

Report of the Executive Policy Committee, dated May 31st, 1979.

Methane Gas Policy - File WT-3

1250 - 2. Your Committee has been advised that Underwood McLellan and Associates Limited (UMA) were commissioned in 1974 to carry out an investigation as a result of a potential hazard due to combustible gas found within buildings located on the St. Boniface Landfill. The report was submitted in October, 1974. As a result of the St. Boniface Landfill Study, it was necessary to determine if other refuse landfills existed in the City having similar conditions.

UMA were retained for a study on the Redonda Landfill where a school was being constructed (reports submitted in March and June, 1975) and another study which identified a total of twenty-eight landfill and dump sites within the Winnipeg area (report submitted in November, 1975).

In 1976 UMA were retained for two additional projects. The first project was to provide specific design recommendations to alleviate the problem due to methane for the buildings located on the St. Boniface Landfill Site. A series of reports covering the investigation of buildings located on the St. Boniface Landfill Site were issued during a period from November of 1976 until July of 1977. These contained recommendations for remedial measures to alleviate the hazard presented by methane. The second project was to evaluate each landfill within the Winnipeg area for specific hazard conditions and develop design and other criteria relating to construction of buildings on or near landfill sites. The Ad Hoc Committee was set up to supervise this study which was completed in May of 1978.

In order to assist in the preparation of recommendations for the buildings on the St. Boniface Landfill Site and policy relating to landfill sites in general, the Committee engaged Emcon Associates of San Jose, California. Emcon's evaluations of the UMA landfill studies were received in May and June of 1978.

Since May, 1978 the Ad Hoc Committee has reviewed a number of reports including UMA reports on "St. Boniface Remedial Measures," UMA's report "City of Winnipeg Landfill Gas Study," Emcon's report "Evaluation of Gas Studies and Selected Reports for the City of Winnipeg" and Emcon's report "Evaluation of City of Winnipeg Landfill Gas Study." In addition the Ad Hoc Committee took into consideration the information two Committee members brought back from Denver and information made available to the Committee by various other Committee members.

The Ad Hoc Committee also took into consideration many administrative, social, legal and economic factors that were not within the terms of reference of our consultants. These include administrative procedures to deal with the problem; the Department of the City most competent to deal with the issue on a continuing basis; the concerns of individuals having and/or working on or adjacent to retired and active landfill sites; and the hidden and identifiable costs in dealing with the problem, to list a few.

Essentially the approach of the UMA study "City of Winnipeg Landfill Gas Study" was to study the problem in an attempt to assess what is occurring and what should be done. The UMA study determined that the landfills were producing methane and that a "zone of concern" should be designated outside the landfill that could be affected by methane gas migration. The "zone of concern" was defined taking into consideration the nature of the soils in the area. The UMA approach was to deal with the methane by constructing remedial measures in buildings built in the zone of concern.

In reviewing the UMA study it was decided by the Ad Hoc Committee that it would be advisable to get an outside opinion on the study. Mr. J. Pacey of Emcon Associates of San Jose, California was engaged. Mr. Pacey reviewed the reports on the buildings situated on the St. Boniface Landfill Site and the UMA study "City of Winnipeg Landfill Gas Study."

The reports prepared earlier by the Ad Hoc Committee on the St. Boniface Landfill Site buildings incorporated both UMA designs and suggestions put forward by Mr. Pacey.

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Mr. Pacey, in reviewing the draft of UMA's "City of Winnipeg Landfill Gas Study," observed: "Within the constraints of available technical knowledge, time and budget, UMA did a commendable study and is to be complimented for their work effort; the UMA study will provide a valuable input to current and future studies in the field of landfill gas production and migration." Mr. Pacey nevertheless did question some conclusions of the draft UMA report. UMA reviewed and addressed some of these in the light of Mr. Pacey's comments. Mr. Pacey's critique, however, did not change the substance of UMA's findings.

In addition to commenting on the UMA "City of Winnipeg Landfill Gas Study," Mr. Pacey made suggestions on another approach the City could take.

Mr. Pacey's approach is to identify whether a problem exists and if it does, to then control the methane at the landfill boundary. The recommended method is to control the methane at the landfill boundary by constructing barrier trenches that are impervious to methane with the provision for venting the trenches to keep the methane concentration in the trench as low as possible. It is felt that the state of the art is such that this is the best approach for the City to take and this opinion has been confirmed by contacts with other experts in the field.

In order to evaluate whether the thirty-five retired landfills are potential problems will require a probe installation program carried out over a three year period with the total evaluation program taking five years to complete. A minimum of three years of observation are required for each landfill to arrive at a decision with respect to a site. This program should allow for the necessary administrative time to study each site before development surrounds the site. In the case of some sites, development may not reach the sites for at least ten years. However, in view of the problem encountered with respect to the St. Boniface Landfill Site, it is advisable that the sites be evaluated as quickly, practically and economically as possible.

It should be noted that the evaluation program will include the monitoring of existing buildings on and adjacent to landfill to verify or complement the probe readings.

It is proposed that one-third of the retired landfills be equipped with probes in 1979 and the remainder in 1980 and 1981. The probes would be spaced on and around the landfills at 1,000 foot intervals. Dependent on site conditions or readings taken at these probes, more probes may be set, say at 100 foot intervals if required. The procedure would be such that if the levels of methane immediately adjacent to the landfill were less than 0.2 Lower Explosive Limit (L.E.L.) -- the lower explosive limit of methane is 5 percent methane in air -- the landfill would be designated as not being a potential hazard to adjacent property. Should the evaluations show the readings to be in excess of 0.2 L.E.L. the site would be designated a potential hazard and additional probes would be installed to determine whether a barrier trench was required. If the additional probes verified significant methane passage in excess of the allowable limits, the study would determine where and along what sections of the landfill a barrier trench should be constructed.

Although it is proposed to use City staff, except for installation of probes which would be done by a drilling contractor, it is anticipated that a consultant will be used when the interpretation of the data leaves some doubt as to what action should be taken. For example, it has been suggested that when the probe readings located 10' outside the landfill boundary read in excess of 0.2 Lower Explosive Limit the City constructs a barrier trench. Since a barrier trench is expensive, if the readings were 0.22 Lower Explosive Limit, it may be desirable to get another opinion on whether the City should proceed with the barrier. If the readings were 0.6 Lower Explosive Limit, the City, in all probability, will not need an outside opinion. Similar problems in the placement of probes or the development of a program for a particular site may require the use of a consultant. This outside opinion would have to come from someone who has considerable and varied experience in methane gas migration such as Emcon Associates.

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The 1979 evaluation program would cost \$210,000 including the additional staff members required to run the program, consultants' fees, equipment, office space, transportation and the installation of probes at one-third of the retired landfills at 1,000 foot spacing. Should the installation of barrier trenches be deemed necessary at any location this would be done in 1980 and included in the 1980 budget and subsequent budgets if required.

The evaluation program in subsequent years is estimated at \$155,000 for Years 2 and 3 and \$143,000 for Years 4 and 5. These estimated costs do not include the cost of installing probes more frequently than 1,000 feet or installing barrier trenches if required.

The actual number of additional employees required would be four, a professional engineer to serve as supervisor, and three technicians - one geotechnical, one structural and one environmental.

The additional employees would be utilized on the proposed 5-year evaluation program. These employees would direct the installation of probes, carry out the testing, evaluate the results, make recommendations to the Planning Department with respect to building permits and development agreements, develop land use policies with respect to various landfill sites, design and supervise the construction of various protective measures such as a barrier trench.

The qualifications and expected duties of the additional employees are attached, and identified as Appendix "A".

The evaluation program will determine whether additional probes and/or barrier trenches should be installed. For Year 1 the expenditure for probe installation at 1,000 foot intervals, which is included in the previous estimate, is \$22,000. If probes had to be installed at 100 foot intervals at all the sites in the first year program, the cost of the first year's probe installations would be \$110,000, an increase of \$88,000. However, a barrier trench at only one site could cost up to \$600,000. Therefore, it is clear that before any investment is made in an exhaustive probe program (100 foot intervals) or in the installation of a barrier trench, that it is cost effective to determine whether these measures are actually required.

The Ad Hoc Committee investigated having the program carried out by consultants and a cost estimate of this was prepared. A City staff member similar to the professional engineer described above would still be required to supervise the study, carry out the necessary interdepartmental work, prepare reports for the supervisory department and Board and recommend policy. The outside opinion from a consultant such as Emcon would still be required since any local consultant engaged to carry out the program would, for the same reasons detailed above, require a second opinion.

The cost of the five-year program relating to Recommendation No. 2 is estimated to be \$806,000. If the work was carried out by a consulting firm, it is anticipated that the costs of the program would be \$995,000. In addition, the cost of the three-year program outlined in Recommendation No. 3 is estimated to be \$50,000.

The program should be carried out by the Works and Operations Department since they have the responsibility for planning and monitoring the disposal facilities. Presently they also have the expertise, some of the equipment and the supervisory staff in their Laboratory Services Branch of the Waterworks, Waste and Disposal Division necessary to carry out such a program. It is proposed that the Planning Department involvement would be limited to those items that deal specifically with buildings. Presently the Planning Department is preparing minimum criteria to be used for the design of buildings on or adjacent to landfills.

The proposed evaluation program will take a minimum of three years to complete for some of the landfill sites and up to five years for others. If barrier trenches are necessary, even more time may be required until such facilities are put into effect. Therefore, it will be necessary that the current interim policies regarding landfills remain in effect until such time as the evaluation of the sites are completed. These interim policies are summarized below.



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1. That no further sales of the City's landfill sites be made.
  2. That the Land Surveys and Real Estate Department not sell or grant easements on any City-owned land within 1,000 feet of a known landfill site, until final policies have been established by the City pertaining to such land.
  3. That no building permits for any new structures be issued on any former landfill sites in the Winnipeg area, until appropriate criteria for preventive measures have been developed and approved.
  4. That building permits for commercial buildings, industrial buildings, non-habitable accessory buildings and modifications to existing residential structures within the zone of concern adjacent to landfill sites be issued only where the applicant acknowledges that he is aware of potential problems and either:
    - (a) acceptable safety measures are incorporated where test results indicate significant amounts of gas are reaching the site, or
    - (b) test results indicate that there does not appear to be significant amounts of gas and the owner understands and accepts whatever risks are involved.
  5. For new residential buildings within the zone of concern adjacent to a landfill site, except as indicated in (6) below, the procedure will be as in (4) above except that approval from the Board of Commissioners is also required.
  6. That building permits for residential buildings within the zone of concern west of the Bonner Avenue Landfill be issued subject to the procedure in (4) above.
- NOTE: The zone of concern adjacent to landfill sites varies from 400 to 700 feet depending on soil conditions.
7. Revision of landfill boundaries only be made upon acceptable documentation in accordance with the investigation program developed by the Ad Hoc Committee for determining the extent and nature of methane gas generating material within landfill.

The moratorium on the sale of City landfill sites and adjacent land should not cause any problems with respect to the availability of land for development. If there is need to evaluate the site before it is studied under the regular evaluation program, this could be done by accelerating the program, or alternatively, having the site evaluated under the interim policies, which would allow the developer to proceed with an evaluation program.

Although the original terms of reference for this study were to address the methane problem at "retired" landfills, it is the opinion of the Board of Commissioners that a similar evaluation program should be instituted at the active landfills in Districts No. 2 and 6 and the Ash Dump in West St. Paul. The evaluation program at these sites should follow a program similar to the one developed for the Northeast Landfill site by the Works and Operations Department.

During the course of deliberations on this matter, and particularly in reviewing the experiences in the Denver area, it is clear that special precautions must be taken by all utilities when utility lines are constructed adjacent to or through landfills to ensure that methane gas is not transmitted to adjacent areas. It is assumed that the cost of the preventive measures to carry out these works will be balanced against alternative routings for the utility lines and that whatever additional costs are incurred will be charged to the utility lines in question.

June 13th, 1979

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Although the discussion in this report is limited to methane gas, it should be noted that other gases and leachate produced by landfills may also pose difficult problems. However, the proposed evaluation program will take these factors into account.

The Underwood McLellan and Emcon Associates reports have been received and evaluated by the Ad Hoc Committee on Landfill Studies. In consideration of these reports and other information, this report has been prepared to advise on what policy should be adopted with respect to the overall management of landfill environmental factors, so as to:

1. reduce the potential of personal injury or property damage arising from the generation and migration of methane gas from landfill sites, and
2. minimize any special constraints on the use of land adjacent to landfill sites by reducing or eliminating the zones of concern around such landfill sites.

After considering all aspects of this matter, your Committee recommends as follows, namely:-

1. That the interim policies regarding landfills remain in effect until such time that it is determined by an evaluation program, whether a landfill is generating sufficient methane or sufficient methane is migrating beyond the landfill boundary to create a hazardous condition.
2. That a comprehensive evaluation program be undertaken to determine which of the retired landfills are a potential hazard. It is estimated that this evaluation program will cost \$210,000 in the first year, \$155,000 per year in the second and third years and \$143,000 per year in the fourth and fifth years, including the addition of four staff members who may be hired on a fixed term contract basis, equipment, office space, transportation, consultant services and the installation of probes.
3. That the evaluation program be made the responsibility of the Waterworks, Waste and Disposal Division of the Works and Operations Department. The coordination of methane gas policies will also be the responsibility of the Waterworks, Waste and Disposal Division.
4. That in addition, an evaluation program be instituted at the operating landfill sites in Districts No. 2 and 6, and at the Ash Dump in West St. Paul, similar to what is underway for the Northeast Landfill Site. The program will cost \$20,000 in the first year and \$15,000 per year in the second and third years.
5. That the Department of Environmental Planning develop appropriate criteria for the design of buildings where significant amounts of methane may be present.
6. That utility lines adjacent or through landfills be so designed as not to transmit methane gas to adjacent areas and the criteria for the design of these utility lines be developed by the Works and Operations Department.
7. That a moratorium be placed on the sale of City-owned land on or adjacent to landfill sites until it is determined that the site is not a hazard under the evaluation program or the interim policies.
8. That an additional appropriation in the amount of \$230,000 be provided for the year 1979, in the Unclassified Section of the Tax Supported Budget under Account No. 319-415-000.
9. That the first ten sites to be evaluated be identified by the Board of Commissioners.

Moved by Councillor Leech,  
Adoption of the clause.

Carried.

(Sgd.) L. Leech, for the Chairman.

(Note: See Minute No. 1252 for attachment.)

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LANDFILL ENVIRONMENTAL SECTION - PERSONNEL

Supervisor

Qualifications:

Professional engineer specialized in solid waste management with expertise in the analysis and control of gas and leachate from sanitary landfill sites.

Demonstrated ability to make good engineering judgement, and an ability to communicate effectively with other professional people and the public.

Duties:

Under the general direction of

- Administers the Landfill Environmental Section
- Directs landfill environmental programs and control works done by the City
- Recommends policy for the management of sanitary landfill sites and adjacent areas
- Approves landfill protective measures
- Advises the Building Inspections Division regarding the need for protective measures for new building construction on and adjacent to landfills
- Reviews and co-ordinates work by others for the City (consultants, contractors) relating to landfill site environmental concerns
- Provides liaison with other City departments and outside agencies regarding landfill environmental concerns
- Compiles and reviews information on the State-of-the-Art regarding landfill environmental concerns.

Technician No. 1 (Geotechnical)

Qualifications:

Certified technician with a working knowledge of soils mechanics.

Demonstrated ability to make good technical judgements and an ability to communicate effectively with other technical people and the public:

Duties:

Under the direction of the section supervisor:

- Plans, co-ordinates and supervises the installation of gas probes on and adjacent to landfill sites
- Conducts testing of gas probes
- Compiles and analyses data from gas probes
- Makes recommendations to the supervisor based on data analysis
- Maintains records
- Maintains testing equipment and gas probes
- Assumes any priority work in the absence of Technician No. 2.

Technician No. 2 (Structural)

Qualifications:

Certified technician with experience in building and underground utilities construction.

Demonstrated ability to make good technical judgements and an ability to communicate effectively with other technical people and the public.

Duties:

Under the direction of the section supervisor;

- Conducts testing in existing structures (buildings and underground utilities)
- In consultation with the supervisor and Technician No. 1, advises applicants regarding any requirements for installation of test probes pursuant to evaluating proposed construction on private property on or adjacent to landfill sites
- Compiles and analyses data from gas testing
- Makes recommendations to the supervisor based on data analysis
- Maintains records
- Maintains testing equipment
- Assumes any priority work in the absence of Technician No. 1

Technician No. 3 (Environmental)

Qualifications:

Certified Technician with working knowledge of chemical analysis field sampling techniques, and environmental control procedures.

Demonstrated ability to make good technical judgements and an ability to communicate effectively with other technical people and the public.

Duties:

Under the direction of the section supervisor:

- Plans, co-ordinates and supervises the installation of gas, leachate, groundwater, and surface water monitoring and control facilities at active landfill sites
- Conducts necessary testing related to above
- Compiles test data and analyses
- Makes report recommendations to the supervisor based on data analysis
- Maintains neat and accurate records
- Maintains test equipment
- Provides test samples to laboratory for further analysis when required
- Co-operates with Geotechnical and Structural Technicians in overall landfill environmental control program.