

**REPORT ON A PUBLIC HEARING
RESPECTING THE PROPOSED
GOOD HOPE HOLDING COMPANY LTD.
WASTEWATER TREATMENT LAGOON
R.M. OF PORTAGE LA PRAIRIE**

**MANITOBA CLEAN ENVIRONMENT COMMISSION
OCTOBER, 1992**

PREFACE

This report contains a summation of the evidence presented at the public hearings convened by the Manitoba Clean Environment Commission to hear evidence on a license application submitted by the Manitoba Water Services Board on behalf of the Good Hope Holding Company Ltd. The application was for the purpose of establishing a wastewater treatment facility at the Good Hope Colony in the Rural Municipality of Portage La Prairie.

A detailed account of the evidence presented before the Commission is contained in the Verbatim Transcript of the hearing and is available for review at the offices of the Clean Environment Commission and at designated Public Registry locations. A list of the individuals and organizations who participated in the hearing process, along with a list of the Exhibits filed, is included in this report as Appendix "A" and Appendix "B" respectively.

READERS NOTE

Questions and comments related to specific evidence have been placed in context, and appear in *Italics*.

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THE CLEAN ENVIRONMENT COMMISSION

Under The Environment Act (1988) the Clean Environment Commission provides a process for the public to participate in the environmental decision making process in Manitoba. The Commission also provides the Environment Minister with advice and recommendations concerning environmental issues and licensing matters.

Commission membership includes a full-time Chairperson and part-time Commissioners appointed by Order in Council. Members come from a wide variety of occupations and reside in different regions of the province.

THE PUBLIC HEARING PROCESS

Public participation in Manitoba's environmental decision-making process is in part facilitated through the Clean Environment Commission hearing process. The Commission conducts these hearings according to procedures that have been developed to encourage and facilitate public involvement.

The Commission strives to ensure that the evidence and opinions of all participants is treated fairly and with due respect and consideration.

**MANITOBA WATER SERVICES BOARD/GOOD HOPE HOLDING COMPANY LTD.
WASTEWATER TREATMENT LAGOON PROPOSAL**

BACKGROUND

The Good Hope Holding Company Ltd. (Good Hope Colony) is a multi-family diversified agricultural land base about 7 kilometers southwest of Portage La Prairie in the Rural Municipality of Portage La Prairie (**Figure 1**). The Colony has existed at this location since 1979, with the Colony officially established in 1988. Although it currently includes approximately 80 residents, the Colony could ultimately have a maximum of 125 residents.

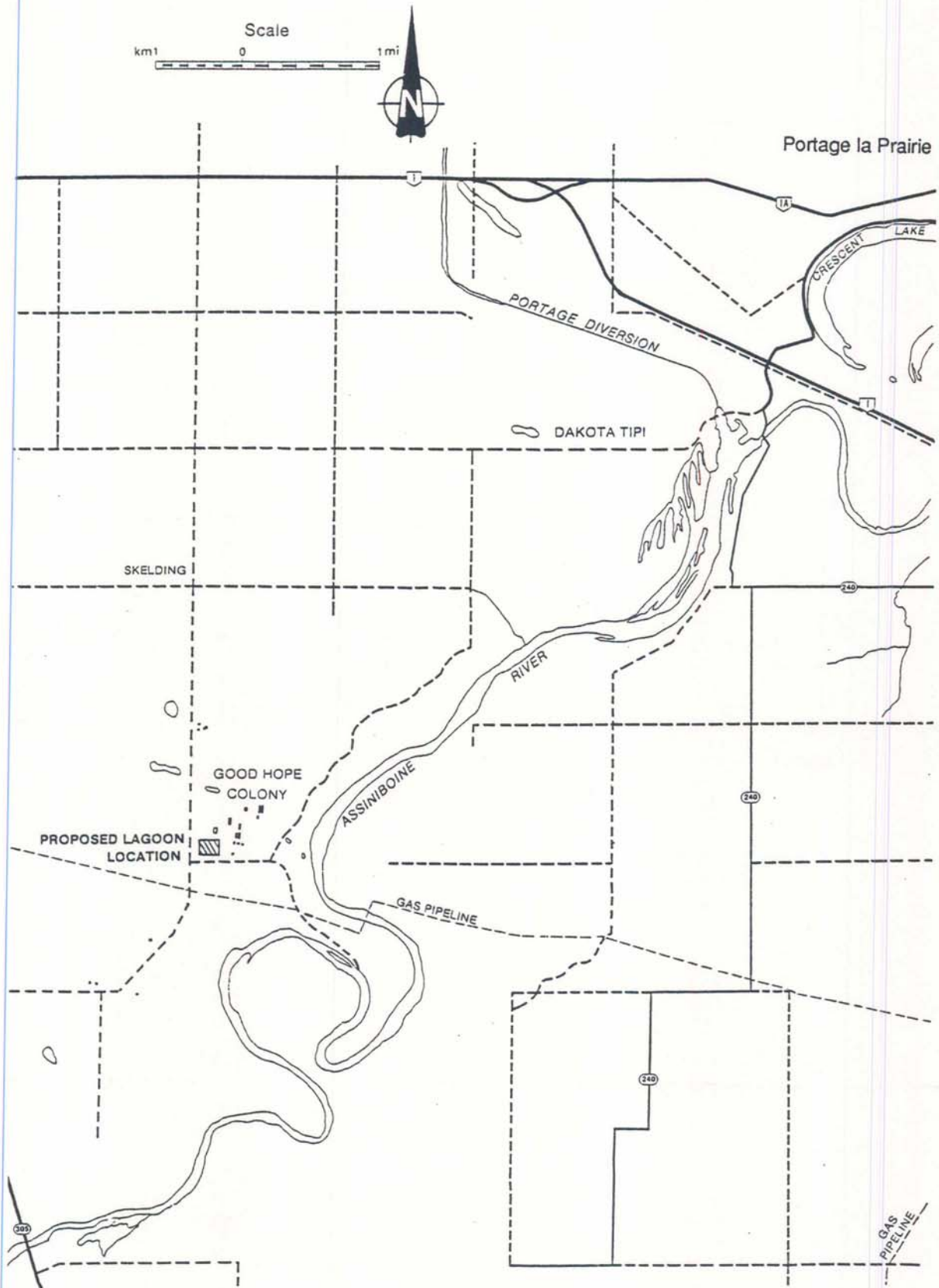
The Colony requested that the Manitoba Water Services Board provide engineering and financial assistance in preparing a report to Manitoba Environment for the purpose of licensing their existing domestic sewage treatment facilities. As the existing facility was not a conventional system and could not be licensed, the Colony was advised by the Manitoba Water Services Board that the facility would have to be replaced with a conventional system.

The existing residential system consists of septic tanks from which the effluent is pumped to a 40,000 gallon storage tank. The contents of the storage tank are periodically spread onto adjacent fields. The majority of the land held by the Colony and in particular that land in proximity of the settlement is identified by the Province as a Ground Water Pollution Hazard Area with sandy soils and a high water table.

COMMISSION TERMS OF REFERENCE

In a letter dated April 15, 1992 the Minister of Environment requested that the Clean Environment Commission convene a public hearing to review the proposal, filed by the Manitoba Water Services Board on behalf of the Good Hope Holding Company, for licensing under The Environment Act to permit the construction and operation of a two celled wastewater treatment lagoon system to service the existing Good Hope Colony farm site in the Rural Municipality of Portage la Prairie.

**FIGURE 1
(Site Location)**



HEARING PROCESS

The hearing, scheduled for June 29, 1992, was advertised in The Winnipeg Free Press, The Portage Herald Leader, and The Portage Daily. The hearing took place in the Westward Village Inn, Portage La Prairie, Manitoba. It commenced at 7:00 P.M. and concluded at 11:00 P.M. on the same date.

Commission panel members included Ms Donna Plant and Dr. David Woytowich, with Mr. Dale Stewart, serving in the capacity of Chairman.

MANITOBA WATER SERVICES BOARD PRESENTATION

Ms Stella Fedeniuk, P. Eng. outlined the Manitoba Water Services Board proposal for the wastewater treatment lagoon. She was assisted by Mr. Kurt Simonsen P. Eng. representing Dillon Engineering Consultants Ltd.

Existing Wastewater Handling System

Ms Fedeniuk indicated that the Colony's wastewater handling system currently consists of individual septic tanks and pumps for each housing unit. Effluent from these septic tanks is pumped into a storage tank from which it is then pumped out onto an adjacent field. The principal problem with the existing system is the impact upon the aquifer of inadequately treated wastewater that is applied to a sandy soil. The aquifer in the immediate area is utilized as a domestic water source by both the Good Hope Colony and surrounding residents. Specific problems include:

- The existing system is not considered a conventional wastewater treatment system;
- The condition of the existing storage tank is unknown;
- There is inadequate treatment of effluent prior to ultimate disposal; and
- The high water table and sandy soil conditions set the stage for potential pollution problems in a ground water sensitive area.

Wastewater Treatment Options Considered

A number of possible solutions to deal with the existing problems were examined. They include:

- Using the existing system and incorporating irrigation points to recirculate ground water within the plume area;
- Hauling the wastewater from the Colony to a treatment facility;
- Installing a package sewage treatment plant facility;
- Construction of a two-cell sewage treatment lagoon; or
- Installation of a combination facility including a package treatment facility and a sewage lagoon.

The option selected by the Water Services Board to be the most practical and cost effective, and the one which would best mitigate environmental impacts, was the two-cell lagoon system.

Lagoon Location

A number of problems were encountered in locating a possible lagoon site for the Good Hope Colony as most of the land owned by the Colony, and the land upon which the settlement is located, is within a ground water sensitive area. Although some of the Colony property is outside the ground water sensitive area, it is located some distance from the Colony. The costs associated with the construction and operation of pipelines and lift stations to transport wastewater off the groundwater sensitive area was considered to be prohibitive.

The advantages of the chosen site for the lagoon include:

- Close proximity and easily accessible to the Colony;
- The operation can be easily monitored;
- Lift stations and a long force main is not required;
- Cost effective construction and operation; and
- The site would meet Manitoba Environment's distance guideline for odours of at least 300 meters from the nearest residence.

The principal disadvantages of the chosen site were identified as:

- Located within a ground water sensitive area;
- High water table in the area;
- Some odour nuisance might be experienced in the spring; and
- Poor "on site" construction material for the lagoon.

Proposed Good Hope Colony Wastewater Treatment System

In developing the proposal for the Good Hope Colony wastewater treatment system, the various problems, concerns, and requirements specific to this site were addressed and summarized as follows.

The land requirement for the proposed lagoon is approximately 1.5 hectares, representing approximately 0.1 percent of the total land owned by the Colony.

Lagoon site problems are a major issue because of groundwater sensitivity. In siting the lagoon, only two options could be considered - construction of the lagoon in excess of 5 kilometers from the Colony settlement to be outside the groundwater sensitive area, or construction of the lagoon on the same quarter section as the settlement. High development and operating costs associated with a lagoon located some distance from the colony dictated the selection of the site close to the Colony.

Construction of the lagoon in a ground water sensitive area remains a concern with the public. Since it would be very easy to contaminate individual water supplies with unchecked disposal practices, adequate safeguards and monitoring would be required in the development and the operation of the lagoon. The Manitoba Water Services Board representative suggested that proper construction materials and techniques would mitigate potential seepage problems. Groundwater monitoring wells could be installed around the lagoon to monitor possible seepage effects on water quality. To assist in the location of these wells, testing could be done to determine the direction of the groundwater flows in the area.

Seepage problems would be minimized by constructing the lagoon with a lining depth of 1 meter to ensure a maximum permeability of 1×10^{-7} cm/sec (or equivalent) in accordance with Manitoba Environment's guidelines for lagoon construction. The maximum seepage out of the

lagoon based upon design permeability of the liner would be less than 5% of the total flow entering the lagoon. Because of the lack of suitable materials on site, and the sandy soil conditions underlying the proposed site, a bentonite clay liner had been specified. Bentonite was identified as relatively inexpensive and easy to apply. The commercially acquired bentonite clay, 12% by weight - or greater, would be mixed with in-situ material until the desired consistency was achieved for application and compaction. Although a one meter thick liner has been identified, the actual depth to which this material would be applied would depend on the permeability limits achieved. The lining thickness would be determined by the engineering consultants, Dillon Engineering Consultants Ltd., subject to approval by Manitoba Environment.

Other environmental problems include possible groundwater contamination because of the sandy soil conditions and the high water table. Groundwater observation wells installed around the lagoon would play an important role in monitoring the facility to determine any impact from seepage.

The potential odour problems caused by the lagoon have been addressed by siting the lagoon so that prevailing winds would not be blowing in the direction of the Colony. The lagoon would be located at least 300 meters from the nearest residence.

Effluent disposal would be accomplished through application to lands owned by the Colony. Initially, the Colony would be transporting and spreading effluent by means of a tank truck. It was recognized that the effluent was only marginally acceptable for land application without undergoing some form of conditioning. It was indicated that the effluent would be checked prior to land application to determine if effluent conditioning (calcium salt, or dilution water) was required. A piped irrigation system would be considered in the future. The effluent would have to meet all guidelines and limits specified in the license.

Effluent would only be applied to actively growing crops under regulated conditions. Monitoring would ensure that soils were not overloaded and that metals were not present. Application rates would be low enough to encourage evaporation and plant up-take of the effluent. Application would take place only between May 15 and November 15 (subject to the effluent meeting the quality and suitability requirements), and done in such a manner as to avoid wind drifting of the effluent. Buffer zones along municipal roadways, residences, major drainage ditches, and surface waterways would be observed.

In terms of design parameters, the Primary Cell would be sized so that a biochemical oxygen demand (BOD) of 56 kilograms per hectare would not be exceeded at a maximum population of 140 residents. Storage in both the primary and secondary cells would exceed 200 days detention.

CONCLUDING REMARKS

The Water Services Board representative stressed that in view of the nature of the existing wastewater treatment facilities at the Good Hope Colony, it was important that the necessary steps be taken to improve the situation. Ms Fedeniuk stated that a lagoon would be a practical and cost-effective means of handling the domestic wastes of the Colony while also mitigating potential pollution problems associated with present disposal methods.

The Board representative recommended that the Good Hope Holding Company Ltd. be granted a license to construct a domestic wastewater lagoon and effluent irrigation system.

QUESTIONS RELATED TO THE PROPOSAL

Responding to a question on the proponent's knowledge of a map identifying the "nitrate sensitive" areas in the province, the Board representative responded that she was not aware of the map but would welcome access to it. However, the Board representative indicated that the proposed rate of effluent application would not cause contamination of the groundwater source because of the combination of substantial evapo-transpiration and a large percentage of the effluent being taken up by the root systems of plants.

The Board representative explained that the rationale for the proposed size of the primary lagoon of 2,964 m² of surface area was based upon projected Biological Oxygen Demand (BOD). The possibility of extraneous water flow entering the system and the lagoon were estimated to be minimal due to the low pressure system design and the use of polyethylene pipes.

In response to a question as to the number of septic tanks that would continue to operate after construction of the proposed lagoon, a representative of the Good Hope Colony indicated that ten septic tanks would be in operation. Responding to a question as to the relationship between the

continuing septic tank operation and the proposed new lagoon system, the Board indicated that the sludge from the remaining septic tanks would be hauled by truck to the primary cell of the lagoon.

In response to a question as to the possibility of overloading the system because of sludge introduced from the septic tanks, the Board indicated that the BOD loading from these tanks would pose no problem in the operation of the lagoon.

Responding to a question on the importance of algae as a key component to the functioning of sewage lagoons, the Board member agreed that algae was important in the production of oxygen utilized by micro-organisms in a primary cell. This would be required for decomposition of waste organic matter and to reduce potential odour casing compounds. The Board representative explained that odour build up occurred during winter months when the lagoons are capped with ice. Any possible odour problems would only occur in the spring during ice break-up and might be noticeable for only 2 or 3 weeks. The Board further indicated that because of the proposed site location, the prevailing winds and the distance from residences, they did not anticipate odour to be a problem.

In response to a further question on odour problems from lagoons, the Board representative indicated that the Brandon lagoon complex should not be used as an example for comparison purposes because it was a system dealing with complex wastes from a large city. By comparison, the Good Hope lagoon would be handling typically domestic wastewater from a small community farm site.

Responding to questions on problems associated with bentonite clay, the Board representative indicated that a number of varieties of clay existed, but the particular clay variety proposed would be suitable for the lagoon construction. Responding to additional question respecting the clay, Ms Fedeniuk indicated that no bentonite deterioration was anticipated due to salt contact, and that changes in the water table were not expected to result in a drying of the clay because of the liquid levels within the lagoon.

In response to a question on the appropriateness of planned effluent disposal on vegetation growing on the type of soil found in the area, the Board representative indicated that as long as the treated effluent from the second cell met the guidelines identified by Manitoba Environment, no problems were anticipated. The disposal of sludge would not be required for 5 to 20 years and a suitable site would have to be identified at that time.

Clarification was requested as to how the thickness of the soil to be mixed with the bentonite clay was determined. The Board representative indicated that the thickness would be determined by the type of soil and the target permeability. The consultant designated to manage the construction of the lagoon indicated that soil tests were currently underway to determine the thickness and the percent of bentonite clay that would be required. Responding to a concern that a clay liner would not eliminate seepage, the Board advised that the function of the liner was not to eliminate, but to "minimize" seepage within the guidelines set by Manitoba Environment.

Responding to a question as to the direction of ground water flow for the proposed site, the Board member indicated that it was assumed to be flowing in the direction of the Colony, but that this would have to be confirmed by a hydrogeologist.

In response to questions respecting the contamination of groundwater, as discovered through the use of monitoring wells, the Board representative suggested that the installation of withdrawal wells around the lagoon could enable the removal of contaminated water.

Residues from household cleaning agents, agricultural chemicals, the flushing of containers and spraying equipment and the possibility of this wastewater finding its way into the lagoon or into the ground water was cited as a concern. In response, the Board representative suggested that any portion of the system that was intended for residual chemical collection would not be part of the domestic wastewater system.

The practices employed by the Colony in the burying of wastes from poultry eviscerating operations and other animal waste accumulated during slaughtering and processing were identified as concerns requiring consideration. The Board witness responded that this particular type of waste was not intended to be dealt with by the proposed wastewater treatment system.

As the design had basically utilized well driller reports and had not involved a detailed soils investigation, the requirement for geotechnical assessment of the ground water was identified. Also, as the proposed lagoon was in a ground water sensitive area with a high water table, concerns were raised as to the depth of the lagoon and the required thickness of the liner. Responding to this concern, the Board representative indicated that depth of excavation would be dictated by the site conditions. If the high water table made it necessary to raise the base of the lagoon, the lagoon would be elevated using materials from a borrow pit.

Clarification was sought as to why a wastewater treatment plant was not being proposed for the Good Hope Colony. The Board representative responded that a two-celled lagoon was recommended largely due to the cost of a plant (estimated at \$100,000 compared to \$70,000 for a lagoon). In addition, the Board suggested that package treatment plants were expensive to operate, easily bypassed in the event of a problem, and rarely provided a back-up system for use in the event of system failure.

There was a concern expressed that in the event of a leak from the lagoon, the impacts could not be estimated due to the absence of hydrogeological information. The board member responded that testing could be done to establish flow patterns.

Questions were raised as to the details of effluent irrigation. The Board representative reported that details had not been worked out and would be provided by the consultants as part of the operations and maintenance manual requirements. Responding to a question on whether the concept of co-disposal of domestic and livestock effluent was required, the Board representative felt that it was not necessary at this time, although blending could be considered if required to achieve the desired chemical characteristics of the effluent.

INDIVIDUAL AND GROUP PRESENTATIONS

J. McLean and D. McInnis, City of Portage La Prairie

The presentation made by the City of Portage la Prairie dealt with the potential pollutant load from the proposed Good Hope Holding Company lagoon on the Assiniboine River and surrounding lands.

Mr. McLean pointed out that the City's diversified economic base includes a major food processing sector which relies heavily on the water quality of the Assiniboine River. The water treated at the City's water treatment plant attracts the food processing industries to the region. He further indicated that the City of Portage la Prairie is planing a major expansion of the wastewater treatment facility. He acknowledged that the Good Hope Colony had demonstrated similar "environmental responsibility" by the submission of the Colony's proposal for a wastewater treatment and disposal program.

Mr. McLean stressed that the current Good Hope Colony treatment process required upgrading in an urgent manner, and encouraged the Clean Environment Commission to help this development to proceed in a timely fashion.

Mr. McInnis offered the following specific comments on the lagoon proposal:

- 1) As the area designated for disposal of the lagoon effluent is on sandy soil, he indicated that a more stringent monitoring program was required. He suggested that a process similar to that required by the City of Portage La Prairie for the filing of a post project report on the application rates of wastewater sludge would be appropriate. He suggested that this should also include laboratory results of a soil sampling program. Mr McInnis asserted that unless a detailed program is carried out, the public would perceive that application rates were not being adhered to;
- 2) The average volume of wastewater based upon 190 liters per person per day as identified in the Board's submission should be increased to 270 liters per person per day and the design modified accordingly;
- 3) Mr. McInnis suggested that the more environmentally suitable site, in terms of clay composition, should not be dismissed on the basis of preliminary cost estimates. He recommended that a further financial analysis should be undertaken before the option was ruled out;
- 4) It was pointed out that a requirement to mix the domestic effluent with livestock waste to condition the effluent prior to disposal involved a technical analysis. The City's representative pointed out that the Colony does not have direct access to laboratory facilities;
- 5) As the proposed lagoon site lies within a "ground water sensitive area", ground water monitoring wells should be installed. The results should be included in an effluent application program report.

R. Dalmyn, Private Citizen

Mr. Dalmyn advised that his submission was titled "Real Facts About Cold Climate Sewage Lagoons". He suggested that Manitoba Environment was not up-to-date on sewage treatment technology and he read excerpts from a 1987 study which he felt supported this position. He also referenced the 1986-87 Annual Report of the Clean Environment Commission which reported that a number of sewage lagoons were discharged because they were "too full". Mr. Dalmyn identified a number of locations in Manitoba where he felt problems existed with sewage lagoons.

He further stated that in regions with moderate or warm climates, lagoons are considered to be the cheapest but also the least effective sewage treatment systems. Mr. Dalmyn advised that a study was under way in Ontario dealing with lagoon upgrading to sewage treatment plants and that the results were encouraging.

He emphasized that the Manitoba Water Services Board report on the proposed Good Hope Colony sewage lagoon identified the danger of nitrates seeping into the ground water. He indicated that installing a bentonite clay liner would be difficult and felt that it would be subject to cracking under the extreme climatic conditions present in Manitoba.

Mr. Dalmyn encouraged the Clean Environment Commission to recommend to the Minister of Manitoba Environment that this proposal be turned down.

H. Syrett, Private Citizen

Mr. Syrett advised that his presentation was not based upon technical knowledge, and that it did not deal with technical aspects of sewage lagoons. Rather, he advised that his concerns were primarily related to the process by which proposals, such as the one under consideration, were reviewed.

He suggested that "we" had not yet learned that "what is useful in the environment will change as our technology changes". He further stated that the issue of Good Hope Colony sewage should not be looked at in isolation, but that the larger problem is "our understanding of ecological principles". Mr Syrett suggested that our ability to predict ecological consequences should be reconsidered.

W. Kuzyk, Private Citizen

Mr. Kuzyk advised that the purpose of his presentation was to inform the citizens surrounding the Good Hope Colony of the problems at Oakville, so that they might be able to avoid the aggravation the Oakville Concerned Citizens for the Environment have experienced.

His objection to the Good Hope Colony lagoon was based upon the development of the facility on a ground water sensitive area, which was a similar concern as that for the Norquay lagoon. Mr. Kuzyk indicated that he currently resides beside the Norquay lagoon, and believes the lagoon is leaking.

He advised that the Oakville group had gone through a set of hearings, similar to those being held respecting the Good Hope Colony proposal, dealing with the Norquay Colony sewage lagoon in 1989.

He further believed that the construction of the lagoon had not been monitored, the construction crew had encountered problems due to sand and water, and that the bottom of the lagoon was never tested for permeability before the facility was put into operation. He reported that Manitoba Environment indicated that further testing was necessary.

Based upon this experience, Mr. Kuzyk encouraged the citizens surrounding the Good Hope Colony to reject the sewage lagoon proposal in its entirety.

W. Paton, Private Citizen

Dr. Paton advised that he was a professor of Botany and Biology at Brandon University and that he had been involved in a number of issues dealing with water quality and air quality. He stated that his purpose in appearing before the Commission was to ensure that the best treatment solution was chosen. Dr. Paton indicated that in preparing his submission he had reviewed the literature on the operation of sewage lagoon systems, focusing primarily on the biology of the process. He identified what he thought to be serious concerns with respect to the operation of these systems in cold climates.

According to Dr. Paton, most of the published literature is associated with lagoon systems in the Mediterranean, semi-tropical and tropical environments. He asserted that when lagoons are located further north, one must consider whether they function as intended. He stated that he was

unable to locate any scientific literature dealing with the performance of lagoons in the prairie provinces and, therefore, did not know if the biological system operated as intended.

He further indicated that the 56 kilogram of BOD per hectare per day would be significantly less for lagoons operating in cool climates according to the Water Pollution Control Federation and, therefore, questioned the validity of its use in calculating the size requirement for lagoons in Manitoba.

Dr. Paton indicated that he felt the issue should be to define more clearly what should be intended by a "more acceptable waste-water handling and treatment system" as stated in of the proposal. In order to assure protection of quality ground water in this ground water sensitive area, he suggested that perhaps the best system might not be the proposed lagoon. This assertion seemed consistent with his recollection of his review of soil surveys in Manitoba and the list of "do's and don'ts" which indicated that sewage lagoons should not be built on this kind of terrain.

Dr. Paton stated as well, his concern about cracks in the bentonite lining, and the resulting reduction of the optimum operating volume of the lagoon, and the dramatic impact this would have on the operating efficiency of the lagoon. He also cited examples where very thick layers of clay in a Regina disposal site had cracked and the ground water had been contaminated. He felt that the direction of flow of the underground water was a critical factor to be determined.

Since so many "accidents" could occur, he indicated that the risks should be determined in advance of any decisions on licensing.

Dr. Paton also indicated his concern over the utilization of the effluent on agricultural land and the importance of adequate monitoring. He suggested that we have much better knowledge today of which lands and crops are the most appropriate for disposal and that barley might be an appropriate crop. He pointed out the danger of disposal in early spring before the plant roots were formed.

Responding to a question as to why the Grace Lake lagoon in The Pas does not function properly, Dr. Paton suggested that he believed to was due to the significant amount of loading that takes place during the winter months which then must be assimilated during the few functional months of the summer.

M. Van Den Bosch, Manitoba Environment

Mr. Van Den Bosch reviewed the responses received by Manitoba Environment as a result of the proposal submission being placed in the Public Registry and circulated to other departments for comment. He reported that the environmental impact of the proposed wastewater treatment and disposal system could be mitigated by the use of appropriate technologies. He suggested that if the proposal received approval, the licence should address the following:

- 1) Organic loading rates on the primary cell;
- 2) Hydraulic storage requirements for the wastewater treatment lagoon based on the disposal of the effluent onto agricultural land;
- 3) Effluent quality limits and disposal periods for effluent application onto agricultural land;
- 4) Requirements relating to the construction of the lagoon facility, including soil criteria, in order to limit seepage;
- 5) Restriction on crops that can be grown on the disposal site and the related cropping practices;
- 6) Buffer zones around the disposal site, if judged to be necessary;
- 7) Ground water monitoring systems, if judged to be necessary; and
- 8) Restricting public access to the lagoon.

In view of current agricultural practices in the area, and the proposal to discharge effluent onto crop land, Mr. Van Den Bosch questioned whether a 200 day storage period could be achieved.

He also suggested that restrictions be applied on the type of wastes entering the collection network, particularly agricultural chemicals. He indicated that a recovery program was available for pesticide residues, and recommended that any left over product be disposed of in accordance with pesticide residue collection procedures.

Responding to questions respecting lagoon failure, and the most frequently observed failure being the integrity of the liner, Mr. Van Den Bosch agreed that the type of bentonite clay used in the construction of the lagoon liner was critical. He stated that although there had been some problems with the application of bentonite clay in the past, current techniques employed to properly incorporate the bentonite were effective. He suggested that the successful application of the clay was found to be related to the competence and the familiarity of the personnel involved in the preparation and installation of the lining.

Responding to the points made that fine ground bentonite is generally more suitable than pit bentonite, and that a proper maintenance program at the end of the first year is necessary, Mr. Van Den Bosch stated that he wouldn't disagree. He elaborated that an annual inspection would be suggested if the bentonite was exposed, a concern in view of wind erosion problems. He indicated that it is because of this that some designs call for the lining to be incorporated into the dike as opposed to dealing with it on the surface. He indicated that he preferred to see the lining system protected from surface deterioration.

Mr. Van Den Bosch stated that the problems with the lining due to receding water levels were somewhat overstated.

The risk factor associated with the bentonite clay liner in a ground water sensitive area prompted a request for comments on the thickness of the liner if the hydraulic conductivity of 10^{-8} cm per second was achieved with 12% application by weight of bentonite. Mr. Van Den Bosch advised that other jurisdictions sometimes made allowances for enhanced quality of the lining and therefore reduced the liner thickness. He stated that this was a reasonable approach depending on the method of construction.

DISCUSSION

The primary concern for the system designer with respect to the disposal of wastewater on sandy soil conditions at the Good Hope Colony was that relating to the contamination of the ground water. This was also identified as a concern by hearing participants including the City of Portage La Prairie, residents of the Oakville area, and a scientist from Brandon University.

The geology of the area was described as being 5 - 12 meters of sand overlying clay. Most of the wells in the area are developed as shallow, large diameter bored holes which utilize the sand aquifer. This holds true for the Colony, which utilizes a series of bored holes to obtain their own water supply.

The Colony was established in 1988, has a current population of approximately 80 residents and can expand to 125 residents. The design of the wastewater treatment facilities were based on 140 residents to insure adequate system sizing.

The current waste disposal system consists of a low pressure wastewater collection system employing a series of septic tanks and pumps. The effluent is held in a 40,000 gallon storage tank. At intervals, effluent is discharged to the ground surface, thus introducing partially treated wastewater to the sandy subsoil. Use of this type of a system is a concern as it may lead to the introduction of contaminants to the ground water. As this system is not considered to be a conventional system for the treatment of wastewater, and cannot be licensed by Manitoba Environment, the Manitoba Water Services Board agreed to design a system that would qualify for licensing under The Environment Act, and to assist the Colony through the licence application process.

Although nitrates are introduced to the groundwater through the current domestic wastewater collection and disposal system, wastes from Colony livestock operations are a greater source of nitrate contaminants to the aquifer. The Colony drinking water supply tested in late 1990 contained 4 -5 mg/L nitrate. This is less than the limit of 10 mg/l NO₃ prescribed in the Canadian Drinking Water Guidelines, but is an indication that contamination has reached the aquifer.

Serving as consultants to the Good Hope Holding Co. Ltd., the Manitoba Water Services Board has proposed to construct a two cell wastewater lagoon system that will meet the "Design Objectives for Sewage Lagoons" prescribed by Manitoba Environment. One of the main

considerations is that of meeting the seepage limits which require that a lagoon be lined with material that results in a hydraulic conductivity of less than 1×10^{-7} cm/sec.

The consultants have proposed the use of a bentonite clay liner. Evidence was presented indicating that this is an accepted technology if undertaken under the guidance of reputable and experienced engineers. The Manitoba Water Services Board representative indicated that Dillon Engineering Consultants were taking over the balance of the design of the project, as well as construction supervision. The Dillon project designer indicated that some laboratory work had been done with a mix of local soils and bentonite to determine the percentage and thickness of the mixed layer required to regulate the seepage, and that this work was continuing.

Of as much importance in the design and operation of the system, is the effluent disposal component. It has been proposed to discharge effluent from the lagoon onto agricultural land under control of the Colony. Unless there is an active growing crop that will remove the nutrients, the nitrogen in the effluent will reach the ground water.

Regulating the type of waste that enters the system and monitoring the effluent disposal, the seepage from the lagoon system, and the ground water are important aspects of any decision on licensing.

A number of the speakers at the hearing took exception to the use of wastewater treatment lagoons, the process used for licensing, and in the enforcement of licences. No spokespersons from the rural area close to the Colony appeared before the Commission.

CONCLUSION

The Commission have concerns related to seepage from the lagoon and effluent irrigation on the water quality of the shallow sand aquifer at the location of the Good Hope Colony on Section 7-11-7W. It is felt that a properly designed, constructed and operated system to handle the domestic wastewater from the Colony, consisting of a lined lagoon and discharge to agricultural land with an appropriate growing crop, will mitigate contamination to the local ground water aquifer.

OBSERVATIONS

During the public hearing process, the following general observations were made by the Commission. These observations do not form part of the commission's specific recommendations concerning the license application, however, they are identified as matters of interest and concern that the Commission believes warrant consideration.

- Representations were made to the Commission that information appears to be lacking on sewage lagoon design, construction, and operation in Manitoba. Concerns were also expressed regarding the longevity of biological organisms in cold climate lagoons and in receiving waters. The Commission suggests that this issue might be appropriately addressed by a study on the design, construction and operational guidelines for sewage lagoons. Any such study might best be guided by an advisory steering body made up of appropriate representatives from the scientific community, the public at large, consultants or association representatives, and by representatives of both the provincial and the federal governments. The intent would be to ensure that design requirements and operational guidelines adequately protect the quality of surface and groundwater resources in the province. The Commission feels that some urgency is attached to this need and that it should receive prompt attention.
- Concerns were raised with respect to agriculture and domestic chemical waste disposal processes and, in particular, the cleaning process used by the Colony for chemical containers and chemical application equipment. The Commission feels that this matter requires examination by Manitoba Environment.
- Concerns were raised relating to the management of livestock waste and the disposal of animal by-products resulting from the processing of livestock (including poultry) on the Colony. The Commission feels that the disposal of livestock waste and its impact on ground water resources warrants examination and consideration by Manitoba Environment and other appropriate agencies.

RECOMMENDATIONS

Premise to the licence:

The CEC recommends that Manitoba Environment issue a licence under The Environment Act to the Good Hope Holding Company Ltd. for the construction and operation of a wastewater treatment lagoon on the SW1/4 7-11-7. The design, construction and operation of the lagoon system shall be subject to the following terms and conditions:

- (1) An on-site plan detailing the location of the proposed lagoon in Section 7-11-7W in relation to the contours and the resulting land drainage pattern, potential water courses, location of dwellings, access roads, fields intended for effluent disposal, the location of wells, the soil type (and other appropriate land and physical features) is required and shall be filed with Manitoba Environment.
- (2) An off-site plan covering an area within a radius of 800 meters of the lagoon showing buildings and structures and their use, stream flows, wet and marshy areas and the general slope and direction of ground water movement is required and shall be filed with Manitoba Environment.
- (3) The lining of the lagoon should be designed with a hydraulic conductivity which meets or exceeds Manitoba Environment's guidelines, as specified in the Design Objectives for Standard Sewage Lagoons (April, 1982), to mitigate seepage and insure no additional adverse effects on the quality of the groundwater supply in the site area. The lagoon should also be designed so that there will be no accidental releases of wastes to the Assiniboine River due to major rainfall events and/or failure of the lagoon dykes.
- (4) All phases of construction must be supervised by an engineer or qualified technician and the development certified to be in accordance with the design criteria in order to ensure the integrity of the liner. The liner is to be inspected, approved, and certified by Manitoba Environment prior to operation.

- (5) Detailed inspection and analysis of the liner (following a total withdrawal of effluent) by an engineer or qualified technician is to be performed two years after operation commences and within two year time intervals thereafter. The results of the analysis are to be filed with Manitoba Environment.
- (6) Observation (ground water monitoring) wells shall be provided to establish base line conditions, ground water levels, and the direction of flow of the groundwater and shall include ongoing operational data. The baseline information will be utilized in the preparation of a hydrogeological study to predict the effluent plume and assist in identifying risks associated with effluent movement. Based upon the hydrogeological study, observation wells are to be placed adjacent to the lagoon, the irrigation tracts and at some location along the projected plume in a direction towards the Assiniboine River.
- (7) The effect of expected seepage on the soil, groundwater, and any bodies of water within the path of discharge flow or in the event of a leak, must be mitigated to the satisfaction of Manitoba Environment. The use of appropriate technologies and their respective environmental impacts (risk assessment) should be evaluated or confirmed after the hydrogeological study has been completed.
- (8) Lagoon operating and effluent discharge guidelines shall be required in the licence.
- (9) An extensive monitoring plan is required for the observation wells, operation of the lagoon and for the effluent disposal program and should include the locations and frequency of the tests and reporting mechanism. Biological and chemical analyses are to be included. The effluent is to be checked (conductivity, S.A.R.) prior to land application to ensure that guidelines are being met. A comprehensive record of the filling and withdrawing of the lagoon shall include the date, origin and estimated effluent volumes. All records should be provided to Manitoba Environment on a specified annual schedule.
- (10) An effluent discharge plan will be submitted annually for approval by Manitoba Environment and must include the proposed application rates, areas available for irrigation, timing and frequency of disposal, the type of crops and their use, the method and the equipment to be used for disposal. Only land owned by the Colony is to be used for effluent irrigation. The plan will include testing of the soils to determine rate of application.

- (11) All domestic sewage from the Colony operation is to be directed to the lagoon. Any dilution of the secondary effluent to achieve the desired sodium absorption ratio is to be approved by Manitoba Environment. No chemicals, livestock waste, or hazardous waste are to be discharged into the domestic wastewater stream.
- (12) A procedural (operating) manual, approved by Manitoba Environment, shall be maintained and kept available for the use of those responsible for the ongoing operation of the lagoon system. The manual shall include a contingency plan to deal with physical or mechanical failure, failure of the lagoon to operate according to the design guidelines, or failure of the effluent disposal to achieve the desired effect. The contingency plan shall include procedures for immediate notification to Manitoba Environment of any and all failures.
- (13) Manitoba Environment shall ensure that the on-site plan, the off-site plan, the monitoring plan, liner certification reports and all monitoring and discharge records are made available to the public.

APPENDIX A: LIST OF PARTICIPANTS

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APPENDIX B: LIST OF EXHIBITS

1. Letter, dated April 15, 1992 from **Hon. J. Glen Cummings**, Minister of Environment, Province of Manitoba, to Dale Stewart, Chairman, Manitoba Clean Environment Commission.
2. Sewage Lagoon Proposal for Good Hope Colony Farms Ltd. - Rural Municipality of Portage La Prairie (SW 7-11-7-WPM). Stella Fedeniuk, P. Eng. Design Engineer, Manitoba Water Services Board, Department of Rural Development, Province of Manitoba. Submitted by **Manitoba Water Services Board**.
3. Overhead Transparencies, submitted by the **Manitoba Water Services Board**.
4. Brief, "Clean Environment Commission Hearing: Good Hope Holding Co. Ltd. - Wastewater Treatment Lagoon", submitted by **City of Portage La Prairie**.
5. Brief, "The Real Facts About Cold Climate Sewage Lagoons. June 29/92", submitted by **Ron Dalmyn**.
6. Brief, untitled, submitted by **Harold Syrett**.
7. Brief, "Sewage Lagoon: Do They Work Efficiently in the Manitoba Climate?", submitted by **Bill Paton**.
8. Submission to the Clean Environment Commission at the Public Hearing on June 29, 1992 on the Wastewater Treatment Lagoon with Effluent Disposal on Agricultural Land for the Good Hope Holding Co. Ltd. Submitted by **Manitoba Environment**.