds must be designed carefully so that they can effectively handle the output of effluent. Underestimation of the volume of discharge, either through poor design or over-capacity operation of a mill can reduce the effectiveness of primary treatment. Disposal of sludge which accumulates at the bottom of clarifiers and ponds is still necessary. In British Columbia, pulp mills use a dewatering vacuum process to dispose of this by-product. This process is prone to difficulties,

> "The major difficulty in designing and operating sludge dewatering vacuum filters relates to the characteristics of the sludge which can vary enormously depending upon the mill operation. For kraft pulp mills, the sludge dewaters so 'easily' when the vacuum is applied, that is tends to slough off. With sludges from goundwood or newsprint mills, the problem is the reverse: the sludge is so 'tight' that the unit becomes grossly inefficient. For integrated mills, the nature of the sludge may vary between these extremes. Thus, sludge dewatering with vacuum filters represents available technology, nonetheless with substantial problems."[25]

Biological treament of sludge is another alternative means of disposal. However, final disposal of this biological sludge (biomass) is also difficult, with few technical solutions available. Modifications of the sedimentation practices include mechanical flocculation and chemical precipitation. Landfills are used where sufficient land is available.

In-plant controls, such as screens and floatation savealls are designed to recover valuable fibres which can be returned to the pulping process. These methods alone, however, will not provide full primary treatment.

While the majority of solid wastes can be removed by primary treatment, suspended or non-settleable solids cannot. Effective technology to remove suspended solids is not available.

Secondary Waste Treatment

Secondary waste treatment can remove 80 to 90 percent of organic and inorganic materials in effluent which are responsible for high BOD levels and toxicity.[26] Biological treatment is the most common abatement technique for reducing BOD and toxicity. In brief, biological treatment attempts to reproduce the natural oxidation process which occurs in water bodies. This is accomplished through holding ponds, oxidation basins, or aerated lagoons. Holding ponds and oxidation basins require large tracts of land in which effluent is held in shallow (two to five feet) ponds for twenty to three hundred days, or until natural bioxidation occurs.[27] Such ponds are not used by pulp mills in British Columbia because of lack of available land and severe winters at interior mills.

Aerated lagoons accelerate the oxidation process. Mechanical aerators force oxygen into the effluent. These lagoons are designed for three to ten days storage and are capable of removing seventy-five to eighty-five percent of the BOD and may detoxify effluents sixty to eighty percent of the time in certain mills.[28] The effectiveness of the process is limited by temperature. In kraft pulp mill effluent a natural foam occurs which has an insulating effect and does not reduce effectiveness of the treatment.

Activated sludge treatment is a more advanced form of secondary treatment. Sludge, composed of bacteria and oxygen is recycled in effluent, causing a more active breakdown of organic and inorganic materials. This form of treatment has gained little acceptance in British Columbian pulp mills,

> "Activated sludge systems are relatively sophisticated biological systems, more subject to upsets and operating problems than lagoons. They offer the advantage of minimal land requirements, high BOD(5) removal capacity, but are at a disadvantage with regard to operation requirements and cost."[29]

Further treatment of effluent, especially colour removal is still very costly and at the experimental stage. Technology under development includes activated carbon treatment and foam separation.[30] Both of these offer possibilities for reducing toxicity but removal of BOD is limited.

Many pulp mills in British Columbia utilize diffusers to dispose of effluent. These are long pipes filled with holes which are designed to distribute effluent and rely on the assimilative capacity of water bodies to dilute wastes. Diffusers are obviously not appropriate in all areas. In areas where flushing action is not adequate, they are ineffective.

Pulp mills are prone to upsets, leakages, and accidental spills of waste materials. In-plant controls , such as spill ponds and good maintenance of equipment can prevent such occurrences. Production changes which recycle water can significantly reduce effluent, while increasing production. Newer mills are often equipped with continuous digesters which re-use wash water, condenser water and other wastes. Chemical recovery of spent liquor is an important in-plant change which would significantly reduce spills, leakages, and general discharges.

POLLUTION REGULATION IN THE PULP AND PAPER INDUSTRY OF BRITISH COLUMBIA

PROVINCIAL STANDARDS

Under the provincial POLLUTION CONTROL ACT, the determination of what constitutes a polluted condition is the responsibility of the Director of the Pollution Control Branch. The Director may also, "prescribe standards regarding the quality and character of the effluent, other waste materials, or contaminants which may be discharged or emitted into water, land, or air."[31] The Pollution Control Board may also prescribe standards.

While final discretion concerning pollution control standards rests with the Director, his decisions are guided by Pollution Control Objectives which have been established for major industrial groups in British Columbia. The first set of Objectives for the Forest Products Industry were established in November 1971, following a public inquiry in August 1970. The POLLUTION CONTROL ACT, under Section 14 allows the Board or the Director to hold a public inquiry if there is any matter within their jurisdiction which requires such a hearing. It is the intent of the pollution control administration to review the Pollution Control Objectives every five years. This has been done in the case of the Forest Products Industry: a second inquiry was held in March 1976.

At these hearings, those who have submitted briefs are sworn in under oath, and then they present a summary of their briefs. Questions are placed to the participants first by the Technical Advisory Panel comprised of individuals with specialized interests (biologist, engineers, conservationist, economists) and then by the general audience. The Panel reviews all the briefs and prepares a draft of Pollution Control Objectives. These Objectives are then distributed to participants in the inquiry for comments. Following these procedures, the Objectives are submitted to the Pollution Control Board for approval under Section 4 of the POLLUTION CONTROL ACT. The Objectives may be appealed withing fifteen days of their issue.

The Director is not legally required to follow the Objectives in issuing pollution control permits. The legality of the provincial Objectives was the subject of an appeal by the Mining Association of British Columbia to the provincial Cabinet in July 1974.[32] The Mining Association argued unsuccessfully that the Objectives were legally binding orders. The Association was concerned that it did not know where it stood in regard to pollution control standards and wanted the security of knowing what the standards would be in the future. In effect, they were arguing against the wide discretionary power of the Director to establish standards. The Cabinet upheld the Pollution Control Board's postion that the Objectives are merely a policy statement to help guide the Director in issuing permits.

The first provincial pollution control standards for the pulp and paper industry were established in 1971. An initial draft of a second set of Objectives was released in October 1976. In the span of six to seven years new information on the effects of pulp mill effluent on the aquatic environment has been developed. Advancements in pollution control technology have also occurred. In a few instances, the present standards have been strengthened, while in others, they are weaker than 1971 levels. For example, Level "A" toxicity requirements for freshwater have been increased, while standards for total suspended solids have been lowered for both fresh and marine water discharges.

Before undertaking a comparison of pollution control standards, it is useful to note the goals upon which the standards are based. These are outlined in the REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, October 1976,

> "The aim of these objectives is to protect the quality of the natural environment of British Columbia and to provide for integrated use of our air, land, and water for the benefit of the present and future citizens of this province and Canada. The philosophy of maximizing waste recycling and utilization for new products, generation of energy, etc. in preference to treatment and direct discharge to the environment, has been followed. In so doing it has been recognized that the assimilative capacity of the environment may be used within limits, without causing unacceptable conditions but use of such assimilative capacity of receiving areas may already have gone beyond acceptable limits in

> certain instances within the province and more stringent requirements will be applied. Accordingly, industry should be prepared to install effective pollution abatement facilities."[33]

The provincial standards emphasize the quality and quantity of discharge and the ability of the receiving environment to assimilate pollutants. There are two levels of standards: "A" level and "B" level. These levels reflect the use of the best practicable technology. "A" level is the more stringent of the two and requires application of the most recent pollution control technology to achieve this level. All new and proposed mills are expected to meet this standard. Level "B" standards are to be met by all existing pulp mills in the province.

> "The timing involved in upgrading existing discharges to meet an objective level will be determined on an individual basis, with due regard to the existing quality of the environment at each particular location."[34]

While standards exist province-wide for the pulp and paper industry, each mill is expected to meet standards based on site-specific evaluation.

The shift to two levels from three (A,B,C) in the 1971 Objectives may appear to be an upgrading of standards, but it is really an admission of reality. Level "C" was a very minimal standard and often just represented a recording of existing discharges by a company. Two types of water quality objectives have been developed: (1) Effluent Quality Objectives and (2) Receiving Water Quality Objectives.

Effluent Quality Objectives

Effluent quality objectives distinguish between fresh and marine water discharges. Freshwater objectives are generally higher than marine standards, reflecting the lower assimilative capacity of lakes and rivers. The biological oxygen demand objectives also distinguish between the three types of pulp mills in the province: kraft, sulphite and mechancial mills. This reflects the biological oxygen demand loadings which these mills produce. Sulphite mills characteristically produce much more biological oxygen demanding effluent than other pulping processes. There are no sulphite mills discharging into freshwater.

Table 4 compares the provincial effluent quality objectives for 1971 and 1976. There are some significant differences between 1971 and 1976 standards. Most notable are the lower 1976 standards for total suspended solids. The forest industry argued for lower standards in their brief to the Public Inquiry held in March 1976.[35] The lower standards may reflect the industry's concern that the 1971 objectives were based on the use of very fine filters to measure suspended solids, making it nearly impossible to meet required levels. Their second concern was that technology to remove very fine suspended solids was unavailable.

The inclusion of objectives for sulphite mills recognizes that the one sulphite mill in the province is now installing

TABLE 4

PROVINCIAL EFFLUENT QUALITY OBJECTIVES FOR THE PULP AND PAPER INDUSTRY

Characteristics	Units	Discharge to Freshwaters Level A 1971		Level B 1971		Discharge to Marine Waters Level A 1971		Level B 1971		Suggested Monitoring Frequency (1976)
		Level A 1971	Level A 1976	Level B 1971	Level B 1976	Level A 1971	Level A 1976	Level B 1971	Level B 1976	
Total suspended solids	lbs./ADT[a]	15	20	30	35	15	20	30	35	Daily composite 3 times per week
BOD_5										
Kraft	lbs./ADT	15	15	40	40	15	40	60	60	Daily composite once per week
Sulphite Paper Grades	lbs./ADT	(b)	-	-	-	-	100	-	225	Daily composite once per week
Dissolving Grades	lbs./ADT	-	-	-	-	-	150	-	350	Daily composite once per week
Mechanical	lbs./ADT	15	15	-	40	15	40	40	40	Daily composite once per week
Temperature	°C	35	35	35	35	35	35	35	35	Daily
pH Range (c)		6.5-8.0	6.5-8.0	6.5-8.0	6.5-8.0	6.5-8.5	(d)	6.5-8.5	-	Continuous
Dissolved Oxygen (e)	mg/l	2.0	2.0	2.0	-	2.0	-	-	-	Daily
Zinc (mechanical)	lbs./ADT	-	-	-	-	0.5	-	4.0	2.0	Once per week
Toxicity (f)		90%	100%	95%	65%	45%	65%	12.5%	30%	Monthly

TABLE 4 (continued)

(a) ADT - Air dry ton of pulp equals 1800 lbs. of oven dry pulp. Weight of contaminant per unit weight of production.

(b) No standards existed for sulphite mills in 1971 and there are no sulphite mills discharging into freshwater.

(c) Where natural background pH value of receiving water is outside designated range, pH of effluent at point of discharge should not vary more than 0.2 pH units from background levels.

(d) Pollution control authorities now feel that pH of effluent discharged to marine waters is naturally buffered, posing no threat to receiving waters.

(e) Applies to effluent after secondary treatment.

(f) 96 hour TLm (static) bioassay on salmonid species, expressed as percent by volume of effluent in receiving waters which is required to give 50% survival over 96 hours.

secondary treatment. It also recognizes industry's concerns that BOD loadings are high for sulphite mills compared to other pulping processes.

The 1976 objective for toxicity has been increased in all cases, except for Level "B" discharges to freshwater. This upgrading may be in response to the federal government's requirement for protection of fish.[36] The present federal government regulations require an 80 percent survival rate in 65% effluent concentration over 96 hours. However, the Subcommittee on Water of the National Research Council Associate Committee on Scientific Criteria for Environmental Quality have recommended using a bioassay criterion of 50% survival in 100% effluent over 96 hours. This toxicity requirement was supported by Environment Canada in its submission to the provincial Public Inquiry in March 1976. Environment Canada also stated that this requirement should apply to all pulp mills, regardless of whether they discharge to fresh or saltwater.[37]

Monitoring of effluent discharge has been increased for three characteristics: total suspended solids from once per week to three times per week, temperature from once per week to daily, and toxicity from quarterly to monthly.

Receiving Water Quality Objectives

Water quality objectives for receiving waters were established in 1970. Ten parameters of water quality were used to determine the quality of receiving waters: dissolved oxygen, pH, turbidity, colour, settleable solids, floatable solids, dissolved solids, toxicity, fecal coliforms, and aesthetics. The objectives were based on natural background levels and for most parameters, minimum variance in natural conditions was considered desirable.

Receiving water quality objectives have also been established for the 1976 Objectives (Table 5). Although the number of characteristics now listed has increased, the quality criteria are unchanged from 1970 Objectives. Those characteristics which cannot be easily quantified or determined for inclusion in effluent quality objectives seem to be listed under receiving water objectives. Most of the water quality parameters listed will require site-specific evaluation. It is expected that receiving water quality objectives cannot be met at the point of discharge, therefore an intial dilution zone has been defined as follows:

1. For point discharges in lakes, estuaries, and marine waters, the zone may extend up to 300 feet horizontally in all directions, but shall not exceed 50% of the width of the water body.

2. For point discharges in rivers and streams the zone may extend up to 300 feet downstream of the discharge point, but shall not exceed 50% of the width of the river or stream.

3. For multiple point discharges, such as multiport outfalls, the zone may extend up to 300 feet horizontally from all points of discharge but shall not exceed 50% of the width of the water body.[38]

There is a provision in the Report which states that the

TABLE 5

PROVINCIAL RECEIVING WATER QUALITY OBJECTIVES

Characteristic	Objective
Dissolved oxygen	negligible change
Toxicity	no increase
pH	no measurable change
Residual chlorine	below detectable limits (amperometric method)
Turbidity (APHA units)	negligible change
Oil	none visible on water surface
Floatable solids, scum	negligible increase
Temperature (^{o}C)	no measurable change
Foam	no increase in natural level
Nutrients (2)	negligible change in site specific productivity limiting parameters
Primary and Secondary (3) production	negligible change
Tainting - edible organism	no change
Colour (APHA units)	negligible increase
Suspended solids	negligible increase
Heavy metals	negligible increase
Mercaptans	negligible increase
Sulphides	negligible increase
Resin acids (total)	negligible increase
Biocide additives	negligible increase
Woodwaste leachates	negligible increase
Aesthetic	no decrease

Notes to Table 5

(1) Not applicable in the initial dilution zone.

(2) Nutrients - Limiting parameters will normally be taken as phosphates and/or biologically assimilative nitrogen compounds.

(3) Primary and Secondary Production - Natural rearing productivity for biota in receiving waters, are major resources in prime areas - like spawning, holding and pasture areas for juvenile and adult fish, crab and oysters, etc., and their food flora and fauna.

(4) A negligible alteration (increase or decrease) is one which leads to no deleterious change in receiving water quality and can therefore be disregarded.

The following parameters may be part of those that are required to be monitored by the Director: -

effluent location tests by discrete sampling; infaunal benthos;

species associations and diversity; settling plate diversity;

primary productivity; oyster condition factor and metal uptake.

Source: Report on Pollution Control Objectives for the Forest Products Industry of British Columbia, October 15, 1976, Pollution Control Branch, Ministry of the Environment, Victoria, B.C.

dilution zone extends from the point of discharge in the receiving water to the surface, but that the zone may not intrude or affect shellfish beds, migrating salmon and trout routes and "other significant biological resource or recreation areas."[39]

The intent of receiving water quality objectives is stated as follows,

> "While the objectives focus on the point(s) of discharge as the most satisfactory regulatory tactic the intent is to minimize effects of known or potentially harmful physical (suspended solids, colour, temperature), chemical (heavy metals, biological nutrients, pH and a wide range of organic compounds) and biological (harmful viral, bacterial or fungal growth and deleterious changes in primary production) changes in receiving waters. This requires regulation of effluent volumes and concentrations at levels consistent with acceptable levels of biological productivity, animal and plant diversity, ecosystem stability and multiple environmental use (other industrial use, human consumption, recreation and aesthetic values)."[40]

While the intent of the objectives may be well meaning, their applicability is limited because the "acceptable levels" for various uses have not been defined or evaluated. In reality, these objectives for receiving water quality are to serve as a very general guide in determining requirements for pollution control permits.

FEDERAL STANDARDS

Under Section 33(13) of the FISHERIES ACT, national effluent discharge regulations have been established for five industry groups. These standards have been developed through a process of joint government-industry task forces. Both federal and provincial governments have representatives as does the affected industry. A task force was established in 1975 to review the effluent regulations for the pulp and paper industry. The information used by the task force is based largely on internal studies undertaken by federal and provincial agencies and the affected industry. There is no public involvement.

The Pulp and Paper Effluent Regulations developed under the federal FISHERIES ACT in November 1971 prescribe quantities of deleterious substances which can legally be discharged into waters by pulp mills. The Regulations are national standards, applicable to all pulp mills in Canada. Three substances are defined as deleterious: (1) total suspended solids; (2) oxygen demanding decomposible organic matter produced as waste from a mill (BOD); and (3) toxic wastes deposited by a mill. The Regulations are intended to protect fish life and the habitat of fish as required under the FISHERIES ACT.

The federal regulations distinguish between two types of mills: existing mills and new, altered or expanded mills. Standards for the latter are more stringent than for existing mills. New mills or mills that expand are expected to install up-to-date pollution abatement facilities. An expanded mill is defined as one in which production is increased by more than ten percent.[41] An altered mill is defined as any mill in which operations have been changed to produce either the same final product or a different final product.[42]

Table 6 shows the federal standards for total suspended solids in pulp mill effluent. Under Column I the components which are used in the processing of pulp and paper are listed. Columns II to V distinguish among existing and new, expanded, or altered chemical pulp mills (kraft and sulphite) and existing and new, expanded or altered mechanical pulp mills. For any particular mill the various component operations must be identified and the corresponding units summed to arrive at an overall permitted daily deposit of total suspended solids. The units assigned to the component categories under Columns II to V are based on the assumption that losses of total suspended solids in the effluent from all mills will be reduced through primary treatment.[43] The actual permitted deposit is calculated through a complicated procedure by multiplying,

1. the tons of wood processed or pulp produced in a day by each component process (Column I) that is included in the mill operations, by,

2. the applicable unit set out next to the component process category under Columns II to V.

Table 7 shows the federal permitted daily deposits of pounds of BOD per air dry ton of pulp. The actual amount which can be deposited is determined by multiplying,

1. the number of air dry tons of products produced by a mill in one day for each type of process described in Column I that is included in the mill operations, by,

TABLE 6

FEDERAL EFFLUENT DISCHARGE REGULATIONS FOR SUSPENDED SOLIDS IN POUNDS PER TON*

Column I	Column II	Column III	Column IV	Column V
Component Process Category	Existing Kraft, Sulphite or Semi-chemical Mill	New Expanded or Altered Kraft, Sulphite or Semi-chemical Mill	Existing Mechanical Mill	New Expanded or Altered Mechanical Mill
1. Wood rewashing	5	5	5	5
2. Debarking - Hydraulic Process	5	5	5	5
3. Debarking - Wet Drum Process	10	8	10	8
4. Pulping	7	5	13	10
5. Bleaching	6	4	2	2
6. Pulp Sheet Formation	2	1	5	4
7. Integrated, Single Product Paper Making	3	2	5	4
8. Integrated, Specialty, Single-Product Paper Making	6	4	10	8
9. Tissue Paper Making	15	10	20	15
10. Fine and Specialty Multi-product Paper Making	25	20	25	20
11. Cylinder Paper or Paperboard Manufacture	15	12	15	12
12. Neutral Sulphite Semi-chemical Corrugating Medium	7	7		

* "Ton" means, in respect of a component process category in (a) items 1 to 3, an oven-dry ton of wood processed without the bark, (b) items 4 to 6, an air-dry ton of product, and (c) items 7 to 12, a ton of product as produced.

Source: Pulp and Paper Effluent Regulations, SOR/71 - 578, Environment Canada, November 2, 1971.

TABLE 7

FEDERAL EFFLUENT DISCHARGE REGULATIONS FOR BIOLOGICAL OXYGEN DEMAND (BOD) PER AIR-DRY TON OF PRODUCT

Column I	Column II	Column III
Type of Process	Existing Mill	New, Altered and Expanded Mill
Sulphite pulping yield of 55% or less	255	170
Sulphite pulping yield of more than 55% and less than 65%	170	115
Sulphite pulping yield of 65% or more	150	75
Sulphite bleaching (market pulp)	35	35
Kraft pulping	64	33
Kraft bleaching	27	27
Neutral Sulphite Semi-Chemical pulping	80	60

Source: Pulp and Paper Effluent Regulations, SOR/71 - 578, Environment Canada, November 2, 1971.

2. the corresponding number in Column II or III, whichever is applicable.

For dissolving grade sulphite mills not described above, a mill can deposit up to 580 pounds for each air dry ton of product produced.[44]

Federal standards also require mills to comply with a standard toxicity requirement for fish. Schedule D of the Pulp and Paper Effluent Regulations requires that a minimum of 80% of the fish in a tank containing 65% pulp mill effluent by volume, must survive over a period of ninety-six hours. The bioassay techniques for determining toxicity of pulp mill effluent have received considerable attention.[45] It is extremely difficult to determine the toxic impact of individual effluent components. The bioassay techniques now in use which indicate acceptable threshold levels have been developed for a limited number of aquatic species and for short term exposures.

Because of the complexity of computing federal effluent standards it is difficult to make across-the-board comparisons between the two levels of government. Prior to the 1976 provincial objectives for toxicity, the federal standards were more strict. Although the provincial toxicity standards have been strengthened, the federal FISHERIES ACT still remains a powerful instrument in protecting fish life.

Both levels of government acknowledge the difficulties of older mills in achieving standards and distinguish between kraft, sulphite and mechanical mills. The federal standards are national standards which apply to pulp mills discharging to fresh and marine waters. The provincial objectives distinguish between fresh and marine water discharges. The provincial objectives include more water quality parameters and have attempted to provide receiving water standards.

MEASURES TAKEN BY THE PULP AND PAPER INDUSTRY TO MEET POLLUTION CONTROL REQUIREMENTS

The pulp and paper industry has been encouraged to install pollution abatement equipment in order to meet required discharge and water quality standards. In the period 1970-1974, the industry spent approximately $50 million in water pollution abatement, or 8% of total capital expenditures. In 1974, about 25% of the capital expenditures in the industry were spent on water pollution abatement.[46]

In-plant controls

Abatement of pulp mill discharges usually involves in-plant control and external treatment of effluent. In-plant control systems may include recovery of waste wood, pulp spills, lime mud spills, liquors, digestor washings, and recycling of wash water. Often, the recovery of these materials results in financial gain and increased productivity. Changes in pulp processing techniques can help to significantly reduce losses of materials. Most newer mills are constructed with recovery systems. The older mills face substantial financial and mechanical difficulties in installing in-plant recovery systems. According to the Council of Forest Industries, most British Columbian pulp mills have spent on the average, $500,000 per mill on in-plant controls between 1970-1975.[47] In-plant controls can help reduce suspended solids, BOD, and toxicity in pulp mill effluent.

Table 8 summarizes existing and planned in-plant controls for bleached kraft pulp mills in the province. According to the pulp industry, some mills are able to meet pollution control objectives for suspended solids and BOD with only in-plant controls.[48] Older mills have been able to reduce suspended solids discharge by 50% since 1970 through in-plant controls, while BOD has been reduced by 10% at most bleached kraft pulp mills.[49] High levels of BOD discharge in bleached kraft pulp mills result primarily from the bleach plant (23-35 lb/ADT), brown stock washer carry over to bleach plant (9-30 lb/ADT), liquor losses and spills (10-30 lb/ADT), condensates (0-15 lb/ADT), and miscellaneous (5-10 lb/ADT).[50]

Mills have taken different approaches to in-plant controls. Some of the mills, especially the newer ones with settling ponds and/or clarifiers, concentrated on improving in-plant control

TABLE 8

IN-PLANT EFFLUENT CONTROL FOR BLEACHED KRAFT PULPMILLS IN B.C.

	Discharges From Mill Before Out-Plant Treatment				In-Plant Control Equipment							
	Susps. Solids * lb./ADT		BOD lb./ADT									Approx. $ Million
Mill	1970	1975	1970	1975	Fibre Spills	Liquor Spills	Lime Mud Spills	Fibre Rejects	Boiler Ash	BSW Loss	Conden- sates	Spent to date
Crofton	50	50	70	64	yes	P.	No	Some	ext.	low	Sewer	0.2
Harmac	95	70	90	55	yes	yes	ext.	ext.	ext.	med.		0.5
Pt. Mellon	150	70	80	50	some MP	P.	yes	some MP	some MP	high	Sewer P. strip	0.8
Wood- fibre	110	50	75	65	P.	P.	P.	P.	yes	high	sewer	0.15
Pow.Riv.	150	87	52	45	yes	yes	ext.	yes	yes	low	strip	1.5
Pt.Alb.	52	45	51	48	yes	some MP	some MP	yes	yes	med.	sewer	1.0
Elk Falls	109	58	N.D.	60	P.	P.	some MP	P.	yes	med.	P. Strip	0.9
Pr.Rup. kraft	100	80	90	80	P.	P.	P.	P.	P.	low	P. Strip	0.1
Castle- gar	52	30	75	62	yes	yes MP	yes MP	yes	yes	high	P. Strip	0.2
Skook- umchuk	188	80	53	51	no	no	no	some	—	low	reuse	nil
Kamloops	40*	70*	60	50	some	some	yes	some	yes	low	Strip & reuse	Original +0.5

TABLE 8 (continued)

Pr.Geo. P & P	31	27	71	65	yes ext.	yes ext.	some	yes	P.	low	Mostly Reused	0.6
Inter-con.	31	28	67	65	yes ext.	yes ext.	yes & ext.	yes ext.	ext.	low	Mostly Reused	0.6
North-wood	35	55	75	55	yes	some	no	ext.	ext.	low	BSW	
Tahsis	50	50	50	70	some MP	some MP	P.	P.	ext.	high	Strip	0.7
Cariboo	--	50	--	65	yes	yes	yes	some	yes	low	Strip & Reuse	Original
Mac-kenzie	--	81	--	80	yes	P.	yes	some	ext.	high P.	Strip	Original
Eurocan	70	95	60	65	some MP	P.	P.	some MP	yes	high P.	Reuse	0.2

P. = Planned
MP = More Planned
e = Estimate
ext.= External Treatment

* Results dependent on analytical technique; e.g. Weyerhaeuser, estimated values on GF/C filter 50 & 60 lb ADT respectively. 1975 values include ash from hog boiler; otherwise 60 lb/ADT.

Source: Council of Forest Industries of British Columbia Brief presented to the Public Inquiry for Pollution Control Objectives in the Forest Products Industry, March 1976.

systems, hoping to reduce the load on, and the need for, external effluent treatment. Other mills have started with external treatment and found that in-plant control was also necessary. Groundwood pulp mills are able to reduce toxicity of effluent through the use of sodium rather than zinc hydrosulphate in their process.[51]

External Effluent Treatment

A number of methods of effluent treatment were discussed earlier and will only be summarized in this section. Table 9 includes the types of effluent treatment in British Columbian pulp mills in 1970, 1975, and future plans until 1980. External effluent treatment systems include: spill ponds or tanks to hold spills of black liquor, chemicals and fibre; pH neutralization using lime mud, slaked lime or sulphuric acid; primary clarification to remove settleable and suspended solids by clarifiers and settling ponds; biological treatment to remove BOD and toxicity; and the method of disposal, either diffuser or point discharge.[52]

The data in Table 9 reveal great differences between coastal and interior mills in pollution abatement. All interior mills have some form of primary treatment and all but one mill (Canadian Cellulose at Castlegar) have some secondary effluent treatment. In comparison, only six of eleven coastal mills have some type of primary waste treatment, and only one mill

TABLE 9

EFFLUENT TREATMENT SYSTEMS AT B.C. PULP AND PAPER MILLS IN 1970, 1975 AND FUTURE PLANS

Forest Company & Location	Type of Treatment System: Emergency Spill Pond 1970	Emergency Spill Pond 1975	pH Control 1970	pH Control 1975	Primary Clarification 1970	Primary Clarification 1975	Biological Treatment 1970	Biological Treatment 1975	Sec. Clarification 1970	Sec. Clarification 1975	Off-Site Disposal 1970	Off-Site Disposal 1975	Future Plans Till 1980
Canadian Cellulose Ltd. Interior pulp operation Castlegar	-	-	-	-	woodroom clarifier	Same	-	-	-	-	Diffuser	Same	A complete system with spill ponds, primary clarification and biological treatment is proposed.
B.C. Forest Prod. Ltd., Crofton Pulp & Paper, Crofton.	-	-	-	-	woodroom settling pond	Same and settling pond for Flyash Stream	-	-	-	-	Diffuser	Same	A clarifier is to be installed. Mill expects to get permit in near future. Date of compliance: 1979.
Crown Zellerbach Ltd., Elk Falls Mill, Elk Falls.	-	-	-	-	-	-	-	-	-	-	Four Outfalls, Point Dischg.	Same	All sewers are to be combined & discharged through a diffuser.
Tahsis Co. Ltd., Gold River.	-	-	lime	-	woodroom clarifier	Same	-	-	-	-	Diffuser	Same	Plans are to install a spill recov. system, lime mud reclam. syst. & eventually a prim. treatment syst. Mill expects to meet Obj. B level by 1978.
MacMillan Bloedel Ltd., Harmac Pulp Div., Harmac.	-	Spill tanks for lime mud bleach plans	-	-	-	1973: recaust. clarifier 1974: woodroom - power boiler effluent Flyash stream	-	-	-	-	-	Diffuser	Improved spill collection syst. condensate stripping; continued color reduction technology development.
Weyerhaeuser Canada Ltd., Kamloops.	Yes	Same	Lime	Same	clarif.of combined effluent in sett. pond	clarif. of alkali strm. followed by sett. pond trtmt. of comb. mill effluent	5-day aerated lagoon	6-day aerated lagoon	-	-	Diffuser	Same	Cooling towers for water savings are proposed.

Forest Company & Location	Type of Treatment System												Future Plans Till 1980
	Emergency Spill Pond		pH Control		Primary Clarification		Biological Treatment		Sec. Clarification		Off-Site Disposal		
	1970	1975	1970	1975	1970	1975	1970	1975	1970	1975	1970	1975	
Eurocan Pulp & Paper Co. Ltd., Kitimat.	**Yes**	**Same**	**Yes (H_2SO_4)**	**Same**	**clarifier settling pond**	**same**	**5-day aerated lagoon**	**Same**	**-**	**-**	**Diffuser**	**Same**	**In-plant color reduction systems are being considered.**
B.C. Forest Prod. Ltd., Mackenzie Div., Mackenzie.	**N**	**1-day reten.**	**N**	**Lime**	**N**	**All Sewers**	**N**	**4-day aerated lagoon**	**N**	**-**	**N**	**Diffuser**	
Finlay Forest Industries Mackenzie	**N**	**-**	**N**	**-**	**N**	**settling ponds**	**N**	**3-day aerated lagoon 9-day polish. lagoon**	**N**	**-**	**N**	**Diffuser**	
Ocean Falls Corp., Ocean Falls	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Six outfalls, point dischg.**	**Same**	**If in-plant changes fail to meet Level B objective for SS by 1977, a clarifier will be installed.**
MacMillan Bloedel Ltd. Alberni Pulp & Paper Div. Port Alberni	**-**	**Kraft mill spill tanks**	**-**	**-**	**Nwsprnt. grndwd., kraft bleach, caustic extract. wdrm eff.**	**Same and belt filter for flyash stream**	**5-day aer.lag. trmt.for wdrm grdwd. kft.cst. ext.eff.**	**Same**	**-**	**-**	**Surface Dischrg.**	**-**	**An expanded spill conrol system is under construction. Reduction of color pH control.**
Rayonier Canada Ltd. Port Alice	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Four outfalls; dischrg. to surface**	**Same**	**A spent sulfite liquor recov. syst. is under construction. A clarifier for mill waste water & a single major outfall are planned.**
Canadian Forest Prod. Ltd., Howe Sound Div., Port Mellon	**-**	**Lime mud spill ponds**	**-**	**-**	**-**	**Settling Ponds for Flyash Stream**	**-**	**-**	**-**	**-**	**Two outfalls. alkaline sewer: surface. acid sewer: submrgd**	**Same Same**	**Plans are to combine all sewers and discharge through a diffuser. No permit; expects to meet Level B objective by 1979.**

Type of Treatment System

Forest Company & Location	Emergency Spill Pond 1970	Emergency Spill Pond 1975	pH Control 1970	pH Control 1975	Primary Clarification 1970	Primary Clarification 1975	Biological Treatment 1970	Biological Treatment 1975	Sec. Clarification 1970	Sec. Clarification 1975	Off-Site Disposal 1970	Off-Site Disposal 1975	Future Plans Till 1980
MacMillan Bloedel Ltd. Powell River	-	Kraft, various spill collect. tanks	-	-	-	recaust clarif.	-	-	-	-	five outfalls; surface dischrg.		Expanded spill control syst., condensate stripping & primary clarif. Possible color reduction Partial closure of machine stock & white water syst. Maximize outfall dispersion.
Inter-continental Pulp Co. Ltd. Prince George	Yes	Same	Lime Mud for acid strms	Same	In-plant 2 side-hill, savealls & 4 re-claim sumps	Same	1-day act. sludge for bleach plant & spill pond stream	1-day act. sludge for blch plt brown white water & spill pd.strm.	-	-	Diffuser	Same	Outplant clarifier on fibrous streams excluding bleach plant; settling pond on all streams. 2nd basin to increase aeration to 5 days.
Northwood Pulp and Timber Ltd. Prince George.	Yes	Same	Lime mud & kiln scrub. slurry	Same	-	clarif. all sewers	19-h actvtd sludge	5-day aerated lagoon & 15-h actvtd sludge	Yes	Same	Diffuser	Same	
Pr. George Pulp & Paper Ltd., Prince George	Yes	Same	Lime mud	Same	In-plant 2 S.P. savealls and 2 sidehill savealls 4 re-claim sumps	Same	1-day actvtd sludge for bleach plant & spill pond stream	Same	-	-	Diffuser	Same	Outplant clarifier on fibrous streams excluding bleach plant; settling pond on all streams. 2nd basin to increase aeration to 5 days.

Forest Company & Location	Type of Treatment System: Emergency Spill Pond 1970	Emergency Spill Pond 1975	pH Control 1970	pH Control 1975	Primary Clarification 1970	Primary Clarification 1975	Biological Treatment 1970	Biological Treatment 1975	Sec. Clar-ification 1970	Sec. Clar-ification 1975	Off-Site Disposal 1970	Off-Site Disposal 1975	Future Plans Till 1980
Canadian Cellulose Co. Ltd., Prince Rupert													
Kraft mill:	-	-	-	-	-	-	-	-	-	-	four outfalls; point discharge	Same	To install equipment as required to meet Level B by Dec. 31, 1978.
Sulphite Mill:	-	-	-	-	-	-	-	-	-	-	3 sewers combined in single outfall, diffuser for red liquor	Same	To modify and install equipment as required to meet Level B Obj. by Dec. 31, 1979.
Cariboo Pulp & Paper Co., Quesnel.	N	Yes	N	Lime	N	clarifier spillpond all sewers except bleach plant effluents	N	5-day aerated lagoon	N	-	N	tear drop diffuser	
Crestbrook Pulp & Paper Limited, Skookumchuck.	-	-	Lime Mud	Same	settling pond	Same	7-day aerated lagoon	Same	-	-	submerged outfall	Same	Inplant changes to reduce color & an emergency spill collection system are planned.
Rayonier Canada Ltd. Woodfibre	-	-	-	-	-	-	-	-	-	-	Seven outfalls with point discharge	Same	A spill basin is planned. Also the sewers are to be combined and put through a clarifier with diffuser by 1978.

Source: Council of Forest Industries of British Columbia Brief presented to the Public Inquiry on Pollution Control Objectives for the Forest Products Industry, March 1976.

LEGEND:

- : No facility is available

N : Mill not in existence

Same : No change in equipment since 1970

Improved : Same basic equipment as in 1970 but enlarged or upgraded.

(MacMillan Bloedel at Port Alberni), has secondary treatment. Two obvious reasons can account for the difference. Firstly, virtually all of the newer mills have been built in the interior and were equipped with at least primary treatment. Secondly, the regulatory agencies have considered interior waters more vulnerable to pulp mill effluent, especially with respect to the effect on fish populations. Marine waters are considered to have a greater assimilative capacity and a buffering effect on pH. As a result, only one coastal mill is planning pH control of effluent. In other cases, diffusers are planned to submerge and disperse effluent away from mill sites.

Coastal pulp mills are older and were built with virtually no pollution control measures. The cost at these mills for the installation of secondary treatment facilities is very high. It is estimated that by 1980, about 60% of the coastal mills will have external treatment facilities for reduction of suspended solids.[53] A number of the older mills have multiple effluent outfalls which create problems for collection and treatment of wastes. Coastal mills are not planning biological treatment systems. Due to site restrictions, coastal mills are also limited in installing large external spill ponds for toxic wastes. Most interior mills have some form of emergency spill pond. By 1980, 62% of all mills are expected to have spill pond facilities.[54]

In general, the future plans of coastal mills are to install spill recovery systems, diffusers and primary clarifiers in those mills in which diffusers are inappropriate or ineffective. In most cases, these measures represent the bare minimum in pollution abatement. Interior mills are planning to improve in-plant recovery systems and install further secondary treatment measures.

THE SUCCESS OF PULP MILLS IN MEETING POLLUTION CONTROL OBJECTIVES

One criterion for the evaluation of a pollution control program is the ability of pulp mills to meet water quality standards. The data presented in Tables 10 and 11 were produced by the British Columbia pulp industry for presentation at the Public Inquiry for Pollution Control Objectives in the Forest Products Industry in March 1976. The data were collected in 1974 and are based on the 1971 provincial objectives and the 1971 federal standards. Four effluent discharge characteristics are presented: pH, suspended solids, BOD, and toxicity. The tables distinguish between freshwater (interior) mills and marine water (coastal) mills.

It can be seen from Table 10 that freshwater mills were required to meet standards between Level A and Level B for BOD and suspended solids. In aggregate, the percent of times that

TABLE 10

SUCCESS OF FRESHWATER MILLS IN MEETING OBJECTIVES

Forest Company & Location	Percent of Times that Objectives Were Met in 1974							
	pH		BOD_5 (lb/ADT)		Suspended Solids (lb/ADT)[5]		Toxicity	
	Objective	Success %	Objective	Success %	Objective	Success %	Fed. Guideline[6] 80% surv. in 65% Conc. after 96-h	Success %
Canadian Cellulose Co.Ltd., Interior Pulp Operations, Castlegar.	6.5 - 8.0	22	40	0	30	29	"	0
Weyerhaeuser Canada Ltd., Kamloops.	"	100	12.8	86 100[1]	12.8	82 92[1]	"	100
Eurocan Pulp & Paper Co.Ltd Kitimat[4]	"	97	15	75	15	44	"	75
B.C. Forest Products Ltd. Mackenzie Div Mackenzie.	"	100	12.3	37	12.3	4	"	89.5
Finlay Forest Industries, Mackenzie.	"	56	5.5 15[3]	30 -	14	85	"	39
Intercontinental Pulp Co. Ltd.,Pr.George	"	97	19 40[2]	6 72	30	90	"	27

TABLE 10 (continued)

Northwood Pulp & Timber Ltd., Prince George.	"	98 100[1]	25	54 20[1]	25	23 9[1]	"	67
Prince George Pulp & Paper Ltd., Pr.George	"	96	15	2	21	22	"	47
Cariboo Pulp & Paper Co., Quesnel.	"	97	13.4	40	15	34	"	95
Crestbrook Pulp & Paper Ltd., Skookumchuck.	"	100	22.5	67	22.5	67	"	79

1 Based on monthly averages.

2 Mill aimed at meeting Level B Objectives in 1974.

3 Revised Objectives as of October 31, 1974.

4 Discharge to a freshwater system.

5 Suspended solids data are not directly comparable, because the various mills used different filters.

6 Roughly equivalent to Provincial Level A objective.

Source: Council of Forest Industries of British Columbia <u>Brief presented to the Public Inquiry on Pollution Control Objectives for the Forest Products Industry</u> March 1976.

TABLE 11

SUCCESS OF COASTAL MILLS IN MEETING OBJECTIVES

Forest Company & Location	pH Objective[1]	pH Success[1] %	BOD$_5$ (lb/ADT) Objective[2]	BOD$_5$ (lb/ADT) Success %	Suspended Solids[5] (lb/ADT) Objective[2]	Suspended Solids[5] (lb/ADT) Success %	Toxicity Federal Guideline	Toxicity Prov. Level B Object.	Toxicity Prov. Level A Object.
	Percent of Times that Objectives Were Met in 1974								
B.C. Forest Prod.Ltd., Crofton Pulp & Paper Div., Crofton.	6.5 - 8.5	-	52	27	30	20	0[4]	-	-
Crown Zellerbach Canada Ltd.,Elk Falls Mill,Elk Falls	"	-	53	0	30	4	0[4]	100[4]	33[4]
Tahsis Co.Ltd. Gold River	"	-	(60)	69	(46)	18	14[4]	-	75[4]
MacMillan Bloedel Ltd., Harmac Pulp Div., Harmac	"	-	60	75	30	8	40[4]	100[4]	50[4]
Ocean Falls Corp., Ocean Falls.	"	-	40	100[3]	60	30[3]	-		
Sewer 1A								100[4]	-
2								50[4]	-
3								100[4]	-
WM								100[4]	-

TABLE 11 (continued)

MacMillan Bloedel Ltd., Alberni Pulp & Paper Div., Port Alberni.	"	-	35	100	20	58	-	100	87
Rayonier Can. Ltd., Pt. Alice Acid Sewer (A) North " (B) South " (C) Wood Plant (F)	"	-	60	0	30	0	 100 9 0 27	-	-
Canadian Forest Prod. Ltd., Howe Sound Pulp Div., Port Mellon.	"	-	60	-	30	4	-	-	-
MacMillan Bloedel Ltd., Powell R. Div., Powell River.	"	-	60	-	30	0	0[4]	-	-
Canadian Cellulose Co. Ltd. Prince Rupert. Kraft mill: Sulphite mill:	"	-	 (60) (60)	 5 0	 30 30	 0 0	-	 55 -	 - -
Rayonier Can. Ltd., Woodfibre.	"	-	60	59	30	0	-	-	-

[1] pH objectives for coastal mills relate to receiving water area, 10 - 20 ft from the point of discharge. Limited data only are available for 1974.

[2] As negotiated in permit, or as expected in future permits.

TABLE 11 (continued)

[3] Calculated from monthly averages.

[4] Only few data available.

[5] Suspended solids data are not directly comparable, because the various mills used different filters.

Source: Council of Forest Industries of British Columbia <u>Brief presented to the Public Inquiry on Pollution Control Objectives for the Forest Products Industry</u> March 1976.

freshwater mills meet requirements were: pH - 87.5%; BOD - 39.7%; suspended solids - 48%; and federal toxicity standards - 62%

Most coastal pulp mills were expected by provincial authorities to meet Level B requirements for BOD (60 lbs/ADT) and suspended solids (30 lbs/ADT) (Table 11). However, the percent of times that these mills met the standards were: BOD - 48.3%; suspended solids - 13%; federal toxicity standard - 21.1%; provincial Level B objective - 88.1% and provincial Level A objective - 61.3%. Caution should be used in comparing figures for suspended solids since mills used a variety of filters for collecting data, hence different results were likely.

There is no strong relationship between mill size and success rate. Some of the larger mills, both coastal and interior, have poor success rates (e.g. British Columbia Forest Products at Crofton) and some have good rates, (e.g. Weyerhaeuser at Kamloops, MacMillan Bloedel at Port Alberni). Using available data, the small mill at Ocean Falls has an 80% success rate compared to 53% for Finlay Forest Products at Mackenzie.

Coastal mills had difficulty in meeting objectives for suspended solids and there is a wide range in the success of all mills in meeting objectives. The industry felt that part of the problem in meeting suspended solids objectives stemmed from the use of a smaller filter size as required by the Pollution

Control Branch. Perhaps realizing the difficulty of the industry to meet suspended solids objectives, the Pollution Control Board has recommended lower standards in the 1976 report.

REGULATION AND ENFORCEMENT OF STANDARDS

The regulation of pulp mill discharges in British Colulmbia is the responsibility of the provincial Pollution Control Branch and the federal Environmental Protection Service. The primary instrument for administering standards is the provincial pollution control permit. As required under the POLLUTION CONTROL ACT, all dischargers must apply for a permit from the Director of the Pollution Control Branch. The permit normally lists the type and volume of waste discharge and the location of discharge. Pollution control equipment, if required, is also listed, along with the date for installation. Monitoring requirments are also included.

In cases where federal standards are more stringent than provincial standards for a particular mill, the Environmental Protection Service will usually work through the provincial Pollution Control Branch's permit system. The Environmental Protection Service also negotiates with individual pulp mills over compliance schedules designed to meet the conditions of the Pulp and Paper Effluent Regulations. New, expanded, and altered mills are expected to meet the requirements after November 24, 1971.[55] No date has been set for existing mills with the expectation that these mills will be negotiated with individually. These negotiations are based on the federal policy of encouraging industry to install the best practicable abatement technology.

One of the primary concerns of the Pollution Control Branch has been to bring all pulp mills in the province under permit. This is done through direct negotiation with each pulp mill company. In 1970, fifteen of twenty-three pulp and paper mills were under permit.[56] By 1975 all pulp mills were under permit. The approach taken by the Pollution Control Branch in bringing waste dischargers under permit was explained in the Branch's 1973 Annual Report:

> "The procedure of ordering persons who had previously registered their discharges as required by the Pollution Control Act, 1967, was relaxed in favour of a procedure of requesting the registrant to apply for a permit. This latter approach was found to generate a high degree of response, it allowed a considerable reduction of administrative work load, and it often resulted in a better feeling of co-operation between the Branch and the registrant."[57]

The enforcement of standards in British Columbia is carried out by the Environmental Protection Service under the federal FISHERIES ACT and by the Pollution Control Branch under the POLLUTION CONTROL ACT. The monitoring of effluent discharge and receiving water quality is necessary in order to ensure that standards are being met. Monitoring of pulp mill discharge is the responsibility of the mills. The mills hold the majority of information on the characteristics of the mill effluent and are required to submit regular monitoring reports as part of their permit requirements. The regulatory agencies do spot monitoring on an irregular basis. They do not have the necessary manpower to monitor all dischargers on a regular basis. The pulp mills are required to use standardized monitoring procedures as specified by the Pollution Control Branch. Mills may also be required to carry out environmental assessment studies when the Pollution Control Branch feels the receiving waters could be impaired by an existing or proposed discharge.[58]

The strategy by the Pollution Control Branch has been to negotiate directly with individual mills over permit requirements rather than take enforcement actions under the POLLUTION CONTROL ACT. This is borne out by the fact that only one charge has been filed against a pulp mill under the Act (Table 12). The charge against Finlay Forest Industries at Mackenzie in September 1973, was for violating permit requirements.[59]

The federal government has taken a more active role in prosecuting pulp mills which violate the FISHERIES ACT (Table 12). Contravention of Section 33(2), which prohibits the deposit of deleterious substances into waters frequented by fish, is the most common offence. Most of the charges against mills involve fish kills rather than violation of pollution control standards. Fish kills are visible and easier to prosecute than violations of pollution control requirements. It has also been argued that

TABLE 12

POLLUTION CONTROL CHARGES AGAINST PULP MILLS IN BRITISH COLUMBIA

Company	Nature of Infraction	Date of Occurrence	Charge/ Legislation	Date of Judgment	Results
Columbia Cellulose (Prince Rupert sulphite mill)	Deposition of deleterious substance (mill effluent) resulting in fish kill	July 23 - August 14, 1970	Section 33(2) Fisheries Act	September 3, 1970	Guilty plea Fine: $3,000
Weyerhauser (Kamloops)	Deposition of mill debris	September 20, 1971	Section 33(3) Fisheries Act	March 13, 1972	Acquitted
Columbia Cellulose (Prince Rupert)	Deposition of deleterious substance	October 13, 1972	Section 33(2) Fisheries Act	November 11, 1972	Guilty plea Fine: $1,500
Finlay Forest Industries (Mackenzie)	Discharging effluent in non-compliance with pollution control permit	March 31, 1973 to May 1, 1973	Section 20A(a) Pollution Control Act	September 11, 1973	Guilty plea Fine: $700
Rayonier (Port Alice)	Deposition of deleterious substance resulting in fish kill	September 10 and 20, 1973	Section 33(2) Fisheries Act 2 counts	March 6, 1974	Fines: $1,500 $1,500

TABLE 12 (continued)

Eurocan (Kitimat)	Same as above also the destruction of eggs or fry on spawning grounds	October 25, 1973	Sections 30 and 33(2) Fisheries Act	January 25, 1974	Total fine: $2,500
Canadian Cellulose Limited (Prince Rupert)	Deposition of deleterious substance: weak black liquor	March 11, 1977	Section 33(2) Fisheries Act	Discharged No evidence	Being appealed by Federal Government
Canadian Cellulose Limited (Prince Rupert)	Polychlorinated biphenol spill	January - March 1977	Section 33(2) Fisheries Act 11 Charges	---	Guilty on 7 of 11 Charges Fine: $24,500 Being appealed by CanCel
Canadian Forest Products Ltd. (Port Mellon)	Deposition of deleterious substance: bunker oil	September 14, 1977	Section 33(2) Fisheries Act	June 1, 1978	Fine: $10,000

Schedule F of the Pulp and Paper Effluent Regulations does not set an application date for existing mills, thereby excluding these mills from violations of the Regulations. The federal government has argued that the Regulations need not apply if it can be proven that a mill has deposited a substance harmful to fish. This situation occurred in a case involving a New Brunswick pulp mill. The Court concluded that where Regulations do apply to a mill, the Crown must prove a breach of the Regulations in order to gain a conviction.[60]

CHAPTER SUMMARY

The control of water pollution in the pulp and paper industry of British Columbia is a responsibility of both the federal and provincial governments. Two key statutes provide the means for controlling pollution in the industry: the federal FISHERIES ACT R.S.C. 1970, and the provincial POLLUTION CONTROL ACT S.B.C. 1967. The federal interest in controlling water pollution is the protection of fisheries and fisheries habitats. The provincial pollution control law applies to air, land and water. Both pieces of legislation prohibit the deposit of "deleterious" substances and include fines for violation of the Acts. The FISHERIES ACT provides a maximum $50,000 fine for a first offence and $100,000 for each subsequent offence. The FISHERIES ACT was amended in July 1977 to strengthen the Act. The Act broadens the definition of fish and increases the penalties for violations. Previously, the maximum fine was $5,000. The provincial legislation includes a maximum $10,000 fine or one year imprisonment for violation of the Act. A fine of $100 exists for a continuing offence.

The POLLUTION CONTROL ACT creates the Pollution Control Board and the Pollution Control Branch, which are responsible for the administration of provincial pollution control laws. The Director of the Pollution Control Branch is responsible for issuing pollution control permits to effluent dischargers. All dischargers must apply to the Director for a permit. In issuing permits, the Director is guided by effluent discharge objectives which have been developed for major industrial groups in the province, including the pulp and paper industry.

Provincial standards for the pulp and paper industry were * first established in 1971 and were revised in 1976. Two levels of standards presently exist: "A" level and "B" level. "A" level is the more stringent and is based on the application of the most recent abatement technology. All new or proposed mills are expected to meet this standard. Level "B" standards are to be met by existing pulp mills. The aim of the Pollution Control Branch is to have all pulp mills eventually meeting Level "A" standards. The standards also distinguish between discharges to fresh and marine waters. The most notable differences between 1971 and 1976 standards are the lower 1976 levels for total suspended solids. The lowering of this standard could reflect the industry's concern that the 1971 standard was based on the use of a very fine filter to measure suspended solids. The 1976 pollution control objectives for BOD levels have recognized the problems associated with reducing BOD discharges of sulphite mills. Toxicity standards have been increased for all mills, except for Level "B" discharges to freshwater.

Very general receiving water objectives have also been developed by the Pollution Control Branch. These simply list the important water quality parameters and prescribe little variance from natural background levels.

The federal standards are national standards designed to regulate three major types of pulp and paper mill effluent discharges: suspended solids, biological oxygen demand, and toxicity. The standards are administered by the Environmental Protection Service and the Fisheries and Marine Service. Both levels of government negotiate directly with each pulp mill to enforce compliance schedules. Although no formal agreement exists between federal and provincial authorities, there is usually collaboration during negotiations with pulp mills.

There are twenty-five pulp and paper mills in the province, four of which are specialty mills producing fine papers, paperboards, etc. Kraft pulp mills dominate the industry. Fifteen of twenty-one mills are located on freshwater streams. The rest discharge into marine waters. Most pulp mill effluent is characterized by a high level of BOD (biological oxygen demand) which often reduces available oxygen levels in water bodies. The effluent may also contain large amounts of suspended solids which can plug fish gills and increase the turbidity of receiving waters. The most drastic effects upon fish life are due to the toxicity of pulp mill effluent. Aesthetic nuisances of colour, tainting, and odour are often associated with pulp mill effluent.

The pulp and paper industry has been encouraged by both levels of government to install pollution control facilities in order to meet required discharge standards. The federal policy is to have industry install the best practicable technology. At present, all interior mills have some form of primary treatment and all but one mill have some type of secondary treatment. Six of eleven coastal mills have some type of primary treatment and one mill has secondary treatment. Future plans call for further secondary treatment measures in interior mills and complete primary treatment in coastal mills.

A survey of pulp mills revealed that mills varied considerably in their ability to meet required pollution control standards. Interior mills were able to meet objectives more often than coastal mills. In reviewing the prosecutions against pulp mills, the majority of cases have been for violating the federal FISHERIES ACT, rather than the POLLUTION CONTROL ACT. It would appear that provincial authorities attempt to negotiate rather than prosecute. The majority of charges under the FISHERIES ACT have been for fish kills rather than specific violations of pollution control standards.

FOOTNOTES TO CHAPTER THREE

1. John G. Ince, 1976 ENVIRONMENTAL LAW: A STUDY OF LEGISLATION AFFECTING THE ENVIRONMENT OF BRITISH COLUMBIA, Centre for Continuing Education, Univeristy of British Columbia, Vancouver.

2. Thomas L. Burton, 1972 NATURAL RESOURCE POLICY IN CANADA, McClelland and Stewart Ltd. Toronto.

3. A.R. Lucas, 1969 "Water Pollution Control Law in British Columbia" U.B.C. LAW REVIEW, Volume 4, No. 1, pp.56-86.

4. Ibid. p.64.

5. J.G. Ince, op. cit. p. 96.

6. Recently there has been discussion to create a new federal department of fisheries and oceans. The new department would be responsible for managing ocean fisheries, fisheries research, hydrographic surveying and charting, environmental impact studies on activities affecting aquatic resources, and the administration of treaties and agreements on fisheries and marine environmental quality. It is uncertain which agencies will be responsible for administrating the various sections of the FISHERIES ACT. It is likely the Fisheries and Marine Service will come under the new department, but the status of the Environmental Protection Service is unclear. See the VANCOUVER SUN, March 14, 1978, p.3.

7. J.G. Ince, op. cit. p.89.

8. Interview with B. Heskins, Manager, Environmental Protection Service, West Vancouver, B.C. March 21, 1977.

9. Province of British Columbia, Ministry of Economic Development, BRITISH COLUMBIA ECONOMIC ACTIVITY 1976 REVIEW AND OUTLOOK, Volume 28, April 1977, Queens Printer, Victoria, p.68.

10. Council of Forest Industries of British Columbia, ANNUAL REPORT 1975, Vancouver, B.C.

11. Ibid.

12. A.H.J. Dorcey (ed.) 1976, THE UNCERTAIN FUTURE OF THE LOWER FRASER, Westwater Research Centre, University of British Columbia Press, p. 37.

13. CANADA WATER YEAR BOOK 1975, Environment Canada, Ottawa, pp.110-113.

14. J.R. Marier, 1973 "The Effects of Pulp and Paper Wastes on Aquatic Life with particular Attention To Fish and Bioassay Procedures for Assessment of Harmful Effects" Technical Report for the National Research Council's Associate Committee on Scientific Criteria for Environmental Quality.

15. Council on Economic Priorities, 1972 PAPER PROFITS: POLLUTION IN THE PULP AND PAPER INDUSTRY, New York, p.21.

16. Ibid. p.21.

17. J.R. Marier, op. cit. p.6.

18. Council on Economic Priorities, op. cit. p.21.

19. J.R. Marier, op. cit. p.3.

20. Council of Forest Industries of British Columbia, BRIEF PRESENTED TO THE PUBLIC INQUIRY ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, March 1976, p.371.

21. J.R. Marier, op. cit.

22. Council of Forest Industries of British Columbia, op. cit. p.13.

23. CANADIAN PULP AND PAPER INDUSTRY, Annual Forecast and Directory Issue 1977-78, May 5, 1977, p.39.

24. Council on Economic Priorities, op. cit. p.26

25. Council of Forest Industries of British Columbia (1976) op. cit. p.135.

26. Council on Economic Priorities, op. cit. p.27

27. Council of Forest Industries of British Columbia (1976) op. cit. p.141.

28. Council of Forest Industries of British Columbia (1976) op. cit. p.143.

29. Council of Forest Industries of British Columbia (1976) op. cit. p.146.

30. Council of Forest Industries of British Columbia (1976) op. cit. p 156.

31. POLLUTION CONTROL ACT S.B.C. 1967 c.34 as amended, Section 10(a).

32. Appeal by the Mining Asociation of B.C. under the POLLUTION CONTROL ACT, 1967 to the Provincial Cabinet Committee, July 17, 1974.

33. REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, October 15, 1976, Pollution Control Branch, Ministry of Environment, Victoria, B.C.

34. Ibid. p.3.

35. Council of Forest Industries of British Columbia (1976) op. cit. pp.172-185.

36. Environment Canada, BRIEF PRESENTED TO THE POLLUTION CONTROL BOARD INQUIRY INTO THE POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, September 1975.

37. Ibid.

38. REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, op. cit. p.26.

39. REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, op. cit. p.26.

40. REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, op. cit. p.19.

41. GUIDELINES FOR THE PULP AND PAPER EFFLUENT REGULATIONS, May 1972, Environment Canada, p.3.

42. Ibid. p.3.

43. Ibid. p.4.

44. PULP AND PAPER EFFLUENT REGULATIONS SOR/71-578, November 2, 1971, Environment Canada, p.3.

45. John C. Davis, 1975 "Important Considerations in Acute and Sublethal Bioassay Procedures For Water Quality Studies With Aquatic Life: A Review" paper presented at the 1975 Aquatic

Toxicity Coordination Conference, Ontario Ministry of Environment, November 4, 1975; and J.R. Marier, op. cit.

46. Council of Forest Industries of British Columbia, (1975 and 1976) op. cit.

47. Council of Forest Industries of British Columbia (1976) op. cit. p.62.

48. Council of Forest Industries of British Columbia (1976) op. cit. p.59.

49. Council of Forest Industries of British Columbia (1976) op. cit. p.59.

50. Council of Forest Industries of British Columbia (1976) op. cit. p.62.

51. Council of Forest Industries of British Columbia (1976) op. cit. p.65.

52. Council of Forest Industries of British Columbia (1976) op. cit. p.65.

53. Council of Forest Industries of British Columbia (1976) op. cit. p.67.

54. Council of Forest Industries of British Columbia (1976) op. cit. p.65.

55. Schedule F, PULP AND PAPER EFFLUENT REGULATIONS, op. cit.

56. Province of British Columbia, Department of Lands, Forests, and Water Resources, Water Resources Service, ANNUAL REPORT, December 31, 1971, p.105.

57. Province of British Columbia, Department of Lands, Forests, and Water Resources, Water Resources Service, ANNUAL REPORT, December 31, 1973, p.140.

58. REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, op. cit. p.5.

59. Peter N. Nemetz, 1977 "Pollution Generation and Abatement in the British Columbia Pulp and Paper Industry" in J.B. Stephenson (ed.) 1977, THE PRACTICAL APPLICATION OF ECONOMIC INCENTIVES TO THE CONTROL OF POLLUTION: THE CASE OF BRITISH COLUMBIA, University of British Columbia Press, Vancouver, p.212.

60. Unreported, October 1, 1976, New Brunswick Provincial Court.

CHAPTER FOUR

METHODOLOGY

In British Columbia, the federal and provincial governments have chosen to control water pollution through the regulation of industrial and municipal discharges. Industry is centrally involved in the decision-making process by way of preparing briefs for presentation at public inquiries and through negotiations over implementation of pollution control standards. The present research recognizes the importance of industry in pollution control decision processes and seeks to explore the relationship between the regulatory agencies and the regulated pulp and paper industry.

THE STUDY DESIGN

Four sources of information were used to examine the regulatory approach for pollution control in the pulp and paper industry of British Columbia and to assist in understanding the differences between regulatory officials and industry officials toward pollution control policies:

1. a review of transcripts of hearings, briefs and policy documents;

2. case study review;

3. a formal questionnaire; and
4. personal interviews.

Public attention on pollution control in the pulp and paper industry of British Columbia has focused on three major events: two public inquiries for examining pollution control objectives in the industry (March 1970 and March 1976) and the Port Alice pulp mill appeal to the Pollution Control Board in June 1973. The transcripts of these public hearings were reviewed to determine government and industry positions toward pollution control policy in the pulp and paper industry. Valuable information was obtained from the cross-examination which took place at the inquiries. Key government agencies and industry personnel were also identified in the written documents and transcripts.

The Port Alice case study highlighted a number of points regarding decision-making in water quality management. The case demonstrated the problems involved in determining an acceptable level of water quality for a particular region. Transcripts of the Rayonier Appeal to the Pollution Control Board were examined. The arguments put forth by the company and the government agencies were assessed to determine the range and scope of information considered in the decision-making process. The information presented was categorized as either technical, social, or economic in nature. Technical information included discussions of the effects of pulp mill effluent on water quality and marine life, pulping processes, and monitoring methods and locations. Social information included the evidence presented by the company on the impact of a mill closure on the community at Port Alice and the North Island region, recreational activities of local citizens, and their personal views on water quality in the area. Economic information concerned the financial aspects of mill operations, the costs of pollution abatement facilities, the economic contribution of the mill to the community and the North Island region, and the economic impact associated with a mill closure.

The public inquiries have provided an opportunity for interested parties to address themselves to the technical issues of pollution control (for example, effluent and receiving water quality parameters and pollution abatement technology). The briefs prepared by the interest groups for presentation at the hearings contain position statements toward a wider range of pollution control issues than are heard at the public inquiries. For example, the Council of Forest Industries brief to the 1976 Public Inquiry discusses the industry position toward the regulatory system, social and economic considerations of pollution control, as well as technical information on effluent discharge standards and abatement technology.

The review of these transcripts and briefs of the public inquiries and a comprehensive study of the Port Alice pulp mill case (via a review of transcripts of Appeal Proceedings, company documents, newspaper reports, and personal experience) led to the formulation of a questionnaire, which was distributed to key government and industry officials concerned with pollution control in the pulp and paper industry. Personal interviews were conducted as a follow-up to questionnaire distribution.

Pollution control in the pulp and paper industry of British Columbia has not been subject to this type of study. Nemetz's work on pollution control in the industry was concerned with describing the current regulatory practice.[1] He examined the legal framework for controlling pollution in the pulp and paper industry and described the measures taken by the industry and regulatory agencies to abate pollution. Stephenson's work concentrated on the potential of economic incentives for controlling pollution in the industry.[2] He found that economic incentives in British Columbia would be difficult to implement because the environmental damages caused by pulp mill effluent are difficult to measure and because many mills are relatively isolated. He concluded that efficient allocation of the assimilative capacity is an irrelevant issue. However, since interior mills are expected to meet higher pollution control standards than coastal mills, it would appear that the government has considered assimilative capacity differences between fresh and marine waters.

The aproach used in the present study parallels, to an extent, the research approach of Mitchell.[3] In his study of water management in England and Wales, Mitchell utilized a framework involving five aspects:

1. an examination of existing or proposed legislation on the basis that it regulates how the environment is used;

2. an examination of organizations which implement or respond to legislation and policies.

3. an examination of the decision process and how the actors decide among various alternatives;

4. an understanding of the perceptions and attitudes of individuals, groups, firms and public organizations toward the resource, social conventions and each other; and

5. an examination of specific resource decision situations in which a range of legislation, organizations, interest groups and resources interact together.

In a similar manner, the present study has examined the legislation for controlling pollution in the pulp and paper industry, compared the standards which provide the means for attaining water quality goals, outlined the agencies responsible for implementing pollution control standards, and described the processes for setting and enforcing pollution control standards. A questionnaire survey and personal interviews were conducted to assess the attitudes and perceptions of the regulators and regulated toward various aspects of pollution control policy. A case study is also used to illustrate the processes involved in establishing pollution control policy for the pulp and paper industry.

This study parallels, especially in questionnaire design, the work of Althoff and Grieg.[4] They undertook a study of industry and government attitudes toward pollution control policy in the state of Kansas on the basis that,

> "We believe that such an analysis will indicate the various areas of environmental pollution control agreement and disagreement within and among the elite groups and as a result, facilitate the process of conflict and compromise which continues to highlight the political bargaining process in this policy area"[5]

They found important differences in attitudes between the regulators and the regulated. The regulated would prefer less stringent pollution control requirements and perceive a more stringent pollution control system in the future. The regulators would prefer a greater degree of control and also perceive a more stringent future system. The researchers concluded that these differences could have important implications for future pollution control decision-making. They feared that such differences could erode the cooperation and compromise which characterizes regulatory policy-making.

Another study which has implications for this type of research was conducted by Rickson, where he attempted to determine the extent to which industrial managers legitimize government regulation of industry.[6] He believes that the first element required in a bargaining or compromise situation is "recognition by a party that the other has the right to participate in the process".[7] His survey of 102 industrial managers in the United States was concerned with,

1. the extent to which industrial managers legitimize regulation of industrial water use and waste abatement by

government officials and agencies;

2. the extent to which managers legitimize certain roles and not others for specific agencies; and

3. whether managers legitimize certain roles for local as opposed to state or federal levels of government.[8]

Rickson found that industry officials acknowledge the regulatory functions of government pollution control agencies.[9] The establishment of standards and enforcement were viewed as the primary roles of government regulatory agencies. Industry officials preferred to have policy established at a federal level with state and local governments resposible for enforcement. The findings were useful in interpreting the results of the present study.

Studies of elite groups, especially decision-makers in environmental policy in British Columbia have been limited. Studies by McMeiken and Sewell[10], examined the perceptions and attitudes of professionals toward environmental problems in British Columbia. McMeiken found that public health professionals viewed water quality as a significant problem. However, their perceptions of solutions to water quality problems were defined in terms of physical health. Sewell compared the attitudes and perceptions of engineers and public health professionals toward environmental quality problems and their solutions. Water quality was perceived as a signficant problem, but more so by public health officials who are centrally involved with water quality issues. The solutions which the groups perceived were related to their respective professions. Interestingly, public health officials believed discussing the problem with the polluter was the best approach to take. Most were uncritical of the policies and strategies taken to abate pollution. Inadequate enforcement of existing legislation was viewed as the major weakness of the present practice. Engineers believed that the best solution was to construct pollution abatement facilities and to enforce the 'adequate' legislation. Both studies evaluated the perceptions and attitudes in terms of information on socio-economic characteristics, job training and experience, job role and views on man's relationship to nature. These were often found to be significant in assessing attitudes and perceptions.

The present study was not concerned with individual motivations underlying attitudes and preferences, but rather with determining a group interest or perspective (regulators vs. regulated) toward particular aspects of pollution control policy. It was felt that additional information and analysis concerning personal characteristics was beyond the particular focus of the study and would not contribute to its analytical framework.

STUDY PARTICIPANTS

The study was concerned with those individuals most centrally involved in pollution control for the pulp and paper industry. Water quality in British Columbia is managed through the regulation of industrial discharges by government agencies. There is close cooperation between government regulatory agencies and industry in establishing and implementing standards. This cooperation is a key element in a workable pollution control program. The opinions and preferences of these two groups are important in determining areas of agreement and disagreement which may affect the formulation and implementation of pollution control policy.

Although a variety of government agencies interact with the pulp and paper industry in water quality management issues, the study was restricted to those agencies most closely involved with the regulation of pollution. At the provincial level, the Pollution Control Branch and the Pollution Control Board are responsible for setting and enforcing standards. The Pollution Control Board also acts as an appeal tribunal in pollution control issues. At the federal government level, the Environmental Protection Service is primarily responsible for negotiating with the pulp and paper industry over pollution control requirements. They also enforce pollution control requirements for pulp mills in the province. The Fisheries and

Marine Service is responsible for conducting research on the effects of pollution on fish and other aquatic organisms. They are responsible for fish habitat protection. This agency generates most of the information upon which the federal pollution control standards are based.

The majority of senior government officials were identified through government documents and reports. To ensure that key agency officials involved in pollution control administration and research in the pulp and paper industry were identified, the names of individuals were checked with the government officials. This procedure helped to safeguard against major omissions.

In the pulp and paper industry, two means were used to identify key individuals. First, inquiries were made through each company head office as to the person(s) most centrally involved in their pollution control operations and those responsible for conferring with government officials. The Environmental Control Committee of the Council of Forest Industries of British Columbia (a coordinating body representing most pulp and paper companies in the province), also assisted in identifying industry officials. Each of these individuals was contacted. In most instances, these individuals were senior management personnel. In a few cases, engineers connected with a particular mill were identified by their companies as being central figures.

The study took place in February-March 1977. In all cases, initial contact was made by telephone. The nature of the study was explained and cooperation asked in completing a questionnaire. Where possible, interviews were also arranged. The questionnaires were sent by mail with a covering letter, briefly explaining the details of the study. In most cases the questionnaires were picked up at the time of the interview. In cases where interviews were not conducted (i.e. northern pulp and paper mills), questionnaires were returned by mail.

The number of questionnaire returns for each group is presented in Table 13. The government returns represent a 68 percent response rate. All of the government agencies are equally represented. Only one agency, the Pollution Control Branch, seemed hesitant in participating. The senior administrators stressed that their role was only to administer pollution control policy and not to make it. These individuals felt the questionnaire asked for judgments on policy which they were not willing to divulge. However, three senior officials did participate and provided valuable information in personal interviews.

Eighty-four percent of industry questionnaires were completed. The forest companies which responded represent all but three pulp and paper mills in the province, including interior and coastal mills. The overall response rate was 76 percent. In comparison to other elite samples this represents a

TABLE 13: QUESTIONNAIRE SAMPLE

GOVERNMENT	Number Sent Out	Number Returned
Pollution Control Branch	5	3
Pollution Control Board	8	4
Environmental Protection Service	5	5
Fisheries Service	4	3
Total	22	15
INDUSTRY		
B.C. Forest Products Ltd.	2	2
B.C. Research Ltd.	3	3
Canadian Cellulose Ltd.	1	1
Canadian Forest Products Ltd.	1	1
Crown Zellerbach Canada Ltd.	1	1
Cariboo Pulp and Paper Co.	1	1
Crestbrook Forest Industries	1	1
Council of Forest Industries	1	1
Eurocan Pulp and Paper Co. Ltd.	1	1
MacMillan Bloedel Co. Ltd.	1	1
Prince George Pulp and Paper Ltd.	1	1
Intercontinental Pulp Co. Ltd.	1	-
Northwood Pulp Limited	1	1
Rayonier Canada Ltd.	1	1
Tahsis Company Ltd.	1	-
Weyerhauser Canada Ltd.	1	-
Total	19	16

reasonable rate of return.[11]

Twenty-six personal interviews were conducted with government (17) and industry (9) officials. The majority of interviews were with individuals who had completed the questionnaire. In the case of industry officials, eight were located in northern and interior British Columbia, which made the possibility of interviews unlikely. In a few cases additional information was obtained via telephone and correspondence. The interviews ranged from forty-five to ninety minutes in length. They were conducted in the business offices of the respondents. The interviews provided an opportunity for participants to clarify or qualify responses to the questionnaire. The interviews focused on both broad and specific issues relating to pollution control policy in the pulp and paper industry, including the jurisdictional arrangements for pollution control, water quality standard setting and socio-economic factors involved in standard setting and enforcement.

QUESTIONNAIRE DESIGN

As outlined in the earlier discussion, the development of the questionnaire followed an examination of the regulatory practice for pollution control in British Columbia. From a review of transcripts and documents of pollution control public inquiries and a case study involving a pollution control issue with a pulp mill, three issues in pollution control policy were identified. The questionnaire study was designed to assess the amount of agreement/disagreement between the regulators (government officials) and the regulated (industry officials) toward the following aspects of pollution control policy in the province's pulp and paper industry: (1) administrative and jurisdictional arrangements; (2) water quality parameters; and (3) socio-economic factors involved in standard setting and enforcement (Appendix 1).

ADMINISTRATIVE-JURISDICTIONAL ARRANGEMENTS

The constitutional separation of jurisdiction over water management has been a continual point of contention. Many feel it has inhibited effective management and created conflicts between competing federal and provincial agencies.[12] This section of the questionnaire was intended to gain information about the preferences and perceptions toward the jurisdictional and administrative arrangements for pollution control in the pulp and paper industry of British Columbia. The format was patterned after Althoff and Grieg, who examined the perceptions and preferences of key individuals in the state of Kansas pollution control system.[13] The two systems are comparable to the extent that at least two levels of government (federal and provincial(state)) are involved in administrating pollution control. Both systems also utilize a permit system based on effluent discharge standards.

In Section A of the questionnaire, five alternative pollution control systems were devised, ranging from least stringent (System 1) to most stringent (System 5), reflecting the degree of federal and provincial government control over industry (See Appendix 1 for specific details relating to the questionnaire). System 3 was based as closely as possible on the present pollution control system for the pulp and paper industry in British Columbia, after reviewing relevant pollution control legislation and administrative practices. Each system was comprised of seven important features of pollution control: (a) federal government control over standards; (b) provincial government control over standards; (c) licensing of polluters; (d) government inspections; (e) monitoring of discharges; (f) enforcement of standards; and (g) financing of pollution abatement equipment.

Three questions were posed, relating to the five pollution control systems:

(1) which system would the respondent prefer;
(2) which system most closely resembles the present system; and
(3) which system would most likely be in existence in the next five to ten years?

In Section B of the questionnaire the respondents were asked to evaluate each separate component (a-g) in terms of their preferred system, perception of the present system, and perception of the future system. This allowed the participants more latitude in defining which parts of a particular system they liked or disliked.

WATER QUALITY PARAMETERS

The development of standards is perhaps the most important element in the water quality management process. Standards are used as a means for attaining water quality goals. They are the legal basis upon which most management schemes depend. However, differences in opinion often occur over which parameters of water quality should be considered in establishing standards. This section of the questionnaire study was designed to gauge the degree of consensus regarding which water quality parameters are important in establishing pollution control standards for the pulp and paper industry in British Columbia.

Two questions were asked, distinguishing between effluent and ambient standards:

(1) How much weight should decision makers give each of these

variables when establishing effluent discharge standards for the pulp and paper industry in B.C.? and,

(2) How much weight should decision makers give to each of these variables when establshing pollution control standards in the pulp and paper industry for receiving waters in B.C.?

A five-point scale was adopted to weigh fourteen variables which are used in formulating water quality standards (suspended solids, pH, toxicity, BOD, etc.).[14] Twelve variables were indentified from the provincial POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY. Two were added in the analysis of receiving water standards: stress on the biological community and synergistic effects of effluent. These two parameters are receiving increasing attention in the concern for water quality.

SOCIO-ECONOMIC FACTORS IN SETTING AND ENFORCING STANDARDS

Utilizing a five-point scale, Question 3 of Section C of the questionnaire asked what weight should be given to a number of socio-economic factors when establishing pollution control standards in the pulp and paper industry. Included were: technical feasibility, economic position of the industry as a whole, maintaining viable fish stocks, public health factors, proximity of a mill to populated areas, aesthetic appearance of water, recreational uses of water, and public attitudes toward water quality.

Question 4 asked what weight should be given to a number of socio-economic factors when enforcing pollution control standards in the industry. The factors included were: available technology, economic position of the firm, the importance of the mill to the community, proximity of a mill to populated areas and public attitudes toward pollution control.

Many of these factors are involved in negotiating standards and implementing them. The aim of this section was to evaluate the level of agreement between the two groups toward these factors. The bargaining position of each group is often based on a combination of these and other factors. A high degree of agreement may indicate a good possibility for compromise to occur in the bargaining relationship.

In summary, the study utilized a broad range of information to achieve an understanding of the regulatory process for pollution control in the pulp and paper industry. The analysis was based upon government documents which provided official policy statements in specific areas (e.g. water quality goals and pollution control standards). Transcripts of hearings and briefs supplied information on policy positions of interest groups toward water quality issues (e.g. pollution control standards and water quality criteria and regulatory policies). The appeal transcripts of the Port Alice case study provided the opportunity for an examination cf interest group positions involved in a specific resource decision situation. The transcripts were also valuable for an analysis of the scope and range of information which was considered in the decision process.

The review of policy documents assisted in preparing the questionnaire study. The questionnaire and personal interviews enabled key officials in industry and government to state their perceptions and preferences toward various aspects of water quality management in the pulp and paper industry. A comparison of the regulated and the regulators toward administrative arrangements, water quality characteristics, and socio-economic factors in setting and enforcing standards was undertaken. In turn, the policy documents supplemented the questionnaire findings and were useful in the questionnnaire analysis.

FOOTNOTES TO CHAPTER FOUR

1. Peter N. Nemetz, 1977 "Pollution Generation and Abatement in the British Columbia Pulp and Paper Industry" in J.B. Stephenson (ed.) 1977, THE PRACTICAL APPLICATION OF ECONOMIC INCENTIVES TO THE CONTROL OF POLLUTION: THE CASE OF BRITISH COLUMBIA, University of British Columbia Press, Vancouver, B.C. pp.188-212.

2. J.B. Stephenson, 1977 "Alternative Pollution Control Mechanisms in the British Columbia Pulp and Paper Industry" in J.B. Stephenson, op. cit. pp.213-234.

3. Bruce Mitchell, 1971 WATER IN ENGLAND AND WALES: SUPPLY, TRANSFER AND MANAGEMENT, University of Liverpool, Department of Geography Research Paper No. 9.

4. P. Althoff and W.H. Grieg, 1974 "Environmental Pollution Control Policy-Making: An Analysis of Elite Perceptions and Preferences" ENVIRONMENT AND BEHAVIOR, Volume 6, No. 3, pp.259-288.

5. Ibid. p. 260.

6. Roy E. Rickson, 1977 "Dimensions of Environmental Management: Legitimation of Government Regulation by Industrial Managers" ENVIRONMENT AND BEHAVIOR, Volume 9, No. 1, pp.15-40.

7. Ibid. p.16.

8. Ibid. p.19.

9. Ibid.

10. J. Elizabeth McMeiken, 1972 PUBLIC HEALTH PROFESSIONALS AND THE ENVIRONMENT: A STUDY OF PERCEPTIONS AND ATTITUDES, Social Science Series No. 5, Inland Waters Directorate, Environment Canada, Ottawa; W.R. Derrick Sewell, 1971 "Environmental Perceptions and Attitudes of Engineers and Public Health Officials" ENVIRONMENT AND BEHAVIOR, Volume 3, No. 1, pp.23-59.

11. J.E. McMeiken, op. cit. sampled 40 public health professionals and W.R.D. Sewell, op. cit. conducted a survey of 30 engineers.

12. R.T. Franson, D. Blair, R. Bozzer, 1976 "The Legal Framework for Water Quality Management in the Lower Fraser River of British Columbia" in Neil Swainson, (ed.) 1976 MANAGING THE WATER ENVIRONMENT, Unvirsity of British Columbia Press, Vancouver, pp.59-96.

13. P. Althoff and W.H. Grieg, op. cit.

14. A five-point scale allows more information to be obtained than a three-point scale, while a seven-point scale presents problems of complexity and manageability in data analysis. See Robyn M. Dawes, 1972, FUNDAMENTALS OF ATTITUDE MEASUREMENT, John Wiley and Sons, New York.

CHAPTER FIVE

THE REGULATORS AND THE REGULATED: A COMPARISON OF PERCEPTIONS AND PREFERENCES TOWARD POLLUTION CONTROL POLICY IN THE PULP AND PAPER INDUSTRY

In a bargaining situation, the regulators and the regulated possess a host of attitudes and preferences regarding pollution control policy. These attitudes and preferences are compared in three major areas: (1) administrative-jurisdictional arrangements for pollution control; (2) water quality parameters; and (3) Socio-economic factors in setting and enforcing standards.

ADMINISTRATIVE-JURISDICTIONAL ARRANGEMENTS FOR POLLUTICN CONTROL

This section examines government and industry attitudes and preferences toward the administrative and jurisdictional aspects of pollution control in the pulp and paper industry, i.e. the extent of government control, licensing of polluters, inspections, monitoring, enforcement procedures and financing of abatement technology.

SYSTEMS CHOICE

Section A of the questionnaire (Appendix 1) was designed to assess differences in the preferences and perceptions of two groups (government officials and pulp and paper industry officials) toward alternative pollution control systems for the pulp and paper industry of British Columbia. The underlying hypothesis was that the regulators and the regulated should prefer different pollution control systems because of their disparate interests.[1]

In the questionnaire, respondents were asked to identify their preferred system, the system which resembled the present pollution control system, and their perception of the future regulatory system. Five alternative systems were presented ranging from minimum control and regulation (Systems 1 and 2) to higher degrees of regulation (Systems 4 and 5). System 3 closely resembles existing regulatory conditions.

Preferred System

Althoff and Grieg found that industry preferred a minimal degree of regulation.[2] The responses presented in Table 14 show that the majority of industry respondents (62.5 percent) preferred System 3 which may indicate that anything less rigorous than the present situation would be a step backwards and perhaps politically not feasible. A study by Rickson of government regulation of polluting industry noted that industry is often willing to accept a certain degree of regulation by government agencies.[3] He interprets this legitimation of government regulatory functions by industry in two ways.

TABLE 14

PERCEPTION OF PREFERRED SYSTEM BY GROUPS

	SYSTEM 1	2	3	4	5	Total Responses
Government	0	0	9 (69.2%)	2 (15.2%)	2 (15.2%)	13
Industry	0	3 (18.8%)	10 (62.5%)	2 (12.5%)	1 (6.3%)	16
Totals	0	3 (10.3%)	19 (65.5%)	4 (13.8%)	3 (10.3%)	29 (100%)

Firstly, industry has now recognized that the public is demanding a certain level of environmental quality. Expenditures for pollution abatement are slowly being accepted as part of production costs by industry. The second interpretation is that it is in the economic self-interest of industries to legitimize government regulation. As Rickson states:

> "In the short run, radical demands of conservation groups, from industry's point of view, can be defused somewhat by the activity of public agencies. In the long run, industry will control agency policy. Fundamental change is not to be expected."[4]

Preference by industry for the present system (System 3), follows closely the industry's stated position:

> "The forest products industry considers that the regulatory system, as applied in British Columbia is the most effective procedure for achieiving pollution control, i.e. defined objectives with individual dischargers operating under permit. This permit system has allowed dialogue between the regulatory officials and industry personnel. The resulting cooperation has provided for more effective pollution control than the situation where industry and regulatory agencies alike fulfill only those minimum functions required legally."[5]

The large proportion (69.2 percent) of government officials who prefer System 3 indicates that they also prefer the present situation. Government regulatory agencies require the cooperation of the regulated industry in order to maintain their legitimation in carrying out their functions. It is possible that under the present regulatory system in British Columbia, government agencies feel they have attained a degree of success in persuading the pulp and paper industry to comply with pollution control objectives. Government agencies may perceive that further government intervention would upset the presently acceptable working relationship with industry while less stringent regulations would not meet public demands for environmental quality.

In the interviews with government and industry officials, the present regulatory system was often favourably referred to as "flexible". Both the regulators and the regulated perceive the present system as adequately serving their respective interests.

Present System

Table 15 compares government and industry responses to the question, "Of the five systems, which one most closely resembles the present pollution control system?" System 3 is based closely on the present regulatory system in British Columbia. This question indicates just how well the present system is understood and whether respondents perceive the system as more or less stringent than it is. The responses indicate that both government and industry have an accurate understanding of the

TABLE 15

PERCEPTION OF PRESENT SYSTEM BY GROUPS

	SYSTEM 1	2	3	4	5	Total Responses
Government	1 (7.1%)	0	10 (71.4%)	3 (21.4%)	0	14
Industry	0	0	15 (93.8%)	1 (6.3%)	0	16
Totals	1 (3.3%)	0	25 (83.3%)	4 (13.3%)	0	30 (100%)

present regulatory system. Slightly over twenty-one percent of government officials identified System 4 which is very similar to System 3. The high level of agreement between the two groups may support the notion that the present regulatory system has been arrived at through a mutual working relationship.

Future System

Table 16 summarizes government and industry responses to the question, "Which one of the five systems most closely resembles the pollution control system which you expect to be in existence within the next five to ten years?" It was felt that industry would perceive a more stringent system (System 4 or 5). There are two justifications for this: (1) amendments to the federal FISHERIES ACT may be seen as increasing involvement by the federal government in the regulation and enforcement of pollution control in the pulp and paper industry;[6] and, (2) rising expectations by regulatory agencies and the public as to what is regarded as "acceptable" pollution control.

The majority in each group perceives no change in the future. This distribution may reflect that a large number in each group do not perceive the FISHERIES ACT as having a very strong effect on pollution control policy in the future. Another intepretation is that these individuals perceive the bargaining and negotiation process continuing, rendering a

TABLE 16

PERCEPTION OF FUTURE SYSTEM BY GROUPS

	SYSTEM 1	2	3	4	5	Total Responses
Government	0	0	8 (57.1%)	5 (35.7%)	1 (7.1%)	14
Industry	0	0	9 (56.3%)	2 (12.5%)	5 (31.3%)	16
Totals	0	0	17 (56.7%)	7 (23.3%)	6 (20.0%)	30 (100%)

relatively unchanged system. For example, an examination of the provincial Pollution Control Objectives for the Forest Products Industry (revised 1976) reveals that they are not much more stringent than 1971 objectives (see Table 4). Government officials perceive a lesser degree of regulation (System 4) than industry officials (System 5). Government officials may perceive changes in policy occurring more slowly than industry officials. Industry reacted strongly against the FISHERIES ACT amendments, lobbying against the initial draft of the Act and demanding the repeal of the recent amendments.[7]

Each of the five alternative pollution control systems consisted of seven components: (a) amount of Federal Government Control; (b) amount of Provincial Government Control; (c) licensing/permits; (d) inspections; (e) monitoring; (f) enforcement; and (g) finances. Section B of the questionnaire enabled the respondents to state their preferences for each of the components.

GOVERNMENT CONTROL

Both the federal and provincial governments are involved in regulating pollution control in the pulp and paper industry of British Columbia. The jurisdictional division has been of concern to both water quality managers as well as industry officials.

It was felt that five distinct systems of control could not be realistically devised without some overlap. To avoid the overlap, three systems were used in the analysis. System 1 represents minimal government involvement, System 3 resembles the present system and System 5 represents increased government regulation.

Preferred degree of control

The amount of federal government control continues to be of concern, primarily to industry officials, but also to provincial pollution control officials. Table 17 presents the comparison of industry and government preferences of the amount of federal government control.

It was expected that industry would prefer lesser degrees of government control because of its opposition to the FISHERIES ACT amendments and their stated position at the Pollution Control Board Public Inquiry into Pollution Control Objectives for the forest products industry:

> "The forest products industry recognizes the interests of relevant federal, provincial, regional and municipal agencies in environmental protection. It is inevitable, under these circumstances, that different agencies should have different views as to the degree of environmental protection required, as reflected by their specific jurisdictions and responsibilities. It should not be the responsibility of the industry, whether the requirements of the Pollution Control Branch are compatible with those of the Federal Fisheries Service. Also, having installed facilities at the request of one organization, industry should not be requested to upgrade these facilities to meet the ensuing

TABLE 17

AMOUNT OF PREFERRED FEDERAL GOVERNMENTAL CONTROL

	SYSTEM 1	2	3	Total Responses
Government	3 (27.3%)	6 (54.5%)	2 (18.2%)	11
Industry	5 (41.7%)	4 (33.3%)	3 (25.0%)	12
Totals	8 (34.8%)	10 (43.5%)	5 (21.7%)	23 (100%)

requirements of another industry."

and,

"The industry strongly recommends that the various government departments get together and that a single agency act in their combined behalf in dealing with the industry on pollution abatement. The industry considers that the Province of British Columbia represents a logical subdivision of both political and geographic interests, and recommends that the Pollution Control Branch constitute the single agency representing various government levels."[8]

In the interviews with industry officials, it was often mentioned that the duplication of regulatory effort by both Environment Canada and the Pollution Control Branch was an unnecessary and costly procedure. Some felt that a federal pollution control policy was worthwhile but that daily administration of pollution control should be a provincial concern.[9] A number of those who did not respond to the question, often commented that they would prefer to see no federal government involvement at all:

"The Federal Government should stay out of the field of direct regulation of industry. This should be a provincial responsibility as they know conditions in the province intimately. The Federal Government should reach agreement with the Province on required standards and the Province should then regulate to the agreed standard. If there is more than one agency for industry to deal with, confusion and duplication of effort result."[10]

and,

"As an industry, we believe pollution control should be regulated by only one control agency, that is the Pollution Control Branch, a provincial organization. This organization, of course can receive input from the Federal Department of Fisheries and other federal departments, but to impose a two permit system on the industry or a two control system is intolerable".[11]

Three industry respondents (25 percent) preferred System 5 (in which the federal government administers compulsory national pollution control standards). In one instance, the respondent qualified his choice for System 5, stating that he would prefer to see a federal policy which would not allow a competitive advantage for pulp mills in those provinces which have lower standards than British Columbia.

Over forty percent of the respondents (43.5 percent) preferred System 3 in which the federal government administers compulsory minimum standards on industry. Many of those interviewed (government and industry) felt that federal government involvement was necessary because of their expertise in fisheries. In other words, federal involvement is necessary, but it should not exceed the present situation and preferably only serve in an advisory role to the Pollution Control Branch.

Of the government officials who responded, 27.3 percent would prefer the Federal government to administer voluntary guidelines on the industry (System 1), 54.5 percent would prefer the present system (System 3), and 18.2 percent would like to see the federal government administer compulsory national pollution control standards (System 5).

Two members of the Pollution Control Board were most vocal about federal government involvement in pollution control administration in British Columbia.[12] Federal-provincial conflict was cited as being a negative aspect in provincial pollution control endeavours. In fact, by early 1978 the government of British Columbia had not signed the federal-provincial Accord For the Protection and Enhancement of Environmental Quality.[13] The Accord was to recognize the jurisdictional divisions between the provinces and the federal government and for both levels of government to work mutually in achieving environmental protection and enhancement. The Accord was aimed particularly at pollution control problems and would see the province and the federal government develop broad ambient quality objectives for air and water. The federal government, after consultation with British Columbia and other provinces, would establish national baseline effluent and emission guidelines for specific industrial groups and specific pollutants.

Implementation, monitoring and enforcement of standards would also be jointly agreed upon. The federal government would reserve the right to take enforcement action in cases where the province failed to fulfill its obligations under the Accord. The reasons why the province refused to sign the Accord are unclear. However, it is known that the province was concerned over the revisions to the federal FISHERIES ACT, especially in regards to increased federal involvement in water quality management.[14]

Three alternative degrees of provincial government control were presented to the two groups:

System 1: Province administers voluntary guidelines on the industry.

System 3: Province administers compulsory minimum pollution control standards on industry.

System 5: Provincial government administers compulsory standards on industry.

One might have expected industry to prefer the minimum amount of control (System 1), while government officials, especially provincial authorities, might be expected to prefer either System 3 or 5. The data presented in Table 18 show that government officials are divided between System 3 (50 percent) and System 5 (42.9 percent). A large majority of industry (73.3 percent) prefer the existing system of control (System 3). Industry has stated a preference for working with the Pollution Control Branch. Only 20 percent of industry officials would like to see the provincial government administer compulsory standards which are not minimum standards. Minimum standards, as presently established in British Columbia, are perceived to be flexible, allowing mills to upgrade the quality of their abatement facilities over time. Maximum compulsory standards are seen as static, in a similar vein as the best practicable technology approach to pollution control.

TABLE 18

AMOUNT OF PREFERRED PROVINCIAL GOVERNMENT CONTROL

	SYSTEM 1	SYSTEM 3	SYSTEM 5	Total Responses
Government	1 (7.1%)	7 (50.0%)	6 (42.9%)	14
Industry	1 (6.7%)	11 (73.3%)	3 (20.0%)	15
Totals	2 (6.9%)	18 (62.1%)	9 (31.0%)	29 (100%)

Present degree of control

Table 19 compares government and industry groups' perceptions of the present extent of federal government control. The majority in each group selected System 3 which corresponds closely to the present situation. A slightly higher number of industry officials perceive the present system as more stringent than government officials (System 5). Table 20 compares the two groups' perceptions of the present degree of provincial government control. The uniformity in responses between the two groups may indicate that the present provincial standards are well known because of the negotiation process. Environment Canada personnel are aware of provincial pollution control standards because of their input on pollution control permit applications. The groups also have an opportunity to become knowledgeable of the provincial standards via the provincial public inquiries.

Future degree of control

It was hypothesized that industry would perceive more federal government control in the future, primarily because of the perceived impact of the new FISHERIES ACT. The data in Table 21 indicate that almost 54 percent of industry officials, compared to 18 percent of government officials, perceive that federal influence will be strong in the future. In addition to the Pollution Control Branch, the Environmental Protection

TABLE 19

AMOUNT OF PRESENT FEDERAL GOVERNMENT CONTROL

	SYSTEM 1	SYSTEM 3	SYSTEM 5	Total Responses
Government	1 (8.3%)	9 (75.0%)	2 (16.7%)	12
Industry	2 (15.4%)	7 (53.8%)	4 (30.8%)	13
Totals	3 (12.0%)	16 (64.0%)	6 (24.0%)	25 (100%)

TABLE 20

AMOUNT OF PRESENT PROVINCIAL GOVERNMENT CONTROL

	SYSTEM 1	3	5	Total Responses
Government	1 (7.1%)	13 (92.9%)	0	14
Industry	0	12 (85.7%)	2 (14.3%)	14
Totals	1 (3.6%)	25 (89.3%)	2 (7.1%)	28 (100%)

TABLE 21

AMOUNT OF FUTURE FEDERAL GOVERNMENT CONTROL

	SYSTEM 1	SYSTEM 3	SYSTEM 5	Total Responses
Government	2 (18.2%)	7 (63.6%)	2 (18.2%)	11
Industry	0	6 (42.2%)	7 (53.8%)	13
Totals	2 (8.3%)	13 (54.2%)	9 (37.5%)	24 (100%)

service is also involved in negotiating compliance schedules with pulp mills in the province to install the best practicable technology. The industry may perceive that a strong federal presence in pollution control negotiations will continue. Government officials are perhaps less likely to feel that federal government involvement will increase because of their perception of the rate at which government policy-making and implementation mechanisms operate.

It was hypothesized that industry officials would perceive more provincial government control in the next five to ten years than government officials. The reason for this hypothesis is that industry may feel standards will be upgraded following reviews of the provincial pollution control objectives every five years. Government officials may perceive that changes in standards will occur less quickly. Table 22 compares the questionnaire responses of the two groups. The majority of government officials do not perceive changes occurring in the future. The industry officials are divided in their perception of future provincial government control. Those who chose System 3 may believe that, through negotiation, pollution control requirements will not increase in the future.

REGULATORY COMPONENTS

The regulation of water pollution in the pulp and paper industry in British Columbia involves four major components:

TABLE 22

AMOUNT OF FUTURE PROVINCIAL GOVERNMENT CONTROL

	SYSTEM 1	3	5	Total Responses
Government	0	10 (76.9%)	3 (23.1%)	13
Industry	0	7 (50.0%)	7 (50.0%)	14
Totals	0	17 (63.0%)	10 (37.0%)	27 (100%)

licensing of polluters, inspection of mills, monitoring of effluent and receiving waters and enforcement of standards. The preferences and perceptions of the two groups toward alternative degrees of regulation for each of the components are examined in this section.

Preferred Regulatory Components

Table 23 summarizes each groups' preferred choices for the four regulatory components:

(1) Licensing/Permits: The primary means of regulating pulp mill discharges in British Columbia is through the issuance of pollution control permits. Three alternative forms of licensing of polluters were presented to respondents:

System 1: No permits required.

System 2,3,4: Provincial permits required by all polluting industry in British Columbia.

System 5: Licensing of all polluting industries by the federal and provincial governments.

A large majority in each group (92.3 percent of government and 86.7 percent of industry respondents) favoured System 3 which is the current practice in British Columbia. The pulp and paper industry has stated publicly its support for this system of regulation,

> "The B.C. permit system is characterized by a considerable degree of flexibility. Each permit granted takes into account differences in the years since

TABLE 23

PREFERRED REGULATORY COMPONENTS

	SYSTEM 1	2	3	4	5
Government:					
Licensing-Permits	0	0	12 (92.3%)	0	1 (7.7%)
Inspections	0	0	1 (7.7%)	7 (53.8%)	5 (38.5%)
Monitoring	0	0	8 (61.5%)	1 (7.7%)	4 (30.8%)
Enforcement	0	2 (15.4%)	6 (46.1%)	0	5 (38.5%)
Industry:					
Licensing-Permits	1 (6.7%)	0	13 (86.7%)	0	1 (6.7%)
Inspections	0	2 (13.3%)	9 (60.0%)	2 (13.3%)	2 (13.3%)
Monitoring	0	2 (13.3%)	13 (86.7%)	0	0
Enforcement	1 (6.7%)	4 (26.7%)	6 (40.0%)	0	4 (26.7%)

> construction and the associated cost differences in minimizing discharges, and some consideration is given to site specific variables which govern the ability of the receiving environment to assimilate discharges."[15]

The present permit system has enabled industry and government to negotiate a mutually acceptable level of pollution abatement. Industry may perceive federal government licensing of pulp mills as an extension of the federal policy of 'best practicable technology'.

(2) Inspections: refers to either routine or periodic inspections by government officials of pulp mill operations and treatment facilities. Effective treatment of effluent requires the proper maintenance of abatement technology. Five forms of inspections were presented in the questionnare:

System 1: No inspections.

System 2: Inspections by the Pollution Control Branch with permission of industry.

System 3: Inspections by the Pollution Control Branch with knowledge of the industry.

System 4: Inspections at anytime by the Pollution Control Branch.

System 5: Inspections at anytime by the Pollution Control Branch and Environment Canada.

Twelve of thirteen government officials (92.3 percent) would prefer to have inspections at anytime (Systems 4 and 5), compared to 26.6 percent of industry officials (χ^2=12.4 $p \leq .01$).

The majority of government officials (53.8 percent) would also prefer the provincial Pollution Control Branch to handle inspection duties (System 4). The majority of industry officials (73.3 percent) would prefer to have the Pollution Control Branch conduct inspections, preferably with knowledge or permission of the industry.

During inteviews with industry officials, many expressed the view that they were on cooperative terms with pollution control authorities of both governments who wished to inspect or monitor pulp mill treatment facilities. Often, the industry official stated that they were aware, in advance, that inspections would take place. Perhaps introducing an element of surprise in inspections would tend to erode the cooperative relationship that exists.

As might be expected, all the provincial government respondents prefer System 4 inspection control, while 62.5 percent of Environment Canada officials prefer federal input (System 5).

Monitoring: The monitoring of effluent and receiving water quality is an essential component of pollution control programs. In British Columbia, monitoring has been primarily the responsibility of individual mills as a condition of pollution control permits. Monitoring of effluent predominates over receiving water monitoring.

Five alternative forms of monitoring were presented to questionnaire respondents:

System 1: Voluntary monitoring by industry.

System 2: Industry monitors itself with the right of the Pollution Control Branch to request information on discharge.

System 3: Both industry and Pollution Control Branch monitor with industry submitting discharge reports on a regular basis.

System 4: All monitoring done by the Pollution Control Branch.

System 5: All monitoring done by the Pollution Control Branch and Environment Canada.

There are differences in group responses to this question ($\chi^2 = 8$ $p \leq .05$). A large majority (86.7 percent) of industry officials prefer the existing monitoring program. Under the existing system, monitoring is a condition attached to a pollution control permit. Therefore, the extent and frequency of monitoring is negotiable. In monitoring its own pulp mill effluent or receiving waters, the industry is able to generate and hold information which is vital in the bargaining process. It is also in a position to compare monitoring reports with those of regulatory agencies. The industry has established a working relationship with the Pollution Control Branch and has stated a clear preference for continuing this procedure with no federal government involvement.

The majority (61.5 percent) of government respondents prefer the present monitoring system (System 3). Federal government officials chose System 5 indicating they would like to be more involved in monitoring. At present, federal government monitoring focuses on periodic toxicity and dissolved oxygen measurements of receving waters in pulpmill localities. Colour is also monitored, but primarily for research rather than regulatory purposes.[16]

(4) Enforcement: A variety of enforcement strategies are commonly used as incentives or disincentives for dischargers to meet pollution control standards. These strategies may include warnings, fines, withdrawal of permits, and industry closure. Four alternative enforcement strategies were presented to questionnare respondents:

System 1: Warnings to industry found in violation.

System 2: Warnings and fines levied on violators.

System 3 and 4: Warnings, fines, and suspension of pollution control permits.

System 5: Fines, suspensions of permits, and power to enforce industry closure by both levels of government.

There is little difference between groups in their preferences of enforcement strategies (see Table 23). Slightly more industry than government officials prefer only warnings and fines. The majority of government authorities prefer the suspension of pollution control permits and industry closure, as well as fines and warnings for violators. Federal government officials prefer the most stringent enforcement (System 5). As discussed in the previous chapter, there have been relatively few prosecutions against pulp mills for violation of provincial pollution control standards. The majority of prosecutions have been under the federal FISHERIES ACT.

Prior to the amended FISHERIES ACT, the regulatory system was based on warnings, fines, and possible suspensions of pollution control permits. Enforcement was usually a last resort, with government agencies (especially provincial) preferring negotiation over prosecution. It appears that the provincial government agencies lean more toward negotiation, while federal government agencies have been more conscious of enforcement. If industry officials perceive these roles for the two government agencies, then it may help explain the industry preference for dealing with only one government agency: the Pollution Control Branch.

Present Regulatory Components

Table 24 shows that the two groups' perceptions of the present regulatory components are very similar. The high degree of agreement suggests that both groups are very aware of current regulatory practices. It would support the idea that a large amount of interaction occurs among and between groups and that the present degree of regulation has been achieved through negotiation.

TABLE 24

PERCEPTION OF PRESENT REGULATORY COMPONENTS

	SYSTEM 1	2	3	4	5
Government:					
Licensing-Permits	0	0	14 (100%)	0	0
Inspections	0	0	5 (35.7%)	5 (35.7%)	4 (28.6%)
Monitoring	0	0	13 (100%)	0	0
Enforcement	0	5 (35.7%)	7 (50.0%)	0	2 (14.3%)
Industry:					
Licensing-	0	0	13 (92.9%)	0	1 (7.1%)
Inspections	0	0	8 (57.1%)	4 (28.6%)	2 (14.3%)
Monitoring	0	1 (7.1%)	12 (85.7%)	0	1 (7.1%)
Enforcement	1 (7.1%)	4 (28.6%)	6 (42.9%)	0	3 (21.4%)

Future Regulatory Components

Table 25 presents the perceptions of government and industry officials of the future regulatory components. While a general level of agreement exists between the two groups for most components, some differences can be noted. Government officials believe that the existing arrangement for licensing of dischargers will remain in effect, while industry officials believe that the federal government will also be involved in licensing (System 5). Industry may perceive this future federal involvement arising from the revised FISHERIES ACT. It might be expected that federal government officials would perceive a federal role in licensing. This was not the case, perhaps strengthening the suggestion that federal officials perceive an enforcement role for themselves and a negotiation role for provincial authorities. In relieving themselves from the licensing of pulp mills, federal authorities could potentially avoid the enforcement-negotiation conflict. They would be free to enforce the FISHERIES ACT without worrying about negotiations over standards.

A similar proportion of each group (38.5 percent of government and 42.9 percent of industry) believes the federal government will play a stronger role in inspections (System 5). However, the groups differ as to the degree of industry awareness of government inspections (Systems 3 and 4). Government authorities expect that they will be able to conduct

TABLE 25

PERCEPTION OF FUTURE REGULATORY COMPONENTS

	SYSTEM 1	2	3	4	5
Government:					
Licensing-Permits	0	0	12 (92.3%)	0	1 (7.7%)
Inspections	0	0	1 (7.7%)	7 (53.8%)	5 (38.5%)
Monitoring	0	0	9 (69.2%)	2 (15.4%)	2 (15.4%)
Enforcement	0	2 (15.4%)	8 (61.5%)	0	3 (23.1%)
Industry:					
Licensing-Permits	0	0	9 (64.3%)	0	5 (35.7%)
Inspections	0	0	6 (42.9%)	2 (14.3%)	6 (42.9%)
Monitoring	0	1 (7.1%)	12 (85.7%)	0	1 (7.1%)
Enforcement	0	0	10 (71.4%)	0	4 (28.6%)

inspections at anytime, while industry officials expect they will have forewarning of intended inspections. Similarly, government authorities believe there will be increased government monitoring of discharges and receiving waters. Industry officials expect monitoring procedures to remain unchanged (System 3).

FINANCIAL ASSISTANCE

As an incentive to pollution abatement, governments often offer financial support to polluting industries. Financial assistance can be either direct or indirect. Direct support involves outright grants, while indirect financial assistance includes subsidies, tax write-offs on abatement equipment, and special loan arrangements. In Canada, the pulp and paper industry has access to federal government financial benefits for pollution control research and development programs.[17] Indirect financial support is available through the federal government's Accelerated Capital Cost Allowance Program which allows a tax write-off of the capital cost of pollution control equipment over a two year period, 50 percent per year.

The questionnaire presented respondents with five alternatives for financial assistance to the pulp and paper industry in British Columbia:

System 1: Federal and provincial grants to industry for 75% of pollution control costs with no tax on this equipment.

System 2: Provincial grants to industry for up to 50% of pollution control costs.

System 3: Government tax incentives for up to 50% of pollution control costs.

System 4: Government loans for pollution control equipment.

System 5: No provincial or federal government financial assistance.

Tables 26, 27, and 28 present government and industry responses to the preferred, present and future financial assistance alternatives for the British Columbia pulp and paper industry.

As expected, industry officials would prefer to receive the maximum possible financial assistance and nothing less than the present system (Table 26). During the interviews, industry officials stressed the need for government financial assistance for abatement facilities. They pointed out that capital costs for pollution abatement are very high, especially for older mills. Among government respondents, half would prefer to see the present situation remain in effect (System 3), while the other half would prefer to see assistance limited to government loans only (System 4).

Both groups agree on the nature of the present financial assistance program (Table 27). There is some disagreement in their perception of future financial assistance (Table 28). The

TABLE 26

PREFERRED FINANCIAL ASSISTANCE

	SYSTEM 1	2	3	4	5	Total Responses
Government	0	0	7 (53.8%)	6 (46.2%)	0	13
Industry	6 (40.0%)	1 (6.7%)	8 (53.3%)	0	0	15
Totals	6 (21.4%)	1 (3.6%)	15 (53.6%)	6 (21.4%)	0	28 (100%)

TABLE 27

PERCEPTION OF PRESENT FINANCIAL ASSISTANCE

	SYSTEM 1	2	3	4	5	Total Responses
Government	0	0	8 (72.7%)	2 (18.2%)	1 (7.1%)	11
Industry	0	0	13 (92.9%)	0	1 (7.1%)	14
Totals	0	0	21 (84.0%)	2 (8.0%)	2 (8.0%)	25 (100%)

TABLE 28

PERCEPTION OF FUTURE FINANCIAL ASSISTANCE

	SYSTEM 1	2	3	4	5	Total Responses
Government	0	0	9 (75.0%)	3 (25.0%)	0	12
Industry	0	0	9 (64.3%)	0	5 (35.7%)	14
Totals	0	0	18 (69.2%)	3 (11.5%)	5 (19.2%)	26 (100%)

majority in each group believe the financial situation will not change (System 3). However, twenty-five percent of government respondents expect that the government will only be providing loans (System 4), while thirty-five percent of industry officials expect that there will be no government financial assistance in five to ten years. This attitude could be attributed, in part, to the speculation at the time of questionnaire distribution, that the federal government was not going to renew the Accelerated Capital Cost Allowance program.

WATER QUALITY PARAMETERS

One of the most important aspects of a water quality management or a pollution control program is deciding what parameters should be included in setting pollution control standards. Water quality parameters generally include biological, chemical, physical, and aesthetic components. The degree to which these components are included in standards will depend upon whether the standards are effluent discharge standards or receiving water standards. Individuals may also differ as to which components are considered more important in setting standards.

Section C of the questionnaire was designed to assess the level of agreement/disagreement between government authorities and industry officials concerning various water quality parameters which are used in establishing pollution control standards for the pulp and paper industry.

EFFLUENT DISCHARGE STANDARDS

The first question in Section C was designed to assess what weight the two groups would attach to water quality parameters used in establishing effluent discharge standards for the pulp and paper industry in British Columbia. Twelve parameters were selected from the provincial POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY. The participants were asked to rate (on a five-point scale) each parameter in terms of the weight decision makers should give to the parameters in establishing standards. A high degree of correlation was found between the two groups in the weights attached to the parameters (Spearmans rank order correlation = .68, $p \leq .05$).

Toxicity, suspended solids, settleable solids, biological oxygen demand and pH are considered by both groups to be the most important parameters for establishing effluent discharge standards. The aesthetic parameters (colour, foam, and odour) ranked near the bottom of the list (Table 29).

Some differences were evident between groups in their attitudes toward certain parameters. Government officials would give more weight to suspended solids in setting standards than industry officials (Table 30). A government scientific committee recommended that suspended solids concentration in pulp mill

TABLE 29

RANKING OF WATER QUALITY PARAMETERS
(EFFLUENT DISCHARGE STANDARDS)

	Mean Rankings		
Parameter	Government	Industry	Combined
Suspended solids	2.5	4	2.5
pH	6	6.5	5
Dissolved oxygen	8	6.5	6
Biological oxygen demand	3.5	3	4
Toxicity	1	1	1
Colour	10	10	11
Foam	9	9	8.5
Odour	7	8	7
Temperature	11.5	12	12
Residual chlorine	5	11	8.5
Coliform organisms	11.5	5	10
Settleable solids	3.5	2	2.5

TABLE 30

WEIGHT GIVEN TO SUSPENDED SOLIDS BY GROUPS

	No Weight	Little Weight	Neutral	Moderately Heavy Weight	Heavy Weight	Total Responses
Government	0	0	0	4 (26.7%)	11 (73.3%)	15
Industry	0	4 (26.7%)	3 (20.0%)	4 (26.7%)	4 (26.7%)	15
Totals	0	4 (13.3%)	3 (10.0%)	8 (26.7%)	15 (50.0%)	30 (100%)

effluent should not exceed 25 ppm.[18] This is considered and optimum value for protection of fish. Suspended solids can plug fish gills and increase the turbidity of water reducing light penetration needed for phytoplankton growth.

The pulp and paper industry in their brief to the 1976 provincial Public Inquiry into Pollution Control Objectives for the Forest Products Industry, stated that technology was not available to remove more than ninety percent of the total suspended solids of clarified and biotreated effluent.[19] Moreover, they claimed that,

> "Available information does not indicate that these nonsettleable solids exert significant, damaging impact on receiving waters. A change in present Objectives (1971) is necessary unless large capital investment (with uncertain performance) and increased mill operating costs, are to be incurred, without any significant environmental benefit. Consequently, we recommend that Objectives be restricted to settleable solids, eliminating Objectives for total suspended solids. Implementation of this recommendation will obviate inconsistencies between Objectives for settleable and total suspended solids, define the type of suspended matter to be removed, relate the regulatory parameter to one which can be controlled by existing technology, while ensuring environmental protection."[20]

Although toxicity was ranked first by both groups, there is some disagreement as to the weight it should be given in establishing standards. Table 31 shows that virtually all government officials believe heavy weight should be given to toxicity, while industry officials are more divided in their responses. As the industry stated in its Brief to the provincial Public Inquiry in 1976,

TABLE 31

WEIGHT GIVEN TO TOXICITY BY GROUPS

	No Weight	Little Weight	Neutral	Moderately Heavy Weight	Heavy Weight	Total Responses
Government	0	0	0	1 (6.7%)	14 (93.3%)	15
Industry	0	2 (13.3%)	1 (6.7%)	5 (33.3%)	7 (46.7%)	15
Totals	0	2 (6.7%)	1 (3.3%)	6 (20.0%)	21 (70.0%)	30 (100%)

"In summary, pulp and paper effluents are only weakly toxic and can be detoxified by treatment systems. From bioassay monitoring data on the biological activity of the waste to fish, it can be concluded that the acute toxicity of pulp and paper mill effluents to fish in freshwater situations in the Province of British Columbia is not a problem. It is more rational to base regulatory Objectives on the substantial available technical information than it is to delay this necessary technical decision and to formulate Objectives on any other basis, where the relationship to the environment is less direct."[21]

Among government agencies, toxicity is a very important parameter in setting standards. As discussed in the previous chapter, the federal government has had a fairly stringent toxicity standard since 1971 and the provincial toxicity standard (1976) has been upgraded for pulp and paper mills.

The pulp and paper industry recommended a number of changes to the provincial pollution control Objectives at the Public Inquiry in 1976. The industry felt that effluent discharge objectives for pH, biological oxygen demand (BOD), dissolved oxygen, temperature, colour, settleable solids, and residual chlorine, should be deleted or changed. The primary concern with pH was that seawater acts as a buffering agent in controlling pH levels of discharged effluent. Therefore, the industry did not believe neutralization of effluent was necessary. The industry also recommended that pH was not a problem for freshwater mills where effluent discharge volume is small.[22]

The industry felt that BOD of pulp mill effluent was not a major problem in causing oxygen depletion of receiving waters, except for sulphite mills. Their argument was based on evidence that BOD of effluent is removed through biotreatment for toxicity. The industry also requested lower BOD standards for sulphite mills:

Level A 150lb BOD per ADT.

Level B 350lb BOD per ADT.

Level C 500lb BOD per ADT.[23]

It would appear that the 1976 Provincial Objectives have followed these recommendations (Table 4).

Industry objected to the requirement that a dissolved oxygen requirement of 2.0 mg/liter be maintained in effluent discharged.[24] It felt that dissolved oxygen is a criterion for receiving water quality and not for effluent discharge standards. Temperature was not considered to be a problem by the industry and recommended it should, therefore, be removed from the Objectives.[25]

The removal of colour from pulp mill effluent has been a difficult problem, with only limited success in achieving technical solutions. It can be seen from Table 29 that colour was ranked low by both groups as a parameter for water quality. Industry claims that colour is an aesthetic problem and that no acceptable standards have been devised. The federal government maintains that colour from pulp mill effluent can inhibit phytoplankton growth.[26] Both industry and government agree that further research should be undertaken to determine the effects of colour on aquatic ecosystems and to find effective technology to reduce colour in pulp mill effluent.

Industry's concern over settleable solids stems from the discrepancy in measuring suspended and settleable solids. Some mills can meet suspended solids objectives but cannot meet objectives for settleable solids. The industry recommended that settleable solids, which are measured on a volume basis, be changed to an analytical or weight basis (lb per ADT) to correspond with suspended solids measurement.[27]

The industry claimed that residual chlorine was not a problem at mills with biological treatment and was only a problem at those coastal locations where freshwater overlays seawater.[28]

Both groups generally agree on the most important parameters for effluent discharge standards. Toxicity, suspended solids, settleable solids and biological oxygen demand are considered key elements for determining effluent standards. Aesthetic standards were not given a high ranking by either group.

The pulp and paper industry has questioned the importance of some parameters for water quality protection. Their arguments are based in part on studies which they have conducted to determine the effects of these effluent characteristics on water quality. They also feel that pollution control technology is limited in treating certain pollutants (e.g. suspended solids and colour). The industry has argued for the setting of standards on the basis of site specific requirements.

The government officials have for the most part not been overly critical of the industry criticism of effluent standards. The POLLUTION CONTROL OBJECTIVES established by the provincial government are the only public policy position of this level of government. In reviewing the 1971 and 1976 Objectives, it would appear that recommendations of the industry were considered. pH standards for marine water discharges were deleted and biological oxygen standards for sulphite mills were lowered for the 1976 Objectives. The federal government has conducted extensive research on the effects of pulp mill effluent on fish life. Their standards are based on the requirements to protect fish and waters frequented by fish. There has been no strong federal government criticism of industry's position on these effluent discharge characteristics. The federal government believes that installation of the best practicable technology is necessary to meet their pollution control requirements for suspended solids, BOD, and toxicity.

RECEIVING WATER STANDARDS

In the second part of Section C of the questionnaire, respondents were asked to rate water quality parameters used for establishing receiving water standards for the pulp and paper industry. In addition to the twelve parameters used above, two more were added: stress on the biological community and synergistic effects of multiple discharges. Stress on the biological community is a broad category including sublethal effects (reproductive, physiological) which may be due to toxicity, low dissolved oxygen and other factors in the effluent and receiving waters. Although sublethal effects are recognized as an important parameter for receiving water quality, it is often difficult to isolate the primary cause(s) of such effects. Many pulp mills discharge their effluent through a number of outfalls, and the effluent may contain a variety of chemicals and substances, each with its own environmental impact. The effects of these substances, acting synergistically on water quality, are relatively unknown.

The rankings of the fourteen parameters are presented in Table 32 (Spearmans rank order correlation = .426, $p \geq .05$). The combined rankings indicate that stress on the biological community, toxicity, dissolved oxygen, and synergistic effects of multiple discharges are the parameters which should be given the most weight in establishing receiving water standards. The aesthetic parameters: colour, foam and odour were all ranked low by both groups.

The industry has recommended site-specific standards with pollution abatement dependent on the requirements of the local receiving waters. However, some differences exist between

TABLE 32

RANKINGS OF WATER QUALITY PARAMETERS
(RECEIVING WATER STANDARDS)

	Mean Rankings		
Parameter	Government	Industry	Combined
Suspended solids	8	13.5	8
pH	5	7	5.5
Dissolved oxygen	2.5	3	3
Biological oxygen demand	5	12	7
Toxicity	2.5	2	2
Colour	10	9	9.5
Foam	11	10	11.5
Odour	13	8	14
Temperature	12	11	13
Residual chlorine	7	13.5	9.5
Coliform organisms	14	5	11.5
Settleable solids	9	4	5.5
Stress on the biological community	1	1	1
Synergistic effects of multiple discharges	5	6	4

government and industry as to the weight parameters should be given in setting receiving water standards. Eighty percent of government officials feel residual chlorine should be given moderately heavy or heavy weight, as compared to 46.6 percent of industry officials. Differences with regard to settleable solids were also evident, with 73.3 percent of government officials and 93.3 percent of industry officials selecting moderately heavy or heavy weight (χ^2=9.8 p≤.05). The importance of BOD as a receiving water quality parameter also differed between the groups (χ^2=8.3 p≤.05), with 93.3 percent of government officials and 50 percent of industry officials selecting moderately heavy or heavy weight. Government officials also ranked suspended solids and pH higher than industry respondents.

In summary, both groups believe stress on the biological community, toxicity, and dissolved oxygen are the most important parameters for establishing receiving water standards. These parameters are particularly important for ensuring the maintenance of fish and aquatic populations. However, difficulties in measuring these parameters and interpreting results may still exist. Aesthetic parameters were ranked low by both groups. While there was agreement in these two general areas, disagreement was evident between groups in consideration of residual chlorine, BOD, and settleable solids.

SOCIO-ECONOMIC FACTORS IN SETTING AND ENFORCING STANDARDS

STANDARD SETTING

In establishing pollution control standards for the pulp and paper industry of British Columbia the assumptions and values upon which the standards are based are often not clearly understood. The questionnaire aimed to assess the attitudes of the two groups toward a number of factors which are often implicit in water quality standard setting, but which are not always stated.

Tables 33 and 34 present government and industry responses to the question, "How much weight should decision makers give to these factors when establishing water pollution control standards for the pulp and paper industry in British Columbia?" There is close agreement between both groups (Spearmans rank order correlation = .875, p=.01). Both groups believe public health factors and maintaining viable fish stocks should be given heavy weight in establishing standards. This would parallel the legislative goals of the FISHERIES ACT and the POLLUTION CONTROL ACT. The setting of standards which can be met technically is important to both groups. Consideration of recreational uses of water was ranked similarly by both groups. The majority of both groups believe public attitudes should be

TABLE 33

GOVERNMENT ATTITUDES OF THE WEIGHT TO BE GIVEN TO SOCIO-ECONOMIC FACTORS IN SETTING POLLUTION CONTROL STANDARDS FOR THE PULP AND PAPER INDUSTRY

	No Weight	Little Weight	Neutral	Moderately Heavy Weight	Heavy Weight
Technical Feasibility	1 (6.7%)	0	1 (6.7%)	5 (33.3%)	8 (53.3%)
Economic position of an individual firm	1 (6.7%)	2 (26.7%)	7 (46.7%)	3 (20.0%)	0
Economic position of the industry as a whole	1 (6.7%)	3 (20.0%)	9 (60.0%)	1 (6.7%)	1 (6.7%)
Maintaining viable fish stocks	0	0	0	4 (26.7%)	11 (73.3%)
Public health factors	0	1 (6.7%)	1 (6.7%)	4 (26.7%)	9 (60.0%)
Proximity of a mill to populated areas	1 (7.1%)	1 (7.1%)	3 (21.4%)	8 (57.1%)	1 (7.1%)
Aesthetic appearance of water	0	0	5 (33.3%)	9 (60.0%)	1 (6.7%)
Recreational uses of water	0	0	3 (20.0%)	6 (40.0%)	6 (40.0%)
Public attitudes toward water quality	0	0	7 (46.7%)	5 (33.3%)	3 (20.0%)

TABLE 34

INDUSTRY ATTITUDES OF THE WEIGHT TO BE GIVEN TO SOCIO-ECONOMIC FACTORS IN SETTING POLLUTION CONTROL STANDARDS FOR THE PULP AND PAPER INDUSTRY

	No Weight	Little Weight	Neutral	Moderately Heavy Weight	Heavy Weight
Technical Feasibility	1 (6.3%)	1 (6.3%)	3 (18.8%)	3 (18.8%)	8 (50.0%)
Economic position of an individual firm	4 (26.7%)	0	5 (33.3%)	5 (33.3%)	1 (6.7%)
Economic position of industry as a whole	1 (6.3%)	1 (6.3%)	3 (18.8%)	6 (37.5%)	5 (31.3%)
Maintaining viable fish stocks	0	0	1 (6.3%)	6 (37.5%)	9 (56.3%)
Public health factors	0	0	0	2 (12.5%)	14 (87.5%)
Proximity of a mill to populated areas	3 (18.8%)	1 (6.3%)	0	7 (43.8%)	5 (31.3%)
Aesthetic appearance of water	0	1 (6.3%)	7 (43.8%)	6 (37.5%)	2 (12.5%)
Recreational uses of water	0	0	2 (12.5%)	12 (75%)	2 (12.5%)
Public attitudes toward water quality	1 (6.3%)	1 (6.3%)	2 (12.5%)	8 (50.0%)	4 (25.0%)

given moderately heavy or heavy weights in setting standards. A larger proportion of industry officials (75 percent) gave more weight to public attitudes than government officials (53.3 percent). Almost half (46.7 percent) of government officials are neutral in the weight given to public attitudes. During interviews with industry officials, most emphasized the Pollution Control Board Public Inquiries as a useful function. The industry realizes that the level of public concern toward environmental quality has risen over the years. The industry views the public inquiry process as a means for presenting their research progress in the field. On the other hand, the federal government encourages no public participation in standard setting for the pulp and paper industry. As Mitchell has pointed out, professionals responsible for water management, often feel they understand the problems to be solved better than the public.[29] Government officials may feel that public attitudes are not overly important in establishing standards.

A reason for this attitude may be that government officials believe that the information required for establishing standards is primarily technical. They have been working with industry in the research and development of pollution control technology. Government officials may perceive that the public does not have the necessary expertise to contribute to this type of information exchange.

Both groups feel that the economic position of an individual firm should not be given much weight in establishing standards. It was expected that industry would give more weight to this factor. It may be that industry officials do not believe that one firm should gain a competitive advantage over another firm. Although the industry has argued for lower standards for sulphite mills, there is now only one such mill (at Port Alice), which has recently spent a considerable amount on treatment facilities.

There is a significant difference (χ^2=10.2, p≤.05), between the two groups concerning the weight which would be given to the economic position of the industry as a whole when setting standards. The industry has maintained that the pulp industry is controlled by world market conditions, which should be taken into consideration when establishing standards. Their main concern is that the pulp and paper industry should not be given a competitive advantage in other provinces or countries where standards may be lower. As a result, the industry feels government financial assistance for pollution abatement facilities is necessary to maintain their competitive position. However, in the previous question the industry has stated that individual mills should not be given preferential treatment. Yet, the industry has also argued for site specific requirements. On one hand, the industry wishes some form of uniform treatment for all mills to prevent possible competitive advantages and at the same time believes that pollution control standards should be based on individual requirements. The majority of government officials (60 percent) are neutral in their opinion of this matter, perhaps indicating the sensitivity of the issue.

Seventy-five percent of industry officials and 64.2 percent of government respondents would give moderately heavy or heavy weights to the proximity of a mill to populated areas in setting standards. Presumably both groups feel higher standards are necessary in regions where a considerable percentage of the population could be affected by pulp mill pollution.

The majority of government officials (66.7 percent) and 50 percent of industry respondents feel that the aesthetic appearance of water should be given moderately heavy or heavy weights in establishing standards. A significant proportion of both groups (33.3 percent of government and 43.8 percent of industry) gave neutral weight to the aesthetic appearance of water. These persons may perceive the difficulty of removing colour from pulp mill effluent, which is the primary cause of aesthetic degradation of water quality.

In summary, both groups would give heavy weight to water quality goals which have been established for British Columbia: public health factors and maintaining viable fish stocks. There is close agreement between government and indusry officials toward setting standards which are technically feasible. Both groups would attach heavy weight to recreational uses of water and the proximity of mills to populated areas in setting standards. This recognizes that water quality standards should vary with water uses and that standards may differ regionally. Consideration of public attitudes in setting standards was given heavy weight by both groups, although industry officials rated this higher than government officials. Industry officials may have perceived public participation in the form of public inquiries. The industry has actively promoted the inquiries as a means for publicly announcing their achievements in pollution abatement. It was stated that perhaps government officials believe that they understand public attitudes, or that the public is not qualified to contribute technical information on water quality and waste treatment. Both groups felt that the economic position of a firm should not be given special consideration in establishing standards, although industry officials believed that the economic position of the industry as a whole should be considered. It was believed that the reason for this was that industry does not want to lose its competitive position in a world market. Higher standards would force many mills to undertake waste treatment at a great expense. Industry favours financial subsidies to help alleviate capital costs. The government officials were neutral on this factor. They may feel undecided given the political nature of this issue. Support for maximum financial assistance could be interpreted as being sympathetic with the industry position. Although aesthetic factors were given fairly heavy weight by both groups, there is a realization that colour is very difficult to remove from pulp mill effluent.

ENFORCEMENT OF STANDARDS

This section of the questionnaire was similar to the previous section, except that individuals were asked what weight decision makers should give to a number of factors when enforcing standards. The enforcement of standards involves three steps: 1) having mills install the necessary pollution abatement facilities to meet a given standard or modify production methods; 2) monitoring of effluent and/or receiving waters to ensure standards are not violated; and 3) warnings, fines, or closures of mills found in violation of standards.

Five important factors in the decision process to enforce standards were listed: available technology, economic position of the firm, the importance of the mill to the community, proximity of a mill to populated areas and public attitudes toward pollution control.

The availability of abatement technology is often cited as being a major factor in the enforcement of standards. While abatement technology is generally available for pulp mills, much research and development remains to be done to make technology both efficient and economical. Industries were often unwilling to invest large capital expenditures on unproven abatement facilities. Tables 35 and 36 show that both government and industry officials agree that heavy weight should be given to available technology when enforcing standards.

Both groups would give lesser weight to the economic position of a firm when enforcing standards. It was expected that industry would give greater weight to this factor. Their concern over scheduling of abatement facilities was expressed in the Brief to the Public Inquiry. Consideration should be taken of,

> "the cost of implementing pollution measures and the related impact of the financial viability of the business firm, recognizing the highly competitive nature of the forest industry in general and the economic handicaps of older, partially obsolescent mills."[30]

There were significant differences between groups in the weight given go the proximity of a mill to populated areas ($\chi^2 = 9.7$, $p \leq .05$) and to public attitudes toward pollution control ($\chi^2 = 10.5$, $p \leq .01$).

Over 46 percent of government officials assigned moderately heavy or heavy weights to the proximity of a mill to populated areas, with 40 percent assigning neutral weight. Industry believes less stringent requirements should be placed on more remote mills.[31] Seventy-five percent of industry gave moderately heavy or heavy weights to this variable.

Seventy-five percent of industry officials would give moderately heavy or heavy weights to public attitudes when

TABLE 35

GOVERNMENT ATTITUDES TOWARD THE WEIGHT TO BE GIVEN TO SOCIO-ECONOMIC FACTORS WHEN ENFORCING POLLUTION CONTROL STANDARDS IN THE PULP AND PAPER INDUSTRY

	No Weight	Little Weight	Neutral	Moderately Heavy Weight	Heavy Weight
Available Technology	0	0	3 (20.0%)	2 (13.3%)	10 (66.7%)
Economic Position of Firm	1 (6.7%)	3 (20.0%)	7 (46.7%)	4 (26.7%)	0
Importance of the mill to the community	0	1 (6.7%)	6 (40.0%)	8 (53.3%)	0
Proximity of the mill to populated areas	1 (6.7%)	1 (6.7%)	6 (40.0%)	6 (40.0%)	1 (6.7%)
Public attitudes toward pollution control	0	0	9 (64.3%)	5 (35.7%)	0

TABLE 36

INDUSTRY ATTITUDES TOWARD THE WEIGHT TO BE GIVEN TO SOCIO-ECONOMIC FACTORS WHEN ENFORCING POLLUTION CONTROL STANDARDS IN THE PULP AND PAPER INDUSTRY

	No Weight	Little Weight	Neutral	Moderately Heavy Weight	Heavy Weight
Available Technology	0	1 (6.3%)	0	4 (25%)	11 (68.8%)
Economic Position of Firm	1 (6.3%)	2 (12.5%)	6 (37.5%)	4 (25%)	3 (18.8%)
Importance of the mill to the community	0	1 (6.3%)	4 (25%)	5 (31.3%)	6 (37.5%)
Proximity of the mill to populated areas	1 (6.3%)	3 (18.3%)	0	7 (43.8%)	5 (31.3%)
Public attitudes toward pollution control	0	2 (12.5%)	2 (12.5%)	9 (56.3%)	3 (18.8%)

standards are enforced. The majority of government officials (64.3 percent) assigned neutral weight to this variable. The industry may have interpreted the importance of this factor in a broad sense. In regard to the scheduling of pollution abatement facilities the industry feels consideration should be given to, "the extent to which the pollution in a locality represents a pressing problem in terms of human, environmental, economic and social values."[32] The industry may also feel public sentiment is not against them, but can be used to strengthen their position with the government, considering the existing high rate of unemployment (8 - 9 percent in British Columbia).

Government respondents may perceive public attitudes toward pollution as a criticism of a lack of enforcement by regulatory agencies. Government officials may also believe that the public has little knowledge of the complicated negotiation process involved in enforcing standards.

One of the most crucial factors affecting decision makers responsible for enforcing pollution control standards is the importance of a mill to a community. A number of communities in British Columbia are dependent upon pulp and paper mills to generate revenue and provide employment. Stringent enforcement of standards could possibly result in mill closures, forcing many individuals out of work and threatening the economic viability of the communities. Just over fifty percent of government officials feel decision makers should give a moderately heavy or heavy weight to this variable. Almost seventy percent of industry officials gave moderately heavy or heavy weights to this factor. Those firms which operate mills in communities where they are the primary income generator hold a very strong bargaining position when enforcement decisions are made. The next chapter will document a case in British Columbia where this issue played a dominant role in the enforcement of pollution control standards.

CHAPTER SUMMARY

This chapter assesses the level of agreement and disagreement between the regulators (government officials) and the regulated (industry officials) regarding important aspects of pollution control policy in British Columbia. Overall, there was general agreement between groups on most components of pollution control policy. Importantly, both groups stated their preference for the same pollution control system, a system which closely represents the present regulatory system in British Columbia. This may be an indication that industry has accepted regulation by government agencies. Another interpretation is that industry officials and government officials have negotiated a mutually acceptable situation. The high level of agreement on the perception of the present regulatory system may support this reasoning. The industry has publicly stated its preference for the present system of pollution control as a "flexible" form of regulation. Both groups also believe that the future system of regulation will be similar to the present system, indicating that bargaining is likely to continue, resulting in a relatively unmodified regulatory system.

The pulp and paper industry has stated a preference to interact with only one level of government: the provincial Pollution Control Branch. They believe that unnecessary duplication of effort exists and that the provincial authorities understand their problems better. Industry officials believe that federal government control is likely to increase in the future. The strengthening of the FISHERIES ACT was given as a reason.

In comparing the differences between the groups' preferences and perceptions toward regulatory components, there was a preference for the provincial government to issue permits to all polluting industries. The industry prefers the provincial government to issue permits which take into consideration the site specific requirements of each mill. There were some differences between groups in the type of inspections which should be carried out of pulp mill treatment facilities. The government officials stated their preference for inspections at any time, while industry officials would prefer to have prior knowledge of forthcoming inspections.

The majority of industry officials would prefer to have both the industry and the Pollution Control Branch monitor effluent discharge with industry submitting discharge reports on a regular basis. While the majority of government officials would also prefer this monitoring system, federal government officials would prefer to be involved in the monitoring. At present, monitoring is a condition attached to a pollution control permit. Although monitoring requirements exist in the provincial Pollution Control Objectives for the pulp and paper industry, individual monitoring requirements are negotiable. In undertaking its own monitoring, the industry is able to generate information which is important in the bargaining process. It is in a position of challenging the monitoring reports of regulatory agencies.

In enforcing standards, slightly more government officials than industry officials would prefer to have a system of warnings, fines, and suspension of permits and power to close pulp mills. Industry officials would prefer to have maximum financial assistance and nothing less than the present level of financial aid. Industry feels assistance is needed to keep the mills competitive on a world market basis. Fifty percent of government officials feel industry should be limited to loans only. A few federal government respondents felt that industry could affort to install pollution control equipment and should be made to install the best practicable technology. This seemed to represent a personal opinion which was not supported by documented information.

Both government and industry officials agreed on which water quality parameters should be used for establishing effluent discharge standards for the pulp and paper industry. Toxicity, suspended solids, settleable solids, biological oxygen demand and pH were considered to be most important. Aesthetic parameters were not considered as important. Some differences did exist as to what particular weight should be attached to suspended solids and toxicity. In their brief to the provincial

Pollution Control Public Inquiry, industry recommended different measurement techniques for suspended solids and felt that toxicity was not a major problem. The federal government has supported a strong toxicity standard to protect fish. Some differences between government and industry in interpretation of test results was evident.

In assessing parameters for receiving water standards both groups agreed that stress on the biological community, toxicity and dissolved oxygen were very important. Less weight was attached to aesthetic parameters of water quality.

In setting pollution control standards for the pulp and paper industry both groups agreed that public health factors and maintaining viable fish stocks were the most important variables to be considered. Both groups believed it was important to set standards which were technically feasible to meet. The majority in both groups also felt public attitudes toward water quality were important in setting standards. However, almost fifty percent of government officials were neutral on this matter. It was hypothesized that perhaps government officials believe they understand the problems to be solved better than the public. Pollution control has been considered a technical problem by regulatory agencies. They cooperate with industry in research and development projects. Government officials may perceive that the public has little to contribute in this information exchange, which requires technical expertise.

Neither group would attach much weight to the economic position of an individual firm in setting standards, but industry officials believe the economic position of the industry as a whole is important. It was expected that the industry would have given more weight to the economic standing of an individual mill on the basis of their request for site specific pollution control requirements. Their main argument has been that the industry as a whole should not be put in an uncompetitive situation with mills in other regions which have lower standards to meet. There is some indication that each group would consider water uses in relation to water quality standards. They would give fairly heavy weight to recreational uses of water, the proximity of mills to populated areas, and consider the aesthetic appearance of water.

In enforcing standards, the respondents were asked to rate five factors: available technology, economic position of a firm, the importance of the mill to the community, proximity of a mill to populated areas and public attitudes toward pollution control. Overall, industry officials attached more weight to these factors than government officials. Most industry officials gave moderately heavy or heavy weights to these variables, while government officials preferred neutral or moderately heavy weight. These government responses may indicate the difficult situation which regulatory agencies encounter. They must set standards which are publicly acceptable and take enforcement action to ensure standards are being met. At the same time, however, they cannot ignore the economic importance of the pulp and paper industry and do not wish to erode the cooperative relationship which they may have established over the years.

In conclusion, the regulators and the regulated display a relatively high level of agreement on the major aspects of pollution control policy in British Columbia. Both groups prefer a regulatory system which depicts the current form of regulation. The findings support the premise that a bargaining process occurs between both groups which is conducive to a satisfactory working relationship. The regulated have legitimized the powers and functions of the regulators, although they would prefer to interact with only the provincial authorities. The regulators require the cooperation of industry in order to carry out their mandate. They must also demonstrate that they have not been co-opted by industry.

FOOTNOTES TO CHAPTER FIVE

1. P. Althoff and W.H. Grieg, 1974 "Environmental Pollution Control Policy Making: An Analysis of Elite Perceptions" ENVIRONMENT AND BEHAVIOR, Volume 6, No. 3, pp.259-288.

2. Ibid.

3. R.E. Rickson, 1977 "Dimensions of Environmental Management: Legitimation of Government Regulation by Industrial Managers" ENVIRONMENT AND BEHAVIOR, Volume 9, No. 1, pp.15-40.

4. Ibid. p.30.

5. Council of Forest Industries of British Columbia, BRIEF TO THE PUBLIC INQUIRY FOR POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, March 1976, p.24.

6. Bill C-38 An Act to Amend the Fisheries Act, R.S.C. 1970 c.F14, and to amend the Criminal Code in Consequences thereof.

7. House of Commons, Parliament of Canada, Minutes of Proceeding and Evidence of the Standing Committee on Fisheries and Forestry Respecting: Bill C-38, An Act to amend the Fisheries Act and to Amend the Criminal Code in consequences thereof, 2nd Session of the 30th Parliament, June 8-22, 1977; and see West Coast Environmental Law Research Foundation, NEWSLETTER, Volume 3, No.1, January 1978, p.4.

8. Council of Forest Industries of British Columbia, op. cit. pp.30-31.

9. Interviews with: Mr. P. Hrushowy, Public Affairs Manager, Council of Forest Industries of British Columbia, March 14, 1977; Mr. A. Chmelauskas, Director of Environmental Control, MacMillan Bloedel Limited, February 23, 1977; Mr. R. Patterson, Vice-President, Canadian Forest Products Limited, March 3, 1977; and Mr. T.W. Leedham, Crown Zellerbach Canada Limited, March 7, 1977.

10. W.H. Bush, Resident Manager, Cariboo Pulp and Paper Company, Quesnel, British Columbia, in correspondance to Michael McPhee, April 26, 1977.

11. D.B. Loyd, Executive Vice Chairman, Crestbrook Forest Industries Limited, and Chairman of the Council of Forest Industries' Directors Environmental Committee, in correspondance to Michael McPhee, April 29, 1977.

12. Interviews conducted with Mr. E. Knight, Special Projects Division, British Columbia Forest Service, Victoria, March 1, 1977; and Mr. B. Caine, Assistant Director, Environmental Engineering, Ministry of Health, Government of British Columbia, Victoria, March 1, 1977.

13. Canada-British Columbia Accord For the Protection and Enhancement of Environmental Quality, to be signed by Jean Marchand, Federal Minister of the Environment and James Nielsen, Provincial Minister of Environment (no date).

14. Minutes of Proceeding and Evidence of the Standing Committee on Fisheries and Forestry, op. cit.

15. Council of Forest Industries of British Columbia, op. cit. p.24.

16. Environment Canada, BRIEF PRESENTED TO THE POLLUTION CONTROL BOARD PUBLIC INQUIRY INTO THE POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, September 1975, pp.45-46.

17. The Co-operative Pollution Abatement Research Program (CPAR).

18. J.R. Marier, 1973 "The Effects of Pulp and Paper Wastes on Aquatic Life with particular attention to Fish and Bioassay Procedures for Assessment of harmful effects", Division of Biological Sciences, National Research Council of Canada, Ottawa.

19. Council of Forest Industries of British Columbia, op. cit. p.185.

20. Ibid. p.188.

21. Ibid. p.371 and p.376.

22. Ibid. p.208.

23. Ibid. p.209.

24. Ibid. p.211.

25. Ibid. p.211.

26. Environment Canada, op. cit. p.45.

27. Council of Forest Industries of British Columbia, op. cit. p.210.

28. Ibid. p.211.

29. Bruce Mitchell, 1971 "Behavioral aspects of water management: a paradigm and a case study" ENVIRONMENT AND BEHAVIOR, Volume 3, pp.135-153.

30. Council of Forest Industries of British Columbia, op. cit. p.31.

31. Ibid. p.32.

32. Ibid. p.32.

CHAPTER SIX

PUBLIC INVOLVEMENT IN SETTING AND ENFORCING STANDARDS IN THE PULP AND PAPER INDUSTRY OF BRITISH COLUMBIA

This chapter will examine two issues within the context of pollution control policy in British Columbia. The first is the degree of public participation in pollution control standard setting and enforcement in the pulp and paper industry. It is argued that the role of 'public' involvement in standard setting and enforcement in the pulp and paper industry has been limited. Where participation has been encouraged, it has been limited in terms of dealing with water quality as a technical matter.

The second issue concerns the role of socio-economic information in deciding what pollution control standards a particular company or industry should meet. While it would appear that pollution control standard setting and enforcement are based primarily on technical information, often the procedure is characterized by bargaining based on social and economic considerations.

The Port Alice case study illustrates the bargaining nature of pollution control decisions in the British Columbia pulp and paper industry. It is argued that the case has important implications for pollution control policy in British Columbia, particularly in the forest products industry.

THE BASIS FOR PUBLIC PARTICIPATION IN POLLUTION CONTROL STANDARD SETTING AND ENFORCEMENT

A number of recurrent issues which characterize the literature on public participation in decision-making have been summarized by Sewell and Coppock.[1] They discuss six basic questions which will be addressed in the following discussion:

(1) Who should participate?

(2) Who is likely to participate?

(3) How much participation is possible and desirable?

(4) On what issues and at what stages in decision-making is public participation desirable?

(5) What weight should be attached to the views of well-organized, articulate interest groups as against the views of the unorganized public?

(6) How can meaningful views on regional and national issues be obtained?

Public participation in decision-making in most democratic countries has been advocated on the basis of ideological principles, that individuals have the right to be informed and to be involved in decisions regarding their personal lives. Participation has been defined as,

> "...part of an evolutionary process of social change which aims at political and social egalitarianism. It seeks a greater degree of power sharing through the politization of the citizen's awareness of his or her

> potential role as a member of the community of interest in shaping the quality of the environment."[2]

Public participation has also been distinguished from public influence in the decision-making process.[3] Participation is defined as direct involvement, usually through established institutional channels, whereas influence in decision-making arises through lobbying, elections, public hearings, letters to the editor, opinion polls, etc.

Public concern for water quality can range from those groups and individuals directly affected by a polluting source (i.e. contaminated water supply) to those persons indirectly affected or mildly concerned with water quality. A person's ability or willingness to take action or to become involved in decisions regarding water quality may be determined by numerous factors, including his degree of perceived concern, the time and investment involved, his perceived degree of success in taking action, and the avenues available for expressing his concern.

As discussed in Chapter Two, a definition of pollution is a problem in human judgment,

> "Any effort to maintain or enhance the quality of water requires a definition of the uses to which it may be put and a judgment of the human preferences for each of those uses in a specific setting of land and water."[4]

Among individuals, many are willing to allow elected and appointed officials to decide what levels of water quality are socially desirable. However, others, who are usually the more articulate and well-educated members of society, would prefer to participate in decisions regarding standards of water quality.

It is impossible in most situations to identify all those who may be affected by, or have an interest in, a decision or issue. In addition, as Wengert has pointed out, there is no strong evidence to suggest that increased public participation will result in a more satisfied society.[5]

Public participation programs have been used primarily in the formative stages of the policy-making process. Questionnaire studies have been used to help identify public preferences. Public hearings have aided in identifying and establishing policy goals and objectives (e.g. the Berger Inquiry into the Mackenzie Valley Pipeline). At this stage in the decision-making process, public participation is primarily an information gathering technique (e.g. the West Coast Oil Ports Inquiry). Participation may also be used in identifying and evaluating policy alternatives. However, this level of participation requires considerable time, expense, innovativeness, and a willingness among planners and decision-makers to involve the public. There is no guarantee that the policy-makers will incorporate public preferences in adopting or implementing a policy strategy. In the policy-making process for establishing water quality standards in British Columbia, public hearings have been used as a means for gathering public response toward specific technical issues. These issues have been identified by the policy-makers and their advisors as the basis upon which water quality standards are to be established. There is no public involvement in identifying or assessing broad policy goals for water quality standards.

There are no inherent mechanisms to judge effectively all the preferences of the public regarding water quality standards. Whether evidence gathered at a public hearing is more worthy of attention than letters or questionnaire responses is difficult to determine. In a Pollution Control Board public hearing, it is difficult to imagine a policy advisor or policy-maker attaching equal weight to a comprehensive brief complete with empirical data and findings, presented by the affected industry, as to a short, non-technical,subjective statement on the negative aspects of pollution, presented by an individual. The nature of the Pollution Control Board hearings requires that a group or individual be knowledgeable of technical matters of pollution control, be able to articulate opinions, and be able to handle cross-examination.

For many persons involved in hearings or other types of participatory action, few will be able to respond with expertise to a wide range of issues. The response rate for many will depend, in part, on the nature of the issue and their interest in the ultimate decision. Also, sustaining an interest over a long period will be difficult. This becomes even more critical when the issues range from local or regional to national in scale.

In British Columbia, apart from the unique Okanagan Basin experience, four primary avenues for public involvement in pollution control can be identified: (1) Common law remedies; (2) Objections to pollution control permits; (3) Public Inquiries; and (4) Pollution Control Board Appeals.

The literature on public participation in pollution control in British Columbia is primarily the work of Lucas and Franson.[6] They have concentrated on the problems associated with private legal remedies and the difficulties involved in raising objections to the granting of pollution control permits. They have given limited attention to the roles of Public Inquiries and Pollution Control Board Appeals as opportunities for public participation in pollution control.[7]

The four options for participation involve the public at different levels in the decision-making process (see Figure 1 for the role of the public in the decision-making process). Common law remedies seek damages after some action has already occurred. They are not a major force for formulating policy although a number of similar court decisions could have the effect of forcing policy-makers to adopt different policies or implementation strategies.

Objections to pollution control permits may be useful in the evaluation or selection stage of policy-making. Objections are initiated in response to some proposed action. They have the potential of identifying affected interests and the possible disclosure of information regarding a proposed effluent discharge. However, public access to the objection process is controlled by the discretionary powers of the Director of the Pollution Control Branch.

Public inquiries are the most accessible form of public involvement available within the formal channels for pollution control policy-making. The pollution control policy-makers have sought a wide representation from the general public. However, as discussed earlier, usually the most articulate and most affected interests participate at these inquiries.

Pollution Control Board Appeals provide a means for discussion and evaluation of pollution control policies. They are restricted to directly affected parties. There is some evidence that the appeal process is becoming a more open forum in allowing a wider range of interests to be involved and by increasing the scope of issues which are discussed. These four means for participation are discussed in further detail below.

COMMON LAW REMEDIES

It is not the intent of this section to provide an exhaustive inventory of possible common law remedies for controlling pollution. Rather, a few general issues which characterize common law techniques will be reviewed. Generally, most authors have commented on the poor prospects for common law action in environmental protection in Canada.[8] From the standpoint of public input into pollution control standard setting procedures, common law remedies offer little help, since they are primarily concerned with damages that have resulted from pollution.

Private nuisance actions require that some damage has occurred to either a plaintiff or his property. The damage must be distinguishable from that suffered by the larger community. If damage is widespread then the nuisance is a public one and not limited to a single person. If an action is brought against a disruption of use or enjoyment, the interference must be of a continuing, substantial nature. What is considered "reasonable" interference has been a significant problem in court decisions. The issue often hinges on the social and economic importance of the defendant to the community, the potential of further damages, and the ability to avoid the interference. Also, it must be demonstrated that the defendant caused the interference or damage to the plaintiff's property. This difficulty of proof can be compounded when a pollution nuisance is caused by multiple dischargers. In such cases it may be possible to charge them jointly.[9] In water pollution cases many plaintiffs may be inhibited from launching nuisance actions because of the expert scientific and technical evidence which is usually required to demonstrate that a defendant caused a particular damage.

A number of problems exist for those wishing to launch a public nuisance action.[10] The first lies in deciding between a civil and a criminal action. A plaintiff undertaking a civil action can only protect his own interest and has no standing if no statute law exists for his particular problem. A case in which the public interest is violated requires the provincial or federal Attorney-General to initiate action, which is discretionary. However, as one legal scholar expresses, "is it reasonable to expect a provincial government to vigorously pursue its duties as guardian of the physical environment, when it is at the same time resource owner, and through its lessees and licencees, resource developer?"[11]

A second problem arises from whether damages suffered by a plaintiff are 'special', that is, signficantly different from those suffered by other members of the public. In a recent Newfoundland case (*Hickey v Electric Reduction Co. of Canada*) commercial fishermen, claiming a loss due to industrial pollution, were denied standing because their position in relation to the rest of the public was not unique.[12]

Similar implications are raised by a decision in a New Brunswick case involving a commercial fisherman who claimed financial losses due to pollution from a pulp mill.[13] The judge dismissed the case claiming that since the fisherman had no special rights in fishing from other members of the public, any damages accruing from pollution were only different in degree from those suffered by other persons.[14]

The consequences of these cases could place significant spatial constraints on the use of a resource as a means of livelihood:

> "The decision(s) fails to recognize that uses of public resources vary considerably in incidence and importance, and that this fact is reflected in a wide spectrum of adverse consequences in the event of interference, ranging from minor annoyance to financial ruin. Moreover, the court by divorcing the issue of rights from that of uses suggested another and more far reaching limitation of the anti-pollution suit, that is that whatever the incidence of the special use recovery for financial loss will be barred. The type of victim of pollution who incurs financial loss is the most likely to suffer from its long term effects because of his permanent interest in the resources and his investment in utilizing it. He therefore has the greatest incentive to remedy it. Accordingly, his exclusion from suit would mean that the effective submersion of the environmental interest in public nuisance suits."[15]

McLaren has noted that a number of Ontario court decisions have awarded financial damages to special users of public waterways.[16] This may be of some limited consolation to those pondering public nuisance actions. Class action suits against environmental nuisance have also met with limited success. Even though a number of persons may suffer from a common environmental nuisance, if it can be shown that each suffers discrete damages or injury, then no class action can be taken.[17]

Another problem facing environmental litigants is the strict liability issue based on the <u>Rylands v Fletcher</u> case.[18] This issue relates to whether it is necessary to show that the defendant had knowledge of his alleged damaging action and had taken precautions to prevent such action. Under strict liability it is not necessary to prove carelessness, only to show that damage was done to a plaintiff's property or person. Controversy arises over whether or not the defendant has made a natural or non-natural use of land. To ground a claim it must be shown that the defendant made a non-natural use of land, however, effluent discharge may qualify as a non-natural use.[19] In the Halsey v Esso Petroleum Co. Ltd. case in England, a petroleum refinery was charged under the strict liability principle for allowing noxious by-products to escape and cause damage to a plaintiff's property.[20]

In situations where water quality is affected by a polluting source, the riparian rights doctrine may be an appropriate means of action. An owner of property which borders on water has the right to the continued flow of water undiminished in quantity and quality.[21] Where that right is disrupted the riparian rights holder may claim damages including injunctive relief to halt the interference. Where pollution from an industrial firm is the subject of concern, the court may consider the social utility function of the firm and the "reasonableness" of its discharge in relation to other water uses. Canadian courts have tended to follow the English interpretation of riparian rights which relies heavily on the 'natural flow' theory.[22] Perhaps the most celebrated case in the Canadian context is McKie v K.V.P. Co.[23] The plaintiffs in this case were awarded an injunction to prevent a kraft pulp mill from discharging waste into an Ontario River. The company's defense that the mill was of economic importance to the community was rejected by the judge,

> "If I were to consider and give effect to an argument based on the defendant's economic position in the community, or its financial interests, I would in effect be giving to it a veritable power of expropriation of the common law rights of the riparian owners, without compensation"[24]

The Ontario legislature subsequently passed legislation giving statutory authority to the mill to discharge wastes.

While a lower riparian has a right to a 'natural flow' of water, this right is conditional on the 'reasonable use' of water by an upstream riparian owner. The problems of this form of legal remedy are that the plaintiff must show a causal relationship between the alleged damage and the polluting source. Many persons may be handicapped by a lack of technical expertise and knowledge in measuring pollution and submitting evidence in court. Soliciting government help may also be difficult because of the oath of secrecy which many civil servants must take.[25] Where injunctive relief is not sought, but other damages are, the plaintiff must prove injury to an usufructury right,

> "that the polluting activity is likely to continue and to cause further pollution; that the water has been made less suitable for some purpose that it might be used for; and that there is a causal connection between the pollution and the defendants's activities"[26]

Another form of legal participation is through private prosecutions. The Criminal Code of Canada provides that an individual who has "reasonable and probable" grounds that an offence has been committed may file an information through a written statement under oath.[27] The person filing an information must have knowledge of the incident, either through his own experience or that of a witness. However, the evidence must be sufficient to justify a charge before the individual can subpoena further evidence. While the informant need not have suffered personal damage or injury from the incident a number of difficulties exist in bringing about a successful prosecution.[28]

Berner outlines four reasons why private prosecutions have not been widely used by individuals.

Firstly, the only compensation which can be awarded to a successful party under a summary conviction are out of pocket expenses. Counsel fees, which form a large expense, are not recoverable.

Secondly, securing the necessary evidence to support a claim may be difficult. The government may invoke Crown privilege which would make it almost impossible to obtain the required documents. If the government has undertaken an investigation, the evidence can be subpoenaed. However, as mentioned above, the informant must meet the qualifying "reasonable and probable grounds" criteria before issuing subpoenas.

Thirdly, a countersuit for malicious prosecution could be initiated if the prosecution fails. This may be a sufficient deterrent for a prospective informant.

Fourthly, the provincial Attorney-General has the right to intervene in the case, by either taking over the prosecution or ending it. Such uncertainty may create too much of a financial and time risk to undertake a private prosecution.

In summary, major limitations exist for those seeking to take common law action against environmental deterioration in Canadian waters. In addition to the costs involved in bringing legal action, plaintiffs must be able to establish their legal standing (often in a proprietary interest), determine the nature and extent of damage, and that a right (which the court recognizes) was interfered with. The court may choose to judge the case and award remedies in light of the defendant's "reasonable use" of the environment and the social utility position of the defendant within the community. Except in those cases where injunctions are awarded, common law remedies are not a viable means for public participation in preventing the deterioration of environmental quality. Compensation, if awarded, is given after the damaging event has occurred. Some environmental legal scholars have argued that by bringing court action against a polluter, it does at least publicize the issue.[29]

Many scholars have called for the relaxation of standing requirements, burden of proof, and a wider consideration of public interests in environmental quality by the courts.[30] However, the wider public interest has supposedly been considered in the formulation of statute law. It has been suggested that by allocating certain rights through legislation (i.e. granting of pollution control permits and water licences) that common law rights have been extinguished.[31]

The extent of public participation under the British Columbia pollution control law will be discussed in subsequent sections.

OBJECTIONS TO POLLUTION CONTROL PERMITS

Under the British Columbia POLLUTION CONTROL ACT, 1967, participation in the decision-making process for pollution control is available in three forms: (1) Objections to the granting of pollution control permits; (2) Public inquiries held to review pollution control objectives for various industry sectors; and (3) Appeals of orders of the Director of the Pollution Control Branch and decisions of the Pollution Control Board.

Under the POLLUTION CONTROL ACT dischargers are required to apply for a permit from the Director of the Pollution Control Branch to discharge effluent. Applications are normally published in the B.C. GAZETTE, with the provision that objections to the application may be filed with the Director within 30 days. The grounds necessary to entitle one to object to the granting of a permit are specified in Section 13 of the Act. An objection to a permit for discharge to water or land,

> "may be filed by any person who has an interest in the land or who is an applicant for or holder of a permit or licence issued under this Act or the WATER ACT and who claims that the land or any interest under such permit or licence would be affected by the granting of a permit."[32]

The Director may, however, decide in his sole discretion whether the objection is worthy of a hearing.[33] Those persons not meeting the requirements listed above, may file an objection with the Pollution Control Board who "shall determine whether the public interest requires that the Director shall also take such an objection into consideration in making his decision."[34] The decision of the Board is final.

The narrow grounds for public participation within the British Columbia POLLUTION CONTROL ACT have been criticized.[35] The criticism is aimed primarily at the broad discretionary power of the Director of the Pollution Control Branch and the necessary standing required to launch an objection. The discretionary power is a result of legislative drafting which allows public officials to act in their own judgment regarding what they believe is in the public interest or public good. This discretion allows flexibility in making decisons and implementing them. However, it is more difficult to have a system of checks and balances on their behaviour especially in the absence of guidelines or standards. Since these officials are under no legal obligation to carry out some prescribed duty, judicial review for breach of statutory authority is unlikely. However, a number of court cases involving the POLLUTION CONTROL ACT have aided in defining the powers of the Director and the manner in which he exercises that power.

In Western Mines Ltd. v Greater Campbell River Water District the Pollution Control Board had awarded pollution control permits to discharge waste into Buttle Lake.[36] The Greater Campbell River Water District had objected to the permits and requested technical data from Western Mines to support their position. The Board refused to consider the objection and issued the permits. The Water District filed a writ of certiorari in British Columbia Supreme Court to quash the permits. The Supreme Court refused to grant the writ, stating that the Board, in granting the permits was performing an administrative function and were not required to give an objector a hearing.[37] However, the case was appealed and the appeal court overturned the original decision, stating that although the Board was empowered to decide who shall be granted a formal hearing, it cannot preclude those who wish to present written objections. The Appeal Court stated that the appropriate section of the Act (1956) gives,

"a right to make an effective objection and that means

> surely, the right to have the objection considered by the Board. That in turn implies a reasonable opportunity to support the objection by representations so that the Board may rule upon it intelligently. Anything less makes the statutory authority right to object illusory and farcial."[38]

The case would seem to allow some scope for those who may wish to gather information on a particular discharger and subsequently file an objection. Since 1970 the Branch has advertised an open file policy for all pollution control permits. The objector must have reasonable time in which to prepare a written submission. However, the director is under no obligation to take the submission into consideration when deciding upon a permit application.

In the 1970 Hooker Chemical case, a commercial fisherman obtained a writ of certiorari against a decision of the Director of the Pollution Control Branch to disallow the fisherman a hearing over his objection to the permit to discharge chemical wastes into Georgia Strait.[39] The judge felt that the Director was not acting in a 'judicial manner' in disallowing the hearing without first supplying the objector with the relevant information filed in support of the permit application. The judge stated,

> "The purpose of the statute must be, because of its title, the control of pollution. There must, therefore, be some machinery whereby the public having an interest in the matter should have an opportunity of objecting to the granting of permits."[40]

This reasoning was reiterated in Hogan v Director of the Pollution Control Branch.[41] The court held that the Director must inform the objector as to the extent of the case which he must meet, including any necessary information required and reasonable time to prepare his case. It would seem the Director interpreted these 'judicial' guidelines in a very selective manner in conducting the Utah Mines hearing.[42] It should be noted, however, that all the above hearings were limited to very technical information relating to pollution control permit applications.

An outcome of the Utah Mines hearing was the Piatocka v Director of the Pollution Control Branch case.[43] In having his objection denied by the Director of the Pollution Control Branch, Piatocka filed for a writ of certiorari to quash the pollution control permits given to Utah Mining and Construction Co. In a reversal of a trend established by previous cases, the British Columbia Supreme Court judge denied the writ on the basis that Piatocka did not have proper standing as required under the POLLUTION CONTROL ACT. The judge stated,

> "It seems to me plain that the intent of the legislature is to limit the objections...and to exclude from the category of 'effective objections' objections filed by members of the public who have not obtained a determination from the Board that public interest requires the Director to take their objections into consideration."[44]

While this decision places restrictions on those who may not have the necessary standing to launch an objection, it does clarify the Board's position. Under Section 13(6) of the POLLUTION CONTROL ACT, the Pollution Control Board holds a powerful position in ruling whether objections shall be considered by the Director. The Board is also becoming more involved in hearings and public participation in pollution control matters in its capacity as an appeal body. This issue will be dealt with in a subsequent section.

As the preceeding court cases would indicate and as a number of writers have inferred, the access for persons who wish to object to a pollution control permit is severely limited. A logical question to ask is what is the role of the objection process as expressed by the POLLUTION CONTROL ACT and interpreted by the Director of the Pollution Control Branch? It is relatively clear from the Utah Mines case, that the objection process is not intended as a review of whether a development or project should proceed.[45] In this case, the company had invested $30 million in mine site development before obtaining a permit. The Director of the Pollution Control Branch has interpreted his role as one not of deciding policy issues, but rather dealing only with the technical matters of waste disposal,

> "The Director does not decide the primary question of whether the development should go ahead at all; he merely makes secondary decisions on the technical acceptability of the proposed effluent disposal systems. He considers that this is the limit of his authority under the Act, and has even gone so far as to suggest that the Act does not permit him to consider the public interest when dealing with permit applications."[46]

In granting a pollution control permit for effluent discharge, the Director of the Pollution Control Branch makes a determination of the water quality in an area. The decision to grant a permit cannot be made in isolation without regard for other water uses in the area and the social and economic impact of the proposed discharge. It would seem that the objection process would provide an opportunity to gather as much information as possible on these impacts as an input for decision-making.

Limiting who can be an objector and the type of information which can be presented, emphasizes the narrow range of choice available to the decison-makers. Both the Pollution Control Branch and the objectors are faced with responding to potential dischargers who have usually prepared reports and documents in support of their permit application. The technical information pertaining to the proposed discharge is the subject of review and discussion between the applicant and the Pollution Control Branch. It is this type of information which provides the criteria for a hearing, should one be held.

These limitations, coupled with the fact that the Director is under no obligation to consider objections in his final decision, may discourage or inhibit interested parties from participating in the objection process.

PUBLIC INQUIRIES

Since 1970, the Pollution Control Branch of British Columbia has adopted a policy of holding public inquiries to gather information which may be relevant in the formulation of pollution control objectives for various industry groups. Inquiries have been held for the Forest Products Industry; the Mining, Mine-Milling, and Smelting Industries; the Chemical and Petroleum Industries; the Food-processing, Agriculturally oriented, and other Miscellaneous industries; and for Municipal type waste discharges. Following the inquiries, Pollution Control Objectives have been published by the provincial government. There is a one to three year period between the Inquiry and public release of the Objectives. It is the intention of the Pollution Control Branch to review the Objectives every five years. Second Inquiries have been held for the Forest Products Industry (1976) and the Mining Industry (1978).

This section will focus on the two Public Inquiries held to establish and review the pollution control objectives in the Forest Products Industry. It is suggested that participation has been limited with respect to: (1) the terms of reference under which the inquiries are conducted, and (2) the range of information which has been allowed at the inquiries.

1970 Public Inquiry

A notice of inquiry was issued on April 21, 1970 to outline the objectives of the Inquiry. The notice stated in part,

> "The inquiry is being held to resolve what technical considerations and measures must be provided by the forest products industry in B.C. for control of discharges to water and/or land and/or air to satifactorily ensure pollution will not be caused in accordance with the Pollution Control Act, 1967."

Written submissions were invited, to be sent to the Director of the Pollution Control Branch by July 24, 1970. By June 25, 1970 the Director had not received any formal submissions.[47] The Minister of Lands, Forests and Water Resources had commented that the response was "both disappointing and frustrating when one considers the extent of public comment and criticism on the subject of pollution control".[48] In a public statement, in April 1970, the Minister seemed to consider a somewhat broader perspective of the inquiry than the one quoted above. He said the Inquiry will consider,

> "...varying circumstances such as the nature of discharge, the capacity of water, air, and land to receive discharges, the uses of the environment affected, location of discharges, technical and social tolerances and the economics of pollution control involved."[49]

The hearings took place at B.C. Research, U.B.C. in Vancouver in August 1970. Seven panel members were appointed by the Director of the Pollution Control Branch to hear the submissions and to prepare a report. The Technical Advisory Panel consisted of individuals with technical expertise in engineering, economics, human rights and biology (see Appendix 2). A total of 39 briefs were submitted, which were considered within the terms of the Inquiry. The briefs, representing many regions of British Columbia were from a wide range of groups and individuals, including environmental groups, forest industry representatives, government agencies, business organizations, homeowner groups, trade unions and private citizens (Appendix 3).

Under the discretionary powers of the POLLUTION CONTROL ACT to determine his own procedures at the Inquiry, the Director held the chair and required all those who were submitting briefs to be sworn in under oath. After a summary of their reports, participants were allowed to cross-examine one another. In his introductory remarks to the Inquiry, the Director stated,

> "An inquiry is a systematic investigation into matters of public concern and at this inquiry we intend to explore the truth and value judgments in an attempt to resolve the many problems created by the discharges and emissions from the forest industries."[50]

This all-encompassing statement is encouraging for those wishing to participate in a public inquiry. However, the range of information which was finally considered at the Inquiry and used to establish pollution control objectives was somewhat narrower. The Report which resulted from the Inquiry stated,

> "Of the submissions relating to pollution control practices in the forest products industry, only a few contained technical information and suggestions consistent with the inquiry terms of reference, whereas the remainder provided descriptive information and

> opinions. The briefs containing technical information have been dealt with in those considerations pertinent to the sections on discharges to air, land, and water which follow. The nontechnical briefs dealt mostly with aspects of pollution which are of a sensory nature, and which constitute a social or aesthetic nuisance. A number of submissions dealt with matters peripheral to the terms of reference of the public inquiry and were outside the jurisdiction of the Director of the Pollution Control Branch as provided in the Pollution Control Act."[51]

Despite these limitations to public participation, the 1970 Inquiry provided a focal point for environmentalists, forest industry groups, and others to meet for the first time. It provided interested parties the opportunity to publicly question government and industry officials regarding pollution control policy. The hearings were well publicized in local newspapers.[52] Transcripts of the Inquiry are located at Pollution Control Branch district offices and selected libraries in the province.

1976 Public Inquiry

In November 1974, the Pollution Control Board was directed by order of the Lieutenant Governor in Council to hold an Inquiry to review the objectives resulting from the 1970 inquiry. In a departure from the 1970 hearing, the 1976 Inquiry had specific terms of reference,

> "The object of the Inquiry is to examine the Pollution Control Objectives for the Forest Products Industry of British Columbia, and to determine whether the measures contained therein, are sufficiently, or excessively, stringent in meeting the requirements of the Pollution Control Act, 1967."[53]

While the Inquiry was publicized in newspapers throughout the province encouraging public participation, a warning to prospective participants was issued,

> "While it is not intended to restrict the content of submissions, it should be appreciated that the Inquiry can deal directly only with those issues which come within the purview of the Pollution Control Act, 1967. If information is received that has to do with issues outside of the jurisdiction of the Act, the Chairman will reserve the right to limit discussion of these issues to the degree that the purposes of the Inquiry are being served."[54]

In contrast to the previous forest industry inquiry, a task force group comprised of three Pollution Control Branch members toured the province to meet with interested parties. Although the informal meetings initially elicited twenty-four responses, the program was curtailed because it could not be economically justified as first envisaged.[55] Those who participated in the task force meetings included industry representatives, environmental organizations, private consultants, unions and individuals (Appendix 4).

The formal Inquiry was held in Victoria, March 2-4, 1976. Eight briefs were submitted to the Inquiry, representing industry, the federal government, environmental groups, a union, a community group and two individuals (Appendix 5). The Inquiry was chaired by the Director of the Pollution Control Branch. An advisory panel consisting of six members was appointed to hear the submissions and present a report (Appendix 6). Four of the six members were associated with either the Pollution Control

Branch or the Pollution Control Board. Four of the six members were engineers, one a biologist, and another a retired farmer and conservationist. The range of interests was narrower than the 1970 Inquiry, excluding expertise in public health and social and economic impacts.

In his opening remarks, the Director indicated that the Inquiry would attempt to incorporate social and economic values,

> "...with this Inquiry, the second phase where we are to examine our previous efforts and adjust our objectives to accomodate new technology and reflect new social and economic values."[56]

Unfortunately, social and economic values were not discussed at the Inquiry, which dealt almost solely with the technical aspects of the pollution control objectives.[57] The 500 page Council of Forest Industries brief dominated the Inquiry. It was praised by the Director, who had earlier expressed dissatisfaction with the 1970 Forest Industry brief.[58] Although the Council of Forest Industries' brief contained a significant portion on pollution control policy in British Columbia there was little discussion of policy during the Inquiry.

The Inquiry was conducted in a manner similar to the 1970 Inquiry with participants sworn in under oath and cross-examined by the Advisory Panel and other participants. Questions from the audience were also accepted. Questions which were considered outside the jurisdiction of the Director and the Inquiry were ruled out of order and stricken from the minutes. A number of

Pollution Control Branch officials were seated in the audience available to assist those persons who had difficulty in understanding the technical information. These persons were rarely consulted.[59]

A number of observations concerning the public inquiry process and the experience gained from the two forest industry hearings are possible. The degree of participation in terms of the number of participants and the nature of information presented at both inquiries differed considerably. During the 1970 hearings, the 'environmental movement' was reaching a peak in British Columbia.[60] Environmental interest groups were numerous and well-organized. The Inquiry brought together these groups, government agencies, and industry to discuss a topical theme - pollution control. By 1976 the environmental movement had waned and environmental groups were channelling their efforts in different directions.[61] The number of submissions to other Pollution Control Inquiries had also dropped in some cases. In March 1972, the Mining Industry heard 12 briefs, in May 1972 the Chemical and Petroleum Inquiry heard 13 briefs (nine of which were industry sponsored), in November 1972, 11 briefs were submitted to the Food-processing, Agriculturally oriented, and other miscellaneous Industries Inquiry, and in April 1973, 28 briefs were submitted to the Inquiry on Municipal type waste discharges.[62] The majority of the briefs presented were by the affected parties (e.g. municipal governments).

The lack of public interest in the 1976 Forest Industry Inquiry could be related to the restrictive terms of reference and the specific purpose of the Inquiry. The necessary technical expertise required in preparing a comprehensive review was unavailable to interest groups and individuals. The Inquiry does not fund interested parties and it was particularly difficult for such persons to compete with the forest industry which spent 18 months and $150,000 to prepare its brief.[63] The 1976 Inquiry was perhaps overshadowed to some extent by the Pearse Commission hearings into provincial forestry policies and practices in June, July, and August 1975.[64] Although the two hearings did not overlap it was necessary for the Pollution Control Inquiry participants to submit their briefs by September 1975.

One of the significant differences between the 1970 and 1976 Inquiries was the quality of information presented by the forest industry. At the 1970 Inquiry, the industry proposed a 'waste management plan' based on site specific requirements of each particular mill, which would "minimize the need for public hearings on each application".[65] The main point of their submission to the Inquiry was that the costs of pollution control must be balanced against economic benefits of the industry to the province.[66] The industry was severely criticized by the Director for not presenting factual information and for evading questions during cross-examination.[67] The industry also came under attack by the union representative and in the press for withholding information.[68]

Although the message contained in the forest industry's submission to the 1976 Inquiry was similar to its 1970 position, its brief contained considerably more technical data. The industry put forth a formidable amount of information and was able to capably criticize the Environment Canada brief during cross-examination.[69]

Apart from the briefs submitted by the Steelhead Society of British Columbia and the British Columbia Wildlife Federation and the Pulp, Paper and Woodworkers of Canada, the Inquiry dealt primarily with the review of specific water and air quality standards and the issue of best practicable technology. The brief by the Gambier Island Community Association voiced concern over air and water quality in the Howe Sound Region.

Perhaps the crucial difference between the two inquiries was that the 1976 hearings were intended as a review of the Pollution Control Objectives. In reality this review was a formal public check on the progress on the forest industry in its efforts to control pollution. In fact, the Council of Forest Industries had approached the former British Columbia Resources Minister for a review of the Objectives.[70] At the same time, if the Inquiry demonstrated to the public that the industry was making progress, it would be a vote of confidence in the Pollution Control Branch.[71] The 1970 Inquiry provided the Branch with the required public support to initiate its policy of bringing forest companies under permit.

In continuing the pattern of holding public inquiries every five years to review pollution control objectives, information is channelled into a very specific purpose. While the inquiries may allow interested parties to debate their views to some extent and offer the potential for public accountability of industry's pollution abatement efforts, the inquiry process assumes that the present regulatory system is the best means of controlling pollution. The main function of the inquiry is to provide new information on pollution effects and abatement technology. This information is then used to modify effluent discharge objectives. There is no opportunity in British Columbia for interested parties to present their views on pollution control policy or alternative means of achieving given standards. Those who have attempted to discuss policy issues at the inquiries are ruled not within the terms of the inquiry and their briefs criticized for a lack of technical data.[72] Since in most cases the majority of technical data is generated by the affected industry, it then becomes the basis for establishing pollution control objectives.

POLLUTION CONTROL BOARD APPEALS

One means of participating in the pollution control decision process is through an appeal under the British Columbia POLLUTION CONTROL ACT. Under Section 12 of the Act an appeal is available from any order of the Director of the Pollution Control Branch to the Pollution Control Board and every order of the Board to either the Lieutenant Governor in Council or to the Supreme Court of British Columbia. The decisions of these latter two tribunals are final.

The most common appeal is over the granting of a pollution control permit by the Director of the Pollution Control Branch. The appeal can be initiated by the party (second) who is receiving the permit or by a (third) party who may object to the terms and conditions of the granted permit. Although records of appeals are incomplete, a summary account is presented in Table 37. It is difficult to determine whether the majority of appeals have been initiated by second or third parties. It is significant to note, however, that during 1973 and 1974 most appeals were undertaken by permit holders, perhaps indicating a more demanding approach by the Pollution Control Branch,

> "In response to increased Branch activities and a strengthening of requirements for the control of pollution it is significant to note that the majority of these appeals have been lodged by the recipient of the permits or orders rather than by the general public as was the case with most appeals prior to 1973, a fact that would appear to confirm that requirements of permits and orders are considerably more stringent."[73]

The predominance of second party appeals during these years was also confirmed by a Pollution Control Board member.[74] Although he said no definitive reason could be given for this pattern, he felt it was partly due to the N.D.P. policy toward

TABLE 37

APPEALS TO THE POLLUTION CONTROL BOARD

Year	2nd Party	3rd Party	Total	Result	Appealed to B.C.S.C./ Cabinet
1968	*	*	7	1 allowed 3 refused 2 withdrawn 1 *	*
1969	1	1	2	1 allowed 1 refused	*
1970	*	*	10	8 allowed 2 refused	*
1971	*	*	5	2 allowed 3 refused	*
1972	*	*	4	2 allowed 2 refused	*
1973	The Pollution Control Board stated that the majority of these appeals were initiated by the 2nd party		13	7 allowed 6 refused	1 B.C.S.C. 3 Cabinet
1974	Most appeals were initiated by the 2nd party		12	3 allowed 8 refused 1 *	2 B.C.S.C. 2 Cabinet
1975	5	2	7	4 allowed 2 withdrawn 1 *	2 Cabinet 1 withdrawn
1976	*	1 known (Afton Mines)	4	2 allowed 2 refused	*

* Information unavailable

Source: Compiled from B.C. Department of Lands, Forests and Water Resources, Annual Reports, 1968-1976.

pollution control (as expressed in the above quote).

In an attempt to make the Board more representative of the public interest, and shielded from political influence, the composition of the Board has changed considerably in recent years. In 1970, the Minister of Lands, Forests and Water Resources, and other provincial Ministers were represented on the Board. During the 1970's political members were no longer included on the Board. The majority of Board members were senior civil servants and members were added from the community (Appendix 7). In 1977 a non-government representative was appointed Chairman of the Board.

The Pollution Control Board, in its tribunal capacity can effectively overturn a decision of the Director and can elicit any information it may wish in reaching a decision.[75] In recent years it has been the practice of the Board to hold hearings on every appeal brought before it. These hearings are often held in the affected community.

The data presented in Table 37 indicate that at least 50 percent of the decisions of the Director have been overturned by the Board. In allowing appeals of permits, the Board dictates policy to the Director. In some cases the Director may feel his power usurped by decisions of the Board. This was the case involving an applicant for a permit to discharge effluent into the Pitt River. As part of the terms and conditions of the permit issued by the Director, the applicant was instructed to carry out monitoring of water quality in the vicinity of the discharge. In an appeal to the Pollution Control Board the applicant argued that the discharge from his hotel operation was minimal and that the River in question was being monitored by Environment Canada. The Board upheld the appeal and instructed the Director to issue a permit with no monitoring requirement. In what is considered a precedent, the Director has appealed the decision of the Board to the Lieutenant Governor in Council (Cabinet).[76]

Since the Director of the Pollution Control Branch has been reluctant to hold public meetings regarding permit applications, the Appeal process is gaining recognition as a forum for public participation in pollution control decision-making. In the August 1976 case of the Afton Mines Appeal, hearings were held in Kamloops. The Appeal acted in part as an environmental impact procedure in which interested groups presented their views on the proposed complex.

The Board in its decision stated that,

> "after a careful review of the evidence present, is of the opinion that the operation of the proposed copper mine-mill-smelter complex does not constitute a threat to the environment of the Kamloops area and that it is in the public interest that the permits be issued."[77]

Another appeal in May 1978, was that of community residents against a permit granted to B.C. Hydro to test burn high sulphur content oil at its Burrard Thermal generating plant.[78] Through community pressure, B.C. Hydro's original application to burn the oil at any time was turned down.

The most celebrated appeal was perhaps the Port Alice pulp mill case in 1973. The appeal was important in the decision-making process for pollution control in British Columbia. It recognized that social and economic issues were important in setting and enforcing pollution control standards. Prior to this case, pollution control had been considered as a technical matter as illustrated in the decisions by the Director of the Branch and at the Public Inquiries held to establish Pollution Control Objectives. The case also illustrated the difficult choices facing decision makers in determining what level of environmental quality is 'publicly' acceptable.

THE PORT ALICE PULP MILL CASE

BACKGROUND

Port Alice is situated on Neroutsos Inlet, an arm of Quatsino Sound on the northwest coast of Vancouver Island (Figure 3). It is a relatively isolated community of 1500 residents. The pulp mill was built in the early 1900's along with a company townsite. After experiencing a series of shutdowns, expansions, and ownership changes, the present owners, Rayonier Canada Ltd., assumed control in December 1954. They immediately undertook further expansion of the mill and in

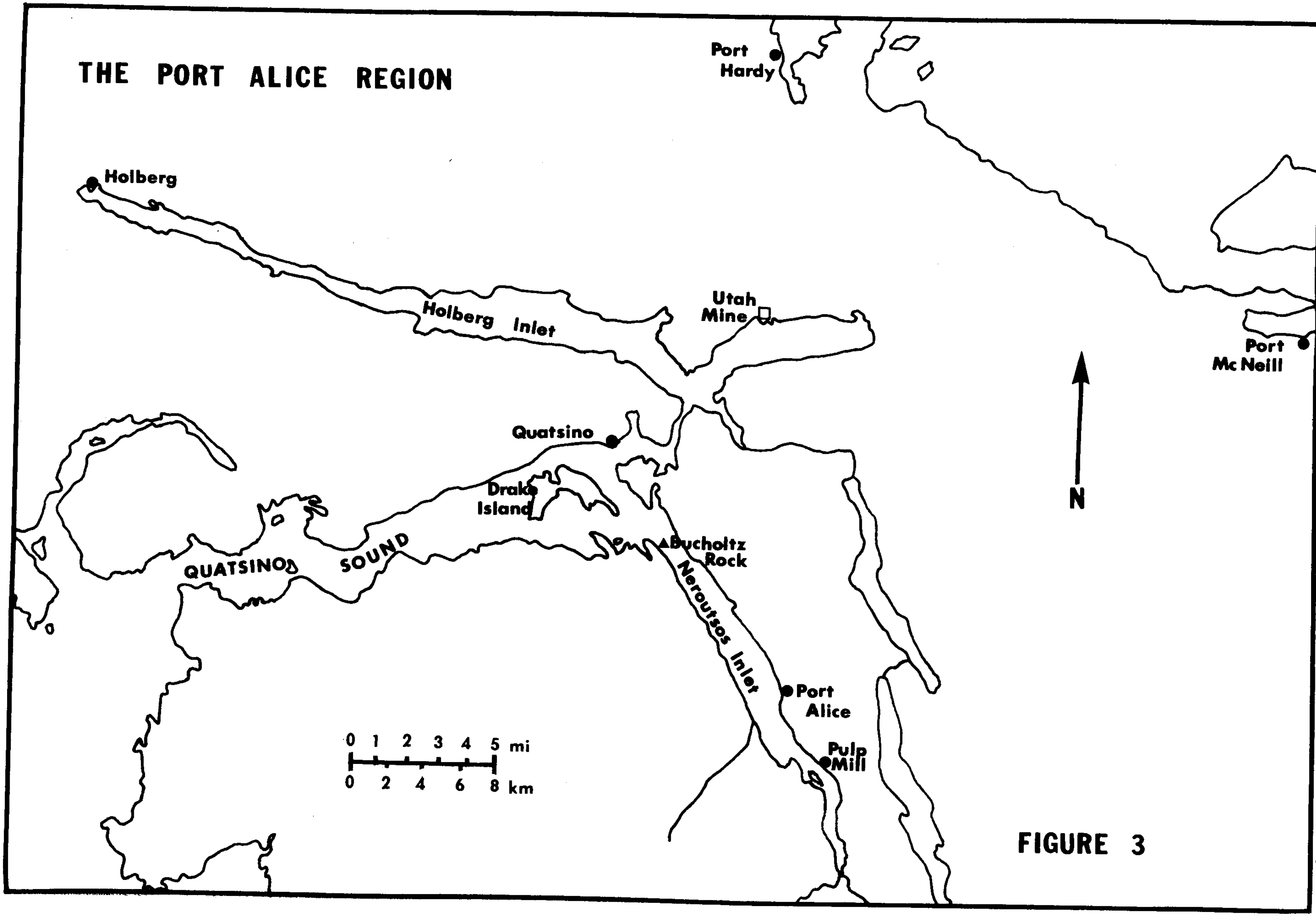

THE PORT ALICE REGION
Port Hardy
Holberg
Holberg Inlet
Utah Mine
Port McNeill
Quatsino
Drake Island
QUATSINO SOUND
Bucholtz Rock
Neroutsos Inlet
Port Alice
Pulp Mill
N
0 1 2 3 4 5 mi
0 2 4 6 8 km

FIGURE 3

1970 converted from a calcium-based cooking process to ammonia-based under pressure from the Pollution Control Branch. Port Alice is the last surviving sulphite pulp mill in British Columbia. It produces a daily average of 460 air dry tons (A.D.T.) of dissolving pulp. Dissolving pulp is used in making films, lacquers, and other plastic and paper products.

Sulphite mills have been characteristically worse polluters than kraft mills. Historically, it has not been to any economic advantage to recover a good portion of the chemical effluent from sulphite mills. Also, the biological oxygen demand loading (BOD) is relatively higher than for kraft mills. The Port Alice pulp mill was constructed during a period when discharge of these wastes was accepted practice. Effluent from the Port Alice pulp mill is discharged into the south end of Neroutsos Inlet, a long fiord running south from Quatsino Sound. Water pollution is quite visible in terms of foam and colour. The visible effects of pollution decrease as one moves north towards Quatsino Sound and west towards the open sea.

The pollution problem at Port Alice was first brought into full public view in August 1970 at the Public Inquiry conducted by the Pollution Control Branch into "Waste Management and Environmental Control in the Forest Products Industry". Rayonier made a presentation on their Port Alice operations and were also cross-examined on the pollution problems existing there. At that time it was established that Rayonier had not obtained a pollution control permit for Port Alice. Rayonier's position was that there was no appreciable harm to fish, aquatic life or to social uses in Neroutsos Inlet. They gave considerable information on the investments made in the new townsite of Rumble Beach and outlined plans for a possible pollution abatement program. A Rayonier official stated that Port Alice, "illustrates the choices society must make" in reference to what pollution standards should be set.[79] The relative insecurity of the community was also demonstrated when a Rayonier official was asked, if it was impossible for the mill to meet the POLLUTION CONTROL ACT, what would happen? Would Rayonier close the plant? The official answered, "I think your question provides its own answer. If it were impossible to meet the requirements, I understand we would have no alternative."[80]

Rayonier, in compliance with the POLLUTION CONTROL ACT, registered its discharge from the Port Alice mill on December 15, 1970. With the issue of new Pollution Control Objectives for pulp mills in September 1971, Rayonier, on April 21, 1972 applied for a pollution control permit to discharge effluent into Neroutsos Inlet.

RAYONIER APPEAL TO THE POLLUTION CONTROL BOARD

On March 30, 1973, eleven months after Rayonier's application, a pollution control permit was granted to Rayonier. Along with the permit was a Letter of Transmittal which required a program of three improvements to pollution control at Port Alice:

(1) To maintain a minimum disolved oxygen level of 60 percent in the top two metres of water at a point aproximately 8 miles up the Inlet from the mill (Bucholtz Rock), effective immediately.

(2) To reduce the suspended solids effluent to 60 lb/ADT and BOD to 500 lb/ADT by December 31, 1975. (Referred to as Stage I)

(3) To futher reduce the effluent of suspended solids to 30lb/ADT and BOD to 60lb/ADT by December 31, 1978.[81] (Referred to as Stage II)

The requirements were designed to bring the Port Alice mill within Level B of the 1971 Pollution Control Objectives by December 1978. Rayonier was also instructed to undertake a monitoring program for effluent in Neroutsos Inlet. Within 30 days Rayonier appealed the permit to the Pollution Control Board. Rayonier stated that it could not meet required dissolved oxygen levels without curtailing production; that the requirements placed economic hardships on the mill and the future of the community; and that there was a lack of evidence to prove that abatement requirements would have a noticeable impact on the improvement of the environment.

On May 3, 1973 the mill at Port Alice curtailed production by 15% in an attempt to meet pollution control requirements and a month later began to operate a five day work week, subsequently laying off 70 employees. At this time, the possibility of a total community shutdown was imminent and the media publicized the issue throughout the province.[82]

The Appeal Proceedings took place over ten days between June 26, 1973 and July 20, 1973 in Victoria before three members of the Pollution Control Board: Valter Raudsepp, Chairman; E. H. Vernon, Department of Recreation and Conservation; and J.S. Allin, Department of Agriculture. The transcripts of the Appeal consume ten volumes of evidence and cross-examination proceedings. Eighty-three exhibits (reports, tables, maps, etc.) were also presented. The Appeal operated like a court proceeding with the right to full cross-examination.

Rayonier Position

Rayonier called twenty witnesses to testify. The witnesses covered a wide range of professions and disciplines. Eight could be considered scientists dealing in scientific/technical information - biologist consultants, engineers, and oceanographers. Two economists and one geographer gave evidence of a socio-economic nature (the importance of the mill to the area and the social conditions in the area - employment, income, etc.). The local doctor presented his views on the abundance of marine life, aquatic recreation, and the quality of the environment in the area. Three other witnesses from the North Island region gave evidence on the impact of the mill on the North Island region and the possible effects should the mill close. The President of Rayonier Canada Ltd. gave evidence, as did the comptroller and two company officials from Rayonier in New York. They presented information on the financial aspects of the Port Alice mill such as production, marketing, as well as economic and pollution control technology comparisons with Rayonier mills in the United States. The Port Alice mill manager testified, supplying information on mill production, mill processes, employment and recent layoffs.

The information presented by these witnesses was comprehensive and voluminous. Rayonier presented a formidable amount of evidence to support its position. Its position was threefold:

(a) Economic:

The company had agreed to Stage I which required the construction of a recovery boiler at a cost of $30 million. This expenditure would benefit their production and quality and therefore was considered a recoverable expense. The Stage II requirements would cost $12 million in further abatement technology to reduce suspended solids and BOD loads. This was considered a costly incremental expense which would seriously affect the economic viability of the mill. According to Rayonier, the sulphite pulp process is more labour intensive than the kraft pulp process per ton of raw material. The market structure for dissolving pulp is different than for kraft. Kraft markets are typical commodity markets, whereas dissolving pulp markets are are more dependent on long term contracts.[83]

(b) Lack of Knowledge:

Rayonier's postion was that (i) there was no strong scientific evidence to suggest that mill pollution was having a serious effect on Quatsino Sound or that there was a detrimental cumulative effect on any portion of the marine environment; (ii) the effects of pollution control, especially Stage II were unproven, and in effect would make the building of Stage II unwarranted until Stage I had been proven ineffective. Rayonier also argued against 'freezing' technology with premature decisions, stating that efficient and economical recovery methods may be developed in the future.

(c) Social and Economic Impact:

Rayonier implied that if forced to comply it would close down its operation. The social and economic impact on Port Alice and the whole North Island region would be very severe. Rayonier's lawyer was reported to have visited a Mount Waddington Regional District meeting in Port McNeill in mid June. At the meeting the lawyer stated Rayonier's position and received a unanimous vote from board directors to send the Regional Board Chairman to attend the Appeal Proceedings to testify on behalf of Rayonier on the importance of the mill to the Regional District.[84]

Rayonier's argument considered a number of other points. They argued that there is a burden on a regulatory agency to decide the issue of vested rights. Rayonier argued that they had been using the Inlet (almost exclusively) for a long time and that in their estimation pulp was more valuable than fisheries in that particular area.

Conflict of Information

It became apparent throughout the Appeal that there was conflict over technical information regarding envircnmental quality. The conflict emerged between the Environment Canada personnel who were called as witnesses by the Pollution Control Branch, and the technical specialists representing Rayonier. The fact that the Pollution Control Branch was unable to generate its own information, clearly demonstrates that it is handicapped when assessing pollution control permits. Decisions regarding permit applications are often based on information produced by the permit applicant.

In the Appeal Proceedings conflicts developed over the effect of pollution on the receiving waters, its cumulative effect, location of monitoring points, assimilative capacity of the Inlet, effect on the fishery and other marine organisms, the spread of pollution into Quatsino Sound, and the physical or oceanographic qualities of the receiving waters, i.e. tidal action, vertical and horizontal mixing, salinity, etc. The crown witnesses were quite explicit in their evidence that mill pollution was having a serious detrimental effect on the marine environment and that it was a cumulative effect and spreading into Quatsino Sound. Rayonier witnesses admitted there was pollution in the Inlet, but were more cautious in stating to what degree the pollution was detrimental.

Information given by scientists for Rayonier was often considered suspect by Environment Canada scientists since very few of the Rayonier specialists had spent any considerable time in the area doing extensive or in-depth studies. Many studies were very limited and often relied on data produced by another party.

Problems were encountered in the Appeal over access to information. Both sides introduced reports, data, documents, etc. which the other party had not been aware of before the appeal. When it came time to cross-examine on this information, counsel were ill-prepared. For example, the lawyer acting for the Pollution Control Branch stated,

> "We had absolutely no notice of the evidence that it (Rayonier) was to bring in these very complicated fields of engineering and the consequences - the economic consequences and so on and many of the witnesses were never called in 1970, and of course many of the engineering data that was brought forward, we had no notice of that at all."[85]

The reference to economic impacts signifies that the Branch had defined its capabilities to dealing primarily with technical data. The counsel for Rayonier was also disturbed that the Crown introduced studies that were done six weeks after the Rayonier permit was issued. These incidences indicate that the problem of 'best advantage' was relevant.[86] Each side attempted to get the upper hand in information generation.

It is interesting and significant to note that although Rayonier's position relied substantially on scientific technical information, the crux of their position was the perceptions of local residents. They depended heavily on the local doctor's perceptions on the quality and abundance of marine life in the area. In his final summation, counsel for Rayonier stated,

> "if you will read the evidence of the first four witnesses who are the inhabitants of that area, you will see many of the issues that are at stake in this case. (Mr.) Furney sees the economic effect of the Port Alice mill throughout the entire district. Mr. Tinkler sees it in Port Hardy and Dr. Morris sees the fish and he gave you his views on the wildlife that was in the inlet. I think that you will find with the evidence of those four the stakes with which we deal."[87]

The Pollution Control Board was confronted with the question of community survival, but at the same time had to justify pollution control standards based on technical grounds. This was illustrated in the Chairman's request to Rayonier on the fourth day of the Appeal to reduce the volume of social and economic testimony and concentrate on environmental quality.

In situations where there is a high degree of uncertainty and lack of information on the quality of the environment, decision makers must often rely on their experience and value judgment in reaching a final decision. This was highlighted in a statement by the Pollution Control Board Chairman at the conclusion of the Appeal Proceedings,

> "Undoubtedly quite often this talk was very, very, difficult, particularly in cases where we were discussing the facts involving the sciences where quite often sometimes, at least, one has to resort to judgment."[88]

A major factor weighing heavily upon the decision makers was the eventual impact the decision could make on the community of Port Alice. The impact had already been felt by community residents and was alluded to in the Appeal Proceedings.

Community Impact and Response

The first and most noticeable impact of the pollution crisis at Port Alice was the curtailment in mill production on May 3, 1973 in order to meet dissolved oxygen standards for Neroutsos Inlet. At the beginning of June the mill began operating on a five day work week and the company laid off seventy employees because of the production cutback. The media began to play a dominant role in the issue at this time. The local press in the area, the NORTH ISLAND GAZETTE, gave top priority to the pollution crisis at Port Alice. Most newspapers reported the issue as one of environmental quality versus community survival and came out heavily on the side of the community.

The immediate community response to the layoffs took two directions. The Union, concerned for its employees, blamed Rayonier for poorly handling the situation.[89] The Union argued that the mill could run at less than full production seven days a week thereby avoiding the layoffs. The mayor of Port Alice was critical of the government for not providing more information to the community.

The feelings of insecurity in the community cannot be overemphasized. A research study carried out during the period indicated that the pollution situation was the most important problem facing people at Port Alice.[90]

Three Union officials from Port Alice met with the Labour Minister in late June. They were quoted as being quite confident that the N.D.P. government would "look after our people as well as they will anywhere else."[91] There was optimism in Port Alice that the government, after taking over the community of Ocean Falls in March 1973, would also save Port Alice should Rayonier decide to pull out.

Information generated by or communicated to the residents of Port Alice Alice was virtually non-existent. Little, or no effort was made to consult, or encourage community participation in the appeal process. One might argue that the Appeal Proceedings should have been held in Port Alice considering the magnitude of the impact on the local residents.

It was evident that Rayonier was using production cutbacks and the possibility of a complete shutdown to strengthen their bargaining position with the Pollution Control Board and the government. There is little doubt that the community impact and response that was evident during the crisis had an influence on the Pollution Control Board and ultimately the political decision regarding the pollution control standards at Port Alice.

POLLUTION CONTROL BOARD DECISION

On August 7, 1973 the Pollution Control Board handed down its decision. The decision, hailed as a major compromise, consisted of the following:

(1) The minimum allowable dissolved oxygen content was reduced from five to four parts per million and the monitoring point was moved two miles from the previous point out into Quatsino Sound. The immediate response by Rayonier was to restore full production of the mill.

(2) An extension of Stage I requirements from December 31, 1975 to May 31, 1976 (Recovery boiler construction).

(3) Stage II appeal refused. Requirements remained the same ordering further reduction in effluent discharge by December 31, 1978.

The Chairman of the Pollution Control Board in announcing the decision, stated that "the Board had been influenced by social and economic factors, as well as environmental and technological, in reaching a decision."[92] A Rayonier official was quoted as saying the decision was undoubtedly due to the information given by the local doctor and the Regional District Board Chairman.[93] Rayonier was still concerned over Stage II requirements but their response was that the Board had given them a fair hearing.[94]

The insecurity which was felt by community residents soon diminished. A federal government official was not pleased with the decision, but accepted the Board's decision, ultimately complying with the provincial pollution regulations. The Regional Director of the Environmental Protection Service was quoted as stating,

> "Stage II is needed to achieve minimum water quality standards under the Federal Fisheries Act. The softening of the interim will impose a further risk on fish life. But when economic and social factors are considered, it is expected that we have to accept some further risk during the interim period."[95]

Interestingly, a large fish kill was reported at Port Alice on September 15, 1973 and Rayonier was subsequently charged under the FISHERIES ACT.[96] Obviously the federal government was not yet willing to concede total pollution control authority to the provincial government.

RAYONIER'S APPEAL TO CABINET

On September 4, 1973 Rayonier gave notice of appeal to the Lieutenant Governor in Council (Cabinet). Rayonier's argument was basically unchanged. In their argument, Rayonier attempted to shift the burden of proof, stating that the Pollution Control Branch had insufficient evidence on the benefits of pollution control to the environment. They also argued on the question of balancing of rights. They stated,

> "The definition of pollution in the Act does not limit the user, you must decide the relative stakes of workers, vacationers, commercial fisherman or investors. The rights of a long established industrial concern should not be adjudged in the absence of knowledge."[97]

Such a statement would imply that wider public involvement is necessary in considering pollution control standards where a number of interests are affected.

The Chairman of the Cabinet Committee, the Minister of Municipal Affairs, was reported to have stated that he did not anticipate conducting any further public hearings, that there were adequate data produced at the first appeal. He did state, however, that if either side had new information to present the Committee could hold a public hearing. However, no further public hearings were held.

The B.C. Environmental Council (a coordinating body of environmental groups) obtained standing at the second appeal. The Council argued that a decision should not be based solely on economic considerations, which would erode the effectiveness of the pollution control objectives established following a public inquiry. The Council also requested a delay in the appeal to study information presented by Rayonier. This request was turned down and the Appeal took place in Victoria on October 29, 1973 and November 7, 1973. The meeting was closed to the public and the press.

In its decision on January 10, 1974 the Cabinet Committee rejected Rayonier's Appeal and upheld the Pollution Control Board's requirements. The final decision was made by a full cabinet meeting, upon the recommendations of the Cabinet Committee. in reaching a decision, the Cabinet did not issue any reasons for judgment.

An intriguing event occured when Jack Davis, federal Minister of the Environment, sent a letter to the provincial Cabinet Committee on October 24, 1973. The letter stated that Rayonier should be given more time to develop the necessary abatement technology and it also refuted much of the information given by Environment Canada personnel at the Appeal Proceedings. Rayonier denied any involvement in the matter. There was speculation that the Federal Department of the Environment had been negotiating a compliance schedule with Rayonier as part of their policy under the PULP AND PAPER EFFLUENT REGULATIONS. This may have been a reason why the Environmental Protection Service had not prosecuted Rayonier under the FISHERIES ACT until after the first appeal was settled.

There was some speculation that the provincial government was prepared to withhold timber licences to Rayonier should they not agree to meet the terms of the Pollution Control Board. As timber rights are a vital resource to a forest company, the government also held a strong bargaining position.

SUMMARY OF THE PORT ALICE CASE

The Port Alice case was an important event in the pollution control decision-making process in British Columbia. It was a major departure from the routine decision process of assessing pollution control permits based primarily on technical grounds. The case illustrated the bargaining process based on the social equity function of a pulp mill in determining pollution control standards. In effect, the Port Alice case became a trade-off between environmental quality and industrial production (or in this case, community survival).

The case may offer some encouragement to those seeking access to pollution control decisions via the appeal process. The fact that an environmental group was given standing, recognizes that bargaining procedures should also include interested and affected parties. However, the appeal process can only begin after a decision to issue a permit has been made. While it may act as a review process, the appeal tribunal may restrict its review to only information upon which the permit is based. In most circumstances this is technical information on the quality and quantity of effluent discharge. It is under no obligation to allow other information at the appeal. Another inhibiting factor made evident during the Port Alice Appeal was the formality of the proceedings. Both parties were represented by legal counsel and undertook formal cross-examination.

Although the final decision regarding Port Alice was a political one, the Pollution Control Board allowed the Director of the Pollution Control Branch to decide whether a further extension of time for installation of Stage I would be justified. Subsequently, the Director extended the compliance date to January 31, 1977. The discretion afforded the Board and the Director of the Branch is to allow flexibility in making decisions. However, this action tends to seriously question the public credibility of the pollution control decision process. It is discouraging for citizens to realize that decisions in which they may take active involvement can be so easily overturned.

CHAPTER SUMMARY

Four means for public involvement in pollution control decision-making in British Columbia were examined: common law remedies, objections to pollution control permits, public inquiries, and Pollution Control Board Appeals. Three of the four mechanisms (objections, public inquiries and appeals), originate in the provincial pollution control legislation: the POLLUTION CONTROL ACT. The role of the public differs for each option. The objection, appeals, and common law procedures specifically define who may participate in a decision issue. The public inquiry process is open to all interested parties. However, because of the nature of the hearings, it was determined that usually the affected industry is the major participant at these hearings.

The four opportunities for participation operate at different stages in the policy-making process for establishing and enforcing pollution control standards. However, each mechanism tends to involve the public on a response-to-issue basis. Even the public inquiries are now designed as a forum for reviewing existing pollution control standards. These public inquiries are a one-way exchange of information. Policy-makers and advisors listen to and undertake cross-examination of participants, but do not actively engage in policy discussions with participants.[98] In all forms of participation, there are no means for individuals to actually take a direct role in the decision or policy-making process. The next chapter will consider changing the existing institutional arrangements and legislating environmental rights as two options for public participation.

The majority of decisions regarding the setting and enforcing of pollution control standards in British Columbia are 'routine' involving interaction between effluent dischargers and regulatory agencies.[99] The objection and appeal processes are designed primarily for public involvement in 'strategic' issues, where often a third or more parties are affected by a water quality decision. However, the range and scope of issues discussed at these hearings are a discretionary decision of appointed officials. Their practice has been to limit discusion to very specific technical matters contained within a pollution control permit.

The Port Alice case study is illustrative of an appeal process which was 'strategic' in nature. The case was a departure from many of the routine pollution control decisions made in the pulp and paper industry. A wide range of issues were discussed in relation to pollution control at Port Alice. It is difficult to determine whether the Port Alice case marks the beginning of a more flexible appeals process, or whether it represents a unique case. It was noted that the Pollution Control Board has adopted a more flexible policy of allowing many affected and concerned parties to present their views. The degree to which a broad range of issues are discussed in the appeals process is, in part, determined by the nature of the case itself. The extent of the perceived impact a particular case could have may motivate the Pollution Control Board to consider many interests. The Port Alice appeal became a celebrated case because of the threat of a community closure. In addition, each side in the appeal process may perceive that bargaining benefits can be achieved through 'public' exposure. In periods of high unemployment, industries can often gain public and political support for their resistance to pollution controls.

To recapitulate, the means for public participation in standard setting and enforcement are limited in terms of who may participate and in the range of issues discussed. To a large extent, these constraints on participation can be attributed to the discretionary powers of appointed officials. They have interpreted pollution control problems basically as matters requiring technical solutions. Secondly, appointed officials do not consider that questions of policy formulation are within their roles as public administrators. This has limited the scope of information to which affected or interested parties can respond.

FOOTNOTES TO CHAPTER SIX

1. W.R. Derrick Sewell and J.T. Coppock, 1977 "A Perspective On Public Participation in Planning" in W.R. Derrick Sewell and J.T. Coppock (eds.) PUBLIC PARTICIPATION IN PLANNING John Wiley and Sons, pp.1-14.

2. W.R. Derrick Sewell and Timothy O'Riordan, 1976 "The Culture of Participation in Environmental Decisionmaking" NATURAL RESOURCES JOURNAL Vol. 16, No. 1, p.16.

3. Harvey R. Doerksen and John C. Pierce, 1976 "Citizen Influence in Water Policy Decisions: Context, Constraints, and Alternatives" in J.C. Pierce and H.R. Doerksen, WATER POLITICS AND PUBLIC INVOLVEMENT Ann Arbor Science Publishers, Inc. pp.3-27; and Steven Schatzow, 1977 "The Influence of the Public on Federal Environmental Decision-making in Canada" in W.R. Derrick Sewell and J.T. Coppock (eds.) op. cit. pp.142-158.

4. Gilbert F. White, 1969 STRATEGIES OF AMERICAN WATER MANAGEMENT, The University of Michigan Press, p.59.

5. Norman Wengert, 1971 "Public Participation in Water Planning: A Critique of Theory, Doctrine and Practice" WATER RESOURCES BULLETIN Vol.7, No.1, pp.26-32.

6. A.R. Lucas, 1969 "Water Pollution Control Law in British Columbia" U.B.C. LAW REVIEW, Volume 4, No. 1, pp.56-86; A.R. Lucas, 1971 "Legal Techniques For Pollution Control: The Role of The Public" U.B.C. LAW REVIEW, Volume 6, pp.167-191; and A.R. Lucas and P.A. Moore, 1973, "The Utah Controversy: A Case Study of Public Participation in Pollution Control" NATURAL RESOURCES JOURNAL, Volume 13, pp.36-75.

7. R.T. Franson and A.R. Lucas, 1975 "Environmental Decision Making in British Columbia" in P.S. Elder (ed.) 1975, ENVIRONMENTAL MANAGEMENT AND PUBLIC PARTICIPATION, Canadian Environmental Law Association, Toronto, pp.84-100; R.T. Franson, D. Blair, and R. Bozzer, 1976 "The Legal Framework for Water Quality Management in the Lower Fraser River of British Columbia" in Neil A. Swainson, (ed.) 1976 MANAGING THE WATER ENVIRONMENT, University of British Columbia Press, Vancouver, pp.54-96.

8. R.T. Franson and P.T. Burns, 1974 "Environmental Rights For the Canadian Citizen: A Prescription For Reform" ALBERTA LAW REVIEW, Volume 12, pp.153-171; J.P.S. McLaren, 1972 "The Common Law Nuisance Actions and the Environmental Battle-Well Tempered Swords or Broken Reeds?" OSGOODE HALL LAW JOURNAL, Volume 10, No. 3, pp.505-561.

9. A.R. Lucas (1971) op. cit. p.173

10. J.P.S. McLaren, op. cit. p.511-515.

11. A.R. Lucas (1971) op. cit. p.173.

12. (1972) 21 D.L.R. (3d) 368.

13. Filion v. New Brunswick International Paper Co. (1934), 8 M.P.R. 89 (N.B.S.C.) (1934) 3 D.L.R. 22.

14. J.P.S. McLaren op. cit. p.513.

15. Ibid. p.514.

16. Ibid. p.514.

17. Ibid. p.518.

18. Rylands v. Fletcher (1866) L.R. 1 Ex 265 affirmed (1868) L.R. (H.C.) 330.

19. A.R. Lucas (1971) op. cit. p.170.

20. Ibid. p.170.

21. G.V. LaForest, 1973 WATER LAW IN CANADA: THE ATLANTIC PROVINCES, Queens Printer, Ottawa, p. 200.

22. J.P.S. McLaren, op. cit. p.538.

23. (1948) O.R. 398 (H.C.), (1948) 3. D.L.R. 201.

24. Ibid.

25. R.J. Roberts and J.L. Sullivan, 1976 "The Role of the Technological Expert in Complex Environmental Litigation" CANADIAN BAR REVIEW, Volume 54, pp.65-104.

26. D. Estrin and J. Swaigen (eds.) 1974, ENVIRONMENT ON TRIAL Canadian Environmental Law Association, Toronto, p.238.

27. THE CRIMINAL CODE OF CANADA, R.S.C. 1970 c-34, Sections 723(1) and 773.

28. S.H. Berner, 1972 PRIVATE PROSECUTION AND ENVIRONMENTAL CONTROL LEGISLATION: A STUDY, Environment Canada, Ottawa.

29. R.T. Franson and P.T. Burns, op. cit.

30. In particular, the Canadian Environmental Law Association; D. Estrin and J. Swaigen (eds.) op. cit.; and R.T. Franson and P.T. Burns, op. cit.

31. Armstrong, W., 1962 "The B.C. Water Act: The End of Riparian Rights" U.B.C. LAW REVIEW, Volume 1, pp.583-594; and A.R. Lucas (1969) op. cit.

32. POLLUTION CONTROL ACT S.B.C. 1967 c.34 as amended, Section 13(2).

33. Ibid. Section 13(4).

34. Ibid. Section 13(6).

35. A.R. Lucas (1971) op. cit.; A.R. Lucas and P.A. Moore, op. cit.; and R.T. Franson and A.R. Lucas, op. cit.

36. Western Mines v. Greater Campbell River Water District (1967), 58 W.W.R. 705 (B.C.C.A.).

37. A.R. Lucas (1969) op. cit. p.76.

38. As quoted in A.R. Lucas (1969) op. cit. p.76.

39. Re Application of Hooker Chemicals (Nanaimo) Ltd. (1970) 75 W.W.R. (n.s.) (B.C.S.C.).

40. Ibid. p.375.

41. Hogan v. Director of the Pollution Control Branch (1972) 3 W.W.R. 519.

42. A.R. Lucas and P.A. Moore, op. cit. p.72.

43. Piatocka v. Director of the Pollution Control Branch (1971) 5 W.W.R. 626 (B.C.S.C.).

44. Ibid. p.633.

45. A.R. Lucas and P.A. Moore, op. cit. p.72.

46. A.R. Lucas and P.A. Moore, op. cit. p. 72; During an interview with H.P. Klassen, Assistant Director, Pollution Control Branch, the point was emphasized that the Branch does not make policy but only carries out decisions, February 28, 1977.

47. THE VANCOUVER SUN, June 25, 1970, p.34.

48. Ibid. Ray Williston.

49. THE VANCOUVER EXPRESS, April 28, 1970, p.3.

50. B.C. Department of Lands, Forests and Water Resources, Water Resources Service, Pollution Control Branch, PUBLIC INQUIRY INTO WASTE MANAGEMENT AND ENVIRONMENTAL CONTROL IN THE FOREST PRODUCTS INDUSTRY, August 11-21, 1970, Volume I, p.5.

51. B.C. Department of Lands, Forests and Water Resources, Water Resources Service, REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, September 1971.

52. See for example, THE VANCOUVER SUN, August 11, 1970, p.6; August 12, 1970, p.1; August 13, 1970, p.26; August 14, 1970, pp.1,2,13; August 15, 1970, p.4; August 19, 1970, p.20; August 20, 1970, p.19; August 21, 1970, p.29; THE VICTORIA DAILY COLONIST: August 12, 1970, p.19; VICTORIA TIMES: August 20, 1970, p.9; August 21, 1970, p.4; and VANCOUVER PROVINCE: August 22, 1970, p.21.

53. British Columbia Pollution Control Branch, INFORMATION SHEET, Relative to the Public Inquiry into the Pollution Control Objectives for the Forest Products Industry of British Columbia, March 1976.

54. Ibid.

55. B.C. Department of Lands, Forests and Water Resources, Water Resources Service, Pollution Control Branch, TRANSCRIPTS OF THE PUBLIC INQUIRY HELD TO REVIEW THE POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, March 1976, Volume I.

56. Ibid.

57. Ibid. Personal observation and notes.

58. Ibid.

59. Personal observation at the Public Inquiry held to review the Pollution Control Objectives for the Forest Products Industry, March 2-4, 1976, Victoria, B.C.

60. Dianne Draper, 1975 "Environmental Interest Groups and Institutional Arrangements in British Columbia Water Resource Issues" in Bruce Mitchell (ed.) 1975, INSTITUTIONAL ARRANGEMENTS FOR WATER MANAGEMENT: CANADIAN EXPERIENCES, Department of Geography Publication Series No.5, University of Waterloo, pp.119-170.

61. In discussion with a S.P.E.C. (Scientific Pollution and Environmental Control Society) official he said the group was more involved with public education programs than presenting briefs at public inquiries.

62. B.C. Department of Lands, Forests and Water Resources, Water Resources Service, REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE MINING, MINE-MILLING, AND SMELTING INDUSTRIES OF BRITISH COLUMBIA, December 1973; REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE CHEMICAL AND PETROLEUM INDUSTRIES OF BRITISH COLUMBIA, March 1974; REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOOD-PROCESSING, AGRICULTURALLY ORIENTATED AND OTHER MISCELLANEOUS INDUSTRIES OF BRITISH COLUMBIA, January 1975; REPORT ON POLLUTION CONTROL OBJECTIVES FOR MUNICIPAL TYPE WASTE DISCHARGES IN BRITISH COLUMBIA, January 1975.

63. THE PROVINCE, "Pollution Probe gets big yawn" March 4, 1976, p.20.

64. British Columbia, ROYAL COMMISSION ON FOREST RESOURCES, 1975, Peter H. Pearse, Commissioner.

65. PUBLIC INQUIRY INTO WASTE MANAGEMENT AND ENVIRONMENTAL CONTROL IN THE FOREST PRODUCTS INDUSTRY, August 11-21, 1970, B.C. Research, Vancouver, Volume I; and see THE VANCOUVER SUN, August 14, 1970 p.13, "Forest Firms Propose Waste Plan".

66. Ibid.

67. VICTORIA DAILY TIMES, August 20, 1970, p.9, "Forest Industry Rapped For Lack of Information".

68. See THE VANCOUVER SUN, August 20, 1970 p.19; and VICTORIA DAILY TIMES, August 21, 1970 p.4, Editorial: "Coy answers at Pollution Inquiry".

69. Personal observation and see, THE PROVINCE, March 6, 1976, p.20.

70. THE PROVINCE, March 4, 1976 p.20.

71. Indeed, as THE PROVINCE, March 6, 1976 p.20 reported in "B.C. keeping on top in pollution fight" both the forest industry and the Pollution Control Branch were given favourable press for their pollution control efforts.

72. This was the case at the 1978 Public Inquiry into Pollution Control Objectives for the Mining Industry. See THE PROVINCE, January 16, 1978, p.17.

73. Province of British Columbia, Department of Lands, Forests and Water Resources, Water Resources Service, ANNUAL REPORT, December 31, 1973, p.140.

74. Interview with E.H. Vernon, Associate Deputy Minister, Ministry of Recreation and Conservation, March 1, 1977.

75. POLLUTION CONTROL ACT, S.B.C. 1967 c.34 as amended, Section 12(5).

76. Interview with Dr. C.J.G. Mackenzie, Chairman of the Pollution Control Board, March 10, 1977.

77. Minutes of the Pollution Control Board Meeting, August 5, 1976.

78. THE PROVINCE May 16, 1978, p.3.

79. G.S. Boswell, quoted in the TRANSCRIPTS OF THE PUBLIC INQUIRY INTO WASTE MANAGEMENT AND ENVIRONMENTAL CONTROL IN THE FOREST PRODUCTS INDUSTRY, August 20, 1970, Volume 8.

80. Ibid. p.48.

81. Pollution Control Permit No. PE 1240 and Letter of Transmittal from the Director of the Pollution Control Branch, March 30, 1973.

82. For example, see numerous newspaper stories reported in THE SUN, THE PROVINCE, DAILY COLONIST, and the NORTH ISLAND GAZETTE, June-August 1973. See especially, THE PROVINCE, June 30, 1973 p.5 "Port Alice - town on trial for its life".

83. Creamer, in APPEAL PROCEEDINGS, Rayonier Canada Ltd. Appeal to the B.C. Pollution Control Board Relating to Port Alice

Pollution Control Permit No. PE-1240, Victoria, B.C. June 26-July 20, 1973, Volume 3, pp.25-28.

84. DAILY COLONIST, June 22, 1973, p.39.

85. L. Lindholm, APPEAL PROCEEDINGS, op. cit. Volume 10, p.27.

86. A.R. Lucas and P.A. Moore, op. cit. p.46.

87. C. LOCKE, APPEAL PROCEEDINGS, op. cit. Volume 10, p.27.

88. V. Raudsepp, APPEAL PROCEEDINGS, op. cit. Volume 10.

89. NORTH ISLAND GAZETTE, June 14, 1973.

90. R.B. Horsfall, B. Bradbury, P. Massiah, M. McPhee, 1974 "Parameters of Healthful Community Functioning in Resource Frontier Towns" Health and Welfare Canada, Department of Geography, Simon Fraser University.

91. DAILY COLONIST, June 21, 1973, p.58.

92. NORTH ISLAND GAZETTE, August 16, 1973, p.1.

93. Ibid. p.1.

94. THE PROVINCE, August 10, 1973, p.22.

95. NORTH ISLAND GAZETTE, August 16, 1973, p.1.

96. Rayonier Canada Ltd. was charged on March 6, 1974 with two charges of violating the FISHERIES ACT, R.S.C. 1970 Section 30 and 33(2). They were fined $1500 on each count.

97. Rayonier Canada Ltd. APPEAL TO CABINET ARGUMENT, September 1973.

98. Margaret Sinclair, 1977 "The Public Hearing as a Participatory Device: Evaluation of the IJC Experience" in W.R. Derrick Sewell and J.T. Coppock, (eds.) 1977, PUBLIC PARTICIPATION IN PLANNING John Wiley and Sons, pp.105-122.

99. W.R. Derrick Sewell and Colin Wood, 1971 "Environmental Decision-Making and Environmental Stress" paper presented at the Annual Meeting of the Canadian Association of Geographers, Waterloo, Ontario.

CHAPTER SEVEN

CONCLUSIONS

This study has been concerned with an examination of water quality management in British Columbia. The particular focus was on water pollution control policies for the pulp and paper industry in the province. An attempt was made to demonstrate that, although broad goals for water quality exist in federal and provincial legislation, the goals are interpreted in terms of technical pollution control standards. It is assumed that by meeting a given standard, an acceptable level of water quality will be achieved.

It was suggested that the existing strategy for pollution control in the pulp and paper industry is a regulatory approach based on the use of effluent discharge standards. It was concluded that this approach primarily involves a process of negotiation and bargaining between industry (regulated) and government regulatory agencies (regulators).

Under the FISHERIES ACT and the POLLUTION CONTROL ACT, respectively, the federal and provincial governments have established effluent discharge standards for the pulp and paper industry. The major criteria on which the standards are based are: total suspended solids, biological oxygen demand, and toxicity. The provincial standards also include temperature, pH, dissolved oxygen and zinc parameters. The provincial standards are classified on two levels: "A" level and "B" level. "A" level standards are the more stringent and are to be met by all new pulp and paper mills in the province. Existing mills are expected to meet level "B" standards and over time upgrade to meet level "A" requirements. The provincial standards differentiate between fresh and marine water discharges.

The federal standards are national effluent standards designed to protect fish, marine animals, and fish habitats. They apply to two categories of mills: new, expanded or altered mills and existing mills. Higher standards are established for newer mills. These higher standards are based on the installation of the best practicable technology.

The provincial government has also established very general receiving water quality objectives, including characteristics such as turbidity, foam, nutrients, tainting, colour, heavy metals, resin acids, and aesthetics. It was concluded that the application of these standards is limited because no attempt has been made to define acceptable levels for various water uses.

A comparison of coastal and interior pulp mills revealed that significant spatial differences exist in the application of provincial standards. The level of abatement technology for each location also differs. Coastal mills are expected to meet lower discharge standards. Only six of eleven coastal mills have some type of primary treatment, and only one mill has secondary treatment. Most interior pulp mills are required to meet higher standards and most have primary and secondary treatment. It was concluded that these differences are attributable to the fact that mills located on the coast are older and were built with few or no abatement facilities. Interior mills are newer and were designed with primary abatement facilities. Interior waters are more vulnerable to pulp mill effluent especially in locations affected by low flow periods. Standards for coastal mills are based on a much greater assimilative capacity.

In order for regulatory agencies to carry out their mandate of enforcing pollution control standards they must enlist the cooperation of industry. The pollution control strategy of government agencies is to negotiate and bargain directly with individual companies. This has led to a two party relationship between the regulators and the regulated. Realizing that this process affects the formulation and implementation of pollution control policy in the pulp and paper industry, an attempt was made to examine and compare the preferences and perceptions of the two parties toward three critical themes in pollution control policy:

(1) administrative/jurisdictional arrangements;

(2) water quality parameters used in establishing standards; and

(3) selected socio-economic factors considered in setting and enforcing standards.

ADMINISTRATIVE-JURISDICTIONAL ARRANGEMENTS FOR POLLUTICN CONTROL

It was found that industry and government respondents preferred the existing regulatory system. It was concluded that both the regulators and the regulated peceive the present system as adequately serving their respective interests. The system is viewed as flexible, allowing individual companies the scope to negotiate pollution control requirements.

Because of their jurisdiction under the FISHERIES ACT, federal government agencies have also been actively involved in negotiating compliance schedules with pulp mills. Many industry respondents complained of the burden of meeting two sets of pollution control standards and stated their preference to deal with only provincial authorities. It was also demonstrated that the federal government has taken a more active enforcement role than the provincial government. With increased penalties under the FISHERIES ACT, the Act may serve as a deterrent or preventive measure. It remains to be seen to what extent the Act will be an effective bargaining tool in negotiations with pulp mills. To date, enforcement has not been of specific, negotiated pollution control standards, but violations of the FISHERIES ACT (e.g. fish kills, deposit of deleterious substances). The Act has been used primarily for corrective action, when some widely visible violation has occurred. Industry may perceive a strong enforcement role for federal agencies, and a continued negotiating role for provincial agencies.

WATER QUALITY PARAMETERS

It was found that a significant degree of agreement existed between industry and government respondents' ratings of parameters used in establishing effluent discharge standards for the pulp and paper industry. Toxicity, suspended solids, settleable solids, biological oxygen demand and pH were considered to be the most important parameters. Aesthetic parameters were ranked low. Differences between the responses of the two groups could often be linked to industry's claim that technology is costly and limited.

There was not the same degree of agreement between groups in their ratings of receiving water quality standards. The combined rankings indicated that stress on the biological community, toxicity, dissolved oxygen, and synergistic effects of multiple discharges are the parameters which should be given the greatest weight in establishing receiving water standards. Differences between the two groups' responses were evident in the weight given to biological oxygen demand, residual chlorine, and settleable solids. Government respondents ranked these parameters consistently higher than did industry respondents. Since the industry has been negotiating for site-specific consideration of pollution control requirements based on local receiving water capacity, these differences may create obstacles to smooth negotiations.

SOCIO-ECONOMIC FACTORS IN STANDARD SETTING AND ENFORCEMENT

The bases on which pollution control standards are established are not always clearly stated. Implicit in standards are assumptions about various water uses and public preferences. In establishing and enforcing standards, other factors may also be considered, including economic viability of a firm, economic health of the industry, mill location, and availability of abatement technology.

Both government and industry respondents believe greatest weight should be given to public health factors and maintaining viable fish stocks in setting standards. However, it is important that standards be established which can technically be met. Both groups feel that recreational uses of water should be considered as well as the proximity of mills to populated regions. These considerations may indicate that regional water quality standards based on water uses should be established.

Both groups feel public attitudes should be considered in setting standards, with slightly more industry respondents favouring such action. The industry has been quite explicit at public hearings about its efforts to abate pollution and may believe it can gain public support for its efforts in a period of high unemployment. Industry respondents believe that the economic position of the industry must be considered when setting standards. Their feelings are based on the claim that the pulp market is closely connected to fluctuating world market conditions. The majority of government respondents were undecided on this issue, which may indicate the difficult position which regulatory officials face. They must enforce regulations, yet at the same time are keenly aware of the value of the industry to the economy.

The most important factor to be considered by both groups when enforcing standards was the availability of abatement technology. To meet many of the more stringent standards, application of advanced technology is required. Such technology is expensive to research, develop and install. The federal government has adopted an enforcement strategy which requires industries to install the best practicable technology. Such a strategy is strongly opposed by industry as "treatment for treatment's sake". More industry than government respondents felt consideration should be given to the location of a mill when enforcing standards. This conforms to industry's demands for site-specific standard setting and enforcement. In other words, more remote mills should meet lower standards. Industry respondents also felt that the importance of a mill to a community should be given heavy weight when enforcing standards.

This is one of the most powerful bargaining issues which industry can use in negotiating compliance of standards.

PUBLIC PARTICIPATION IN SETTING AND ENFORCING STANDARDS

It was demonstrated that avenues for third party participation in the pollution control decision process are limited. Common law remedies offer limited support for persons seeking to correct or prevent deterioration in water quality. Potential plaintiffs are faced, among other constraints, with standing requirements, marshalling evidence, legal fees, and time. The remedies are normally damage payments or possibly injunctive relief. These, however, offer little help to those wishing to participate in standard setting procedures. It remains to be seen whether private prosecutions available under the revised FISHERIES ACT will encourage concerned parties to take action.

The objection process available under the British Columbia POLLUTION CONTROL ACT, 1967, has been of limited value to those wishing to question the conditions of the pollution control permit. Potentially, the objection process could be of significant value in assessing environmental impacts of proposed discharges. It could provide an opportunity for concerned and affected parties to examine and evaluate all information relating to discharges. In addition, this process could lead to an assessment of alternative standards of water quality and related water uses. However, the process can only be initiated when there is an application for a permit. This focuses attention on a very specific problem. The Director of the Pollution Control Branch, because of his discretionary powers, is under no obligation to allow an objection or to hold a hearing. If an objection is allowed it can be restricted to the information upon which the application is based. If the applicant is a large discharger, such as a pulp mill, the supporting documentation will include consulting reports and other technical information. Unless an objector has the necessary expertise to critically evaluate the information he will lose the objection.

Public inquiries have been held as a means of gathering information to be used in establishing pollution control objectives in the Forest Products Industry as well as other industries. It was shown that the terms of reference for the Inquiries have been narrow, allowing only those submissions which are considered technical. The result has been that the affected industry is the prime generator of information. Since industries monitor their own waste discharges and water quality, it is difficult to effectively evaluate this information. Those persons unable to generate technical information are often unable to participate at the Inquiries.

The Appeal process is potentially a useful forum for interested parties to participate in pollution control decisions. However, as with objections, the process can only be initiated with the granting of a permit. Also, the burden of proof is upon the appellant to prove the extent of the pollution control problem. The composition of the appeal body, the Pollution Control Board, has changed in recent years. There has been a definite move to make the Board more separate from the Pollution Control Branch and the Water Resources Service. The Board represents a variety of government and public interests. The Board has adopted a policy of holding public hearings on many pollution control issues. A second and final appeal lies to either the Cabinet, which will be a political decision, or to the Supreme Court of British Columbia.

The Port Alice case demonstrates a shift from the routine decision-making procedures in setting and enforcing standards for the pulp and paper industry of British Columbia. The appeal allowed the bargaining process to become public. The issue became a dichotomy between environmental quality and community survival. It demonstrated the difficulties in assessing water quality criteria and public perceptions of environmental quality.

In summary, public participation in pollution control in British Columbia has been channelled into technical issues at public inquiries and over a specific issue such as a permit application. Recent statements by pollution control authorities to include socio-economic information at public inquiries has not materialized. While appeals such as the Port Alice case offer some encouragement that this process is becoming more flexible, it is too early to effectively assess whether these underlying trends will continue. The nature of the appeals themselves, and their perceived public impact will undoubtedly determine the number of participants involved and the types of issues discussed.

Very few opportunities exist for soliciting and evaluating public preferences toward water quality in British Columbia. The Director of the Pollution Control Branch has interpreted his role as one of controlling waste discharge at its source. The Pollution Control Branch has concerned itself primarily with technical solutions to pollution control problems.

Although this study has been primarily concerned with an examination, rather than a specific evaluation of pollution control policies in the pulp and paper industry of British Columbia, a few tentative suggestions concerning policy approaches seem appropriate. Recommendations for changes in the existing pollution control system are limited to two issues: (1) legislative-institutional arrangements for controlling pollution and (2) individual rights concerning environmental quality.

It has been noted that current regulatory practice in British Columbia has focused on the control of effluent discharges. Effluent discharge standards have been developed to meet water quality objectives for protection of fish and public health. The permit system is used as a means for regulating individual dischargers. While this system has been advocated on the basis of flexibility and its ability to efficiently process a large number of applicants, it has encouraged a two-party bargaining relationship and limited the range of possible alternatives for pollution control. Pollution control administrators, through their discretionary powers, have defined pollution control as a waste disposal problem requiring technical solutions. However, there are no legislative critieria by which to judge whether discretionary decisions have taken into consideration the public interest.

One of the major weaknesses in the regulatory system in British Columbia is the process by which water quality standards are formulated. At present, pollution standards exist which are minimum guidelines. Because the control of pollution is on an individual basis, abatement requirements are negotiated with each discharger. This leads to a situation in which the setting and enforcing of standards become part of the same process. To a large extent, the public has been excluded from this process. Standards of water quality are relative, depending upon the values which society attaches to various water uses. The present system should provide mechanisms which allow those who are interested, to make their views and preferences known. A number of approaches were reviewed in this study which seem to have made the bargaining process more open. It would be unrealistic to suggest that a model, which apparently works reasonably well in one situation, could be completely adapted to British Columbia.

An interest-based planning approach does, theoretically, offer some attractive features. In British Columbia, the Pollution Control Branch has regional offices for the purpose of processing pollution control permits. Water quality management boards could be established in these regions which would be involved in establishing water quality standards based on water use priorities in the region. The boards could be comprised of various water user interests - industry, government agencies, recreational and conservation groups, and other interested groups and individuals. Some form of cost accounting could also be instituted. The details of how such a system would operate are beyond the scope of the present study. Ideally, a water quality management system would also be linked to a land use planning agency which would determine land use and water quality relationships. Permit applications should include information on proposed discharges, as well as potential impacts on receiving waters. Other uses of water should also be considered in permit applications. Information on these impacts should be widely disseminated and in terms which are understandable to the general public.

Many of these changes will require amendments to the existing provincial legislation. The legislation should also provide means for public hearings at various stages in the regulatory process. Discretionary decisions made by appointed officials should be open to judicial review. This would ensure public accountability. A certain amount of discretion is unavoidable in our democratic system. However, criteria should be developed which would assist appointed officials in carrying out their duties.

A second course of reform would be to legislate citizens' private rights to a "clean" environment. While this does not solve the problem of defining a "clean" environment, it would allow persons to seek court action where they believed their environment was being impaired. The standing requirments should also be relaxed to allow persons a right to protect their interests. In addition, some form of access to necessary government documents would also be required. These changes would still create problems for many, in terms of time, cost, and necessary expertise. However, it would provide another option for participation.

These suggested modifications to current water quality management practices in British Columbia must still cope with the dual government responsibility for water resources. It is unlikely that the federal government will become less involved (except, perhaps through constitutional reform) in water quality issues. The federal government is well established in its research capacity with regard to water quality and aquatic life. This role is a very necessary one. In a reformed pollution control system, the federal government could perhaps serve a useful function as a monitoring and enforcement agency. While it would not be involved in direct negotiations with dischargers, it would set national minimum water quality standards to protect the fisheries. In regions where higher standards are required, the two levels of government would jointly develop these requirements. The provincial government would negotiate with dischargers, with the provision that the federal government would take enforcement action where minimum requirements are not being met. The FISHERIES ACT provides a strong vehicle for enforcement action by the federal government. This scheme may partially avoid the negotiation-enforcement conflict which now characterizes pollution regulation. Failure to take enforcement action would then be placed solely on one agency and open to public view.

All the above modifications should only be viewed as possible suggestions, not as a panacea for water quality management in British Columbia.

In conclusion, a few highlights and unanswered questions resulting from the study can be summarized. Firstly, the study has emphasized the importance of the standard setting process in water quality management. This process has often been overlooked in the environmental management literature. Understanding the important relationships between identifying water quality goals and formulating standards is an integral component of water quality management.

Secondly, the study attempted to understand pollution control policy-making in British Columbia as a bargaining relationship between the regulators and the regulated. This framework, which is unique for research in B.C., provided some valuable insights into pollution control administration in the pulp and paper industry. Areas of agreement and disagreement between the regulators and the regulated toward various aspects of pollution control policy were identified. These have implications in formulating and implementing pollution control policies. A case study provided further understanding of pollution control decision-making in the pulp and paper industry.

An important aspect which received attention was the means for public participation in pollution control. While other studies have focused on common law remedies and the objections process (within the provincial pollution control legislation), this study provided an examination of the role of public inquiries and appeals in pollution control decision-making.

In a number of ways, this study represents a preliminary investigation. The bargaining procedure between the regulators and the regulated is a complicated relationship. While the present research provided an introductory examination, many other factors will have to be considered for a more complete understanding. For example, it is not totally clear from this study how different variables are evaluated and weighed in the decision-making process, or what variables are the most important in establishing and enforcing standards. The questionnaire study, in a sense, was a pilot investigation. A more in-depth approach, utilizing scenarios and specific case studies would be useful. Another challenge would be to compare the findings of this study with other resource or industry sectors (e.g. mining, petro-chemical) and with air quality management.

Pollution control policies in British Columbia will continue to change over time. It is hoped that this study can provide a useful basis for furthering our understanding of the complex nature of pollution control.

APPENDIX 1

NAME: ______________________________

POSITION: ______________________________

ORGANIZATION: ______________________________

SECTION A

Listed on the following page are five alternative pollution control systems (columns 1-5). Please answer the following questions relating to these five systems.

1. Of the five alternative systems, which one is the closest to being the system you would prefer? (Circle one) 1 2 3 4 5

2. Of the five systems, which one most closely resembles the present pollution control system?
(Circle one) 1 2 3 4 5

3. Which one of the five systems most closely resembles the pollution control system which you expect to be in existence within the next five to ten years? (Circle one) 1 2 3 4 5

SECTION B

In the above questions you have stated a preference for one of the pollution control systems. In each system, there may or may not be parts which you like or agree with. This section will give you a chance to state your preferences for the various component parts of the five systems (Rows a-g).

1. In examining each of the component parts, rows a-g, (for example, (a) Amount of Federal Government Control, (b) Amount of Provincial Government Control, (c) Licensing/Permits, etc.) which one of the five alternatives would you prefer?

	Circle one				
(a) Amount of Federal Government Control	1	2	3	4	5
(b) Amount of Provincial Government Control	1	2	3	4	5
(c) Licensing/Permits	1	2	3	4	5
(d) Inspections	1	2	3	4	5
(e) Monitoring	1	2	3	4	5
(f) Enforcement	1	2	3	4	5
(g) Finances	1	2	3	4	5

2. For each of the component parts, which one of the five alternatives do you think most closely represents the present pollution control situation?

	Circle one				
(a) Amount of Federal Government Control	1	2	3	4	5
(b) Amount of Provincial Government Control	1	2	3	4	5
(c) Licensing/Permits	1	2	3	4	5
(d) Inspections	1	2	3	4	5
(e) Monitoring	1	2	3	4	5
(f) Enforcement	1	2	3	4	5
(g) Finances	1	2	3	4	5

3. For each component part, state which of the five alternatives <u>you</u> expect to most closely resemble the pollution control situation 5 to 10 years from now.

(a) Amount of Federal Government Control	1	2	3	4	5
(b) Amount of Provincial Government Control	1	2	3	4	5
(c) Licensing/Permits	1	2	3	4	5
(d) Inspections	1	2	3	4	5
(e) Monitoring	1	2	3	4	5
(f) Enforcement	1	2	3	4	5
(g) Finances	1	2	3	4	5

SECTION C

In this Section I am interested in your opinions on what weight various factors should be given when setting pollution control standards for the pulp and paper industry in B.C.

1. How much weight should decision makers give to the following factors when establishing <u>effluent discharge</u> standards for the pulp and paper industry in B.C. (Circle one number from 1-5 for each factor).

		Heavy weight	Moderately heavy	Neutral	Little weight	No weight at all
(a)	Suspended solids	1	2	3	4	5
(b)	pH	1	2	3	4	5
(c)	Dissolved oxygen	1	2	3	4	5
(d)	Biochemical oxygen demand	1	2	3	4	5
(e)	Toxicity	1	2	3	4	5
(f)	Colour	1	2	3	4	5
(g)	Foam	1	2	3	4	5
(h)	Odour	1	2	3	4	5
(i)	Temperature	1	2	3	4	5
(j)	Residual chlorine	1	2	3	4	5
(k)	Coliform organisms	1	2	3	4	5
(l)	Settleable solids	1	2	3	4	5
(m)	Stress on the biological community	1	2	3	4	5
(n)	Synergistic effects of multiple discharges	1	2	3	4	5

2. How much weight should decision makers give to the following factors when establishing pollution control standards in the pulp and paper industry for receiving waters in B.C.? (Circle one number from 1-5 for each factor).

		Heavy weight	Moderately heavy	Neutral	Little weight	No weight at all
(a)	Suspended solids	1	2	3	4	5
(b)	pH	1	2	3	4	5
(c)	Dissolved oxygen	1	2	3	4	5
(d)	Biochemical oxygen demand	1	2	3	4	5
(e)	Toxicity	1	2	3	4	5
(f)	Colour	1	2	3	4	5
(g)	Foam	1	2	3	4	5
(h)	Odour	1	2	3	4	5
(i)	Temperature	1	2	3	4	5
(j)	Residual chlorine	1	2	3	4	5
(k)	Coliform organisms	1	2	3	4	5
(l)	Settleable solids	1	2	3	4	5
(m)	Stress on the biological community	1	2	3	4	5
(n)	Synergistic effects of multiple discharges	1	2	3	4	5

3. How much weight should decision makers give to the following factors when establishing water pollution control standards for the pulp and paper industry in B.C.?

	Heavy weight	Moderately Heavy	Neutral	Little weight	No weight at all
(a) Technical Feasibility	1	2	3	4	5
(b) Economic position of an individual firm	1	2	3	4	5
(c) Economic position of the industry as a whole	1	2	3	4	5
(d) Maintaining viable fish stocks	1	2	3	4	5
(e) Public health factors	1	2	3	4	5
(f) Proximity of a mill to populated areas	1	2	3	4	5
(g) Aesthetic appearance of water	1	2	3	4	5
(h) Recreational uses of water	1	2	3	4	5
(i) Public attitudes towards water quality	1	2	3	4	5

4. How much weight should decision makers give to the following factors when enforcing pollution control standards for the pulp and paper industry in B.C.?

	Heavy weight	Moderately Heavy	Neutral	Little weight	No weight at all
(a) Available technology	1	2	3	4	5
(b) Economic position of the firm	1	2	3	4	5
(c) The importance of the mill to the community	1	2	3	4	5
(d) Proximity of a mill to populated areas	1	2	3	4	5
(e) Public attitudes towards pollution control	1	2	3	4	5

APPENDIX 1 (cont.)

ALTERNATIVE POLLUTION CONTROL SYSTEMS FOR THE PULP AND PAPER INDUSTRY IN B.C.

	System 1	System 2	System 3	System 4	System 5
a) Amount of Federal Government Control (Environment Canada)	Federal Government administers voluntary guidelines on the industry	Federal Government administers compulsory minimum standards on industry	Federal Government administers compulsory minimum standards on industry	Federal Government administers compulsory minimum standards on industry	Federal Government administers compulsory national pollution control standards (not minimum standards)
b) Amount of Provincial Government Control (Pollution Control Branch)	Province administers voluntary guidelines on the industry	Province administers compulsory minimum pollution control standards on industry	Province administers compulsory minimum standards on industry	Province administers compulsory minimum standards on industry	Provincial government administers compulsory standards on industry
c) Licensing/Permits	No permits required	No permits required	Provincial permits required by all polluting industries in B.C.	Provincial permits required by all industry in B.C.	Licensing of all polluting industries by the Federal and Provincial governments.
d) Inspections	No inspections	Inspection by the Pollution Control Branch with permission of industry	Inspection by the Pollution Control Branch with knowledge of the industry	Inspections at any time by the Pollution Control Branch	Inspections at any time by the Pollution Control Branch and Environment Canada
e) Monitoring	Voluntary monitoring by industry	Industry monitors itself with the right of the Pollution Control Branch to request information on discharge	Both industry and Pollution Control Branch monitor with industry submitting discharge reports on a regular basis	All monitoring done by the Pollution Control Branch	All monitoring done by the Pollution Control Branch and Environment Canada
f) Enforcement	Warnings to industry found in violation	Warnings and fines levied on violators	Warnings, fines, and suspension of pollution control permits	Warnings, fines, and suspension of pollution control permits	Fines, suspensions of permits, and power to enforce industry closure by both levels of government
g) Finances	Federal and Provincial grants to industry for 75% of pollution control costs with no tax on this equipment	Provincial grants to industry for up to 50% of pollution control costs	Government tax incentives for up to 50% of pollution control costs	Government loans for pollution control equipment	No provincial or federal government financial assistance

APPENDIX 2

Members of the Technical Advisory Panel at the 1970 Public Inquiry into Waste Management and Environmental Control in the Forest Products Industry.

A.J. Chmelauskas, P. Eng., Chief, Industrial Division, Pollution Control Branch, Victoria, B.C.

Dr. F.E. Murray, Head, Department of Chemical Engineering, University of British Columbia, Vancouver, B.C.

Mrs. E. Ostapchuck, Executive Director, British Columbia Human Rights Council, Vancouver, B.C.

Dr. J.M. Rienstra, P. Econ., Vice-President and Chief Economist, Joseph B. Ward and Associates (International) Limited, Vancouver, B.C.

Dr. J.H. Smith, M.D. Director, Division of Occupational Health, Province of British Columbia, Vancouver, B.C.

Prof. R.O. Sylvester, Head, Division of Water and Air Resources Engineering, University of Washington, Seattle, Washington.

Dr. C.C. Walden, Head, Division of Applied Biology, B.C. Research, Vancouver, B.C.

APPENDIX 3

Briefs submitted to the 1970 Public Inquiry into Waste Management and Environmental Control in the Forest Products Industry.

Aspen Grove Cottages, Revelstoke, B.C.
B.C. Aviation Council
B.C. Department of Recreation and Conservation, Fish and Wildlife Branch
Canadian Department of Fisheries and Forestry
Society for Pollution and Environmental Control (S.P.E.C.)
Comox Valley Action Group and Vancouver Branch
Cariboo Lumber Manufacturers Association
Comox District Mountaineering Club
Comox/Strathcona Natural History Society
Council of Forest Industries of B.C.
District of Squamish
Kurt Otto Embacher
Federation of B.C. Naturalists
Fisheries Association of B.C.
Douglas and Diane Gordon
Interior Lumber Manufacturers Association
International Brotherhood of Pulp, Sulphite and Paper Mill Workers and United Paper Makers and Paper Workers
Kamloops Pulp and Paper Co.
C.J. Keenan
Kootenay Pollution Control Association, Nelson Chapter
North Okanagan Board of Health and North Okanagan Health Unit
Okanagan Basin Water Board
Alvin Parkin and J. Bundy
Powell River Anti-Pollution Association
Prince Rupert Chamber of Commerce
Provincial Council of Women
Pulp and Paper Workers of Canada, Union Pollution Control Committee, Local No. 2
Richmond Anti-Pollution Society
Robinson Agencies Ltd.
Sierra Club of B.C.
Shuswap Rural Ratepayers Association
Thompson Basin Pollution Probe
United Fisherman and Allied Workers Union
Vancouver Inner-City Service Project
B.C. Wildlife Federation
United Church of Canada
Rayonier Canada Ltd.
Association of B.C. Professional Foresters

Sierra Club of B.C., Okanagan Section
S.P.E.C., Kamloops Branch
Steelhead Society of B.C.
S.P.E.C., Vernon Chapter

APPENDIX 4

Presentations to the Pollution Control Branch task force on Pollution Control Objectives for the Forest Products Industry, 1976.

New Westminster:

K.O. Kenzer and Associates, Vancouver
Welder Construction Co. Inc. Bellingham
B.C.F.P. - Crofton Logging Group, Crofton
B.C.F.P. - Cowichan Nitinat Logging Division
Shultz International Ltd. Vancouver
Institute of Environmental Studies - Douglas College, New Westminster

Powell River:

Powell River Anti-Pollution Association

Ladysmith:

Ladysmith Harbour Citizens Association

Nelson:

International Woodworkers of America

Pollution Control Branch Offices, Victoria:

Mr. G.S. Nagle, Nawilka Renewable Resources Consultants Ltd.,Ladysmith
Mr. B. Hardy, President, Victoria Chapter, Sierra Club
Mr. A. Roper, Victoria

APPENDIX 5

Briefs submitted to the Public Inquiry into the Pollution Control Objectives for the Forest Products Industry, March 2-4, 1976.

Council of Forest Industries of British Columbia

B.C. Wildlife Federation

Dr. R.D. Cameron

Dr. D.B. Ellis

Gambier Island Community Association

Pulp, Paper and Woodworkers of Canada

Steelhead Society of British Columbia

Environment Canada

APPENDIX 6

Members of the Advisory Panel at the 1976 Public Inquiry into the Pollution Control Objectives for the Forest Products Industry, March 2-4, 1976.

Mr. H. English, Advisor to the International Pacific Salmon Fisheries Commission, Member of the Pollution Control Board

Mr. R.H. McBean, P. Eng., Environmental Protection Service, Environment Canada

Dr. J.E. McInerney, Member of the Pollution Control Board, Director, Bamfield Marine Station

Mr. B. Mills, P. Eng., Greater Vancouver Regional District, Vancouver

Mr. H.P. Klassen, P. Eng., Panel Co-ordinator, Assistant Director (Services), Pollution Control Branch

Mr. M.W.H. Kreuger, P. Eng., Head, Forestry Section, Pollution Control Branch

APPENDIX 7

Pollution Control Board Members:

1970

F.S. McKinnon, Chairman (retired Deputy Minister of Forest Service)

The Hon. R.G. Williston, Minister of Lands, Forests and Water Resources

The Hon. D.R.J. Campbell, Minister of Municipal Affairs

The Hon. R.R. Loffmark, Minister of Health Services and Hospital Insurance

V. Raudsepp, Deputy Minister of Water Resources

Dr. J.A. Taylor, Deputy Minister of Health, Health Branch

R.G. McMynn, Director, Commercial Fisheries Branch, Department of Recreation and Conservation

J.W. Peck, Chief Inspector of Mines, Inspection Branch, Department of Mines and Petroleum Resources

J.S. Allin, Agriculture Department

Dr. C.J.G. Mackenzie, Director, Department of Health Care and Epidemiology, U.B.C., Vancouver

1974

B.E. Marr, Chairman, Associate Deputy Minister of Water Resources

B.D. Caine, Assistant Director of Environmental Engineering, Department of Health, Victoria

Howard English, retired farmer and conservationist

Dr. C.J.G. Mackenzie, Head, Department of Health Care and Epidemiology, Faculty of Medicine, U.B.C. Vancouver

Dr. J.E. McInerney, Department of Biology, University of Victoria

R.J. Miller, Director, Special Services, Department of Agriculture, Victoria

J.W. Peck, Chief Inspector of Mines, Department of Mines and Petroleum Resources, Victoria

J.S. Stokes, Deputy Minister of Forests, Victoria

E.H. Vernon, Associate Deputy Minister, Department of Recreation and Conservation, Victoria

<u>1977</u>

Dr. C.J.G. Mackenzie, Chairman, Professor and Head, Department of Health Care and Epidemiology, U.B.C. Vancouver

Mr. B.D. Caine, Assistant Director of Environmental Engineering, Ministry of Health

Mr. B.G. Keefer, Ph.D. (Physics), Bowie Keefer and Associates Ltd., Vancouver

Mr. E. Knight, Forester in Charge of Special Studies, Ministry of Forests

Dr. J.E. McInerney, Director of Bamfield Marine Station, Bamfield, B.C.

Mr. R.J. Miller, Director of Special Services, Ministry of Agriculture, Victoria

Mr. J.W. Peck, Chief Inspector of Mines, Department of Mines and Petroleum Resources, Victoria

Mr. E.H. Vernon, Associate Deputy Minister, Ministry of Recreation and Conservation

BIBLIOGRAPHY

BOOKS AND PERIODICALS

Abbott, R.D., 1971 READINGS ON THE LAW OF ENVIRONMENTAL QUALITY, Volumes I and II, Canadian Council of Resource Ministers, Montreal, Quebec.

Ackoff, R.L. 1953, THE DESIGN OF SOCIAL RESEARCH, The University of Chicago Press, Chicago.

Agassiz Centre for Water Studies, 1974, THE ALLOCATIVE CONFLICTS IN WATER-RESOURCE MANAGEMENT, University of Manitoba, Winnipeg.

Althoff, P. and Grieg, W.H. 1974, "Environmental Pollution Control Policy-Making: An Analysis of Elite Perceptions and Preferences", ENVIRONMENT AND BEHAVIOR, Volume 6, No.3, pp.259-288.

Armstrong, W.S., 1962, "The British Columbia Water Act: The End of Riparian Rights" U.B.C. LAW REVIEW, Volume 1, No.5, pp.583-594.

Barker, M.L. 1974, "Information and Complexity: The Conceptualisation of Air Pollution by Specialist Groups" ENVIRONMENT AND BEHAVIOR, Volume 6, No.3, pp.346-377.

Baumol, W.J. and Oates, W.E., 1971, "The Use of Standards and Prices for Protection of the Environment" in Bohm, P. and Kneese, A.V., (eds.) 1971, THE ECONOMICS OF ENVIRONMENT, MacMillan, London, pp.53-65.

Blalock, H.M. and Blalock, A.B., 1968, METHODOLOGY IN SOCIAL RESEARCH, McGraw-Hill.

Bower, B.T., Lof, G., and Hearon, W.M.,1971, "Residuals Management in the Pulp and Paper Industry" NATURAL RESOURCES JOURNAL, Volume 11, No.4, pp.605-623.

Brown, R.M., McClelland, N.I., Deininger, R.A., O'Connor, M.F., 1972 "A Water Quality Index-Crashing the Psychological Barrier" in Thomas (ed.) 1972, pp.173-182.

Buchanan, J.M. and Tullock, G., 1975 "Polluters Profits and

Political Response: Direct Controls versus Taxes" AMERICAN ECONOMIC REVIEW, Volume 65, No.1, pp.139-147.

Burton, T.L., 1972, NATURAL RESOURCE POLICY IN CANADA, McClelland and Stewart Ltd., Toronto.

Campbell, R.S., Pearse, P. and Scott, A.D. 1972 "Water Allocation in British Columbia: An Economic Assessment of Public Policy" U.B.C. LAW REVIEW Volume 7, No.2, pp.247-292.

Campbell, T.H. and Sylvester, R.O., 1968, WATER RESOURCE MANAGEMENT AND PUBLIC POLICY, Washington University Press, Seattle.

Canadian Council of Resource Ministers, 1966, PROCEEDINGS OF THE NATIONAL CONFERENCE ON POLLUTION AND OUR ENVIRONMENT, Volumes 1-3, Montreal.

Chevalier, M. and Cartwright, T.J., 1971 "Public Involvement in Planning: The Delaware River Case" in Sewell, W.R.D. and Burton, I., (eds.) 1971, PERCEPTIONS AND ATTITUDES IN RESOURCES MANAGEMENT, Resource Paper No.2, Policy Research and Coordination Branch, Department of Energy, Mines and Resources, Ottawa, pp. 111-120.

Coase, R., 1960 "The Problem of Social Cost" THE JOURNAL OF LAW AND ECONOMICS, Volume 4, pp.1-44.

Coughlin, R.E., 1976 "The Perception and Valuation of Water Quality: A Review of Research Methods and Findings" in Craik and Zube (eds.) 1976, pp.205-227.

Council on Economic Priorities, 1972 PAPER PROFITS: POLLUTION IN THE PULP AND PAPER INDUSTRY, New York.

Craik, K.H. and Zube, E.H. (eds.) 1976, PERCEIVING ENVIRONMENTAL QUALITY: RESEARCH AND APPLICATIONS, Plenum Press, New York.

Craine, L.E., 1969, WATER MANAGEMENT INNOVATIONS IN ENGLAND, Johns Hopkins Press, Baltimore.

Dales, J.H., 1968, POLLUTION, PROPERTY AND PRICES: AN ESSAY IN POLICYMAKING AND ECONOMICS, University of Toronto Press, Toronto.

Davies, J.C. and Davies, B.S., 1975, THE POLITICS OF POLLUTION, 2nd edition, Bobbs-Merrill Co. Indianapolis.

Davis, R.K., 1968, THE RANGE OF CHOICE IN WATER MANAGEMENT: A

STUDY OF DISSOLVED OXYGEN IN THE POTOMAC ESTUARY, Johns Hopkins Press, Baltimore.

Doern, G.B., 1974 "The Concept of Regulation and Regulatory Reform" in G.B. Doern and V.S. Wilson, ISSUES IN CANADIAN PUBLIC POLICY, MacMillan, pp.8-35.

Dorcey, A.H.J., 1973 "Effluent Charges, Information Generation and Bargaining Behaviour" NATURAL RESOURCES JOURNAL, Volume 13, No. 1, pp.118-133.

Dorcey, A.H.J. and Fox, I.K., 1974 "Research Issues in Water Quality Management" in Leversedge (1974), pp.63-77.

Dorcey, A.H.J. (ed.) 1976, THE UNCERTAIN FUTURE OF THE LOWER FRASER, Westwater Research Centre, University of British Columbia Press, Vancouver.

Dorcey, A.H.J., 1977 "Policy Mechanisms for Water Quality Management in a Metropolitan Area: Greater Vancouver and the Fraser Estuary" in Stephenson (ed.) 1977, pp.255-302.

Draper, D., 1975 "Environmental Interest Groups and Institutional Arrangements in British Columbia Water Management Issues" in Mitchell (ed.) 1975, pp.119-170.

Dwivedi, O.P. (ed.) 1974, PROTECTING THE ENVIRONMENT Copp Clark Publishing.

Elder, P.S. (ed.) 1975, ENVIRONMENTAL MANAGEMENT AND PUBLIC PARTICIPATION, Canadian Environmental Law Associaticn, Toronto.

Estrin, D. and Swaigen, J., (eds.) 1974, ENVIRONMENT ON TRIAL, Canadian Environmental Law Association, Toronto.

Farley, A.L. 1972 "The Forest Resource in British Columbia" in Robinson, J.L. (ed.) 1972, BRITISH COLUMBIA: STUDIES IN CANADIAN GEOGRAPHY, Published for the 22nd International Geographical Congress, University of Toronto Press, pp.87-118.

Fox, I.K., 1970 "The Use of Standards in Achieving Appropriate Levels of Tolerance" PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, Volume 67, No. 2, pp.877-886.

Fox, I.K., and Wible, L.F., 1973 "Information Generation and Communication to Establish Environmental Quality Objectives" NATURAL RESOURCES JOURNAL, Volume 13, No. 1, pp.134-149.

Fox, I.K., 1977 "The Assessment of Pollution Control Policy Mechanisms: Some Basic Concepts" in Stephenson (ed.) 1977, pp.19-38.

Franson, R.T. and Burns, P.T., 1974 "Environmental Rights for the Canadian Citizen: A Prescription for Reform" ALBERTA LAW REVIEW, Volume 12, pp.153-171.

Franson, R.T. and Lucas, A.R., 1975 "Environmental Decision Making in British Columbia" in Elder (1975), pp.84-100.

Franson, R.T., Blair, D., and Bozzer, R., 1976 "The Legal Framework for Water Quality Management in the Lower Fraser River of British Columbia" in Swainson (1976), pp.54-96.

Freeman, A.M. and Haveman, R.H., 1972 "Residual Charges for Pollution Control: A Policy Evaluation" SCIENCE, Volume 174, pp.322-329.

Gibson, D., 1973 "Constitutional Jurisdiction over Environmental Management in Canada" UNIVERSITY OF TORONTO LAW JOURNAL, Volume 23, pp.79-85.

Good, P., 1971 "Anti-Pollution Legislation and its Enforcement: An Empirical Study" U.B.C. LAW REVIEW, Volume 6, No. 1, pp.271-286.

Gregg, P.M. (ed.) 1976, PROBLEMS OF THEORY IN POLICY ANALYSIS, Lexington Books.

Haefele, E.T. (ed.) 1974, THE GOVERNANCE OF COMMON PROPERTY RESOURCES, Resources For the Future, Inc. Johns Hopkins Press, Baltimore.

Hagevik, G., 1968 "Legislating for Air Quality Management: Reducing Theory to Practice" LAW AND CONTEMPORY PROBLEMS, Volume 33, No. 2, pp.369-398.

Hardwick, W.G., 1963 "Geography of the Forest Industry of Coastal British Columbia" in Occasional Papers in Geography, No. 5, Tantalus Press, Vancouver.

Hayter, R., 1976 "Corporate Strategies and Industrial Change in the Canadian Forest Product Industries" THE GEOGRAPHICAL REVIEW, Volume 66, No. 2, pp.209-228.

Hogg, P.W., 1977, CONSTITUTIONAL LAW OF CANADA, Carswell Co. Ltd., Toronto.

Holden, Jr., M. 1966, POLLUTION CONTROL AS A BARGAINING PROCESS, Cornell University Water Resources Center, Publication No. 9, Ithaca, New York.

Ince, J.G., 1976, ENVIRONMENTAL LAW: A STUDY OF LEGISLATION AFFECTING THE ENVIRONMENT OF BRITISH COLUMBIA, Centre for Continuing Education, University of British Columbia, Vancouver.

Inhaber, H., 1976 "Environmental Quality: Outline for a National Index for Canada" SCIENCE, Volume 186, pp.798-805.

James, L.D. (ed.) 1974, MAN AND WATER: THE SOCIAL SCIENCES IN MANAGEMENT OF WATER RESOURCES, The University of Kentucky Press.

Johnson, R.W. and Brown, G.M., 1976, CLEANING UP EUROPE'S WATERS: ECONOMICS, MANAGEMENT AND POLICIES, Praeger Publishers, New York.

Kasperson, R.E., 1969 "Political Behavior and the Decision Making Process in the Allocation of Water Resources Between Recreational and Municipal Use" NATURAL RESOURCES JOURNAL, Volume 9, pp.176-211.

Kneese, A.V. 1964, THE ECONOMICS OF REGIONAL WATER QUALITY MANAGEMENT, The Johns Hopkins Press, Baltimore.

Kneese, A.V. and Bower, B.T., 1968, MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS, The Johns Hopkins Press, Baltimore.

Kneese, A.V. and Schultze, C.C., 1975, POLLUTION, PRICES AND PUBLIC POLICY, The Brookings Institution, Washington.

Krueger, R. and Mitchell, B. (eds.) 1977, MANAGING CANADA'S RENEWABLE RESOURCES, Methuen, Toronto.

LaForest, G.V., 1973, WATER LAW IN CANADA: THE ATLANTIC PROVINCES, Queens Printer, Ottawa.

Leversedge, F.M. (ed.) 1974, PRIORITIES IN WATER MANAGEMENT, Western Geographical Series, Volume 8, Department of Geography, University of Victoria.

Lieber, H. 1975, FEDERALISM AND CLEAN WATERS, Lexington Books.

Lindholm, C.E. 1965, THE INTELLIGENCE OF DEMOCRACY: DECISION MAKING THROUGH MUTUAL ADJUSTMENT, Free Press, New York.

Lindholm, C.E. 1968, THE POLICY MAKING PROCESS, Prentice Hall, New Jersey.

Lucas, A.R., 1969 "Water Pollution Control Law in British Columbia" U.B.C. LAW REVIEW, Volume 4, No. 1, pp.56-86.

Lucas, A.R., 1971 "Legal Techniques for Pollution Control: The Role of the Public" U.B.C. LAW REVIEW, Volume 6, pp.167-191.

Lucas, A.R. and Moore, P.A., 1973 "The Utah Controversy: A Case Study of Public Participation in Pollution Control" NATURAL RESOURCES JOURNAL, Volume 13, No. 1, pp.36-75.

Lucas, A.R., 1976 "Legal Foundations For Public Participation in Environmental Decisionmaking" NATURAL RESOURCES JOURNAL, Volume 16, No. 1, pp.73-102.

McKee, J.E. and Wolf, H.W. (eds.) 1963, WATER QUALITY CRITERIA, Publication No. 3-A, 2nd edition, California State Water Quality Board.

McLaren, J.P.S., 1972 "The Common Law Nuisance Actions and the Environmental Battle - Well Tempered Swords or Broken Reeds?" OSGOODE HALL LAW JOURNAL, Volume 10, No. 3, pp.505-561.

McMeiken, J.E., 1972, PUBLIC HEALTH PROFESSIONALS AND THE ENVIRONMENT: A STUDY OF PERCEPTIONS AND ATTITUDES, Social Science Series No. 5, Inland Waters Directorate, Environment Canada.

Mitchell, B., 1971 "Behavioral Aspects of Water Management: A Paradigm and a Case Study" ENVIRONMENT AND BEHAVIOR, Volume 3, pp.135-153.

Mitchell, B. (ed.) 1975, INSTITUTIONAL ARRANGEMENTS FOR WATER MANAGEMENT: CANADIAN EXPERIENCES, Department of Geography Publication Series No. 5, University of Waterloo.

Mitchell, B., 1975 "An Investigation of Research Barriers Associated With Institutional Arrangements in Water Management" in Mitchell (ed.) 1975, pp.247-285.

Morley, C.G., 1973 "Pollution as a Crime: The Federal Response" MANITOBA LAW JOURNAL, Volume 5.

Nagel, S.S. (ed.) 1974, ENVIRONMENTAL POLITICS, Praeger Publishers, New York.

Nemetz, P.N., 1977 "Pollution Generation and Abatement in the British Columbia Pulp and Paper Industry" in Stephenson (1977).

Olson, M. 1965, THE LOGIC OF COLLECTIVE ACTION, Harvard University Press.

O'Riordan, J., 1976 "The Public Involvement Program in the Okanagan Basin Study" NATURAL RESOURCES JOURNAL, Volume 16, No. 1, pp.177-196.

O'Riordan, T., 1971, PERSPECTIVES ON RESOURCE MANAGEMENT, Pion Limited, London.

O'Riordan, T. and O'Riordan, J., 1972, OKANAGAN WATER DECISIONS, Western Geographical Series, Volume 4, Department of Geography, University of Victoria.

O'Riordan, T.,1976 "Policy Making and Environmental Management: Some Thoughts on Processes and Research Ideas" NATURAL RESOURCES JOURNAL, Volume 16, No.1, pp.55-72.

Page, T., 1973 "Failure of Bribes and Standards for Pollution Abatement" NATURAL RESOURCES JOURNAL, Volume 13, No. 4, pp.677-704.

Paulsen, D. and Denhardt, R.B. (eds.) 1973, POLLUTION AND PUBLIC POLICY: A BOOK OF READINGS, Dodd, Mead and Co., Toronto.

Pierce, J.C. and Doerksen, H.R. (eds.) 1976, WATER POLITICS AND PUBLIC INVOLVEMENT, Ann Arbor Science Publishers.

Rickson, R.E., 1977 "Dimensions of Environmental Management: Legitimation of Government Regulation by Industrial Managers" ENVIRONMENT AND BEHAVIOR, Volume 9, No. 1, pp.15-40.

Roberts, M.J., 1976 "Environmental Protection: The Complexities of Real Policy Choice" in Swainson (1976), pp.157-235.

Roberts, R.J. and Sullivan, J.L., 1976 "The Role of the Technological Expert in Complex Environmental Litigation" CANADIAN BAR REVIEW, Volume 54, pp.65-104.

Rose-Ackerman, S., 1973 "Effluent Charges: A Critique" CANADIAN JOURNAL OF ECONOMICS, Volume 6, pp.512-528.

Schatzow, S., 1977 "The Influence of the Public on Federal Environmental Decision-Making in Canada" in W.R. Derrick

Sewell and J.T. Coppock (eds.) 1977, pp.142-158.

Sewell, W.R.D., 1971 "Environmental Perceptions and Attitudes of Engineers and Public Health Officials" ENVIRONMENT AND BEHAVIOR Volume 3, No. 1, pp.23-59.

Sewell, W.R.D., 1973 "Broadening the Approach to Evaluation in Resources Management Decision Making" JOURNAL OF ENVIRONMENTAL MANAGEMENT, Volume 1, pp.33-60.

Sewell, W.R.D., 1975 "Public Involvement" in MONOGRAPH ON COMPREHENSIVE RIVER BASIN PLANNING, Department of the Environment, Ottawa.

Sewell, W.R.D. and O'Riordan, T., 1976 "The Culture of Participation in Environmental Decisionmaking" NATURAL RESOURCES JOURNAL, Volume 16, No. 1, pp.1-22.

Sewell, W.R.D. and Coppock, J.T., 1977 "A Perspective on Public Participation in Planning" in Sewell and Coppock (eds.) 1977, pp.1-14.

Sewell, W.R.D. and Coppock, J.T. (eds.) 1977, PUBLIC PARTICIPATION IN PLANNING, John Wiley and Sons, London.

Shaw, C.L., 1970 "B.C. Mills Face Dilemma of Conflicting Pollution Laws" PULP AND PAPER, Volume 44, No. 11, pp.120-121.

Sinclair, M., 1977 "The Public Hearing as a Participatory Device: Evaluation of the IJC Experience" in Sewell and Coppock (eds.) 1977, pp.105-122.

Stamp, B., 1968 "The Constitutional Aspects of Water Pollution and the Need for Government Cooperation" in CONSTITUTIONAL ASPECTS OF WATER MANAGEMENT, Agassiz Centre for Water Studies, University of Manitoba, Research Report No. 2.

Stephenson, J.B. (ed) 1977, THE PRACTICAL APPLICATION OF ECONOMIC INCENTIVES TO THE CONTROL OF POLLUTION: THE CASE OF BRITISH COLUMBIA, British Columbia Institute for Economic Policy Analysis, University of British Columbia Press, Vancouver.

Stephenson, J.B., 1977 "Alternative Pollution Control Mechanisms in the British Columbia Pulp and Paper Industry" in Stephenson (ed) 1977, pp.213-234.

Teniere-Buchot, P.F., 1976 "The Role of the Public in Water

Management Decisions in France" NATURAL RESOURCES JOURNAL, Volume 16, No. 1, pp.159-176.

Thomas, W.A. (ed.) 1972, INDICATORS OF ENVIRONMENTAL QUALITY, Plenum Press, New York.

Thompson, A.R., 1972 "Legal Responses to Pollution Problems - Their Strengths and Weaknesses" NATURAL RESOURCES JOURNAL, Volume 12, No. 2, pp.227-241.

Waverman, L., 1970 "Fiscal Instruments and Pollution: Evaluation of Canadian Legislation" CANADIAN TAX JOURNAL, Volume XVIII, pp.505-513.

Wengert, N. 1955, NATURAL RESOURCES AND THE POLITICAL STRUGGLE, Doubleday, New York.

Wengert, N., 1971 "Public Participation in Water Planning: A Critique of Theory, Doctrine and Practice" WATER RESOURCES BULLETIN Volume 7, No. 1, pp.26-32.

White, G.F. 1969, STRATEGIES OF AMERICAN WATER MANAGEMENT, The University of Michigan Press.

Wood, C.J., 1976 "Conflict in Resource Management and the Use of Threat: The Goldstream Controversy" NATURAL RESOURCES JOURNAL, Volume 16, No. 1, pp.135-158.

GOVERNMENT DOCUMENTS

Reports and Studies:

British Columbia, ROYAL COMMISSION ON FOREST RESOURCES, 1975, Peter H. Pearse, Commissioner.

CANADA WATER YEAR BOOK 1975 and 1976, Inland Waters Branch, Environment Canada, Ottawa.

Council of Forest Industries of British Columbia, 1975, ANNUAL REPORT, Vancouver.

Department of Lands, Forests and Water Resources, Water Resources Service, 1971, REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, Queens Printer, Victoria, B.C.

Department of Lands, Forests and Water Resources, Water Resources Service, December 1973, REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE MINING, MINE-MILLING, AND SMELTING INDUSTRIES OF BRITISH COLUMBIA, Queens Printer, Victoria, B.C.

Department of Lands, Forests and Water Resources, Water Resources Service, March 1974, REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE CHEMICAL AND PETROLEUM INDUSTRIES OF BRITISH COLUMBIA, Queens Printer, Victoria, B.C.

Department of Lands, Forests and Water Resources, Water Resources Service, January 1975, REPORT ON POLLUTION CONTROL OBJECTIVES FOR FOOD-PROCESSING, AGRICULTURALLY ORIENTATED, AND OTHER MISCELLANEOUS INDUSTRIES OF BRITISH COLUMBIA, Queens Printer, Victoria, B.C.

Department of Lands, Forests and Water Resources, Water Resources Service, September 1975, REPORT ON POLLUTION CONTROL OBJECTIVES FOR MUNICIPAL TYPE WASTE DISCHARGES IN BRITISH COLUMBIA, Queens Printer, Victoria, B.C.

Berner, S.H. 1972, PRIVATE PROSECUTIONS AND ENVIRONMENTAL CONTROL LEGISLATION: A STUDY, Environment Canada, Ottawa.

Edgeworth, L. 1973, CANADA'S APPROACH TO ENVIRONMENTAL POLLUTION CONTROL IN THE PULP AND PAPER INDUSTRY, Environmental Protection Service, Ottawa.

Environment Canada, PULP AND PAPER EFFLUENT REGULATIONS, SOR/71-578, November 2, 1971.

Inland Waters Branch, 1972, GUIDELINES FOR WATER QUALITY OBJECTIVES AND STANDARDS, Department of the Environment, Ottawa.

Horsfall, R.B., Bradbury, B., Massiah, P. and McPhee, M., 1974 "Parameters of Healthful Community and Individual Functioning in Resource Frontier Communities" Study done for Health and Welfare Canada, Department of Geography, Simon Fraser University.

MacLatchy, J., 1976, CASE LAW: PROSECUTIONS UNDER THE POLLUTION CONTROL PROVISIONS OF THE FISHERIES ACT, Environment Canada, Ottawa.

Marier, J.R. 1973, "The Effects of Pulp and Paper Wastes on Aquatic Life with particular attention to Fish and Bioassay Procedures for Assessment of Harmful Effects" Divison of

Biological Sciences, National Research Council of Canada, Ottawa.

National Academy of Sciences, 1974, PLANNING FOR ENVIRONMENTAL INDICES, Preliminary Final Report, Washington, D.C.

Organisation for Economic Co-operation and Development, 1973, POLLUTION BY THE PULP AND PAPER INDUSTRY, Paris.

Organisation for Economic Co-operation and Development, 1975, THE POLLUTER PAYS PRINCIPLE, Paris.

Province of British Columbia, Department of Lands, Forests and Water Resources, ANNUAL REPORTS, 1967-1974, Queens Printer, Victoria.

Province of British Columbia, Department of the Environment, Water Resources Service, ANNUAL REPORT, 1975, Queens Printer, Victoria.

Province of British Columbia, Ministry of Environment, ANNUAL REPORT, 1976, Queens Printer, Victoria.

REPORT ON POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, October 15, 1976, Pollution Control Branch, Ministry of Environment, Victoria, B.C.

World Health Organisation, 1974, HEALTH ASPECTS OF ENVIRONMENTAL POLLUTION CONTROL, PLANNING AND IMPLEMENTATION OF NATIONAL PROGRAMMES, Technical Report Series No. 554, Geneva.

Briefs, Proceedings and Transcripts:

B.C. Department of Lands, Forests and Water Resources, Water Resources Service, Pollution Control Branch, TRANSCRIPTS OF THE PUBLIC INQUIRY HELD TO REVIEW THE POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, March 2-4, Victoria, B.C., Volumes I-III.

British Columbia Pollution Control Board, Appeal Decisions 1970-1976 (unpublished decisions, minutes of meetings), Water Resources Service, Parliament Buildings, Victoria, B.C.

British Columbia Pollution Control Branch, Copies of pollution control permits for pulp and paper mills, Parliament Buildings, Victoria, B.C.

Council of Forest Industries of British Columbia, 1976, BRIEF TO THE PUBLIC INQUIRY FOR POLLUTICN CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY, March 1976

Environment Canada, 1975, BRIEF PRESENTED TO THE POLLUTION CONTRCL BOARD INQUIRY INTO THE POLLUTION CONTROL OBJECTIVES FOR THE FOREST PRODUCTS INDUSTRY OF BRITISH COLUMBIA, March 1976.

House of Commons, Parliament of Canada, MINUTES OF PROCEEDINGS AND EVIDENCE of the Standing Committee on Fisheries and Forestry Respecting: Bill C-38, An Act to Amend the Criminal Code in consequences thereof, 2nd Session of the 30th Parliament, June 8-22, 1977, Ottawa.

Rayonier Canada Limited, APPEAL TO CABINET ARGUMENT, September 1973.

Rayonier Canada Limited Appeal to the B.C. Pollution Control Board Relating to Port Alice Pollution Control Permit No. PE-1240, APPEAL PROCEEDINGS, Volumes 1-10, June 26-July 20, 1973, Victoria, B.C.

GOVERNMENT LEGISLATION

Federal Government:

BRITISH NORTH AMERICA ACT, 1867.

CANADA SHIPPING ACT R.S.C. 1970 c. S-9 as amended.

CANADA WATER ACT R.S.C. 1970 c. 5 (1st Supplement) as amended.

FISHERIES ACT R.S.C. 1970 c. F-14 as amended.

MIGRATORY BIRDS CONVENTION ACT R.S.C. 1970 c. M-12 as amended.

NAVIGABLE WATERS PROTECTION ACT R.S.C. 1970 c. N-19.

OCEAN DUMPING CONTROL ACT S.C. 1974-75 c. 55.

Provincial Legislation:

ENVIRONMENT AND LAND USE ACT S.B.C. 1971 c. 17.

FISHERIES ACT R.S.B.C. 1960 c. 150 as amended.

HEALTH ACT R.S.B.C. 1960 c. 170 as amended.

LAND ACT S.B.C. 1970 c. 17 as amended.

LITTER ACT S.B.C. 1970 c. 22 as amended.

MUNICIPAL ACT R.S.B.C. 1960 c. 255 as amended.

POLLUTION CONTROL ACT S.B.C. 1967 c. 34 as amended.

WATER ACT R.S.B.C. 1960 as amended.

NEWSPAPERS AND NEWSLETTERS

NORTH ISLAND GAZETTE

VICTORIA DAILY COLONIST

VICTORIA TIMES and VICTORIA DAILY TIMES

THE VANCOUVER EXPRESS

THE VANCOUVER PROVINCE

THE VANCOUVER SUN

CANADIAN ENVIRONMENTAL LAW NEWS, Canadian Environmental Law Association, Toronto.

NEWSLETTER, West Coast Environmental Law Association, Vancouver, B.C.