

Report of the Committee on Works and Operations, dated October 2nd, 1984.

2. That the requirement to purchase by contract or quotations be waived, and that the Communications Branch of the Streets and Transportation Department be authorized to purchase from the Manitoba Telephone System those maintenance supplies and test equipment used by M.T.S. for maintaining the Transit-Com system at a negotiated value equal to, or less than, the price at which said supplies could be purchased directly from other suppliers.
3. That the proper officers of the City do all things necessary to implement the foregoing.

Moved by Councillor Eadie,
Adoption of the clause.

Carried.

Methane Gas Policy - Landfill
Environmental Program. File WT-3

1397 - 6. On June 13th, 1979, Council adopted a Methane Gas Policy and authorized a five-year Landfill Environmental Program to investigate landfill sites within Winnipeg, which thereafter commenced with the addition of term staff to the Waterworks, Waste and Disposal Department. Since September 24th, 1979, progress reports have been submitted to the Board of Commissioners on a regular basis. On November 24th, 1983, the Waterworks, Waste and Disposal Department met with members of the former Methane Gas Ad Hoc Committee to discuss progress in, and the future of the Landfill Environmental Program, which expires at the end of this year. On July 9th and 10th, 1984, representatives of the Waterworks, Waste and Disposal Department met with an engineering consultant of Emcon Associates, who is acting in a review capacity regarding the program findings and recommendations.

The concern with methane is the explosive nature of this gas and the accidents that have occurred where the gas has collected in structures and exploded from a source of ignition. This gas is also flammable and can cause asphyxiation. The objectives of the five-year Landfill Environmental Program were as follows:-

1. To reduce the potential of personal injury or property damage arising from the generation and migration of methane from landfill sites; and
2. To 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.

The program methodology involved investigating the limits and composition of the 36 sites, with instrumentation installed inside and immediately outside of fill to allow for gas testing. Buildings and underground structures on and adjacent to the sites were also tested. If gas concentrations immediately outside of fill exceeded the commonly accepted standard of 20 percent of the lower explosive limit for methane, (which is explosive at concentrations of 5-15 percent by volume in air) gas barrier controls were to be considered. Previous consulting work identified a potential for methane migration for a distance of 700 feet from landfill boundaries, which was designated as the zone of concern. In addition to the main objectives, the following additional work was part of the program, i.e. testing for liquid pollutants which may affect the groundwater or surface water at the three active landfills (Brady, Summit, Northeast Park), development of criteria for structures in methane hazard areas and, interim policies (Appendix II), regarding building and land sales on and within 700 feet of landfills were to remain in effect.

Investigations have essentially been completed at all of the 36 sites identified prior to the Landfill Environmental Program, and based thereon, gas migration controls have been implemented at two sites, the Kimberly and Margaret Park Landfills. The controls appear to be functioning satisfactorily, but on-going monitoring will be required to ensure satisfactory long-term performance. Three other sites, the St. Boniface Landfills I and II and the Cordite Landfill require some modification at the site perimeters to ensure confinement of methane within the sites. Another three sites require a final assessment as to the need for any physical gas controls and four sites require some additional work to better define the site limits. Two additional sites in the Additional Zone, the CPR/Plessis Road and Pritchard Farm Road sites have been identified for investigation.

Testing at instrumentation installed at the sites has been supplemented with testing of buildings and underground services on and around the sites. During this program hazardous conditions from landfill-related methane have not been encountered within occupied structures. As a precaution, the potential for gas build-up has been addressed by way of an automatic detection, venting and alarm system at the Incinarena on the Kimberly Landfill. The Police Department will also be modifying its clubhouse on the Cadboro Landfill to prevent any potential gas build-up. There are also a number of sites where the potential for gas infiltrating structures must be addressed by on-going testing because of the difficulty in implementing physical controls in the alternative. Consultants have advised that in such cases, monitoring is an acceptable alternative to physical controls. The testing of buildings included those that contained methane protective measures of various types, including underslab membranes, perimeter trenches and membranes, elevated construction and mechanical detection, alarm and ventilation systems. All of these types of control methods appear to be effective. Of these types of controls, the mechanical systems require the most surveillance to ensure adequate performance. Significant methane readings have not been encountered at underground services with the exception of the St. Boniface Landfill where occasional readings are encountered. Construction standards have been implemented for underground service work on or adjacent to landfills.

Significant methane readings attributed to organic deposits local to the buildings rather than landfill related, have been encountered at seven buildings located within the 700 foot zones of concern. The scale of readings encountered warrants continued surveillance. It should be noted that the investigations have confirmed that buried organics (such as topsoil) other than refuse can produce methane.

Based on the program findings, there is justification for substantially reducing the zones of concern from 700 feet to 300, 150 and 50 feet or the site boundary depending on the site particulars and provided further monitoring is carried out to confirm the new zones. This monitoring will also serve to substantiate further reductions in zones at some of the sites. The land area under constraint within the 700 foot zone of concern is approximately 3,800 acres or 1,500 hectares. The land area under constraint within the new proposed zones is approximately 700 acres or 280 hectares, representing an 82 percent reduction in area under constraint.

Testing has been carried out at the three active landfills for liquid pollutants (leachate) resulting from percolation of precipitation and groundwater through the refuse. Testing of groundwater outside of the sites has thus far not revealed any evidence of migration of leachate out of the sites. The sites are located in clay areas which retard the migration process, however the effects of migration could show up in the longer term. In the course of investigations at older refuse sites, leachate was found to be present and in a few cases was breaking out through the surface cover.

Within the program period, a survey of landfills in Manitoba was carried out under a Federal/Provincial program which largely excluded the Winnipeg area. Therefore, the results of this survey, for the most part, did not impact this program. Another study is being completed regarding gas migration in Ontario, but the information is unlikely to be directly applicable to the Winnipeg situation because of differences in soil and groundwater tables.

The Methane Gas Policy report of 1979 referred to accidents that has occurred resulting from landfill gas. These incidents continue to occur in localities where methane has not been addressed. Recent explosions in a building in Madison, Wisconsin and in an underground service line in Akron, Ohio are examples of the kinds of problems that continue to occur with landfill gas. There are also numerous examples elsewhere of leachate contamination of ground and surface waters.

Based on the work carried out, the following conclusions have been reached:-

1. All of the sites investigated containing significant amounts of decomposable buried organics (refuse, ash, vegetation, topsoil) produce methane, although in varying amounts, with large refuse fills yielding the highest concentrations (maximum observed 84.4 per cent methane-in-air) and ash and topsoil fills the lowest concentrations. Organic topsoils and vegetation in shallow fills apart from major deposits can produce some methane.

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2. Significant methane migration beyond the immediate periphery of filling has been detected and addressed at the Kimberly and Margaret Park Landfills. The remainder of the sites can be categorized as follows:

Three sites (Cordite, St. Boniface I, St. Boniface II) require some modifications at the perimeters to ensure gas containment. Two sites require further work to establish any need for physical controls (Harcourt and Riel).

Four sites require further definition of site boundaries and fill conditions (Leila, Leila West, Elmwood, Brooklands).

Five sites have a higher potential for significant migration, (McPhillips, Summit, Brady, Cadboro West and Northwest Park Landfills); however these sites are remote from current development. The remaining 20 sites have displayed little to no migration.

3. This program has allowed for the reduction of the 700 foot zone of concern around the sites. Monitoring continues to be the basis for the evaluation of landfill gas hazard environments and the assessment of development in the zone of concern. The additional work required at some of the sites is based on the program findings and is directed at site specific reduction of the zone of concern or migration barriers if required. Based on the additional work, there is reason to believe that within the next 3 years, most control zones should be in the range of 50 to 150 feet. One or two sites may still be the exception due to soil anomalies.
4. Natural conditions around landfills may adequately limit gas migration from landfills, where soil conditions, the water table or landforms are favourable. Where limits on migration are required relative to existing or proposed development, barrier systems can be utilized with a monitoring program to assess adequate performance.
5. Laboratory analysis utilizing a gas chromatograph is necessary to define landfill gas components present and their composition.
6. Within the zone of concern but outside the landfill boundaries, barrier systems or elevated construction with a monitoring program to assess adequate performance, may be used at buildings and at underground services for protection against methane migration.
7. Elevated construction is the preferred method of construction for buildings on landfill, subject to a site specific design and a monitoring program to assess adequate performance.
8. Methane extraction as a control and for energy recovery may be viable for large refuse fills.
9. Leachate is produced at all refuse fills.
10. At the three landfills that have been monitored for leachate, migration has not occurred to date.

Both gas generation and migration are subject to changes resulting from weather variations and soil disturbance related to development. For the sites that have not demonstrated problems thus far, there is no guarantee that problems will not occur at a future time, and it is estimated that gas production at most of the sites will not be drastically reduced in the foreseeable future. Consultants have advised that monitoring is an acceptable alternative to physical controls where sites have not demonstrated problems in the short term. The long term control would take the form of continued monitoring at the proposed new zones to provide sufficient advance warning of any significant change in gas conditions. In the event significant readings were encountered at a later date, physical controls would then be implemented. The frequency of monitoring would be reduced as confidence was gained through testing. Any new or existing structures within the revised control zones would still require regular monitoring as would the recently installed gas barriers at the Kimberly and Margaret Park sites. With this approach the program objectives will have been met, namely safety in and around the sites and minimizing restrictions on land use around them. This alternative is also the most cost effective approach when compared to the other alternatives.

Restrictions outside the new control zone could be lifted, with the interim policies (Appendix II) applying only within the new zones. Existing and future land use on and around the sites would be reviewed in preparation for

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implementing development and land use controls as required. For example, the freeze on sales of City-owned landfills could be lifted at sites suitable for development. Any sales of City-owned lands and construction within the new control zones would be preceded by detailed evaluations as to the type of controls required. Although the next three years of the program should serve to optimize the control zones, land use development controls at the sites for the long term, it is envisioned that on-going monitoring will be required beyond the next three years and perhaps in perpetuity, depending on the further results of testing, technological advance in this field and the extent of future landfilling activities.

Although no pollution of groundwater or surface waters has been evidenced at the active sites thus far, this type of dedicated monitoring should be carried out on a long term basis as an assurance for the prevention of possible irreversible pollution of groundwater as experienced elsewhere. Approvals for operating sites such as Kilcona Park, (Northeast Park) stipulate the requirement for continued monitoring. Approvals for any new sites will also carry this requirement. This type of monitoring should also be extended to include former landfills, especially since some of these sites received industrial waste and construction of the sites would not conform to current standards. Should leachate testing indicate the need, remedial measures would be developed to prevent pollution of ground and surface waters.

Emcon Associates, engineering consultants specializing in environmental control, were first retained by the City in 1979 to review reports regarding methane prepared by the local consultant for the City. Emcon's recommendations were used in preparing the Methane Gas Policy report in 1979. During the course of this program, Emcon have been consulted on several occasions regarding difficult technical matters and prior to the preparation of this report, Emcon Associates were retained in an advisory capacity. The program findings and the proposed long term approach were reviewed in detail with Emcon. The Company subsequently advised that the City's approach is sound and consistent with the state-of-the-art for addressing landfill gas and leachate concerns.

It is proposed that long-term control of gas and leachate at the sites consist of on-going monitoring, with physical controls implemented only where demonstrated problems exist. In addition to this testing, some additional work remains to be carried out at specific sites related to migration controls and further site definition. This program can be carried out by the City or by an engineering consultant. Based on 1984 costs it is estimated that the funding required over the next three years for staffing, transportation, maintenance and instrumentation and equipment and consultation with specialists would be \$400,000.00 if the work was done by the City. In comparison, a consulting firm has estimated their cost for carrying out this work to be in excess of \$1,000,000.00. At the end of the third year, the results would again be evaluated, with the likely result of a reduction in the monitoring. For the future, for both methane and leachate, private landfills should be tested by the owner and monitored by the City. Private landfills are defined as refuse and/or other waste material fills that are deemed to be the responsibility of the owners by virtue of their management and control of a site.

In light of these conclusions, opinions from the former Ad Hoc Committee, and the Law and Environmental Planning Departments specifically, the following alternative long-term approaches were examined:-

Regarding Methane Gas:

1. Terminate program at the end of the five years.

This alternative has been discussed in detail with the Supervisor of Building Inspections and the Law Department. The Supervisor of Building Inspections has indicated that because of the great concern with the methane gas affecting buildings, terminating monitoring would not be acceptable. Also, based on comments from the Law Department, this alternative does not appear to be acceptable.

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2. Construct barriers around all sensitive sites.

The construction of barriers around all sensitive sites would be extremely costly (the Kimberly and Margaret Park landfill gas barriers cost \$560,000.00 not including follow-up monitoring) and owing to complexities at several of the sites, would be tantamount to acquiring affected lands. Barriers or any other physical controls would still require follow-up monitoring and/or maintenance in the long term. Other than relocating the sites, which is impractical for most of them, no ultimate solutions have emerged either locally or in the field as a whole.

3. Acquire all properties in the Zones of Concern for a buffer zone.

Approximately 700 acres (280 hectares) of land falls within the proposed new zones of concern. This alternative would be very costly and is not justified in most cases based on conditions found thus far, but may have limited application in special instances.

Your Committee on Works and Operations therefore recommends that the City's Methane Gas Policy-Landfill Environmental Program be continued and:

1. That the zones of concern be reduced at the sites commensurate with the program findings as follows:-

300 feet

Cordite Landfill
 McPhillips Landfill
 Harcourt Landfill
 Summit Landfill
 Cadboro West Landfill
 Brady Landfill
 Northeast Park Landfill

150 feet

St. Boniface Dump
 St. Boniface I Landfill
 St. Boniface II Landfill
 Redonda Landfill
 Kimberly Landfill
 Margaret Park Landfill
 Leila West Landfill
 Charleswood South Landfill
 Cadboro Landfill
 Shaftsbury Dump
 Elmwood Landfill
 Nairn Landfill
 Riel Dump
 River Road Dump
 Leila Landfill (Developed Area)

50 feet

Beliveau Dump
 Redonda Dump
 Bonner Landfill
 McPhillips Dump
 Saskatchewan Dump
 Barry Dump
 Leila Landfill (Park Area)
 Charleswood Landfill
 Brooklands Landfill
 CNR/Dugald Road Landfill
 River Lot 61 Dump

Site Boundary

Charleston Site
 CN-Osborne Site
 CN-Red-Assiniboine Site
 Sterling Site

2. That any methane related caveats, conditions or agreements outside the new zones in 1 above, be removed where applicable.
3. That the new zones at City sites be confirmed and/or reduced further by on-going monitoring on a three-year review basis.
4. That the owners be responsible for testing to confirm the new zones at private sites with monitoring as required by the City.

5. That additional work be carried out at specific sites as follows:

<u>Modifications at Site Perimeters</u>	<u>Investigate need for Physical Controls</u>	<u>Further Site Definition</u>
Cordite St. Boniface I St. Boniface II	Harcourt Riel	Leila Leila West Elmwood Brooklands

6. That the two additional sites, CPR/Plessis Road and Pritchard Farm Road be investigated and tested for three years by the owners, with monitoring as required by the City.

7. That the interim policies, (Appendix II) revised where necessary to conform to the program findings, remain in effect within the revised zones.

8. That leachate and groundwater monitoring continue at the active sites at the present scale of monitoring.

9. That leachate and groundwater monitoring be carried out by the City at the following sites:-

Margaret Park Landfill
Beliveau Dump
St. Boniface I Landfill
St. Boniface II Landfill
Kimberly Landfill
Cordite Landfill
McPhillips Dump
McPhillips Landfill
Saskatchewan Dump
Harcourt Landfill
Riel Dump

10. That the owners be responsible for testing of leachate and groundwater at the St. Boniface Dump.

11. That appropriate action be taken to secure development and land use controls in the long term within the control zones, using methods such as zoning, agreements, caveats and acquisition.

12. That these recommendations be carried out by the Waterworks, Waste and Disposal Department in conjunction with other appropriate departments of The City of Winnipeg.

13. That the sale or lease of any City-owned lands within the new zones of concern be subject to a review and favourable recommendation by the Waterworks, Waste and Disposal Department.

14. That the Personnel Department be instructed to review staffing requirements for the on-going program.

15. That an appropriation in the amount of \$140,000.00 be provided for the year 1985, in the Unclassified Section of the Tax Support Budget under Account No. 314-959-XXX.

16. That the proper officers of the City do all things necessary to implement the foregoing.

For the information of Council, the Committee on Environment, at its meeting on September 10th, 1984, concurred in the above recommendations.

Moved by Councillor Eadie,
Adoption of the clause.

Carried.

(Note: See Minute No. 1405 for attachment.)

Councillor Skowron and Councillor Eliason asked to be recorded as being opposed to the above motion, in accordance with Section 49.8 of the Procedure By-law.

1405 - Attachment referred to in Clause 6 of the Report of the Committee
on Works and Operations, dated October 2nd, 1984.

TABLE I - SITE ASSESSMENT SUMMARY

	<u>Proposed Control Zone</u>
<u>High Risk</u>	
<u>First Priority</u>	
St. Boniface Landfill I	150'
Meadowood - Riel Dump	150'
<u>Second Priority</u>	
Redonda Landfill (Harold Hatcher School)	150'
River Road Dump	150'
<u>Medium Risk</u>	
<u>First Priority</u>	
Kimberly Landfill	150'
Harcourt Landfill	300'
Elmwood Landfill	150'
Nairn Landfill	150'
<u>Second Priority</u>	
St. Boniface Dump	150'
St. Boniface Landfill (Kildonan Concrete)	150'
St. Boniface Landfill II	150'
Redonda Landfill (Park Area)	150'
Cordite Road Landfill	300'
Leila Landfill (Developed Area)	150'
<u>Third Priority</u>	
Margaret Park Landfill	150'
Cadboro Road Landfill	150'
River Lot 61 Dump	50'

Low Risk

Proposed Control Zone

First Priority

Bonner Landfill	50'
McPhillips Dump	50'
McPhillips Landfill	300'
Leila West Landfill	150'
Summit Road Landfill	300'
Shaftesbury Dump	150'
Charleswood Road South Landfill	150'
Cadboro Road West Landfill	300'
Brady Road Landfill	300'
Brooklands Landfill	50'
Northeast Park Landfill	300'

Second Priority

Beliveau Dump	50'
Redonda Dump	50'
Leila Landfill (Park Area)	50'
Saskatchewan Dump	50'
Barry Dump	50'
Charleswood Road Landfill	50'
CNR/Dugald Landfill	50'

Third Priority

Charleston Site	Site Boundary
CNR/Osborne Site	Site Boundary
CNR/Red-Assiniboine Site	Site Boundary
Sterling Site	Site Boundary

APPENDIX IIINTERIM POLICIES

At its meeting held on October 10th, 1979, The Board of Commissioners approved the following interim policies regarding landfills:

1. a) That no further sales of the City's landfill sites be made.
- b) That no further sales of City-owned land within the zone of concern adjacent to landfill sites be made unless a specific review is undertaken and approval is obtained from the Waterworks, Waste and Disposal Division.
2. That the Land Surveys and Real Estate Department not grant easements on an City-owned land on or within the zone of concern adjacent to landfill sites unless a specific review is undertaken and approval is obtained from the Waterworks, Waste and Disposal Division.
3. That no building permits for any new structure be issued on any former landfill sites in the Winnipeg area, until released under the current testing program approved by Council and until appropriate criteria for preventative measures have been developed and approved.
4. That building permits within the zone of concern adjacent to landfill sites be granted where:
 - a) Test results indicate that there does not appear to be significant amounts of gas, or
 - b) Acceptable safety measures are incorporated where test results indicate significant amounts of gas are reaching the site.

If the City's monitoring program is not in place at the particular site, the owner must also install and maintain for up to three years acceptable gas test probes and must grant the City access for testing.

5. Revision of landfill boundaries only be made upon acceptable documentation in accordance with an investigation approved by the Waterworks, Waste and Disposal Division for determining the extent and nature of methane gas generating material within landfill.

NOTE: The zone of concern adjacent to landfill sites varies from 400 to 700 feet, depending on soil conditions.

Nairn-Elmwood Only - Approved November 15, 1979.

1. An investigation of the subject site approved by the Waterworks, Waste and Disposal Division be undertaken to determine the nature and extent of methane generating material.
2. If methane generating material is found, it be removed from the subject site and replaced with inorganic fill to the satisfaction of the Waterworks, Waste and Disposal Division.
3. Methane protective measures approved by the Department of Environmental Planning be incorporated in the design of buildings and services.
4. Approval be obtained from The Board of Commissioners prior to building permit issuance.

TABLE 2

SITE	Gas Probes		Structures		Underground Structures (Semi-Annual Basis)	Leachate Testing (Annual Basis)	Groundwater Testing (Annual Basis)
	Number	Monitoring Frequency	Number	Monitoring Frequency			
St. Boniface Dump	41	monthly	7	quarterly	yes	yes	yes
Meadowood - Riel	31	quarterly	50	5 times/yr	yes	yes	-
Redonda Landfill	17	quarterly	School 20 homes	quarterly annual	yes	-	-
River Road	11	quarterly	12	semi-annual	yes	-	-
Kimberly	78	quarterly	Arena 6 homes	quarterly semi-annual	yes	yes	-
Harcourt	26	quarterly	0	-	yes	yes	yes
Elmwood	16	quarterly	20	semi-annual	yes	-	-
Nairn	16	quarterly	20	semi-annual	yes	-	-
St. Boniface Dump	10	quarterly	0	-	-	yes (by owner)	yes (by owner)
St. Boniface II	15	quarterly	0	-	-	yes	yes
Cordite Road	21	quarterly	2	quarterly	-	yes	yes
Leila	20	quarterly	2 shop- ping centre	annual semi-annual	yes	-	-
Margaret Park	14	quarterly	1	quarterly	-	yes	-
Cadboro Road	9	quarterly	1	quarterly	-	-	-
River Lot 61	43	quarterly	0	-	yes	-	-
Bonner	14	semi-annual	1	semi-annual	-	-	-
Ash Dump	8	semi-annual	0	-	-	yes	yes
McPhillips	21	semi-annual	0	-	-	yes	yes

TABLE 2

SITE	Gas Probes		Structures		Underground Structures (Semi-Annual Basis)	Leachate Testing (Annual Basis)	Groundwater Testing (Annual Basis)
	Number	Monitoring Frequency	Number	Monitoring Frequency			
Leila West	8	semi-annual	0	-	-	-	-
Summit Road	19	semi-annual	1	annual	-	yes	yes
Shaftesbury	6	semi-annual	0	-	-	-	-
Charleswood Road	8	semi-annual	0	-	-	-	-
Cadboro West	10	semi-annual	0	-	-	-	-
Brady Road	27	semi-annual	2	annual	-	yes	yes
Brooklands	14	semi-annual	0	-	yes	-	-
North-East Park	25	semi-annual	1	annual	-	yes	yes
Beliveau Road	6	semi-annual	0	-	-	yes	-
Redonda Dump	4	semi-annual	0	-	-	-	-
Saskatchewan Ave.	8	semi-annual	3	annual	-	yes	-
Barry	7	semi-annual	2	annual	-	-	-
Charleswood Road	7	semi-annual	0	-	-	-	-
CNR-Dugald	5	semi-annual	0	-	-	-	-
Charleston	0	-	0	-	-	-	-
CN-Osborne	0	-	0	-	-	-	-
CN-Red-Assiniboine	0	-	0	-	-	-	-
Sterling	4	semi-annual	0	-	-	-	-