REPORT ON HEARING

CITY OF PORTAGE LA PRAIRIE

SEWAGE SLUDGE DISPOSAL PROJECT

THE CLEAN ENVIRONMENT COMMISSION

JULY 27, 1989

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BACKGROUND

On February 17, 1989, MacLaren Engineers Inc., with the authority of the Council of the City of Portage la Prairie, registered a proposal under the Environment Act for a short term sludge disposal/land application program designed to dispose of sludge accumulated in the south lagoon of the City's wastewater treatment facility by subsurface injection of the liquid sludge into agricultural fields.

The proposal stated that the proposed program is distinct from interim and long term sludge disposal for the City and does not represent a permanent "development".

Early in March the Environment Department advertised its consideration of the licensing of this proposed operation under the Environment Act.

A number of expressions of concern or objection were received by the Environment Department from local citizens, and on April 12, 1989 the Honourable Ed Connery, then Environment Minister, requested the Clean Environment Commission to hold a public hearing on the proposal and to subsequently provide a report and recommendations on this matter.

After giving due notice, and advertising in appropriate newspapers, the Commission convened a hearing in Portage la Prairie at 7:00 p.m., May 29, 1989, and continuing the following day. Commissioners in attendance were Mr. Stan Eagleton, Chairperson; Mr. Maurice Blanchard, Ms. Elizabeth Pawlicki, Mrs. Joan Vestby and Dr. Barrie Webster.

In this report the terms "sludge" and "sewage" are frequently used. Raw sewage is untreated wastewater from domestic and industrial sources. Sludge is the accumulation of solid materials removed from sewage, and is the material regularly pumped out of septic tanks, or more generally is the solid material which settles out from treated wastewater during one of the final treatment steps. Digestion of sludge can be carried out to further reduce undesirable characteristics such as biological oxygen demand, odour and pathogen content. The characteristics of both raw sewage and sludge vary depending on the wastewater source and the treatment process.

PUBLIC PARTICIPATION AND HEARING

The Proposal

Mayor McMillan of Portage la Prairie introduced the team of consultants from MacLaren Engineers Inc. who had developed the proposal and were appointed by the City to present it. These consultants were Mr. Eric Hutchison, a professional engineer and Ms. Ruth Marr, an environmental scientist with a masters degree in plant ecology. In addition the MacLaren

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presentation team included Prof. G. Racz, Head of the Department of Soil Science at the University of Manitoba.

Mr. Hutchison described sludge as a by-product of sewage treatment processes, generated through biological activity and the solid separation involved in the sewage treatment processes. The major constituents of sludge are nitrogen and phosphorous compounds. When withdrawn, sludge is 93% to 99% water. Other components are heavy metals, pathogens (disease carrying organisms), and toxic organic compounds.

The Portage la Prairie sewage treatment system now employs a sludge dewatering system and the sludge produced is hauled to, and disposed of, in a landfill site. This operation is covered by regulations under the Environment Act. The dewatering system has been in operation only since the first of May, 1989. Up till then some sludge was directed to the south cell of the Portage la Prairie wastewater treatment facilities. Raw sewage was last added to the south cell in December of 1988.

Previously the north cell of these facilities was used, since built, as an aerated effluent polishing cell producing some sludge which settled on the bottom. Originally the south cell was utilized as part of the treatment process but since the late '70's it has been used for sludge containment.

In 1988 the City cleaned and refurbished the north cell, removing the sludge which was in part hauled to a landfill site while the remainder was added to the south cell which, as a consequence, has little remaining capacity.

As a part of the overall planned upgrading of the City of Portage la Prairie sewage treatment operation, the planned sludge disposal program is to dispose of sludge in the south cell by subsurface injection into agricultural land. This program is planned to require one or two years for completion, commencing in the fall of 1989. The solid sludge, which exists at the bottom of the south cell will be landfilled in accordance with the regulations under the Environment Act.

A long term plan for disposal of sewage sludge generated by the Portage la Prairie sewage treatment operation is still under consideration and development.

The original proposal documents had estimated the requirement to dispose of only 40 million litres of sludge, rather than 70 million litres, which was the figure presented at the hearings. In response to a question, Mr. Hutchison stated that some raw sewage had been added to the south cell by force of operational or construction circumstances during the past year, and that this would account for a significant part of the increase in quantity.*

*** The Commission was advised by the consultant since the hearing that water from the south cell has been decanted back to the sewage treatment plant, reducing the total volume of sludge to an estimated 40 million litres by Mid-July, 1989.**

PUBLIC PARTICIPATION AND HEARING (continued)

Background on Land Application of Sludge

Ms. Marr stated that land application has become the most common method of sludge disposal in North America and much information is available on impacts, benefits and methodology. Numerous jurisdictions have regulations or guidelines for land application of sludge, including the United States Environmental Protection Agency, Ontario and Alberta. This information was utilized in developing the proposal, and reference was made to Environment Department licenses issued to the City of Winnipeg which has disposed of sewage sludge by land application for a number of years.

Benefits from land application include fertilization of the soil, and a soil conditioning effect which provide a significant economic gain for the farmer whose land receives the sludge. Of general benefit to society is the recovery and beneficial utilization of the sludge rather than taking up more landfill space. Also, land application is often the cheapest disposal alternative.

There are hazards to consider. Pathogens (bacteria, viruses and parasites) may remain in the sludge after the wastewater treatment process. These might lead to contamination of crops, surface water or groundwater. Metals can possibly affect crop plants, and human consumption of crops grown on sludge amended land may be a hazard if proper precautions over sludge characteristics, rate of application of the sludge, monitoring of the soil, and selection of crops grown are not taken. Toxic organics in sludge are a hazard that could lead to groundwater contamination. Possible leaching of nitrates into groundwater is another important consideration.

Sludge contained in the south sewage lagoon cell will be mixed before removal. It will then be drawn directly into tank truck equipment and transported in a completely enclosed and contained manner to farm properties, selected through application of criteria developed for this proposal. At the farm property the tank trucks will unload into temporary storage tanks. Mobile sludge injection equipment (Terri-Gators) will be loaded from storage tanks and travel across the field, cutting a furrow, injecting the sludge, and then turning over the furrowed soil to cover the sludge.

Sludge Characteristics and Application Rates

Sludge quality in the south lagoon was tested for this proposal in August 1988, and retested on May 8, 1989. Results from these analyses were presented by Ms. Marr.

PUBLIC PARTICIPATION AND HEARING (continued)

Composite samples for three depths were taken and analyzed for a number of parameters, including: total solids; volatile total solid content; nutrients; various metals; and trace organic compounds. The sludge was found to be stratified, with a very liquid layer on top, and a solid layer at the bottom.

Total solids is an important parameter because if sludge contains much more than 15% solids it is too thick for sub-surface injection. In August, 1988 the average total solids content was found to be 8.6%.

Volatile total solid content of sludge is an indication of its stability, and is also an indication of the extent of breakdown of products from the wastewater treatment plant. This indicator is used to estimate the decrease of pathogens which occurs when sludge is digested, and to estimate the decrease in odor. Most stabilized sludges average about 40% volatile solids. The average volatile total solids in August, 1988 were found to be about 36%.

Based on the 1988 test results it was concluded that the sludge was acceptable for land application. Test results showed low metals and high nutrients, but because sludge in the lagoon is stratified, concentrations were highly variable within the lagoon.

The addition of raw sewage since August, 1988, caused an increase in volatile total solids by May, 1989 to about 50%. This is still within the range for stabilized sludge, which is between 30% and 60%. Since the addition of raw sludge has stopped it is expected that storage will contribute to further stabilization.

Analysis for toxic organic compounds in the sludge determined that very small quantities of PCBs and DDE (a decomposition product of DDT) were present. Concentrations found were considered to be within reasonable limits for application to soils.

Application rates of sludge to soil should take into account the percentage of solids, the concentration of nutrients and equipment limitations. Application rates from 140,000 liters/hectare to a maximum of 200,000 liters/hectare, the maximum volume that the Terri-Gators can put in the soil in a single pass, are proposed.

It is proposed to use percentage solids as the guide to determine the application rates, with actual application based on the liquid application rate. Sludge containing between 6 and 12% solids would be applied at a volume rate that delivered about 8.4 to 16.8 dry tonnes of sludge per hectare. The percent solids present in the sludge will be a function of how much water is in the lagoon when application begins, and of mixing success. If the total volume of sludge in the lagoon is 40 million liters, then a liquid application rate of 140,000 liters/hectare would be required. For 70 million liters the required liquid application rate would be 200,000 liters/hectare. This rate

PUBLIC PARTICIPATION AND HEARING (continued)

of application would deliver an average of 140 kg of plant available nitrogen per hectare (range of 100-185 kg/hectare) The range of metal concentrations added would be below Ontario and Alberta guidelines.

The amount of land required will depend on the final volume of sludge in the lagoon when the land application program begins. Testing will be conducted at that time to determine the final characteristics of the sludge. As a guide, approximately 140 kg/hectare of plant available nitrogen will be the target the proponent will aim for, but because percent solids is variable in the stratified lagoon, actual application to a particular field will be within the range of 100 to 185 kg/hectare plant available nitrogen.

Site Selection

Site selection criteria were developed by the consultants to identify potential sites. Ms. Marr stated the criteria were based on a Clean Environment Commission Order to the City of Winnipeg as the principle guide, and also drew on criteria used in other jurisdictions. The three main categories of criteria were soil characteristics, landscape features and groundwater conditions. A copy of the criteria used is appended to this report.

Soil criteria included soil type, phosphorous and nitrate nitrogen concentrations and soil pH. Landscape criteria included slope of the land, distance from non-farm occupied residences, distance from surface water and whether the land is subject to flooding. Groundwater criteria were based on a map of groundwater pollution hazard zones for the area developed by Maris Rutulis, a hydrogeologist with the Water Resources Branch, Department of Natural Resources.

MacLaren consultants met with interested farmers controlling land identified as a potential site. After farmers indicated approval, test drilling was conducted at potential sites to confirm the absence of shallow aquifiers.

Sites identified in the proposal as those which will receive subsurface application of sludge were all screened using the criteria. Some of the sites initially identified were eliminated from consideration through this process, the remaining sites have been confirmed as suitable sites.

Methodological Mitigation

Land application of sludge is a common disposal method in North America. Methods and equipment are well developed and many aspects of operations minimize environmental impacts. The mitigation and safety procedures which are built into this land application program are termed "methodological mitigation".

PUBLIC PARTICIPATION AND HEARING (continued)

Characteristics of the sludge, combined with the proposed application rates will provide nutrients at a level beneficial to crops, but at levels that will provide protection against nitrate leaching. Potential problems from heavy metals, toxic organic compounds and pathogens will also be mitigated through the low levels applied.

Site selection criteria will protect against nitrate leaching to groundwater, reduce nuisance caused by odour, and limit pathogen and nitrate entry into surface water.

Mixing of stratified layers of sludge in the lagoon will reduce variability of nutrient application, and is expected to further reduce pathogen levels.

Sub-surface injection reduces pathogen and nutrient run-off to surface water. Pathogen transmission to crops is reduced, and field odour is limited. Flotation tires used in fields will reduce soil compaction. Enclosed tankers will reduce odour and restrict spillage during transportation, thus reducing the risk of contamination of groundwater. Regular grading and watering of roads will reduce road damage and dust problems.

Additional mitigation and monitoring measures were proposed by the proponent. Sludge testing during the program will confirm mixing success and track the nutrient concentration. Post application soil testing will be done to identify the fertilizer requirement one year after sludge application, to monitor heavy metal concentrations and to track nitrate movement. Crop restrictions will minimize the potential for disease transmission and avoid nitrate poisoning in cattle. Farmers will be contacted about the acceptable condition of the field and consulted to avoid field compaction. A contingency plan for response to accidental spills during transportation has been developed.

Potential Impacts

Potential impacts of the proposal were reviewed by the MacLaren consultants. Ms. Marr said the consultants believed that impacts were adequately addressed either through methodological mitigation or additional monitoring. Impacts from the variability of nutrients applied to the land and from odour given off at the lagoon could not be fully addressed.

Addition of nutrients to soils was considered a beneficial impact. The variability of nutrients make it difficult to predict nutrient additions except in a general range. A soil testing program one year after sludge application will assist farmers in planning future fertilizer requirements. Variability within a field will be minimized but may be greater between fields. This problem has already been discussed with the farmers interested in receiving sludge.

PUBLIC PARTICIPATION AND HEARING (continued)

Variability of the sludge will be minimized by pre-mixing the sludge in the lagoon, and by removing sludge from a constant depth, and on any day only about 1% of the lagoon will be withdrawn. Sludge will be monitored daily for percent total solids, in part to monitor mixing success. Once a week a composite sample will be prepared and analyzed for nutrient content. Monitoring information will be provided to farmers receiving sludge.

While small quantities of some metals may be beneficial to soils and crops, high concentrations of some metals may be detrimental. This issue was more fully addressed at the hearings during latter testimony by Dr. Racz. Amounts of metals that would be applied to the soils are below the guidelines set in Alberta, Ontario, and by Agriculture Canada. The impact on crops from metal additions is not expected to be measurable, but they will be monitored during post-application soil testing.

Toxic organic compounds present in the sludge are few in number, and are present in low concentrations. Studies indicate these organic chemicals are absorbed to upper soil layers where degredation occurs. No additional mitigation is proposed.

Even if sludge application machinery is equipped with flotation tires, the potential exists, particularly in wet weather, to cause some soil compaction. If a farmer becomes concerned that compaction is occurring operations can be halted.

Contamination of surface water by pathogens or nitrates could occur, but it is expected that sub-surface injection and application of the site selection criteria will minimize any impact so that runoff to surface waters will not be measurable. The key concern with groundwater is contamination of shallow aquifers with nitrate. The risk of nitrate contamination is minimized through the site selection process and the application rates. Other sludge constituents are believed to absorb to organic material in the upper soil layers where they will be broken down. Post application soil testing will monitor nitrate movement, and will provide better information than would groundwater monitoring to track nitrate movements.

Health concerns related to pathogens and heavy metals were identified. Pathogens may survive in the soil and be transmitted to crops and hence to humans, or pathogens could contaminate water supplies. Most jurisdictions agree that sludge application to land is acceptable from a health perspective providing compliance with protective measures occurs. Protective measures for this proposal include testing to confirm stability of the sludge, the application rate, sub-surface injection and a crop restriction incorporated into the farmer agreements. Only grains, oilseeds, lentils and field peas, crops which will not be consumed raw, will be permitted during the growing season following application of sludge. Forage crops, root crops, fruits and vegetables will be prohibited. These precautions are believed to make the possibility of any potential impact highly unlikely.

PUBLIC PARTICIPATION AND HEARING (continued)

Any heavy metal impacts on health through diet are believed to be immeasurable. Low levels in the sludge, combined with low application rates will result in heavy metal content below levels set in guidelines established by other jurisdictions.

Odour problems may occur either at the lagoon or field. Mixing and removing sludge from the lagoon may aggravate existing odour problems. This problem will continue until the lagoon is cleaned out, and would continue to affect Portage la Prairie residents if this proposal is not carried out.

In the field, odour problems will be minimized through sub-surface application. Experience in other jurisdictions using this method is that odours are minimized, even after rain. Odour arising from storage tanks will be minimized by storing as little sludge as is possible overnight if the tanks are open.

Road impacts from tanker travel on gravel roads will be minimized by weekly grading. Dust raised by the increased traffic will be minimized by daily watering. Dust raised on stubble fields during sludge application will be similar to that arising from normal field operations.

Socio-economic impacts are believed to be a positive factor because of the reduced fertilizer cost to farmers. Net benefits are debatable because yield increases are unknown and there may be higher weed control costs.

Wind transportation of heavy metals, pathogens or PCBs is not expected to be a problem, even during dry springs. Sludge constituents will be under the surface.

A revised schedule for the project was presented by Ms. Marr. Uncertainty about when the licencing process would be completed and mobilization could begin, and about the final volume of sludge in the lagoon, made it difficult to state when sludge application would be conducted. It is expected that sludge application could require two fall seasons to complete. In the event that work begins in the fall of 1989, it could carry over into the fall of 1990, otherwise work will begin in the fall of 1990 and could continue in the fall of 1991.

In summary, Ms. Marr pointed out that this is a proposal for a short term program of sludge disposal through sub-surface injection into agricultural land. The consultants believe this program to be environmentally responsible. They asked for sufficient flexibility for practical implementation. Permission for application at a rate of 140,000 litres/hectare up to a maximum of 200,000 litres/hectare is being sought.

The proponent is also seeking to have site selection criteria specified in the licence that would allow verification of potential sites through reporting mechanisms.

PUBLIC PARTICIPATION AND HEARING (continued)

Effect of Sludge Application

Dr. G. Racz, Professor and Head of the Department of Soil Science at the University of Manitoba gave a detailed presentation on behalf of the proponent. During the presentation Dr. Racz discussed the fate and mobility of nutrients and metals contained in sludge added to soil, and presented scientific information about the effect of sewage sludge on groundwater and crop quality.

Soil properties, and rates of sludge application are important factors in determining whether problems will occur. Heavy textured clay soils have low permeability to water, restricting the potential for leaching, and also have a great capacity to absorb metals and other constituents. High soil pH favours precipitation of non-soluble forms of phosphorous and metals. If application rates of sludge are too high, this natural capacity of soil to contain sludge constituents can be exceeded, and these materials would be available to leaching processes. High calcium or magnesium content in soil can interfere with the uptake of metals such as zinc, cadmuim, copper, etc. These considerations were included in the site selection criteria.

Fate and Mobility of Nutrients in Soil

Of the total nitrogen applied with sludge to a field, only a small portion is available to plants. Dr. Racz explained that much of the nitrogen is bound up as organic nitrogen. This is slowly mineralized in the soil to form ammonia nitrogen. Some ammonia nitrogen is lost to volatilization, and the rest is rapidly oxidized to nitrate nitrogen. Nitrate nitrogen is the form available for uptake by plants, and is also the form most subject to leaching. Conversion of organic nitrogen to the nitrate form may take several years, so there will be a residual fertilization effect beyond the year after sludge application. There are also losses of nitrogen during conversion, so some of the total nitrogen applied will never be available for plants, or for leaching. In terms of the sludge application rates proposed for this program, an average of 140 kg plant available nitrogen per hectare will be provided in the first year. Less nitrate, in unknown amounts, will be available for the next two or three years. This rate of application is well within the range normally recommended for fertilizer additions.

Research into leaching of nitrate in clay soils similar to those at the selected sites found no movement of nitrate below the rooting depth of annual crops. Even when very high rates of nitrate were applied, during exceptionally wet years, no leaching of nitrate was detected. Leaching is not a function of the rate of nitrogen application, it is controlled by soil type and climate.

Nitrate nitrogen is mobile within the rooting zone of crops. It can also accumulate if application rates exceed plant uptake, such that over a series of years of high application rates leaching of nitrate could occur.

PUBLIC PARTICIPATION AND HEARING (continued)

Post-application soil testing of residual nitrate is proposed to prevent over-fertilization. It has been found that in heavy clay soils there are significant losses of nitrate nitrogen through bacterial denitrification, especially lower down in soil profiles, where oxygen is often unavailable.

Phosphorous content of the Portage sludge is about 2%. Much of this phosphorous (75-80%) is present in an inorganic form, precipitated with metals in the sludge as insoluble compounds. About 20-25% of the phosphorous is present in an organic form which can mineralize to plant available phosphate. A very small fraction of the phosphorous in sludge is present as plant available phosphate. Soluble phosphate precipitates rapidly (days) in soil to form calcium magnesium phosphates. This phosphate compound is soluble enough to be available to plants, but insoluble enough that it is not mobile in soil. Within a period of months these compounds undergo reactions to form even less soluble calcium or magnesium phosphates, and these are the native mineral forms of phosphorous in our soils.

Research has indicated that even very high applications of phosphorous to crops have no harmful effects on the plants. Phosphorous remains in the soil in insoluble forms that do not leach, but for a few years are available to plants in small quantities, until they are converted into insoluble minerals.

Fate and Mobility of Metals in Soil

Dr. Racz stated that most of the metals present in the sludge present little risk, and are naturally found at high concentrations. Iron, aluminum and manganese fall into this category. These metals are rapidly precipitated into very insoluble forms and remain in surface layers of soil.

Chromium can be toxic to plants if added in much higher quantities than proposed in this program. Chromium is naturally present in soil, and is held immobile by clays.

Arsenic is also absorbed by clay and is not mobile in soil. Amounts of arsenic that would be added in this program are about 0.11 kg/hectare. The maximum permissible level in Ontario is 14 kg/hectare.

Mercury is strongly absorbed by soil organic matter, forming covalent bonds. It is also absorbed or precipitated with a variety of inorganic soil constituents. Mercury is not readily absorbed by plants. In aquatic ecosystems mercury can create problems, but in soil it is too strongly bound to soil particles to enter the food chain.

Zinc, copper, molybdenum and nickel are all bound tightly to soil clays and become immobile. Levels of these metals which would be added with the sludge are well below maximum permissible loading levels allowed in other jurisdictions. Zinc and copper are in fact present at levels that might be added as fertilizers if soil was deficient of these metals.

PUBLIC PARTICIPATION AND HEARING (continued)

Cadmium is the metal of greatest concern. It is highly toxic, and can be taken up by plants so that it may enter the food chain. Some plants are cadmium accumulators, and so should not be grown on sludge amended soils for a period of time. Salad plants and root crops accumulate significant amounts of cadmium, whereas concentrations of cadmium in the edible parts of peas, beans, barley and wheat are insignificant. The uptake of cadmium after large applications occurs primarily during the first year. There is a residual effect of cadmium uptake in the following years, but resulting concentrations are considered insignificant. These are some of the reasons why certain crops are not permitted to be grown on sludge amended fields during the first year. Risk of pathogen contamination accounts for the remaining crop restrictions.

Cadmium loading through the proposed sludge application program will be an average of about 0.09 kg/hectare. The federal government recommends that loadings of cadmium should not exceed 4 kg/hectare. Ontario set limits at 1.6 kg/hectare. At the loading levels proposed in Portage la Prairie, sludge application presents virtually no effect to the food chain with respect to cadmium.

Dr. Racz concluded his presentation by stating that the proposed rate of sludge application will provide yields generally similar to those resulting from the application of commercial fertilizers, and there may be some slight soil conditioning effects. Groundwater quality will not be affected, as was shown in information presented about the fate of nitrate nitrogen in soils. The heavy metal content of food or animal feed will virtually be unaffected.

Rural Municipality of Portage la Prairie Position

The submission from the Rural Municipality of Portage la Prairie was presented by Councillor Harold Brown.

Mr. Brown stated that while Council recognized that land application of sludge may provide economic and other benefits, unfamiliarity with the method created areas of concern and uncertainty for Council and most residents.

The first concern presented by Mr. Brown was whether there was sufficient data to assure that prime agricultural land would not be damaged for growing crops in future years.

The potential for impacts on surface and groundwater supplies was of concern to Council because of the importance of good quality water supplies to several residential development sites throughout the area. The number of shallow wells in the Peony Farm area already place extreme stress on the water supply. Council wondered whether there had been sufficient soil testing to provide assurance that there will be no surface or groundwater contamination.

Mr. Brown asked if there was adequate data to provide assurance that there would be no contamination of forage and edible crops by various infectious agents applied with the sludge to the soil.

PUBLIC PARTICIPATION AND HEARING (continued)

Council wanted assurance that injection of the sludge would be conducted by a qualified contractor using appropriate equipment so that odour problems would be minimal.

Assurance was sought that any road damage that may occur, and the suppression of road dust would be the responsibility of either the contractor hauling the sludge or the City.

It is the position of the Council of the Rural Municipality of Portage la Prairie that if assurance can be provided for the concerns expressed, and that if the City of Portage la Prairie accepts all liability they are not opposed to the proposed sludge disposal/land application program.

Citizen Concerns

The hearing was well attended by local residents, especially by those from the Peony Farm Community. In addition, a number of letters sent by residents unable to attend the hearings were taken as exhibits. Residents were opposed to the sludge application program, or very sceptical about the proposal. The primary concern was the possible contamination of groundwater supplying domestic wells. Possible damage to roads by trucks hauling sludge and odour problems associated with sludge application were also of concern.

Mr. Grant Dunfield representing an ad hoc committee from the Peony Farm Community was of the opinion that the consequences for the 400 people living in his community had not been taken into account during the planning process. Residents of Peony Farms did not become aware of the proposal until they read the Environment Department's "Notice of Environment Act Proposal" published in the newspaper, while local farmers were approached by the consultants in the early stages of the planning process. Mr. Dunfield also took the position that proposed mitigation measures did not go far enough to secure the interests of his community.

The most serious concern that Mr. Dunfield had was that the water supply of Peony Farm Community residents be protected. Domestic water supplies are drawn from a shallow aquifer by sand point wells at a depth of about 7 meters. Waste water is disposed of into shallow septic fields. Further subdivision in the Peony Farm Community from the present approximately 120 homes has been prohibited. (Although this prohibition is partly a result of the potential for groundwater contamination from septic fields, Mr. Keryluk, a representative of the Environment Department from Portage la Prairie, said it also arose because recent changes in Environment Department requirements are such that it is very difficult to install a system on the half acre parcels of land like those of the Peony Farm subdivision.) Mr. Dunfield took the position that because the water supply in his area was already threatened by septic fields, and residents were required to bear the cost of maintaining and upgrading septic fields to prevent possible contamination, there was no room for any more possible sources of contamination.

PUBLIC PARTICIPATION AND HEARING (continued)

If damage to the water supply did occur, Mr. Dunfield wanted to know what the options for other sources of water supply would be, and what level of government would pay to compensate for the loss of the existing water supply.

Mr. Dunfield said that the MacLaren study underestimated the damage to local roads that would result from hauling of semi-trailer loads of sludge. He also wanted more information on what routes the trucks would follow.

The likelihood of odour problems was not, in Mr. Dunfields opinion, adequately addressed in the study.

The MacLaren study identified other sites of equal quality for the disposal of sludge that were not near residential developments. Mr. Dunfield questioned the particular sites chosen, and stated that the impression in the community was that the sites were selected on the basis of cost saving because it is the shortest distance to haul sludge.

Mr. Lory Wowk, who lives in the immediate area of fields proposed to receive sludge made a brief statement about his concern over possible health effects resulting from the heavy metals, toxic organic compounds and pathogens present in the sludge. He wondered if there would be any assistance in meeting the costs that would arise to provide safe water if the proposed sludge injection caused a deterioration in the groundwater on which he draws.

Ms. Helene Hoggarth, a resident from the Peony Farm community was critical of statements made by MacLaren consultants that included "we believe" and "we hope". She wanted guarantees like "it will be this" or "it will be that". She cited, as an example, how the reported quantity and quality of sludge in the lagoon kept changing, and wondered what other changes might occur before the sludge was removed. Ms. Hoggarth was suspicious that the same sites could be used again in the future for more sludge disposal. She understood that the City needed to remove and dispose of the sludge, but wanted to know why City sludge could be disposed of in the area when Peony Farm residents were required to be very careful about ensuring proper operation of their own septic fields. She wondered if city sludge was better than rural sludge? Family health was pointed out to be an important consideration.

The question of monitoring was raised by Ms. Hoggarth. Who would determine what monitoring was required, who would conduct it, and who would determine what was significant?

Water Resources Branch Presentation

Groundwater resources at the proposed sludge application sites, and an evaluation of measures necessary to protect these resources were described in a presentation by Maris Rutulis, a hydrogeologist representing the Water Resources Branch of the Manitoba Department of Natural Resources.

PUBLIC PARTICIPATION AND HEARING (continued)

Limestone bedrock underlies the area at a depth of approximately 30 meters. This is a water bearing formation but the water is salty. Overlying the bedrock are glacial till or lacustrine clays composed of practically impermeable clays containing no silts or sands. These clays are in turn overlain by a thin deltaic deposit composed mainly of silty clay with low permeability and some isolated lenses of sand. Subsequent stream activity in the area cut through the deltaic deposits, leaving relict stream channels containing sand deposits.

The significant aquifers in the area, such as the one Peony Farm Community draws well water from, are found in the sand deposits of the relict stream channels. To prevent aquifer pollution there should be no sludge application over these aquifers.

During discussions with MacLaren consultants while the proposal was being developed, Mr. Rutulis communicated the need to avoid areas above aquifers located in relict stream channels. Good information is available to identify the location of these aquifers, especially from maps prepared when a route for the Portage Diversion was being planned. Test drilling conducted for MacLaren provides further information about the location of aquifers in relation to proposed sludge application sites. Mr. Rutulis stated that based on available information the proposed sites are far enough away from any aquifers to prevent groundwater pollution. The map prepared is quite accurate, and the physical edges of the aquifers are quite distinct. Most of the wells in the area are at the Peony Farm Community, and there will be no sludge application over this or any other aquifers. There is almost no movement of groundwater through the clays which make up the sub-soil in this area, and what little groundwater movement that does occur is in an east or northeast direction, away from Peony Farm.

Mr. Rutulis stated that the proposed sludge disposal sites are close to ideal in terms of groundwater protection from sub-surface sludge application to land. An ideal site would be one in which there were no aquifers in the area. Since none of the sludge application sites are located over an aquifer there is no danger of aquifer contamination. There are even better sites southeast of Portage la Prairie where there is a solid clay underlain by till and limestone, and the groundwater in general is salty.

Manitoba Agriculture

A number of points were raised during the hearing by Mr. Dale Partridge, Chief of Land Utilization and Soil Survey Section of the Manitoba Department of Agriculture. His main concern was that the proposed rates of sludge application seemed to be related more to disposal needs than to agricultural fertilization needs. Mr. Partridge was of the opinion that therates proposed, 12 dry tonnes/hectare of sludge, calculated to deliver 140 Kg/hectare of plant available nitrogen, delivered as 200,000 liters of wet sludge per hectare was the upper limit of what would be acceptable from an agricultural viewpoint. An application rate using 12 dry tonnes/hectare as an

PUBLIC PARTICIPATION AND HEARING (continued)

average would result in over application of nutrients in the upper end of the range proposed. Even if 12 dry tonnes/hectare was the upper limit of application rates, care must be taken to ensure that natural soil nitrate levels are not high, or excessive nutrients would result. The physical ability of the soil to absorb the water applied at the 200,000 liters/hectare rate was questioned by Mr. Partridge, and he recommended the sludge be injected 6 to 10 inches (15-25 cm) deep into dry soil to prevent wet soils with sludge at or on the surface.

Environment Department Position

Land application of sewage sludge is supported in concept by the Manitoba Department of Environment. Mr. Mike Van Den Bosch, an Environmental Engineer represented the Department at the hearing, and explained that from an environmental standpoint they preferred the land application of appropriate sludge over disposal to a landfill site. Support for the concept of land application is qualified, however, by the requirement that the sludge be of appropriate quality.

Concerns about the levels of pathogens in the sludge were expressed by Mr. Van Den Bosch. Of the techniques available to reduce pathogen levels in sludge, the treatment provided by sewage lagoons is not considered to be very efficient. The degree of pathogen reduction achieved in lagoons is a function of the time of sludge isolation and temperature. How long sludge must be isolated until pathogens are suitably reduced is a big question, and requirements vary according to site specific conditions. In the United Kingdom a two year isolation period is required, while other jurisdictions require six months.

Total volatile solids content is an indicator used to estimate pathogen reduction. It is a measure of decomposition of organic material present in the sludge. When volatile solids content is used to estimate pathogen reduction, the assumption is that the isolation time and temperature which control organic material decomposition rates will have had a similar effect on reducing pathogen levels. Volatilization is not a measure of pathogen reduction, it is a surrogate estimate, based on the above assumption. Mr. Van Den Bosch pointed out that by adding raw sewage and re-infecting the sludge this assumption was violated. When fresh sludge is added to a lagoon sitting full of sludge, as happened to the lagoon under question, the isolation period must start again from that time. Measuring the reduction of volatile solids remains important in terms of estimating odour production, but it no longer measures pathogen levels.

Isolating the sludge prior to land application is necessary to reduce pathogen levels and associated risks. Mr. Van Den Bosch stated that, with no further addition of raw sludge, four summer months would improve the sludge quality, and a year would be more appropriate.

PUBLIC PARTICIPATION AND HEARING (continued)

The first condition was that sludge considered most suitable for land application should have been fully digested, dewatered and preferrably disinfected. The introduction of raw sewage to the sludge might be a serious consideration if this proposal is carried out this year, because of the time interval involved. Dr. Rihal recommended an isolation period of one year for sludge applied to land.

If sludge application takes place in the fall there should be no farming activity until the following summer, and this restriction should include any grazing of the land by cattle. Cereal grains would be the best crop selection for the following summer, and certainly there should be no salads or other vegetable crops grown for 12 months or longer after sludge application.

Sludge application rates should be adjusted suitably, based on crop requirements and soil conditions, to protect underground water supplies. Soils underlain by fractures or fissures should be avoided.

In view of the special circumstances in Portage la Prairie, causing addition of raw sewage to the stabilized sludge, Dr. Rihal recommended that disinfection of the sludge, using chlorination, should be done.

Mr. Van Den Bosch pointed out that chlorinating the volume of sludge in question would be a complicated and expensive undertaking, and that landfilling the sludge would be the realistic option.

DISCUSSIONS AND CONCLUSIONS

The Commission believes that the proposal, as put forward by the proponent, can be a safe method to dispose of the sludge presently contained in the south lagoon cell at the Portage la Prairie wastewater treatment facility. However, some doubts were raised by the Environment Department and the Department of Health about possible dangers from pathogens further introduced to the lagoon through late additions of sludge and raw sewage.

On the basis of expert hydrogeological evidence presented at the Hearing, the Commission is satisfied that implementing the proposed sludge disposal/land application program will not cause any deterioration of groundwater supplies in the Peony Farm Community aquifer, or any other aquifers.

It is the opinion of the Commission that applying the sludge to farmland represents a good "use" of sludge, and that use of sludge is preferable to disposal in a landfill site.

Sites identified in the proposal to receive land application of sludge are appropriate. The Commission believes that the selection process and criteria applied were sufficient to exclude inappropriate sites, and the identified sites are confirmed to be suitable. It should, however, be noted

DISCUSSIONS AND CONCLUSIONS (continued)

that if local, non-farm residents had been contacted early in the site selection process, much of the controversy that has followed this proposal might have been avoided. An exchange of information about concerns over certain sites, and/or a removal of certain sites from consideration before making considerable efforts to confirm suitability, would have prevented the level of opposition from local homeowners which arose. There is a very real need to protect the aquifer under the Peony Farm Community from further sources of groundwater contamination, especially since this aquifer is already jeopardized by septic fields operating in the area.

The proposed rates of sludge application to agricultural land are acceptable to the Commission. There was some concern and argument that liquid application rates of 200,000 litres/hectare might be a little high, but the Commission agreed that, as a maximum limit, this rate should be allowable. An average application rate of 12 dry tonnes of sludge per hectare, with a range of 8.4 to 16.8 dry tonnes per hectare was also considered to be allowable, providing the sludge was well mixed before removal to reduce variability and farmers were made aware of this range of application.

RECOMMENDATIONS

The Clean Environment Commission recommends:

1. That a license under the Environment Act be issued to the City of Portage la Prairie to permit a temporary sludge disposal/land application program as proposed.

2. That the program can start in September of 1989, providing that pathogen levels in the sludge are acceptable to the Department of Environment and the Department of Health.

3. That sludge in the lagoon shall be thoroughly mixed, to the satisfaction of the Department of Environment, before disposal/land application begins, and that the sludge be maintained in a homogenous condition as long as sludge is being removed for disposal.

4. That sludge be applied to soil by subsurface injection at a rate of 12 dry tonnes/hectare (range: 8.4 - 16.8 tonnes/hectare), and that liquid rates of application up to 200,000 litres/hectare be allowed.

5. That crop restrictions acceptable to the Department of Environment be specified under the terms of the licence to prevent entry of pathogens, heavy metals or other toxic compounds into the food chain, and that these restrictions be incorporated into any agreements with farmers receiving sludge.

DISCUSSIONS AND CONCLUSIONS (continued)

6. That in the event additional land is required for sludge disposal for this proposal, the proponent shall follow similar protocol utilized in the selection of the farmland in the current sludge application program. In addition to the review and approval of the proposal by representative from the Department of Environment, residents living in the vicinity of the proposed sludge application should be advised and any concerns identified.

7. That monitoring of the sludge disposal program, including pre and post sludge application soil testing, be carried out as specified in the proposal, subject to approval by the Department of Environment.

8. That routes taken by vehicles used to transport sludge, and road maintenance including dust control programs be acceptable to the Rural Municipality of Portage la Prairie.

9. That no further sludge or raw sewage be added to the south lagoon cell until the disposal program is finished, and that if there are further additions, the lagoon be isolated to allow reduction of pathogen numbers for a period of time deemed necessary by the Department of Environment.

A P P E N D I X A

CITY OF PORTAGE LA PRAIRIE HEARING

L I S T O F E X H I B I T S

May 29-30, 1989

1. Mr. Larry Stachan, Chief, Environmental Management Programs, Report, City of Portage la Prairie, Sludge Disposal/Land Application Program

2. Mr. J.E. Hutchison, P. Eng., Project Management, MacLaren Engineering, Brief, Addendum to Environment Act Proposal (dated May 25, 1989).

3. Mr. J.E. Hutchison, P. Eng., Project Management, MacLaren Engineering, Brief, Addendum to Environment Act Proposal (dated May 29, 1989).

4. MacLaren Engineering Services Ltd., Brief, Introduction to Outline of Presentation (saubmitted February 17, 1989).

5. Rural Municipality of Portage la Prairie, Brief, dated May 29, 1989.

6. Peony Farm Committee, Brief, Sludge Injection, dated May 29, 1989.

7. Mr. G. J. Racz, MacLaren Engineering, Dept. of Soil Science, University of Manitoba, Brief, Land Utilization of Sewage Sludge, dated May 29, 1989.

8. Mr. Wolf Winkler, Peony Farm Committee, Brief, dated May 29, 1989.

9. Department of Agriculture and Conservation, Water Control and Conservation Branch, Maps, Portage Division, Elevation of Piezometric Surve and Water Tables.

10. Dr. N.S. Rihal, Chief Epidemiologist, Environmental Health Services, Brief, Microbiological Aspects Regarding the City of Winnipeg Sludge Disposal Program.

11. Brief, Contingency Plans

A P P E N D I X B

CRITERIA USED BY THE PROPONENT TO SELECT SITES

Several site selection criteria have been used to identify agricultural fields which could receive sludge. The selection criteria are intended to minimize potential environmental impacts (Section 2.4), and the criteria closely follow the Clean Environment Commission Varied Order for the City of Winnipeg sludge application program. The City of Portage la Prairie will not apply sludge to land which:

(a) soil tests show the concentration of sodium bicarbonate extractable phosphorus, as P, exceeds 60 micrograms per gram in the upper 15.0 centimetres;

(b) soil tests show the level of nitrate-nitrogen exceeds 67 kilograms per hectare in the upper 15.2 centimetres;

(c) soil tests show the soil pH to be lower than pH 6.0;

(d) the surface slope of the land is greater than 3%;

(e) is less than 300 metres from any occupied residence (other than the residences associated with the farms on which sludge is deposited);

(f) is less than 15 metres from a First Order Waterway;

(g) is less than 30 metres from a Second, Third, or Fourth Order Waterway, and less than 90 metres from any other waterway;

(h) is subject to flooding;

(i) is located within a zone of groundwater pollution hazard as defined by Rutulis 1982.