16 Waste Management

The collection, handling, treatment and disposal of wastes are not issues that attract much public attention during the review of a huge project such as the proposed pipeline. They are regarded by most people as matters of routine. However, the evidence now before me demonstrates that explicit directions must be given to avoid unnecessary problems that may arise through misunderstanding rather than from conflicting objectives.

1. *Waste from construction camps and permanent facilities associated with the pipeline must be collected, treated and discharged in a manner that will eliminate any hazard to public health, avoid the creation of a nuisance, maintain the quality of the environment, and protect the indigenous flora and fauna.*

Everybody will agree with this recommendation, but problems will arise as the Agency tries to quantify, and as the Company strives to meet, these broad objectives.

The northern environment poses special problems for waste management engineers. For example, the prolonged cold inhibits biological degradation of waste and extends the survival period for many pathogenic organisms. Natural dissolved oxygen levels in northern watercourses are often very low, so that the introduction of project-related wastewater (which consumes dissolved oxygen during its decomposition) may locally reduce the oxygen to a level below that necessary to sustain aquatic organisms. The attraction of wildlife to domestic solid waste is a matter of particular concern.

In the North today, there are relatively few major sources of pollution: the rivers, lakes and streams are among the cleanest in North America, and the land has not yet been much altered by man. These qualities are, in themselves, worth preserving, but in attempting to preserve them, we must be realistic, particularly in view of the limited duration of most pipeline activities. There are limits to environmental control: we cannot protect every blade of grass. We cannot guarantee that there will be no losses to fish and wildlife populations.

On the other hand, we must work with the environment as much as possible to reduce total impact. For example, if waste were allowed to be disposed of without the use of elaborate treatment facilities, its short-term impact could be great, but its long-term impact might be less than the total environmental consequences that would result from the fabrication, construction and abandonment of such facilities. We must understand the costs and limits of practicable technology and we must know what is the environment's natural assimilative capacity. For example, some of the large waterbodies in the North, particularly the Mackenzie River, can assimilate substantial quantities of domestic wastewater without environmental harm. Prudent use of such assimilative capacity, particularly on a temporary basis, may be good environmental management.

Waste Management Plans

For a realistic and comprehensive approach to the management of waste produced by the pipeline project, there must be, at the outset, agreement between the Company and the Agency about the nature and extent of the subject. The preliminary nature of the waste management proposals that were put before the Inquiry makes it impossible, at this stage, to piece together an overall picture. However, it is important to say something about the relation of the locations, volumes, and periods of discharge of all wastes – liquid and solid – to other aspects of the project, especially if they may have a cumulative or compounding effect on the receiving environment. Sources of water and the points at which pipe test liquids are discharged should be considered, as well as environmental constraints, such as the natural characteristics and fluctuations of dissolved oxygen levels in waterbodies, permafrost soils, fish spawning and overwintering areas, and the use of water, land and renewable resources by people. In this way, the problems posed by waste disposal may be seen from the overall perspectives of both the project and the local environment.

Consequently, I endorse the approach taken in the submission of Commission Counsel in his final argument, which

requires the Company to develop an overall waste management plan before submitting site-specific applications. Commission Counsel's proposals, which I present here in a slightly revised form, should be adopted.

Overall Plan

2. *Before the final design phase, the Company shall prepare for approval by the Agency an overall plan for the disposal of wastewater and solid waste from all construction activities and from all permanent facilities related to the pipeline project, up to and including abandonment. Subject to the direction of the Agency, the overall plan shall, as far as possible, be in cartographic form, shall be presented by drainage basin (or a part thereof) as designated by the Agency, and shall take into account, by means of overlays or other graphic techniques at the same scale or by notations, the other overall plans requested elsewhere in this document. The Agency may request the Company to resubmit parts of this overall plan if, for any reason, they do not meet with its approval; the Company shall undertake to keep the overall plan up to date so that it reflects the latest policies and actions of the Company, the Agency and government.*

3. *The overall plan shall specify such items as the general timing and the extent of pipeline-related activities; the points of generation and disposal of waste; the proposed methods of collection, storage, treatment and disposal of all waste; the anticipated volumes, the physical, chemical and biological characteristics, and the periods of discharge of all waste; the general physical and biological characteristics of the environment in the vicinity of any waste discharge sites; the location of any communities or camps in the vicinity of the proposed activity, with a description of the use they make of the waters and lands that may be affected by the waste disposal actions of the Company; and other details the Agency may require, such as alternative waste disposal sites and plans.*

4. *The overall plan shall be approved by the Agency before site-specific applications are submitted for wastewater discharge.*

Site-specific Applications

5. *The Company shall file with the Agency a separate site-specific application for each discharge site of solid and liquid waste, regardless of the quality, rate or duration of the discharge. Each of these applications shall be keyed to the overall plan. For administrative purposes, such individual applications may be group-filed by each spread year except when they are not related to any specific spread location. In this event, they shall be filed on the basis of the activity or the geographical area involved.*

6. *Each application shall specify such items as the normal and maximum population of all facilities at which domestic waste will be generated; the complete design parameters of the facility proposed to dispose of waste, including a documented estimate of the quantity, its chemical, physical and biological characteristics, and the location, method and periods of discharge; the design and operating considerations for handling upset conditions such as surge flows, hydraulic overloading, equipment failures and the collapse of biological processes; the particular physical characteristics of the receiving environment, its use by fish and wildlife species and by hunters, trappers or anyone else for recreational, professional or other use, together with the Company's assessment of the degree of treatment that is needed at a particular discharge site; and the proposed methods and times both for the monitoring of receiving lands and waters, and for their rehabilitation after the discharge has stopped.*

7. *The Company must be able to satisfy the Agency that the collection and treatment processes will be performed to the standards specified under the prevailing field conditions.*

8. *The Agency must approve an application before any on-site construction begins. Approved applications shall be valid for only the quantities, qualities, locations and periods of discharge specified. If the conditions are altered in any way that would increase or change the location of the impact, the Company shall submit an amended application for approval.*

9. *The Company shall supply to the Agency all information that may be required and requested regarding the effect of any waste discharge on the environment.*

Wastewater

The primary purpose of any scheme to manage wastewater is the establishment and maintenance of effluent standards that will achieve the objectives I set forth in my first recommendation. This task is not as straightforward as it may at first seem, and it could lead to misunderstanding among all the parties that will be involved in the construction and regulation of a pipeline.

The Application of Standards

It is worthwhile to place the subject of wastewater treatment in perspective so that we can understand the application of relevant standards in the North. Everyone agrees that it is important to treat sewage to protect the environment. In urban and industrial areas, where most of us live, the volume of wastewater is greater than the local environment can absorb. Thus, treatment of sewage is desirable – if not essential – to our well-being.

Most wastewater technology and programs tend to focus on the urban and industrial problems we face in the South. This perspective is often transferred to the treatment of wastewater problems in frontier regions. Furthermore, we all tend to feel satisfied with forms of technological responses that

result in measurable improvements. But is this the right approach in the North? Is there an entrenched administrative approach here, an approach that is strengthened by urban-industrial attitudes, that views with suspicion any softening of southern regulations in the northern context?

Presumably there are economic, technical and administrative limits to environmental protection programs. Are we not, then, obliged to define our concerns on the basis of the actual priorities of the northern environment rather than on the basis of the problems and the technology applied in other parts of the nation? Are not other fresh water issues more important in the North than elaborate sewage treatment? Is it not, for example, more important to eliminate barriers to fish by installing more bridges and larger culverts, to reduce the problems of siltation by using more elaborate devices to control erosion, or to institute comprehensive procedures to prevent and control toxic substances?

I am dismayed by the huge amounts of money and effort that have been spent on sewage treatment in connection with the Alyeska pipeline. Many of the secondary treatment plants did not meet their design specifications, and often the effluent produced by secondary treatment was only slightly better than it was after primary treatment. The Alyeska Pipeline Service Company did not, therefore, achieve the environmental benefits of secondary treatment, yet they poured hundreds of thousands of dollars into the effort. The friction that resulted between the surveillance and administrative authorities seems to me to have been far out of proportion to the importance of the subject. In considering the Alaskan experience, we must look not only at the reasons why the secondary treatment plants failed to operate properly, but also at the justification for these plants in the first place.

Commission Counsel said that "procedures to minimize the adverse effects of waste disposal on the receiving environment are not ... well understood" (Commission Counsel, 1976, "Construction Services and Activities: Wastewater and Sewage: Camps and Facilities," p. 1). Archie Pick, of the Environmental Protection Service, Department of the Environment in Edmonton, after reviewing the argument, disagreed:

> The aspect that is not well understood is a method of rational analysis to determine the level of treatment efficiency required in each site-specific case. The gap is more in the ability to interpret the receiving environment and its limitations and the time required to do so, rather than with the waste treatment systems available. In fact, it is this gap that has led most jurisdictions to adopt a strategy similar to "Best Practicable Technology," which is based on a concept of incremental improvement rather than doing nothing because rational engineering analysis is not fully available. The difficult part of the concept is to define technology that is "practicable." Practicability infers that the system is available, proven and does not create an unnecessary economic or technological hardship....
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> Conceptually I do not object to the need to consider the assimilative capability of the receiving environment; however, the difficulty that has been experienced in arriving at waste treatment requirement this way should be recognized. I challenge the second statement [in Commission Counsel's submission] which states that "it would be irresponsible to lay down blanket-type effluent standards that ignore the influent characteristics and the site-specific characteristics of the receiving environment." It has been the cumulative experience of pollution control agencies that attempts to regulate on a site-by-site basis lead to interminable delay and a failure to achieve pollution abatement goals.
>
> In effect, I am saying that the assimilative approach, while scientifically desirable, is virtually unworkable from an administrative perspective. I believe such a requirement would ensure that no decisions of consequence could be reached until after a pipeline was completed. With the large number of sites involved, the Agency would become bogged down in rhetoric and alternatives. [Pick, personal communication, June 28, 1977]

I am persuaded that these are vital points: we must specify standards that are attainable with practicable technology, as suggested by Mr. Pick, and be prepared to specify the standards without the extensive site-specific analyses necessary to define scientifically the assimilative capacity of the local environment. In doing so, we must recognize the temporary nature of most of the discharges associated with the project and the time constraints that all parties will have to meet during the design and construction periods.

I have heard evidence on the problems of managing the wastewater associated with the Alyeska pipeline. There, the high cost of treatment, and the design and operating problems encountered seem to be tied, in part, to the nature of wastewater produced by the camps: it is several times more concentrated than that produced by cities and towns. The standards applied, however, often do not take this fact into account.

The pipeline companies initially told me that they would provide secondary treatment for all wastes from large camps, and the quality of the effluent from them would have been close to the standard specified in *Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments* and in *Recommended Environmental Standards for the Design and Construction of a Mackenzie Valley Gas Pipeline*, both published by the Environmental Protection Service, Department of the Environment. However, the companies later modified their statements and suggested a lower quality of effluent. The National Energy Board has rejected this modification and said that the standards set out in the federal guidelines must be met.

I think that, in our efforts to protect the environment, we must be careful that we do not lose sight of our overall objectives and of the limits of practicable technology. The federal guidelines were intended as an example, and they are, therefore, equal to, or more stringent than, the established standards or requirements of any other federal or provincial regulatory agency. I am advised that the effluent limits set out

in the guidelines are based on the quality of municipal effluent attainable with well-operated, standard secondary treatment technology, which is considered to be the best practicable technology. This technology is considered to remove at least 85 percent of suspended solids and five-day biological oxygen demand (BOD). For domestic wastewater at the federal establishments for which these guidelines are intended, the specific effluent limits are, therefore, 20 milligrams per litre (mg/l) BOD and 25 mg/l suspended solids.

However, if we recognize that camp wastewater will be several times stronger than municipal wastewater, it is obvious that a practicable reduction by 85 percent of camp wastewater will yield an effluent that exceeds the limits specified in the federal guidelines. If the numerical limits of the guidelines are applied, we shall, in fact, be asking the Company to reduce its wastes by over 96 percent – and that is not practicable. In most instances, it would place an unnecessary burden on the Company and its enforcement would cause considerable difficulty for the Agency. Quite simply, such an approach to the problem will be unmanageable.

James J. Cameron of the Northern Technology Centre, Department of the Environment, in Edmonton has written the Inquiry on this subject.

> I do not believe the *Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments* (EPS-1-EC-76-1) have direct application in these circumstances. I agree that the wastewater management requirements should be site-specific to allow flexibility in engineering and administration and tailoring to the characteristics and uses of the receiving environment. Domestic wastewater effluent quality requirements should be cognizant of the present and future very low population densities, and industrial and agricultural activities within northern watersheds. However, wastewater disposal must not adversely affect the local environment. Northern effluent guidelines must consider the relatively long survival time of pathogenic organisms in cold environments and the resulting potential health hazard which is enhanced by the use of receiving waters by local people in their extensive land use activities.
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> Unfortunately, it is generally impracticable to assess scientifically and to define clearly the assimilative capacity and public health requirements and to administer strict receiving water quality regulations. This is particularly true in the northern environment, which is less studied and understood, and where there are few relevant precedents. Also, the transient nature of this project's activities negates incremental response. Therefore, I believe that it is prudent to present a precise, conservative, yet rational *general* effluent standard. However, these should not be based on the Federal Establishment Guidelines. Rather, their intention of a well-operated secondary treatment system should be applied to the characteristically concentrated nature of the camp wastewater.
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> Effluent BOD from normal camps is expected to be approximately 600 mg/l. Higher values would be produced where kitchen wastes and grease are not segregated or where water conservation measures are implemented. In contrast, the BOD of domestic type effluents from normal municipalities is generally less than 200 mg/l. The higher strength wastewater is relatively easier to treat and normal secondary treatment technology can achieve a 90 percent reduction in BOD. I understand that on this latter point there is precedent in the Great Lakes regulations for ships. In these circumstances, a strong waste with BOD of 500 mg/l is anticipated and the effluent guidelines specify a maximum effluent BOD of 50 mg/l.
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> If this "best practicable technology" concept is followed, then maximum effluent requirements for BOD of 60 mg/l and suspended solids of 75 mg/l with a minimum of 90 percent removal and fecal coliform count less than 400 per 100 ml would be appropriate. If such a reasonable general effluent guideline were presented, I believe that it would be adopted without dispute for the majority of camp locations. Indeed, to standardize the design and to show good corporate citizenship and leadership, the pipeline company may choose to adopt these at all but the small, temporary camps, even though such standards were not required on environmental grounds. In those instances where the receiving environment could not readily assimilate such a loading, then flow management lagoons to prevent discharge during critical times of the year will probably be the most economical and environmentally sound solution. [Cameron, personal communication, July 15, 1977]

Effluent and Disposal Standards

Before giving my recommendations, I want to dispel any misunderstanding that may arise from my general conclusion that, although the same principles of waste treatment should be applied to the pipeline project as would be applied to a federal establishment in southern Canada, less stringent numerical standards should be used. This conclusion does not contradict my general view that ambient water quality standards, which I proposed in The Physical Environment: Water, should be maintained. The temporary nature of most discharges, the design and location of camp facilities and the natural assimilative capacity of waterbodies will help to limit most of the adverse impacts on water quality. Of course, if there is any danger of overtaxing the natural assimilative capacity of waterbodies, higher effluent standards can be provided or the discharge may be held until it can be released without harm. My point here is that we must not try to apply standards that we know from the outset are virtually unattainable.

In the chapter on The Physical Environment, I said that wetlands should be accorded the same level of protection as other elements of the landscape. Thus, although I recognize that the Company may, in some circumstances, use wetlands to receive sewage effluent, the quality of the effluent that may be discharged into swamps must be strictly controlled, as outlined below. The value of wetlands, in this context, lies in their capacity to hold water and as habitat for aquatic and other wildlife species. Their value as habitat would not be decreased – in some cases, it could be enhanced – by the addition of nutrients. Also, if wetlands are used as natural sewage lagoons, there will be no need to dig artificial lagoons,

which would remain, after they were abandoned, as scars on the landscape. My recommendations aim to prevent the abuse of all northern lands and waterbodies and to ensure the continued viability of their ecosystems.

Obviously a balance must be struck that will ensure the attainment of our objectives in a practicable way under the field and administrative conditions of the project. I have asked my staff to pursue this issue. They have received useful information from the Environmental Protection Service, Department of the Environment, in Edmonton, on which I have relied, in part, in writing the foregoing paragraphs and in what follows.

10. *The Minimum Effluent Standards for all facilities shall be based on primary treatment, which shall consist of the removal of settleable, floatable and suspended solids and grease and of appropriate disinfection to ensure that public health standards are met. Primary treatment could be accomplished by screening, grit removal, pre-aeration and primary sedimentation, with surface skimming to reduce grease and floatable solids.*

11. *The General Wastewater Treatment Requirements that are applicable to major construction camps and to permanent facilities that discharge into environments that have a relatively limited assimilative capacity shall be based on the best practicable technology and on the capabilities of a well-operated secondary treatment technology. In view of the relatively high concentration of camp wastewater, the effluent may have a maximum BOD of 60 mg/l and suspended solids of 75 mg/l, but the maximum must not exceed 10 percent of the influent values and the fecal coliform count must be less than 400 per 100 millilitre (ml). The Agency may specify more or less stringent effluent standards in view of the volume of effluent, its quality, the timing of its discharge or because of other developments in the area and the nature and uses of the particular receiving environment.*

12. *Unless otherwise noted by the Agency, any application to dispose of effluent in a way that deviates from the General Wastewater Treatment Requirements shall be supported by site-specific information.*

13. *The discharge of an effluent without disinfection shall be permitted only when it has been proved beyond reasonable doubt that it poses no threat to public health. The Company may be required to institute higher standards of treatment on a site-specific basis to ensure that the effluent is adequately disinfected.*

14. *The use of chlorine as a disinfectant is discouraged, but where it is used the Company shall demonstrate that the chlorinated effluent is not toxic to aquatic organisms.*

15. *The wastewater effluent shall be discharged only into a receiving environment that can assimilate the residual pollutants. Outfall works shall be designed to disperse the effluent. Particular attention shall be given to the protection of waterbodies from excessive organic loading during periods of ice cover or low water levels and to preventing discharges into waterbodies that are quiescent or that could become thermally stratified, thereby causing localized concentrations of effluent.*

16. *Unless otherwise demonstrated as environmentally acceptable, swamps, bogs or fens shall not be used to receive treated effluent for more than five years, and they shall be of sufficient size to allow approximately 120 square yards per contributing man-year. The disposal of treated effluent should, if possible, be into swamps, bogs and fens that have sub-pools that maintain flow throughout the year (Hartland-Rowe and Wright, 1974). All swamp, bog or fen areas used for effluent disposal shall be clearly posted to alert trappers and others that sewage effluent is present.*

17. *All solids and sludges in, or resulting from, the treatment of wastewater or sewage shall be handled and disposed of in a manner approved by the Agency and consistent with its requirements for solid waste disposal as detailed in Waste Management: Solid Waste.*

18. *To ensure proper operation of all treatment facilities, a qualified operator or other designated individual shall attend all wastewater and sewage operations at such times as the Agency may designate. The Agency must approve the training program and qualifications of such an operator or individual.*

Sampling and Records

19. *The procedures for effluent sampling and analysis shall be in accordance with the latest edition of* Standard Methods for the Examination of Water and Wastewater *(American Public Health Association, 1974).*

20. *During periods of effluent discharge, composite samples shall be taken and analysed daily or as otherwise specified by the Agency for BOD and suspended solids to ensure that the specified standards are not being violated. Referee samples shall be taken at times specified by the Agency and analysed by personnel approved by the Agency. The results shall be incorporated into the plant records.*

21. *The Company shall conduct additional tests, such as fecal coliform tests, chlorine residual tests (when chlorine is used as a disinfectant in the effluent stream), and nutrient, chemical oxygen demand (COD), total organic carbon (TOC), and other tests, as the Agency may require to measure the impact of the effluent on the receiving environment.*

22. *If an effluent is discharged directly or indirectly into any stream, the Company shall sample the water both above and below the discharge point. These samples shall be taken at the same time as effluent samples, or as otherwise directed by the Agency, and they shall be analysed for BOD, suspended solids, total coliforms, chlorine residual and other parameters, as the Agency may specify. The results shall be incorporated into the*

plant records. Sampling points shall be established as outlined in the chapter on Fish or as otherwise directed by the Agency.

23. *For both composite and grab samples taken at wastewater treatment sites, the arithmetic mean for any consecutive 30-day period should not exceed the limits specified; in accounting for minor disturbance to plant operations, the seven-day arithmetic mean shall not exceed 150 percent of the limits specified. If the effluent does not meet these limits, the treatment system shall be declared deficient, and the Company shall immediately take corrective measures that are acceptable to the Agency.*

24. *Adequate records and reports of the wastewater treatment operation shall be maintained on site in a form approved by the Agency. They shall indicate the characteristics of the raw waste; the amount of waste treated, chemicals used and sludge produced; final deposition of sludge; effluent quality; maintenance done; and characteristics of the receiving environment. During pipeline construction, a copy of all records, duly certified by the operator and camp superintendent, shall be forwarded to the Agency at the end of each month. During operation of the pipeline, these records shall be made available upon request.*

Design Guidelines

The terms and conditions I have outlined above to deal with plans for wastewater management and with effluent standards should provide the basis for the preparation, implementation and assessment of comprehensive measures for the management of wastewater. However, further guidelines may be needed to clarify various details. To assist the Company and the Agency, I include below guidelines taken from Commission Counsel's final argument, revised to accommodate the views of participants, and others.

I must emphasize that the objectives of wastewater treatment will be best met by having a plant design that is appropriate to the type of waste expected from camps and by ensuring that the system is operated well. The quality of operation is of paramount importance because excellence of design cannot fully compensate for a poor operator. A good operator, on the other hand, can often compensate for minor shortcomings in design.

QUALIFIED OPERATOR

25. *A qualified operator for the wastewater and sewage operations shall be on site at all times when construction and related operations exceed 200 man-days at one location; one day a week, with a minimum of two visits per site, when construction and related operations are less than 200 man-days at one location; and as required at permanent facilities on the operating pipeline to perform normal maintenance and repairs, except that there shall be a minimum of two visits a year (one of which shall be in winter) or once every 200 occupied man-days.*

26. *A qualified operator shall have successfully completed a training program approved by the Agency. The operator training program being developed by the Water Pollution Control Directorate, Environmental Protection Service, Department of the Environment, and the guidelines for the classification of treatment facilities and certification of personnel developed by the Committee on Training and Certification, Federation of Associations on the Canadian Environment, should be used in developing a program to train operators for work on the pipeline project. Qualified operators should have a demonstrated knowledge of wastewater treatment processes; wastewater sampling procedures; wastewater tests, such as those for BOD, COD, suspended solids, pH, dissolved oxygen, and chlorine residual; interpretation and application of laboratory results; equipment operations, basic repairs and preventive maintenance; basic public health practices; and safety. In particular, the operator must be able to deal with start-up and upset conditions such as surges and the collapse of biological processes.*

27. *At locations where a full-time qualified operator is not required, one individual shall be designated to ensure the safe and proper functioning of all wastewater and sewage systems. That designated individual shall have a demonstrated knowledge of wastewater sampling procedures; steps to be taken to deal with start-up and upset conditions such as surges and the collapse of biological processes; equipment operations, basic repairs and preventive maintenance; testing and reporting responsibilities; basic public health practices; and safety.*

DESIGN

28. *Before disposal, all wastewater and sewage shall be collected and treated in accordance with detailed site-specific plans prepared by the Company, signed and sealed by a professional engineer and approved by the Agency.*

29. *Each wastewater and sewage treatment system shall be designed to handle maximum possible peak flows and surges, plus 20 percent, to minimize the chances of hydraulic overloading of the system. The use of flow equalization systems shall be mandatory for all mechanical treatment plants. Continuously recording flow meters shall be included at the effluent points of all treatment facilities. Biological treatment plants at facilities that experience wide variations in population should use parallel treatment plants to ensure that organic and hydraulic loading are within the acceptable range for optimum treatment.*

30. *To ensure proper operation of the facility, all treatment plants shall include a laboratory adequately equipped to make the routine influent and effluent analyses.*

31. *All continuous-flow wastewater treatment facilities that depend upon the operation of mechanical equipment shall have temporary emergency storage ponds or tanks with a capacity sufficient for a 10-day flow of untreated effluent.*

Pump facilities to return such stored waste to the treatment facilities shall be provided.

32. *All domestic water and sewage systems used in camps or in permanent facilities shall be evaluated so that practices and equipment may be incorporated to minimize the use of water and thus to reduce the volume of wastewater produced. This evaluation will be particularly important in environmentally sensitive areas and in locations without abundant water.*

These design considerations are based on the use of conventional systems of water supply and sewage collection and they should be applied accordingly. Where the Company uses a system to conserve water, as it is actively encouraged to do, the Agency should give special consideration to proposals for the adjustment of specific effluent quality limits and to the disposal of any special effluents, such as concentrated sludges and grey water.

33. *Sufficient spare parts and equipment shall be stocked in appropriate locations to provide for the timely maintenance of wastewater treatment and disposal systems.*

LAGOONS

34. *Lagoons for wastewater and sewage treatment shall be designed for a minimum retention period of one year under the worst case of infiltrated water conditions and with maximum population, plus 20 percent, to account for unforeseen variations and to ensure, as far as possible, that hydraulic overloading will not occur. The Company shall limit discharge from lagoons during critical periods of the year, such as the period of ice-cover, to ensure compliance with the criteria for the quality of the receiving water.* (See The Physical Environment.)

35. *Lagoons shall include a separate primary cell. The sludge shall be cleaned out of it as often as required for good operation and disposed of in a manner approved by the Agency and consistent with the requirements as specified in* Waste Management: Solid Waste.

36. *All plans for sewage lagoons shall be accompanied by detailed, site-specific, geotechnical and thermal (permafrost) analyses. The materials to be used for waste-impounding embankments, their source, permeability and stability shall be specified. Measures to control seepage shall be described.*

37. *Natural waterbodies shall not be used as lagoons unless the Company can demonstrate the site-specific benefits of such a practice.*

38. *Unless otherwise approved by the Agency, sewage lagoons shall not be located within 1,000 feet of any waterbody that supports fish, that is a source of water supply or that is used by local people for hunting, trapping, fishing or for recreational purposes.*

39. *When submissions are made for the initial authorizations to work, the Company shall submit for approval specific details of the measures that will be taken when each lagoon or wastewater retention pit is to be abandoned. Upon termination of use, lagoon storage facilities shall be maintained for a minimum of one year or until the water quality has sufficiently recovered to permit the discharge of its total contents into the receiving environment. The topography of the lagoon area shall be restored to be compatible with the surrounding terrain and it shall be revegetated. Abandoned lagoons shall be posted.*

INDUSTRIAL WASTE

40. *Wastewater and sewage from non-domestic operations associated with the pipeline shall be discharged into sanitary sewers only if they do not interfere with the treatment process. Subject to site-specific approvals by the Agency, the wastes should comply with the guidelines given below. Industrial effluents shall not be diluted to comply with these maximum levels.*

a) *The temperature of industrial waste discharge shall not disrupt the treatment process or the receiving environment.*

b) *The industrial waste flow shall not exceed twice the designed average daily flow.*

c) *The pH of the industrial waste shall be between 5.5 and 9.5.*

d) *Organic and other industrial waste concentrations shall not overload the treatment system.*

e) *Toxic materials discharged into sanitary sewers shall not exceed the following levels (expressed in mg/l):*

Cadmium	*3*
Chromium	*3*
Copper	*3*
Cyanide as HCN	*2*
Lead	*3*
Mercury	*0.005*
Nickel	*3*
Phenolic compounds	*1*
Zinc	*3*

Pretreatment to reduce toxic materials to this level will result in sludges, the disposal of which must be described to and approved by the Agency.

f) *Flammable or explosive materials shall not be discharged into sanitary sewer systems but shall be contained and treated as hazardous materials.*

g) *Animal or vegetable fats or oils shall be limited to 150 mg/l; mineral oil effluent levels shall not exceed 15 mg/l.*

h) *Substances emitting hazardous or noxious gases, such as hydrogen sulphide, carbon monoxide and ammonia, shall not be discharged into the sanitary system.*

i) *Wastes containing dissolved salts in excess of 1,500 mg/l shall be pretreated before discharge.*

j) The discharge of radioactive materials into sanitary sewer systems shall be prohibited.

Solid Waste

The particular nature of both the proposed pipeline project and the northern environment make it difficult to use a standard approach to meet objectives for the management of solid wastes, such as domestic garbage, and industrial non-combustible refuse. Here again, permafrost, low temperature and remoteness severely limit and, in many cases, preclude the use of conventional southern techniques for the handling and disposal of solid waste.

During the construction of the pipeline, large volumes of various kinds of solid waste will be produced during a short period from centres of activity that are spread over a vast area. Wildlife, particularly bears, foxes and rodents, will be attracted to the organic waste, unless it is properly handled and treated. The disposal of excavated soil and rock will also pose special problems. Much of it will have high ice content, thereby inducing erosion and siltation.

The pipeline companies have said that combustible wastes from camps and facilities will be incinerated and that non-combustible wastes will be stockpiled until they can be taken to previously designated areas or can be buried. In areas without permafrost, the companies have said that they will use sanitary landfill. Scrap metal and machinery will be stockpiled in designated areas approved by the Agency or will be returned to the South. Site-specific details for this plan are lacking, and the need for the overall plan that I have recommended is obvious. However, of all the problems related to solid wastes, the attraction of wildlife to domestic waste is, in my opinion, the most important. It is a common problem throughout the North and the South, and the only sure solution to it seems to be incineration.

I commend to government, the Agency and the Company the following set of guidelines relating to all aspects of solid waste management.

Waste Guidelines

WASTE HANDLING: GENERAL

41. *The Company shall adhere to the* Code of Good Practice for Handling Solid Waste at Federal Establishments *(Environmental Protection Service, Department of the Environment), unless it can demonstrate to the Agency that other practices are preferable.*

42. *All domestic solid waste produced along the right-of-way or anywhere away from a camp or permanent facility shall be incinerated daily on location or stored in tight, animal-proof containers for regular shipment to the nearest approved disposal facility.*

43. *Scrap metal, oil drums, discarded equipment and other non-flammable wastes shall be stored temporarily in designated areas. The volume of these wastes shall be reduced by compaction, and the material shall be transported to previously designated and approved disposal or storage sites, unless the Company can demonstrate that other methods of handling them are preferable.*

44. *Sludges from sewage or from the treatment of water shall be handled at each location according to methods developed by the Company and approved by the Agency. The preferred method of disposal is incineration.*

INCINERATION

45. *All combustible wastes shall be incinerated in an approved incinerator, unless the Company can demonstrate, on a site-specific basis, that other means of disposing of these wastes are preferable and will not attract wildlife.*

46. *Open incineration shall be prohibited except with prior authorization of the Agency.*

47. *Unless otherwise approved by the Agency, emissions from incinerators shall meet the standards prescribed in* Air Pollution Emissions and Control Technology, Packaged Incinerators *(McColgan, 1976).*

DISPOSAL SITES

48. *To avoid nuisance and the contamination of streams, lakes or groundwater, solid waste disposal sites shall be located at least 1,000 feet away from watercourses, human settlements or camp sites, unless otherwise approved by the Agency.*

49. *Solid waste disposal sites shall be managed in accordance with the* Code of Good Practice on Dump Closing or Conversion to Sanitary Landfill at Federal Establishments *(Environmental Protection Service, Department of the Environment), unless the Company can demonstrate to the satisfaction of the Agency that other practices are preferable.*

50. *If borrow pits are to be later used as solid waste disposal sites, they must be so described on the application to use materials from them and shall be approved as such by the Agency.*

51. *Hazardous or toxic wastes, as defined in Management of Fuels and Hazardous Substances, shall be excluded from normal landfills, unless specifically approved by the Agency.*

52. *Storage areas and disposal sites shall be adequately fenced to prevent or restrict, so far as practicable, access by scavengers, such as bears, foxes, wolves and wolverines, and to contain wind-blown rubbish.*

53. *Upon completion of disposal operations at a particular site, the Company shall grade and revegetate the area in keeping with local topography and drainage characteristics, and it shall post permanent signs to indicate the extent of the abandoned site and its dates of use.*

WASTE DISPOSAL: CLEARING AND EXCAVATED MATERIALS

54. *Trees and shrubs made waste by clearing or cutting shall be burned or chipped.* (See Terrain Considerations.)

55. *An undisturbed area of natural vegetation at least 300 feet wide shall be left between any disposal site that contains waste soil or excavated material and any waterbody or public right-of-way.*

56. *Waste soil, rock and other materials resulting from construction, operation or maintenance activities shall not be deposited in any waterbody, ice-covered or not, unless specifically approved by the Agency.*

57. *Waste soil from the pipeline trench or other excavations, stumps and other excavated residue should be deposited in designated borrow pits. Waste soil may be spread over the right-of-way or other approved sites, if the Company can demonstrate that this means of disposal will not cause siltation of adjacent waterbodies or interefere with natural drainage, local vegetation or any local program of revegetation. To reduce the risk of erosion and siltation, the waste excavated material shall be spread out in layers not greater than six inches thick and on slopes not greater than three degrees, unless otherwise approved by the Agency.*

58. *Small amounts of waste organic material, such as peat, may be spread on cleared areas, provided it is spread in layers not exceeding six inches thick and is covered with soil or rendered harmless as a fire hazard in some other way approved by the Agency.*

59. *If the amount of waste soil exceeds the capacity of the designated borrow pits and of the right-of-way, the soil may be disposed of in spoil mounds. The Company shall prepare plans for spoil mounds on a site-specific basis and include such details as clearing and stripping of topsoil at the site; topography and drainage before and after disposal occurs; nature of the substrata; properties of the soils or other excavated material to be disposed of at the site; height, side slopes and drainage features of the spoil mound; and measures for rehabilitation of the area, including grading and revegetation.*

60. *Disposal of unstable, ice-rich excavated material shall be completed before it has deteriorated by thawing.*

61. *Unstable, ice-rich excavated material shall be disposed of only in designated borrow pits or as otherwise approved by the Agency. The rehabilitation and revegetation of designated borrow pits shall be carried out in such a way that the areas will be stabilized.*

Hazardous and Toxic Wastes

I heard evidence about the problems of handling, storing, transporting and disposing of hazardous and toxic substances. In the chapter entitled Management of Fuels and Hazardous Substances, which contains a full definition of these substances, I discuss specific aspects of these problems. In this section, I want to cover the problems of disposing of these wastes.

Procedures

No comprehensive approach to the disposal of such wastes was presented to the Inquiry. The problem involves a wide variety of waste products and many special procedures and approvals. The Environmental Protection Service has prepared a comprehensive description of hazardous and toxic wastes, and I recommend its use in disposing of such wastes produced by activities related to the proposed pipeline.

62. *All hazardous and toxic wastes associated with the project shall be handled in compliance with the* Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments *(Environmental Protection Service, Department of the Environment, 1977).*

63. *Substances used on the project shall be selected, so far as practicable, according to their least toxicity and persistence of their waste products in the living environment.*

64. *Hazardous and toxic wastes shall be listed and especially noted in the overall and site-specific plans. Each application to the Agency for a permit or approval for any purpose shall specify the use of any or all hazardous and toxic wastes associated with the activities included in the application. Information will include details such as the name, properties and use of each substance; the volume or weight of waste; the toxicity of each substance (if known); the proposed method of packaging, transporting, transforming and stowing of waste; and the proposed method of disposal.*

65. *Radioactive materials shall be handled, stored, transported and disposed of according to the latest government regulations and according to specific plans developed by the Company and approved by the Agency.*