

SHELL PRAIRIE INN AND GAS STATION
REPORT ON A WASTEWATER TREATMENT
AND DISPOSAL SYSTEM

THE CLEAN ENVIRONMENT COMMISSION

MARCH 23, 1989

SHELL PRAIRIE INN

On November 4, 1987, Environmental Control Services directed Shell Prairie Inn and Gas Station located on lot 25 in the Parish of High Bluff to replace the existing septic tank soil absorption system by December, 1987. The system had failed resulting in sewage effluent ponding on the ground surface. Until such time as a new system was installed, Shell were required to withdraw liquid wastes from the septic tank (which was oversized) and haul the liquid to a registered waste disposal grounds in the R.M. of Portage la Prairie.

I.D. Engineering Canada Inc. were retained as consulting engineers on behalf of Shell. A proposal consisting of a waste stabilization pond located on river lot 25 in the Parish of High Bluff at a site 300 to 400 metres south of the Shell Prairie Inn was submitted to the Department of Environment on September 29, 1988. The proposal also included a system of effluent irrigation on nearby agricultural land to utilize the effluent.

The proposal was advertised on October 8, 1988 in the Winnipeg Free Press and October 11th in the Portage Herald Leader Press by the Department. Objections were received from two neighbors who reside approximately 0.5 kilometres east of the proposed facility. Their concerns related to impact from the pond and effluent irrigation on their well water supplies, possible contamination of surface water which would flow from the Shell site to their property, and also odor that might emanate from the ponds and impact their quality of life.

On November 21, the Honourable Ed Connery, Minister of Environment and Workplace Safety and Health requested that the Commission hold a hearing on the matter and report back with recommendations. The Clean Environment Commission gave notice of the hearing on December 28, 1988 and the hearing was held on January 5, 1989 at Portage la Prairie beginning at 10 a.m. Approximately 20 people were present including the proponent, their consultant, a number of concerned nearby residents and representatives from the Environmental Control Branch and the Water Resources Branch.

Position of Proponent

John Ilg, P. Eng., of ID Engineering made the presentation on behalf of the proponent. He noted that after investigating several wastewater treatment methods, a waste stabilization pond was found to be the best option. Some water metering had been undertaken in order to establish the hydraulic loading of the system. Wastewater characteristics were estimated from similar facilities and a conservative estimate of the BOD was made. It was further noted that the system would not be required to handle garage wastes.

A 2 cell pond system was proposed with a design that exceeded the requirements found in the publication "Design Objectives for Standard Sewage Lagoons" prepared by the Environmental Management Division. Rather than discharging treated effluent to a surface drain, it was proposed to dispose of effluent by means of irrigation to agricultural land. To ensure that adequate effluent storage was available to accommodate late springs, storage of 230 days was provided. The consultant also noted that the effluent irrigation system would meet or exceed design requirements and would therefore not adversely affect the surrounding environment.

The pond and irrigation tract are to be located on a 4 hectare site some 3-500 metres south of the service station. In-situ soils will be used to construct the ponds which with proper compaction will achieve a permeability of 1×10^{-7} cm/sec. It is the expectation that effluent will be applied to nearby agricultural land designated for the purpose at a rate of approximately 1 cm/hr to a maximum annual loading of 10 cms/year. The soils onto which the effluent is to be applied are being examined to ensure that salinity is not a concern. The preliminary indication is that there should not be a problem.

Position of R.M. of Portage

Councillor H. Brown of the R.M. of Portage pointed out that their main concern is that the lagoon should be environmentally safe. The two areas of concern were the contamination of groundwater and odor.

Position of Residents

The position of the nearby residents was expressed by Mr. N. Gage and Mr. W. Ronald. The residences represented by these individuals are located east of the Shell site on parish lots (PL) 26 and 27 at a distance of approximately 400 metres from the proposed lagoon and effluent irrigation site. The principle concern relates to contamination of groundwater. The water supply of the 8 or 9 residences located on PLs 26 & 27 is obtained by sand point and drilled well from a sand bearing shallow aquifer (less than 8 metres). In the view of these concerned citizens, the groundwater flows from west to east; that is from the direction of Shell Prairie Inn towards the residences. They also noted that surface water from the Shell facility drains towards the residents on PL 27 and contaminants from the Shell operation would impact the local drainage water. There was also a concern that odor from the proposed facility would be a problem.

Position of Water Resources Branch

Mr. M. Rutulis was present in his capacity as a hydrogeologist with the Provincial Water Resources Branch. With the aid of an aerial photograph and knowledge arising from training and experience, Mr. Rutulis was able to identify that the water bearing aquifer serving the residences in parish lots 26 and 27 was localized in that general area having been created by an old river channel of the Assiniboine River. The alignment of the channel was in a north-south direction and not in the direction of the Shell station. Recharge of this aquifer would be confined to the sand deposit and the main concern from a contamination perspective would be from the septic tank soil absorption systems of the residences themselves. On the other hand, the results of soil testing undertaken by the proponent's consultant revealed that the subsoil in the proposed area of the lagoon was a silty clay to a depth of at least 2 metres. This soil is suitable for the construction of a waste stabilization pond since it wouldn't transmit water. Also the volume of effluent to be irrigated is relatively small and the application rate could be adjusted to avoid ponding and run-off. Unlike the shallow relatively isolated aquifer serving the residents on PL 26 and 27 the Shell well was located in a coarse

gravel underlying 30 or more metres of clay. The water from this service was moderately mineralized (a dissolved solids level of 1000 mg/L) containing principally calcium and magnesium salts of bicarbonate and sulphate. Of importance from the viewpoint of irrigation was a relatively low level of sodium (approximately 40 mg/L). The sodium adsorption ratio or SAR must be maintained below a pre-determined limit to be acceptable (viz., 6) to ensure that water movement in the soil and plant growth are not impaired.

Position of the Environment Department

Mr. M. Van Den Bosch representing the Environmental Control Branch had no formal presentation but did express a concern for the long term ability of the irrigation system to function based on concerns expressed by the Department of Agriculture relative to the salinity of the effluent. The Department were awaiting the results of analyses from samples of well water and soil samples at the proposed irrigation site and septic tank effluent samples in order to judge the acceptability of irrigating with waste water effluent.

At this stage of the hearing, the Chairman requested the proponent's consultants to secure the necessary samples and undertake analyses of the various constituents in order that the Department could determine the viability of effluent irrigation.

Results of Analysis of Wastewater Effluent and Soil Samples

As directed at the hearing, the consultant collected soil samples from the area of the irrigation tract in addition to well water and wastewater samples. A principle concern reflected at the hearing was the addition of sodium to the wastewater effluent associated with the practise of softening the entire water supply at the Shell Prairie Inn by a process known as sodium zeolite. Sodium chloride is exchanged with calcium and magnesium ions from the water supply thus reducing the hardness and rendering the water more acceptable for washing and cleaning. Unfortunately an increase in sodium in the water supply adds to the problem of the suitability of the effluent for

irrigation due to an increase in the SAR. The results of the analysis showed the SAR increased from less than 1 to 12.7 as a result of the softening process. One Department of Agriculture source recommended that a reasonable range for SAR in irrigation water is 6 to 9. The consultant has proposed that the SAR in the effluent could be reduced to a range from 5.4 to 8.0 by reducing the sodium concentration in the wastewater effluent by a process of utilizing unsoftened water for toilet flushing purposes. In terms of a water balance for a service station and restaurant, toilet flushing water represents approximately 40% of the overall water useage, which would result in a 40% reduction in sodium.

Representatives from the Environment Department reviewed the soil and effluent quality data in conjunction with Department of Agriculture personnel. It is their belief that both the use of the effluent for irrigation (based on quality) and the texture of the soil (the soil being fine grained) are marginal as far as irrigation is concerned. If effluent irrigation is to be employed the practice should be discontinued if the soil conductivity exceeds 6 millisiemens per centimetre and the SAR exceeds 6 units. Irrigation should be applied to an actively growing crop and the crop should be a selected grass that has a salt tolerance. Ponding of the effluent should not occur. In order to ensure that there is not a build-up of salt in the soil, sampling of the irrigation tract should be undertaken annually for pH, SAR, conductivity, sodium, calcium and magnesium at depths from 0-30 centimetres and 30-60 centimetres.

Discussion and Conclusion

The testimony of Mr. Rutulis assured the Commission that the waste stabilization pond and effluent irrigation system proposed for the Shell Prairie Inn would not contaminate the groundwater aquifer utilized by the residents in parish lots 26 and 27. The water supply utilized by the residents is obtained from relatively shallow sands laid down by a river channel at some earlier period. This channel was some distance from the proposed wastewater stabilization pond and irrigation site. The subsoil at

least to a depth of 2 metres at the wastewater treatment and disposal site was a silty clay which does not transmit water readily.

The wastewater stabilization pond size and loading are such that in the Commission's view, odors from the pond would be confined normally to a short period in the spring time. The severity of the odors as well as their duration coupled with the separation from the homes (0.4 kilometres) should not cause annoyance to the residents located along parish lots 26 and 27.

The other outstanding concern is that of the salinity of the effluent in terms of its usefulness for irrigation purposes. The proposal made by the proponent's consultant to utilize unsoftened water for toilet flushing, should bring the SAR value into line with a water supply acceptable for irrigation. Representatives of the Departments of Environment and Agriculture offered an opinion as to the acceptability of both the soil and effluent for irrigation purposes. They reported that such an operation would be marginal; however, criteria were identified that would permit effluent irrigation and at the same time prevent long term soil degradation.

Recommendations

1. The applicant shall ensure that all wastewater generated within the service station complex, exclusive of the service bay area is directed towards the wastewater treatment lagoon.
2. The applicant shall ensure that the well water supply utilized for toilet flushing purposes is unsoftened.
3. The applicant shall not discharge effluent from the wastewater treatment lagoon:
 - (a) where the organic content of the effluent, as indicated by the five day biochemical oxygen demand, is in excess of 30 milligrams per litre;

- (b) where the fecal coliform content of the effluent, as indicated by the MPN index, is in excess of 200 per 100 millilitres of sample;
 - (c) where the total coliform content of the effluent, as indicated by the MPN index, is in excess of 1500 per 100 millilitres of sample;
 - (d) between the first day of October of any year and the 15th day of May of the following year, unless prior approval by the Director, is given.
- 4. The applicant shall not discharge effluent from the primary cell of the wastewater treatment lagoon, except to the secondary cell of the said lagoon.
- 5. The applicant shall operate and maintain the wastewater treatment lagoon in such a manner that:
 - (a) the release of offensive odours is minimized;
 - (b) the organic loading on the primary cell of the sewage lagoon system, as indicated by the five day biochemical oxygen demand, is not in excess of 56 kilograms per hectare per day;
 - (c) the depth of sewage in the primary cell does not exceed 1.5 metres.
- 6. The applicant shall discharge effluent from the wastewater treatment lagoon only onto lands owned or lawfully controlled by the applicant.
- 7. The applicant shall not discharge effluent within 300 metres of any dwelling not owned or lawfully controlled by the applicant.

8. The applicant shall not discharge effluent within 60 metres of any property boundary, surface watercourse or groundwater well.

9. The applicant shall carry out the irrigation with effluent in such a manner that:

(a) effluent is only discharged to irrigate:

(i) actively growing crops with such crops being grasses with a salt tolerance.

(ii) grasslands which will not be utilized for hay, grazing or similar use during or for at least:

A. 30 days prior to grazing by dairy cattle;

B. 7 days prior to grazing by livestock other than dairy cattle; or,

(iii) agricultural crops where:

A. irrigation does not take place during or for at least 7 days prior to harvesting of the crops;

B. forage crops, cereals grain or oil seed crops are grown on effluent irrigated lands provided that where corn is grown it is used solely for silage.

(b) no surface ponding or surface runoff occurs during irrigation;

10. The applicant shall obtain representative soil samples from the irrigation tract on an annual basis from a depth of 0-30 centimetres and 30-60 centimetres and subject the samples for analyses for pH, conductivity, sodium adsorption ratio, calcium, magnesium and sodium and such analyses shall be submitted to the Director within 60 days.

11. The applicant shall submit samples of the lagoon effluent for conductivity and sodium adsorption ratio analyses to the Director prior to the irrigation season.

12. The applicant shall, in case of physical or mechanical breakdown of the wastewater collection and/or treatment system:
 - (a) notify the Director immediately;

 - (b) identify the repairs required to the wastewater collection and/or treatment system;

 - (c) complete the repairs in accordance with the written instructions of the Director.

13. The applicant shall prior to the construction of dykes for the wastewater treatment lagoon:
 - (a) remove all organic topsoil from the area where the dykes will be constructed; or,

 - (b) remove all organic material for a depth of 0.3 metres and a width of 3.0 metres from the area where the dyke will be built, providing all the lagoon dykes are lined with clay or other suitable material as required by Clause 14 to a minimum thickness of one metre measured perpendicular to the face of the side wall.

14. The applicant shall construct the wastewater treatment lagoon with clay or other suitable material such that all interior surfaces of the lagoon structure are underlain with a minimum of 1 metre of soil having a hydraulic conductivity of 1×10^{-7} centimetres per second or less.
15. The applicant shall arrange with an Environment Officer a mutually acceptable time and date for any required soil sampling.
16. The applicant shall either:
 - (a) subject undisturbed soil samples from the completed wastewater treatment lagoon to hydraulic conductivity tests, the number and location of said samples to be specified by an Environment Officer up to a maximum of twenty samples; or,
 - (b) where undisturbed soil samples cannot be taken, test the soil of 4 plane surfaces of the wastewater treatment lagoon for hydraulic conductivity by an insitu field test method as prescribed by an Environment Officer.
17. The applicant shall, not less than 2 weeks before the wastewater treatment lagoon is placed in operation, submit to the Director the results of the tests carried out pursuant to Clause 16.
18. The applicant shall install a fence around the sewage lagoon facility to limit access.

19. The applicant shall in the event that the limits for soil conductivity and sodium adsorption ratio at the location of the irrigation tract exceed values of 6 millisiemens per centimetre and 6 units shall within 2 years discontinue the use of the irrigation tract and within 1 year thereafter register with the Director an alternate plan for effluent disposal.