

City of Winnipeg

Land and Development Services Department

# Public Markets Development Concept Study

November 1996

**DS-Lea Consultants Ltd.**  
Consulting Engineers • Planners • Transportation Consultants

Vancouver • Winnipeg • Toronto • Ottawa • London • Overseas





**PUBLIC MARKETS  
DEVELOPMENT CONCEPT STUDY**

**Prepared for the  
Land and Development Services Department  
City of Winnipeg  
(File 7485/A)**

**By  
DS-Lea Consultants Ltd.**

**November 1996**



## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1
1.1	Background .....	1
1.2	Purpose of the Study .....	4
1.3	Methodology .....	5
2.0	LAND USE PLANNING .....	5
2.1	Plan Winnipeg .....	5
2.2	Land Use Zoning .....	6
2.3	Present Land Use Within the Study Area .....	6
3.0	COMMENTS FROM THE CITY OF WINNIPEG ADMINISTRATION .....	8
3.1	Streets and Transportation Department .....	8
3.1.1	Long Range Transportation Plans .....	8
3.1.2	Access to Regional Streets and the Internal Street Pattern .....	12
3.2	Water and Waste Department .....	13
3.2.1	Water .....	13
3.2.2	Wastewater .....	13
3.2.3	Land Drainage .....	13
3.3	Civic Buildings Department .....	14
3.4	Parks and Recreation Department .....	15
3.5	Community Services Department .....	15
3.6	Business Liaison and Intergovernmental Affairs .....	16
4.0	ENVIRONMENTAL ISSUES .....	16
4.1	Background .....	16
4.1.1	The Public Markets Ltd. ....	16
4.1.2	Other City-owned Lands .....	18
4.2	Legislative and Environmental Impact Review and Analysis .....	19
4.3	Remediation .....	19
4.4	Cost Estimates .....	20
4.5	Conclusions .....	20
5.0	GENERAL CONSTRAINTS AND ASSUMPTIONS .....	21
5.1	The Existing Rail Facilities .....	21
5.2	The Existing Industrial Uses Outside the Study Area .....	21
5.3	The Existing Institutional Uses on Rue Archibald .....	22
5.4	The Existing Industrial/Commercial Uses Within the Study Area .....	23
6.0	DISCUSSION ISSUES .....	25
6.1	Separation of Incompatible Land Uses .....	26
6.2	Land Drainage .....	29
6.3	Regional Streets .....	31
6.4	Environmental .....	31
6.5	Public Works Yard .....	32
6.6	Recreational Uses .....	34



7.0	DEVELOPMENT OPTIONS .....	36
7.1	Residential .....	37
7.2	Recreational .....	38
7.3	Industrial .....	39
8.0	SUMMARY AND CONCLUSIONS .....	45
8.1	Land Use .....	45
8.2	Transportation .....	45
8.3	Land Drainage .....	46
8.4	Regional Public Works Yard .....	46
8.5	Environmental .....	47
8.6	Aesthetics .....	47
9.0	SUMMARY OF OUTSTANDING ISSUES AND RECOMMENDED ACTION ..	48

#### LIST OF FIGURES:

Figure 1	Location Plan .....	2
Figure 2	Study Area .....	3
Figure 3	Land Use Zoning .....	7
Figure 4	Proposed New Regional Streets .....	9
Figure 5	Proposed Grant Avenue Extension – Alignment Alternatives .....	11
Figure 6	Testing Locations .....	17
Figure 7	Heavy Industrial – Residential: Separation Distances .....	28
Figure 8	Retention Pond Outlet Options .....	30
Figure 9	Industrial Park Concept – Option A .....	40
Figure 10	Industrial Park Concept – Option A/Phase 1 .....	41
Figure 11	Industrial Park Concept – Option B .....	43
Figure 12	Industrial Park Concept – Option B/Phase 1 .....	44

#### APPENDIX A

A.1	Legislative Review .....	i
A.2	Environmental Impact Review .....	iii
A.3	Analysis .....	iii
Table 1	1990 Criteria for Soils for Industrial Sites	
Table 2	1996 Criteria for Soils for Industrial Sites	
Table 3	1996 Criteria for Soils for Residential Sites	
Table 4	1990 Criteria for Groundwater for Industrial Sites	
Table 5	1996 Criteria for Groundwater for Industrial Sites	



# PUBLIC MARKETS DEVELOPMENT CONCEPT STUDY

## 1.0 INTRODUCTION

The Public Markets site is located south of Marion Street and east of rue Archibald in St. Boniface (Figure 1). For purposes of this report, the term "Public Markets site" is used to describe a study area bordered by rue Archibald on the west, Marion Street on the north, the CNR Sprague line on the east and the CP/CN transfer track and Paddington Yard on the south (Figure 2).

*The Public Markets Limited* was the name of the company which owned and operated the former stock yards. This land was acquired by the City of Winnipeg in 1991. The study area includes the former Public Markets land, the former Canada Packers and Swifts meat packing plant sites, as well as other private holdings. In total, the study area is comprised of approximately 87 hectares (215 acres) of land, including 3.14 ha. west of the CPR Emerson line. The right-of-way for the CPR Emerson line, which cuts through the study area, occupies 1.63 ha. The City owns approximately 85 % (72 ha./178 ac.) of the land within the study area. The balance is privately held.

### 1.1 Background

For eighty years prior to the late 1980s, much of the Public Markets site had been used for livestock related uses including holding, selling, transferring, killing and packing. The primary operations were the Public Markets Limited stockyards, which occupied most of the land away from the Marion Street frontage, the Canada Packers and Swifts plants, located near the Marion and Archibald intersection, and a hide processing plant. A number of rail yards and sidings also existed on the property at one time.

The stock holding pens, barns and most of the associated buildings were removed between 1983 and 1988. Structures remaining on the site include the administration building, powerhouse and water tower. The former Swifts plant was demolished in 1993 and the former hide processing plant in 1995. The former Canada Packers plant is being demolished by the owner.

The site is generally characterized by limited remaining industrial and commercial uses, derelict buildings and vast tracts of vacant land. In its present state, it does not compliment the community from either a visual or economic perspective. The Chambre de Commerce Francophone de Saint-Boniface and Winnipeg 2000 have both conveyed their concerns to the City that the appearance of the area detracts from Saint Boniface and



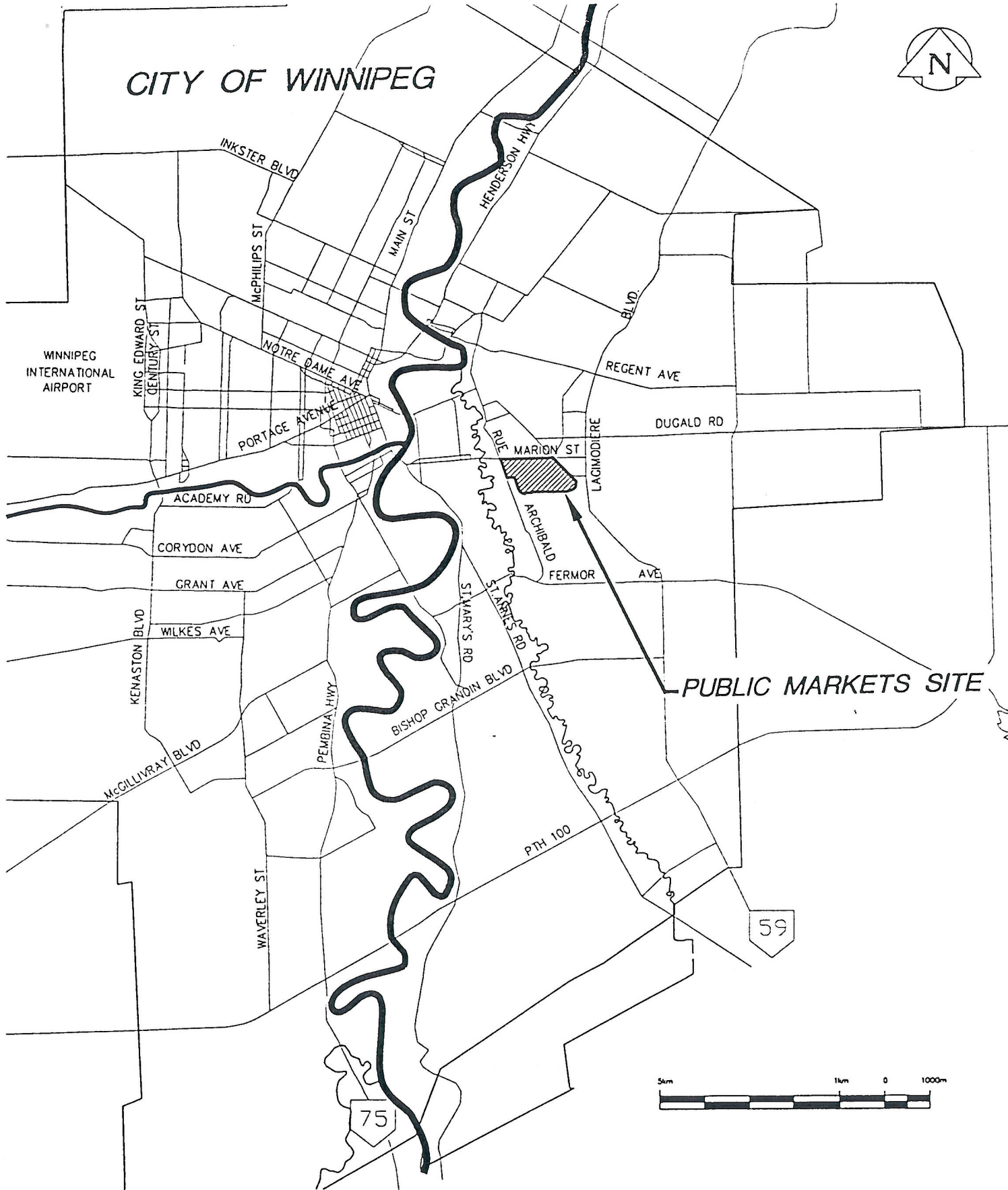


Figure 1  
Location Plan



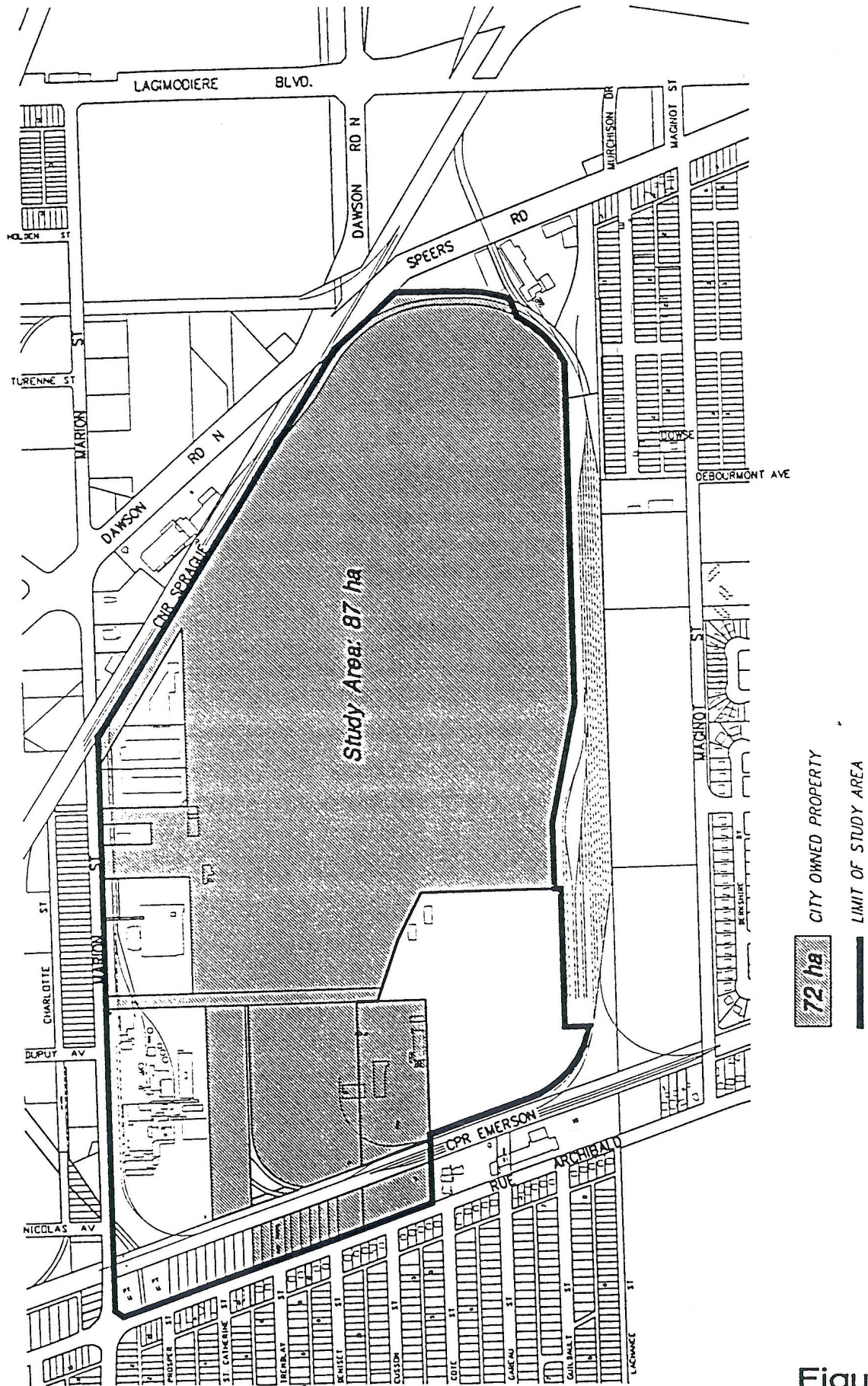


Figure 2  
Study Area

Winnipeg and they would like to see some physical changes or development which would improve its character. They point out that the site presents a poor image to visitors who approach the Winnipeg from the southeast, particularly along PTH 59 from the United States.

In addition, residents of the adjacent communities of Windsor Park and Archwood have expressed concern about the appearance of the site and the potential risks associated with derelict buildings because of their attractiveness to children. They are also concerned about the future use and the apparent lack of planning or policy statements for the site.

## 1.2 Purpose of the Study

The City of Winnipeg originally purchased the Public Markets Limited land to establish a consolidated central works yard to replace the Ross Avenue yard. The Ross Avenue yard was being closed and relocated to free up the site for the development of the new Federal Laboratory Centre for Disease Control. Subsequent to the purchase of the Public Markets land, a decision was made to relocate the public works yard to a site on Pacific Avenue. As a result, the Public Markets land was no longer needed for the purpose that it was originally acquired.

Since the purchase of the Public Markets Limited land, the former Swifts plant and land was acquired in tax sale in 1993 and the buildings, excluding the Super-tech Feeds buildings (operating under a lease agreement), were demolished shortly thereafter. The City has also purchased the former C.H.E. Services Ltd. (856 Marion) and demolished the buildings.

The City of Winnipeg presently owns approximately 72 ha (178 ac.) of industrially zoned land which is, for the most part, vacant and unserviced. The bulk of the land does not front onto existing streets and will require significant investment in new services prior to development unless it is developed as a "dry land industrial" site.<sup>1</sup>

The Land and Development Services Department needs to confirm the future use of the land so that it can either be sold or developed. Super-tech Feeds, which is leasing land from the City, has offered to purchase its site. In addition, several City departments have expressed interest in the possible use of portions of the site and there are plans for regional services such as transportation and land drainage which have an impact on the site.

---

<sup>1</sup> Not requiring sewers or watermain services.



And finally, although the land is zoned for industrial uses, it has been suggested by some residents of the adjacent residential communities that the current zoning is inappropriate and the site should be redeveloped for residential purposes.

The primary purpose of the study is to consider different scenarios with respect to the future development of the land. The analysis of the scenarios will assist the Land and Development Services in developing recommendations for a land use policy statement. The policy statement is needed to provide the department and City Council with a framework in which to make decisions and to provide information to area industries, businesses and residents so they can plan accordingly.

### 1.3 Methodology

DS-Lea Consultants conducted the study in two phases. The first phase provides a current status report for the study area with respect to land use and zoning, a review of the previous work carried out with respect to potential environmental contamination from prior uses, and discussion of the potential impacts of planned regional services and possible land requirements for City purposes.

The second phase of the report considers future land use scenarios including industrial, residential and recreational options. The purpose of generating the land use scenarios is to provide the Land and Development Services Department with a framework which can be used to assist in responding to issues and developing on-going policies for the Public Markets and adjacent lands.

## 2.0 LAND USE PLANNING

Planning and land use controls for the Public Markets area are under the jurisdiction of the City of Winnipeg. It is situated in the St. Boniface Ward in the Riel Community Committee area.

### 2.1 Plan Winnipeg

The Public Markets site, as well as the lands to the north and east, are designated as "Industrial" in the City of Winnipeg's development plan (By-law No. 5915/92, *Plan Winnipeg...toward 2010*). The Riel Community Committee passed a motion on March 17, 1993, requesting that the Committee on Planning and Community Services initiate an amendment to Plan Winnipeg to change the designation of the Public Markets area from an "Industrial" classification to a "Neighbourhood" classification. A neighbourhood classification would allow the area to be redeveloped with residential and local commercial uses. This request has not been acted on to date.

## 2.2 Land Use Zoning

Under City of Winnipeg Zoning By-Law No. 6400/94, all of the lands east of the CPR Emerson line, west of the CNR Sprague line and north of the Paddington Yard (including the yard), are zoned "M3" (Figure 3). The "M3" zoning district is intended to accommodate heavy industrial uses which produce emissions or noise of a potentially noxious nature and/or which are particularly unattractive in appearance.

The lands to the north and east of the Public Markets are also zoned "M3" and contain a mixture of industrial uses mostly related to agricultural business including slaughter houses and meat processing plants.

The vacant land west of the CPR Emerson line is a mix of "C2" (general commercial), "M1" (light industrial) and "R2" (low density residential) zoning. The Archwood School and Holy Family Church properties are also zoned "R2". The land along the west frontage of Archibald is primarily zoned "C1". The Archwood residential community to the west of Archibald is zoned "R2" but is primarily single family detached houses.

The land immediately to the south of the Paddington Yard, north of Maginot Street, is zoned "M2" (medium industrial). The easterly part of this area (around DeBourmont Avenue and east) is developed as a school bus depot and a trucking terminal (TriMac Transportation Services). The lands west of the bus depot are undeveloped, however, City Council has approved a rezoning of these lands under file DASZ 16/94 to low and medium density residential to permit the land to be developed by a private company (Ladco Company Limited).

The land south of Maginot, which is part of the Windsor Park residential community, is a mixture of predominately low density residential uses.

## 2.3 Present Land Use Within the Study Area

The majority of the Public Markets site is vacant and not in productive use. The active commercial and industrial uses which remain are primarily located along Marion Street. These include the Manitoba Pork Inc. marketing board offices and auction floor (750 Marion); a video rental outlet (800 Marion); and a three-building industrial strip mall complex (850 Marion).

The former Canada Packers plant located on the south east corner of Marion and Archibald is vacant and partially demolished.



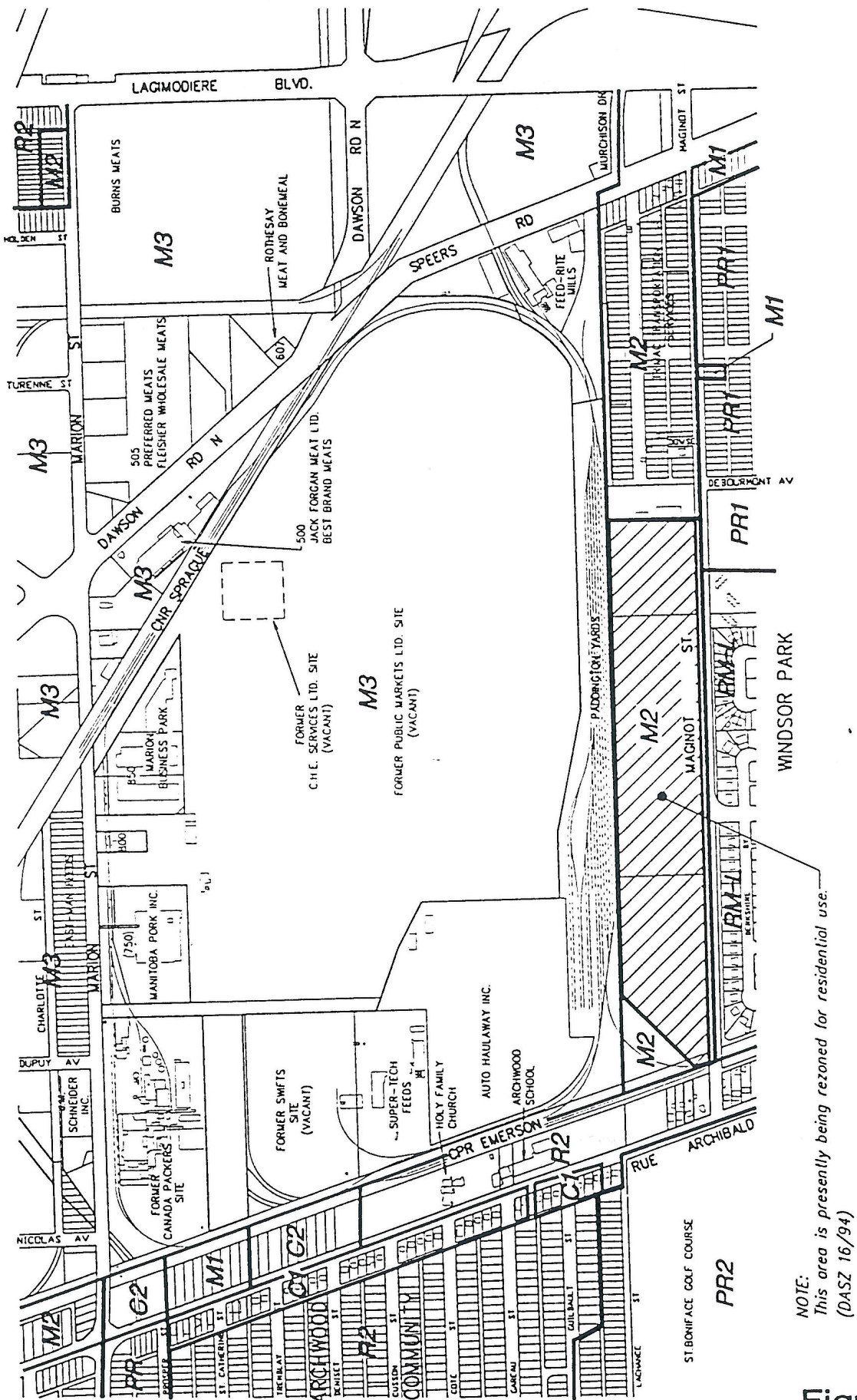


Figure 3  
Land Use Zoning

The major use internal to the site is the Auto Haulaway Inc. (736 Marion) operation which is located on an eight hectare parcel in the south west corner of the site adjacent to the CPR Emerson line and the CN/CP transfer tracks and yard.<sup>2</sup> Automobiles and light trucks are unloaded from CPR and CNR rail cars, stored, and distributed by transport trucks to dealerships in southern Manitoba from this location. Access to the site is by way of a private approach located on Marion just east of Dupey Avenue. The approach and access road are located on City-owned property and exist by right of an easement.

Truck access to the west side of the Manitoba Pork facility is via the same private approach.

The only other active use on the site is Consolidated Agricultural Products Ltd., operating as Super-tech Feeds (746 Archibald), located adjacent to and north of the Auto Haulaway operation. Access to the site is provided via a private approach on Archibald and a private crossing of the CPR Emerson line, as well as the same City-owner private approach on Marion used by Auto Haulaway and Manitoba Pork. Super-tech leases the property from the City of Winnipeg, but has expressed an interest in purchasing it.

### 3.0 COMMENTS FROM THE CITY OF WINNIPEG ADMINISTRATION

City of Winnipeg departments which were identified as having a potential interest in the development of the Public Markets site, either from the perspective of future facilities or from a land use planning and regulatory role, were contacted during the course of this study. Input and comments from these departments are summarized in the following sections.

#### 3.1 Streets and Transportation Department

##### 3.1.1 Long Range Transportation Plans

The Streets and Transportation Department has long range plans for two major regional street initiatives which have a potential impact on the development of the Public Markets site. These are the pairing of Marion and Goulet and their extension to Dugald Road (referred to as the Marion/Dugald Connection); and the Grant Avenue Extension (Figure 4). In addition, provision is being made for a future widening of rue Archibald.

##### *Marion/Dugald Connection*

Goulet Street and Marion Street presently operate as a one-way couplet between St. Mary's Road and rue Youville. From Youville to Lagimodiere Boulevard, Marion is a two-way arterial street with an four lane undivided cross section. The George C. MacLean Pumping Station and water reservoir prevent the extension of Marion further east. Dugald Road intersects Lagimodiere at a point approximately 450 metres north of the Marion intersection.

---

<sup>2</sup> The Auto Haulaway operation is situated on land jointly owner by CNR and CPR.



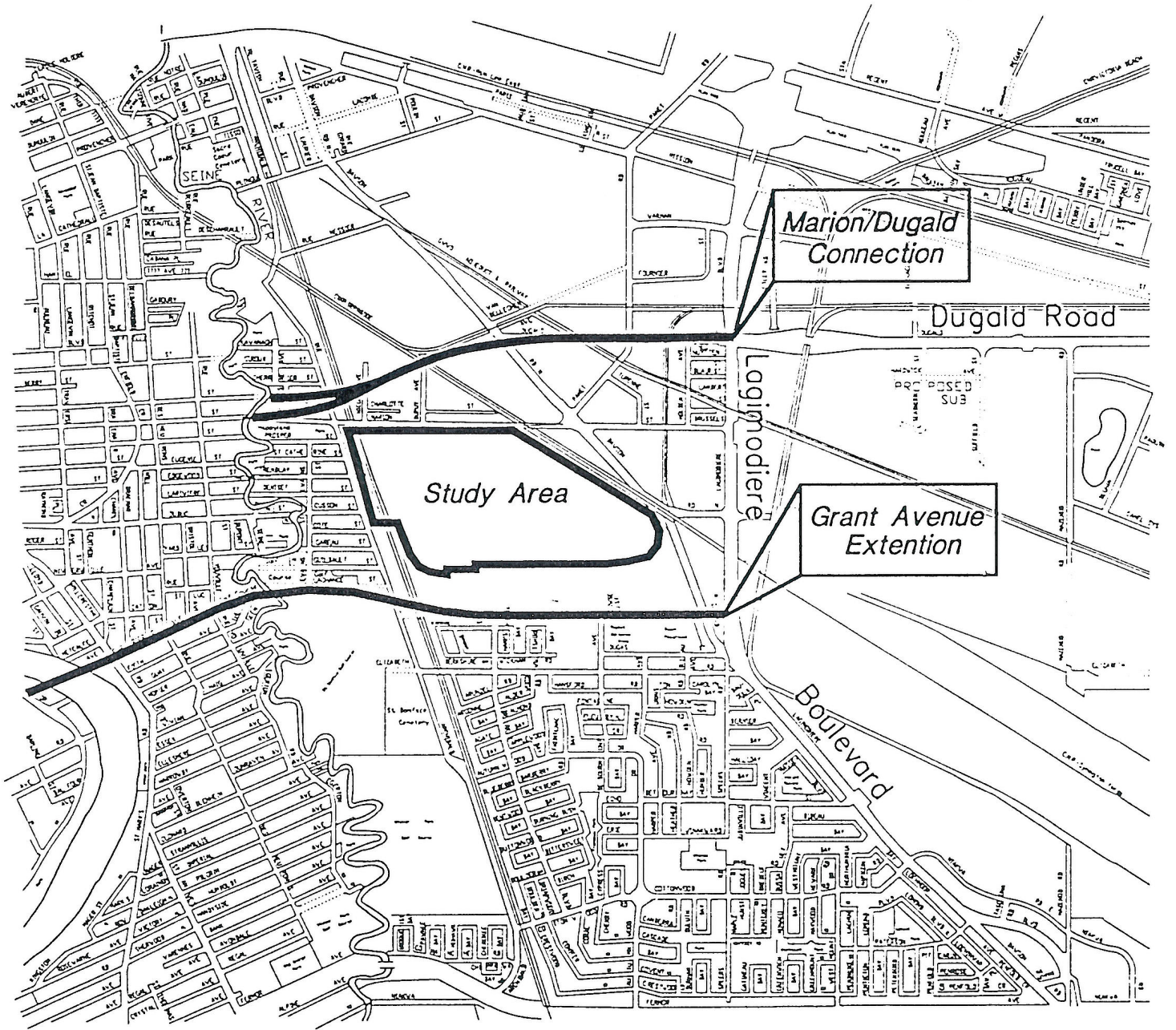


Figure 4  
Proposed New Regional Streets

The Streets and Transportation Department is recommending that the existing one-way pairing of Marion-Goulet be extended across the Seine River to connect with Dugald Road. This would involve a new grade separation of rue Archibald and the CPR Emerson line.

If this connection is built, it should significantly reduce present traffic volumes on Marion. However, if the Marion/Dugald connection is not built on the proposed alignment, it is likely that the existing Marion right-of-way adjacent to the Public Markets site would require widening to accommodate future traffic flows and to allow for appropriate channelization and turning lanes.

The standard right-of-way width for a major arterial street is 40 metres. This allows for up to a six lane divided roadway cross section. If the full widening were taken from the south side of Marion, a 20 metre wide strip of land would be required from the Public Markets site. A minor arterial street (four-lane divided) normally has a right-of-way of 32 metres. This would require a 12 metres widening of the existing right-of-way.

#### *Grant Avenue Extension*

The Streets and Transportation Department has long range plans for the extension of Grant Avenue to connect with Lagimodiere Boulevard. In the St. Boniface area, the extension was to cross the Seine River in the vicinity of the present Carriere Avenue, traverse the St. Boniface Golf Course along its northern boundary and connect with Maginot Street and Lagimodiere (Figure 5).

City Council's recent approval of the Ladco residential subdivision north of Windsor Park precludes the Maginot alignment for the extension to Lagimodiere. One of the limitations of the Maginot alignment was the inability to extend the route east of Lagimodiere because of the presence of the CNR Symington Yards. The City's acquisition of the Public Markets presented an opportunity to reconsider the alignment and the connection to Lagimodiere.

Several options have been considered by the Streets and Transportation Department for a new alignment through the Public Markets site. The most direct alignment would be to run the connection from the golf course diagonally across the site to align with Dawson Road and utilize the existing intersection of Dawson and Lagimodiere. This alignment would allow for a future eastern extension of the route into south Transcona.



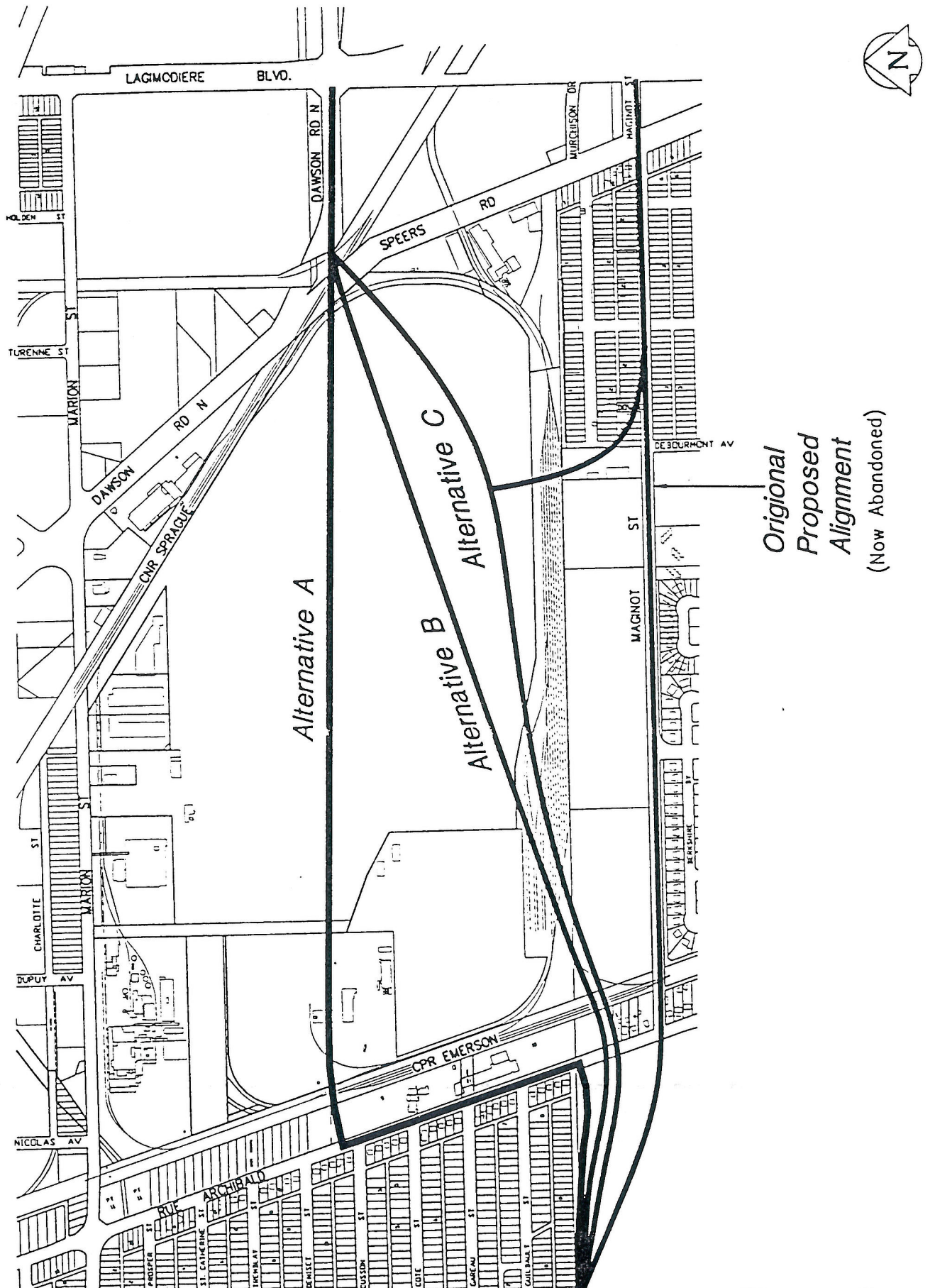


Figure 5  
Proposed Grant Avenue Extension  
Alignment Alternatives

An obstacle to this alignment is the existing uses on land required for the right-of-way including Archwood School, the CN/CP transfer line/yard and the Auto Haulaway operation. CN Rail and CP Rail have advised that they consider these yards to be essential to their operations and have no plans to abandon them. In light of this, an extension on this alignment would result in a considerable cost to the City if the CN-CP/Auto Haulaway operations were to be bridged. Because the grade separation of the CNR Emerson line would likely include Archibald, this would be a major bridge structure.

The scenario currently considered most likely for the Grant Avenue Extension is the Alternative "A" because it is the most practical given existing land uses. The Public Markets site would be bisected by the street with connections to rue Archibald and Dawson Road. Although less than ideal because the route would not be continuous, this alignment is considered more practical because it does not require the purchase of additional property and it could be constructed in conjunction with the development of the Public Market lands.

The Streets and Transportation Department may wish to protect the alternative diagonal alignment (Alternative B) through the Auto Haulaway site, as well as the Alternative "A" alignment, as a long range strategy.

#### *Rue Archibald Widening*

As the opportunity arises, the Streets and Transportation Department intends to secure a 4.883 metre widening along the east side the Archibald right-of-way for a future street widening. This would increase the right-of-way to 25.0 metres.

#### **3.1.2 Access to Regional Streets and the Internal Street Pattern**

If the Grant Avenue extension through the site were to follow the Cusson-Dawson alignment (Alternative "A"), it is possible that the new street could also be utilized to serve the Public Markets site, depending on the nature of the development of the land. Two new, north-south collectors could be constructed to connect to Marion Street, at Dupuy Avenue and a point approximately 300 - 350 metres east (in the vicinity of the video store). A series of local streets would be developed in conjunction with the subdivision pattern for either residential or industrial development.

Access to Manitoba Pork is currently provided using two City-owned private approaches: the approach west of their facility which also serves Auto Haulaway and Super-tech, and an approach east of the Video store. If these approaches were closed as part of the redevelopment of the site, access to Manitoba Pork would have to be assessed.

The lands located between Archibald and the CPR Emerson line can be served directly from Archibald and would not need to be connected to the internal roadway system of the Public Markets site.



### 3.2 Water and Waste Department

Information on the existing utilities in the adjacent street rights-of-way were reviewed. In brief summary, it appears there is sufficient water and wastewater capacity to accommodate redevelopment of the Public Markets site, but insufficient land drainage capacity.

#### 3.2.1 Water

Watermains in the adjacent regional streets include:

- a 300mm WM (watermain) in Dawson Road;
- a 600mm feedermain and a 300mm WM in Marion Street; and
- a 250mm WM in rue Archibald.

#### 3.2.2 Wastewater

Wastewater sewers in the adjacent regional streets include:

- a 1370mm x 2060mm CS (combined sewer) in Dawson Road;
- a 600mm CS leading to a 900mm x 1375mm CS in Marion Street; and
- a 600mm CS leading to a 900mm CS in rue Archibald.

#### 3.2.3 Land Drainage

As with most of the combined sewers in the Mission Street Sewer District, additional storm water flows are not acceptable in the combined sewers because of capacity problems. New development must restrict storm water flows to pre-development rates. In the longer term, or for significant redevelopment, establishing a separate land drainage sewer system is desirable.

Wardrop Engineering conducted a drainage study in 1986 which recommended establishing a storm water retention pond within the Public Markets site as part of a larger storm water relief and land drainage servicing plan for the Mission Street Combined Sewer District. The retention pond would serve not only the Public Markets site, but part of the surrounding lands as well as providing storm water relief to the north eastern portion of Windsor Park. It would eventually be part of a system of interconnected retention ponds and sewers which would drain the existing retention ponds in the St. Boniface Industrial Park through the Public Markets land to the Seine River.

On the basis of the Wardrop report, the Water and Waste Department has identified a requirement for 6 - 6½ hectares (15 - 16 ac.) of land within the Public Markets site to accommodate a storm water retention basin with a normal water surface area of approximately 3½ hectares (8 ac.). The location, configuration and outlet location to the

Seine are conceptual at this time, however, the most appropriate location for the pond appears to be in the eastern part of the site. The details of the design will be determined in conjunction with the preparation of a detailed development concept.

### 3.3 Civic Buildings Department

There has been on-going discussion within the administration regarding the consolidation of the public works operations east of the Red River into a single regional yard. This would include functions of the Streets and Transportation and the Water and Waste departments. The review of the consolidation is part of the functional planning for the "public works campus" concept which is looking at all City works and operations land and building requirements.

The Public Markets site was originally considered in 1990 as the primary location for a consolidated central works yard. This plan was abandoned in the face of opposition from the ward councillor (Councillor Reese) and residents of the Windsor Park neighbourhood who were concerned about the possible construction of a concrete batching plant and an asphalt mixing plant. A new central works yard has since been established on Pacific Avenue west of McPhillips Street.

Although the public works campus concept is still evolving, the Public Markets site remains a potential location for a regional works yard to consolidate functions currently operating out of three locations east of the Red River. Land requirements had previously been identified ranging up to 13½ hectares (33 ac.). Current requirements for a regional yard have not been determined, but would likely be in the range of 8 hectares (20 ac.). A regional works yard would not include an asphalt or concrete plant.

Since frontage on an arterial street is not a requirement for purposes of public visibility or recognition, a works yard could be established on an internal site within the Public Markets. Although frontage on an arterial street is not essential, convenient and safe access, particularly to Lagimodiere Boulevard, is critical. Providing access to the Public Markets site via a new crossing of the CNR Sprague line in the vicinity of Dawson Road and the addition of traffic control signals at Dawson and Lagimodiere, or a connection to Speers Road would meet these criteria.

The establishment of a public works yard on the site would be consistent with the current land use zoning. It may also be a compatible use for part of the site even if the Public Markets were to be redesignated for a use other than industrial because buffering will likely be needed between the existing heavy industrial uses along Dawson Road and the land use on the balance of the site.



### 3.4 Parks and Recreation Department

The Parks and Recreation Department in association with the Water and Waste Department prepared a plan in 1993 for the Public Markets site which illustrated the redevelopment of 16½ hectares (40 ac.) of the south east corner of the Public Markets site into four baseball diamonds, four soccer pitches, associated parking and other facilities. Although there is no planning document or policy statement which identifies a specific need for consolidated regional facilities in St. Boniface of this magnitude, the department considers this general area to be deficient in suitably sized parcels of land for community sports activities and playing fields.

If the land were to be available for development at a nominal cost or as a result of consolidated land dedication for open space purposes, the Parks and Recreation Department has expressed an interest in developing facilities at this location. The department does not, however, presently have funds in its five year capital budget to acquire new sites of this magnitude and or make significant contributions to development costs such as the land drainage retention pond or new streets.

In addition, the department has expressed concern about the attractiveness of outdoor public recreational facilities within close proximity to the industrial uses located on Dawson Road. Under certain wind conditions, odours could be significantly objectional that the facilities would be under-utilized.

### 3.5 Community Services Department

The Community Planning Division has expressed concern about the possible redesignation of this area for residential use. Although there are few remaining heavy industrial users within the Public Markets site, there are concentrations of heavy industrial users immediately east and north of the area. Locating new housing within the Public Markets would likely result in conflict between established industrial uses and the new residents due to odour and dust generated by the industries. Not only would the placement of new residential in close proximity to heavy industrial uses be poor planning, it would be inconsistent with Plan Winnipeg policy regarding protecting future residential development from the adverse impacts of air pollution (policy 3I-02).

The division would prefer to see the area redeveloped in lighter industrial or recreational uses. These uses would provide a reasonable buffer between the Windsor Park and Archwood residential communities and the established industries along Dawson Road and the north side of Marion.

### 3.6 Business Liaison and Intergovernmental Affairs

The Business Liaison and Intergovernmental Affairs Department would prefer to see the Public Markets area remain available for industrial use to provide options in marketing sites to prospective businesses.

The department is also concerned that the introduction of residential use in this area will put additional pressure on existing industries to curtail their operations if they are producing noise, dust or odour. There are only a few areas within the city that are zoned and are appropriate for heavy industrial use. Allowing residential uses to encroach on these areas may make business owners reluctant to build new facilities in a location where they may become the target of complaints from adjacent residents. Similar concerns may cause existing companies to be reluctant to expand their operations. Allowing this to happen in this area would be contrary to policies contained in Plan Winnipeg under "Industrial Initiatives" (2D).

## 4.0 ENVIRONMENTAL ISSUES

### 4.1 Background

#### 4.1.1 The Public Markets Ltd.

Until the late 1980s, the Public Markets site was used as a livestock, selling and transfer facility for about 80 years. The northern half of the site was occupied by barns and holding pens. Manure was stored to the south of the pens until it could be sold as fertilizer. A garage and refuelling station were located immediately east of the property between the abandoned Canada Packers and Swifts buildings (Figure 6). Hay barns were located at the east end of the property as well. The property is bounded on three sides by railroad tracks. A number of rail yards and sidings existed on property at one time.

The stock holding pens, barns, garage and underground fuel tanks were removed between 1983 and 1988. Structures remaining on-site include the former administration building, powerhouse and water tower as well as the concrete floor slabs of the holding pens and barns.

Adjacent properties include hide treatment, abattoir, meat processing, feed lots and vehicle repair and maintenance facilities. Super-tech Feeds and Auto Haulaway Inc. are located along the western boundary. The Public Market powerhouse and office buildings are located on the north side of property. Manitoba Pork's offices and auction floor are located between the north boundary of the property and Marion Street. The St. Boniface Hyde & Wool Company Ltd. was located at the northeast edge of the property.





Figure 6  
*Testing Locations*

In 1990 the site was considered as a potential site for the City of Winnipeg new central yards and an environmental study, *Environmental Assessment, Public Markets Site*, was conducted (prepared for DS-Lea Consultants Ltd. by TetrES Consultants Inc. in association with Wardrop Engineering Inc.). The assessment was based on the potential use of the property for industrial purposes and the environmental regulations in place at that time. The locations of the test holes and sampling were based on a review of the historic use of the site and the resulting potential for contamination.

The TetrES report was limited to the lands associated with the Public Markets Limited acquisition and did not include additional properties which the City now owns including the former Swifts and C.H.E. sites or the privately owned lands within the study area.

This review of the TetrES report has been conducted in terms of new or amended legislation and standards adopted since 1990 and in terms of potential other non-industrial uses for the site based on existing information. No additional sampling and/or testing was carried out for this review.

#### 4.1.2 Other City-owned Lands

As previously noted, subsequent to the purchase of the Public Markets Ltd. land, the City also acquired the former Swifts packing plant in tax sale and a former tannery from C.H.E. Services Ltd. No environmental investigations of the former Swifts site have been provided for review.

The C.H.E. site was subject to two known environmental investigations prior to its acquisition by the City. These were: *Environmental Property Audit - Phase I, 856 Marion Street, St. Boniface, Manitoba*, dated March 1993, prepared by Kilborn Western Inc.; and *Environmental Investigation at 856 Marion Street, Winnipeg Manitoba*, dated August 5, 1994, prepared by the National Testing Laboratories Limited. Although a copy of the Kilborn report was not available for review, the National Testing report referred to the findings of the Kilborn report.

The Kilborn report dealt with the past use of the site as a hide processing plant and recommended that: after the 1993 spring thaw the entire grounds be inspected and any minor spills cleaned up; if any major spills were noted, a further investigation should be conducted; stored barrels of oil and grease be removed immediately; and the floor of the building be cleaned and pressure washed. Subsequent to the completion of the report, the site was taken over by Reliable Tire Recycling. The National Testing investigation was conducted shortly after a tire fire broke out on the site on June 19, 1994. The study was conducted to determine what environmental impact the fire had on the site, if the recommendations of the Kilborn report had been dealt with appropriately, and if any groundwater wells on the site had been properly identified and tested.



National Testing concluded that: there had been no significant environmental impact as result of the fire; the stored barrels of oil and grease had been removed; and the one well identified on the site was not accessible for sampling at the time of the investigation. High oil & grease concentrations on the site at the time of the investigation were attributed to the tire fire but not considered environmentally significant probably because the Total Semi-Volatile Hydrocarbons were less than 50 mg/kg.

Subsequently, the building has been demolished and the cleaning of the floor is academic. The well has apparently been buried under fill and may be difficult to locate. When the building was demolished, the contractor was responsible for removing and disposing of several loads of water contaminated with waste oil. As with the balance of the Public Markets site, additional testing is not recommended until a specific use is identified.

#### 4.2 Legislative and Environmental Impact Review and Analysis

A detailed comparison of the relevant environmental legislation and guidelines in place in 1990 (at the time of the original investigation) and in 1996 (at the time of this review), as well as a review of the potential impacts and analysis of results, were conducted as part of this study. A summary of the comparison, impacts and analysis is provided in Appendix A.

#### 4.3 Remediation

Unless residential, schools or other indoor public activities are considered for the immediate area of BH3 and BH4 (Figure 6), no remediation is considered necessary for the oil and grease contaminated soil. In any case, none of the "contaminants" exceed the levels for disposal at the Brady landfill.

If the area in and around the manure pit is to be used for building purposes, the manure should be excavated and the excavations backfilled with clean soil because of associated problems with methane gas. Alternatively, the manure could be left in place and the area used only for outdoor storage. Further investigations regarding the potential for methane gas migration from the site should be undertaken. Consideration could be also be given to using the manure as fertilizer for areas to be landscaped at the site or sold and disposed of elsewhere.

#### 4.4 Cost Estimates

Cleaning up the hydrocarbon contaminated soil in the area of BH3 and BH4 to the Level I criteria, if required, is expected to be in the range of approximately \$15,000 plus costs of sampling, testing and the preparation of a report for submission to Manitoba Environment.

This is based on the assumption that the contamination is confined to an area of roughly 100 m<sup>2</sup> and no deeper than 3 metres and that the soil can be disposed of at a privately licensed disposal site within 30 km of the Public Market site. This does not include remediation of any contaminated soil associated with the Swifts and C.H.E. sites or adjacent private property.

The cost of dealing with the manure is dependent on a number of factors including the future use of the site. Costs may be relatively minimal if the area is used for outdoor recreational purposes and the subsurface manure left in place. Any development involving buildings would likely require complete removal of the manure because of the potential of methane gas escaping. If the manure is removed, it is estimated that an area approximately 40 metres by 90 metres may have to be excavated to a depth to as much as 10 metres in some places. The cost associated with this is variable and dependent on the possibility of combining the excavation with the construction of a storm water retention pond or selling the manure.

#### 4.5 Conclusions

The review of the 1990 test results-in light of 1996 criteria indicates that some contaminated soil would require cleaning up in the vicinity of the former garage if this area is intended for residential or other use with a Level I sensitivity. The manure piles should possibly be cleaned up from an aesthetic perspective and the subsurface manure should possible be removed to mitigate potential problems as a result of methane gas. Even if it is possible to clean-up the manure by utilizing it as fertilizer on site, there may be a significant associated cost.

The review of the 1990 assessment was intended solely to compare the conclusions of that report in terms of current environmental legislation and possible uses for the site other than industrial. It was not intended to expand the scope of the original work. No additional fieldwork was undertaken. Therefore, it does not preclude the potential for contamination that was not identified in the original report and more detailed investigations may be required depending on specific uses of the site. It has also been observed that additional fill has recently been hauled into the south eastern part of the site. This fill was not included in the original testing. In addition, since the Swifts site is now part of the area under consideration for future development, additional testing of this area should be considered before development.



## 5.0 GENERAL CONSTRAINTS AND ASSUMPTIONS

There are certain constraints, limitations and assumptions which affect any future use of the site. One of the most significant factors is that the Public Markets site exists within the context of established transportation systems and land uses around it. If for no other reason than financial limitations, it has been assumed that some of these major constraints will remain, or at least will not be displaced by redevelopment of the site. These include:

- the CN and CP rail facilities,
- the existing industrial uses north and east of the site,
- the existing institutional uses on rue Archibald, and
- most of the existing industrial/commercial uses within the study area.

### 5.1 The Existing Rail Facilities

The CPR Emerson line is utilized by 8-10 trains daily moving freight to and from destinations in the United States. This link may increase in importance in the future. The relocation of the CPR Emerson line would be prohibitively expensive and likely vigorously resisted by CP and others.

The CNR Sprague line handles 4-5 train movements daily leading into the Symington Yards.

The Public Markets transfer yards and interconnecting rail lines between CN and CP is the primary such link in the city and one of the few remaining. It is, therefore, an important part of their respective operations. It is also an ideal location for the "rail to rubber" transfer of automobiles and light trucks because it allows the road operator access to both rail companies at a single location. It is anticipated that CN and CP Rail would oppose any attempt to eliminate the rail transfer facilities because of the cost and the difficulty of establishing a similar facility at any other location.

For the above reasons, it has been assumed that the existing rail lines and operations will continue to function and the site planning for the Public Markets site must work within the constraints imposed by them.

### 5.2 The Existing Industrial Uses Outside the Study Area

The lands to the east and north of the site are zoned for and utilized for the most part by heavy industrial users. These include J. M. Schneider Meats, East-Man Feeds, Burns Meats, Feed-Rite Mills and several smaller custom packing, meat and feed processing plants along Dawson Road and Marion Street. Many of these industries produce significant levels of dust and objectional odour.

The operation of the meat processing plants in such close proximity to the eastern boundary of the Public Markets site (separated only by the CNR Sprague right-of-way) imposes severe limitations on the practical use of property in this general area. Relocating the Dawson Road plants would be a costly course of action and may prove difficult because of the likely opposition for their re-establishment elsewhere in the city. Although the Terms of Reference for this study did not include an analysis of the potential costs associated with relocating these plants, it appears highly unlikely that relocation costs could be recovered from any potential increase in value of the City-owned land within the Public Markets site resulting from their relocation.

With advances in technology it may be feasible to operate many heavy industrial type uses in a manner which controls emissions, dust and noise to the point of public acceptance. The challenge is to accomplish this while remaining competitive in the market place. For example, outside storage and handling of materials such as soil or gravel could be replaced with indoor facilities, but at an increased cost. Without enforceable market-wide standards, this additional cost of production could not be absorbed by a limited number of producers. In recognition of the difficulties and the costs involved in reducing or eliminating emissions, tiered industrial zoning districts were established to separate and segregate the industries which are most likely to produce objectional by-products.

While it may be technically feasible to operate heavy industries which produce few or no emissions, it is not reasonable to expect that all heavy industries will achieve this objective in the near future (20 - 30 years). There will, therefore, be a continued need for heavy industrial zoning districts within the city and it is appropriate that these zones be adequately separated from residential zones to avoid conflict.

Although the odours generated by the industries in the vicinity of Dawson Road have a significant impact on the potential use (and possibly on the value) of the Public Markets site, because of the costs associated with relocation and the general policy objective of the City to protect appropriate existing industrial areas, it has been assumed that the plants will remain or eventually be replaced with other similar industries. It is also assumed that the existing industries are not likely to be sufficiently upgraded in the near future to eliminate odours to the point where they would be compatible with residential uses. Therefore, land use planning for the northern and eastern parts of the Public Markets site must take this into consideration.

### 5.3 The Existing Institutional Uses on Rue Archibald

There are two institutional use located on the east side of rue Archibald: Archwood School and Holy Family Church. For purposes of this study it has been assumed that these two uses will remain. Although neither of these facilities have a direct impact on planning for the Public Markets, they have an indirect bearing related to the proposed Grant Avenue Extension.



With Archwood School remaining, it is not likely that the alignment for the Grant Avenue Extension preferred by the Streets and Transportation Department (Alternatives "B" and "C", Figure 5) will occur within the short term. Protecting either of these alignments for the long term, as well as constructing a segment of the extension along alignment "A" (from Archibald/Cusson Street to Dawson), would have a significant impact on the viable development of the southern half of the Public Markets site because of the amount of land involved and the limitations imposed on the design and configuration of the remaining lands.

The impact would be similar regardless whether the future use of the Public Markets is to be industrial or residential. It is possible that the layout of a recreational use could be more flexible in accommodating provision for both a short term and a long term alignment of the extension, but there would still be a considerable impact.

#### 5.4 The Existing Industrial/Commercial Uses Within the Study Area

There are several existing industrial and commercial uses on the Public Markets site. These include several businesses along the Marion Street frontage and two businesses internal to the site.

##### *Marion Street Frontage*

There are three general uses located along the Marion Street frontage: the Manitoba Pork Inc. marketing board offices and auction floor, a commercial retail outlet (currently a video store), and a three-building industrial strip mall containing several businesses.

There has been considerable recent comment in the local media concerning the future of marketing boards in Manitoba. If Manitoba Pork Inc. were to lose its almost exclusive mandate, the nature of the marketing of hogs and pork could change significantly and the facilities on Marion may no longer serve the same function as they presently do. However, it is beyond the Terms of Reference of this study to speculate on the future of marketing hogs. Therefore, it has been assumed that the current facility will continue to operate at its present location.

The commercial building located at 800 Marion is a relatively new structure and appears to be adaptable for a variety of retail uses. It has been assumed that it will remain as a commercial site.

The industrial strip mall located at the east end of the Marion frontage is a relatively new complex containing a mix of low intensity industrial and semi-retail uses. It has been assumed that the mall complex will remain in operation.

The City owns four parcels of frontage along Marion as part of its ownership of the Public Markets. Three of these are narrow strips associated with access to the back lands and have no development potential on their own. One of the holdings, immediately west of the video store (800 Marion), has approximately 52 metres (170 feet) of frontage and does have some development potential as a light industrial or commercial development site.

In addition, the former Canada Packers plant, near the corner of Archibald and Marion, is still in private ownership and is being demolished by the owner. It is assumed that the owner intends the property for redevelopment, either as industrial or commercial.

In summary, most of the Marion frontage is in industrial or commercial use and this is not likely to change in the short term. Given the nature of Marion as an arterial street, the current uses are appropriate for the location. However, the "M3" zoning permits a broad mix of uses including potential industrial producers of noise, dust and odour which may not be compatible with the intended use of the balance of the site. Also, given the proximity of the Archwood and Windsor Park communities, the establishment of new heavy industrial uses near these communities may not be desirable.

Regardless of which of the development scenarios is considered, a review of the zoning of the Marion Street frontages should be undertaken to ensure that any potential future uses are appropriate. This may result in a recommendation to "down-zone" the frontage area from "M3" to lighter industrial or commercial zoning (i.e., "M2" or "C2"), or a combination of both.

Given the present sub-standard right-of-way width of Marion Street, it may also be desirable to confirm the intent to widen the right-of-way at this time. If there is any new development to be considered for the Public Markets, it is likely that Marion Street will be one of the primary access routes. Even if the Marion/Dugald Connection were to be built, a widening of Marion would be appropriate to accommodate future local traffic needs. Although the land for the widening may not be acquired immediately, appropriate set backs for new development should be established.

### *South West Corner*

There are two businesses operating in the south western part of the site. Consolidated Agricultural Products Ltd., operating as Super-tech Feeds, is an animal feed mix and supply enterprise. Auto Haulaway Inc. operates a storage yard for automobiles and light trucks in the south east corner of the study area. Access to both operations is via a City-owned road and approach off Marion Street located approximately 65 metres east of Dupuy Avenue.



Super-tech Feeds, which is leasing its land from the City, has expressed a desire to acquire its site. It has indicated an interest in expanding its operations if it can secure the land. An animal feed plant and sales operation is considered as a "*Grain: Milling; Processing*" use in the zoning by-law. This is a permitted use only in the "M3" zoning district. There are no provisions for this as a conditional use in other industrial zones in the by-law.

The Auto Haulaway operation utilizes eight hectares of land adjacent to the CPR Emerson line and CN/CP rail transfer yards. Cars and light trucks are off-loaded from rail cars, stored and distributed from the site by truck. As noted previously, this location is one of the few in the city where there are CP/CN transfer tracks and it is a good location for this operation because it provides an interface with both rail companies at a single location.

An auto transfer and storage facility is classified as a "*Storage Compound for New Automobiles*" use in the zoning by-law. This is a permitted use in the "M3" zoning district and a conditional use in the "M2" district.

A policy decision to discontinue these uses, particularly the Auto Haulaway operation, may not be practical. Auto Haulaway is located on land owned jointly by CN and CP. Without the cooperation of the railways, redesignating or rezoning these lands for non-industrial use would have little impact because the present industrial use could continue to operate. Rezoning the lands could limit future expansion or redevelopment. The railways have indicated they have no plans to release this property for redevelopment.

#### *Rue Archibald Frontage*

Although included within the study area, the lands which front along rue Archibald are separated from the main study area by the CPR Emerson line. Given the limited depth of the frontage (55.5 metres after the allowance for the street widening), it is logical that these lands should be permitted to be developed for commercial, light industrial or institutional uses based on market demand regardless of the intended use of the land to the east of the tracks. In the event that the land east of the CPR Emerson line is down-zoned from "M3", the possible development of some of the Archibald frontage for multi-family residential use may also be appropriate.

## 6.0 DISCUSSION ISSUES

There are several issues that have a bearing on the potential development of the Public Markets. These are discussed in the following sections as a preamble to the recommended concept plan.

## 6.1 Separation of Incompatible Land Uses

Lands designated as "M3" Industrial District in Zoning By-Law No. 6400/94 are intended to accommodate industrial development of a potentially noxious or unsightly nature. Some of the uses which are permitted exclusively in "M3" zoning districts include: animal stockyards, feeding pens, slaughter houses and rendering plants; asphalt manufacturing; concrete batching plants; explosives plants; grain milling and processing; gypsum manufacturing; gravel and soil processing/distribution; leather, hides, fur and bone processing; petroleum refining; plastic and rubber manufacturing; salvage yards; and seed cleaning plants. All of these uses are potential producers of objectional odours, dust and noise and are not considered appropriate for more restrictive industrial zoning categories.

Although advances in technology and environmental standards may reduce the amount of potential nuisance associated with some heavy industries, it is not practical to assume that such nuisances can be eliminated or reduced below objectional levels near the sources. Separating non-compatible land uses such as heavy industrial and residential areas by means of a reasonable buffer allows for dispersal of odour and dust.

Plan Winnipeg contains policies in *Chapter 2 Economic Development – Section D, Industrial Initiatives* to "... establish and maintain an economic environment that encourages industrial growth." and *Chapter 3 Environmental Stewardship – Section I, Air Quality Measures* "... to protect existing and future residential development from adverse impacts of air pollution sources." When read together, these policies suggest that in the interest of protecting both the quality of life in residential neighbourhoods and the commercial benefits of industry, the City should consider adopting minimum separation criteria between residential and potentially noxious industrial land uses.

The City's zoning by-law currently is silent on the issue of separation of non-compatible uses, except in Rural Districts. Some of the permitted uses in the "A" district, such as feedlots, dairy and poultry operations, must be separated from the boundary of a residential district by not less than 92 metres (300 feet).

Because the City has not established criteria for separating industrial and residential uses, criteria from other applicable jurisdictions were considered. Manitoba Agriculture has guidelines for the separation of new livestock operations from existing residential development.<sup>3</sup> The objectives of the guidelines include assisting producers to minimize odour and to provide standards that may be used in determining normal farming practices.

---

<sup>3</sup> *Farm Practices Guidelines for Beef Producers in Manitoba* (Manitoba Agriculture), 1994.



They are also intended to protect residential communities from the impacts of objectional odours and, in cases of existing livestock operations, to protect the agricultural uses from complaints from encroaching new residential settlement areas. Many rural municipalities are adopting these guidelines and incorporating parts of them into their zoning by-laws.

The recommended separation distances vary based on the size and intensity of the livestock operation. For example, the guidelines recommend that the minimum separation distance between designated residential areas and farm operations involving from 10 - 100 animal units<sup>4</sup> should be 530 metres ( $\approx 1,700$  feet) to barns and other buildings and 800 metres ( $\frac{1}{2}$  mile) to manure storage. The recommended separation distances increase up to 2,400 metres ( $1\frac{1}{2}$  miles) as the number of animal units increase.

By way of general observation, many of the permitted uses within "M3" industrial districts in Winnipeg are comparable to agricultural operations with respect to their potential to produce objectional odour. Based on fundamental planning principles and Plan Winnipeg policies, it would not be desirable to establish new residential uses in close proximity to established industrial uses which are producing potentially objectional levels of dust, noise or odour. Although separation distances of up to 2,400 metres may not be practical in an urban setting, a reasonable separation distance between heavy industrial and residential uses should be established with appropriate transitional uses in between.

Figure 7 illustrates 92 metre (300 feet)<sup>5</sup> and 530 metre ( $\approx 1,700$  feet)<sup>6</sup> separation distances within the Public Markets site from the established "M3" industrial uses along Dawson Road and Marion Street. If the 530 metre separation distance is accepted as a reasonable distance between residential and the existing heavy industrial uses, it is not practical to consider residential development in any part of the Public Markets east of the CPR Emerson line. Establishing residential use in the limited area available outside of the 530 metre setback would leave the residents isolated from community services and other residents.

---

<sup>4</sup> An animal unit is a measure of the nitrogen excreted by livestock and it varies depending on the type and stage in life cycle of the animal. For example, a herd of 5 dairy cattle or 8 beef cows are the equivalent of 10 animal units.

<sup>5</sup> The minimum separation distance between residential development and some of the permitted livestock uses in the "A" and "A.5" zoning districts, Winnipeg Zoning By-Law No. 6400/94.

<sup>6</sup> The minimum separation distance between residential development and relatively small scale livestock operations in rural districts recommended by Manitoba Agriculture.



Figure 7



## 6.2 Land Drainage

Although constructing the future retention pond in the south eastern part of the Public Markets site has been recommended only in concept, there appear to be several factors which suggest that this would be an appropriate location. One of these is the intent to provide storm water relief for the north eastern part of Windsor Park. Another is the intent to connect future land drainage systems serving land east of the Public Markets to this pond.

One of the limitations on developing the retention pond at the eastern end of the Public Markets is the lack of an existing outlet system to the Seine River. The concept suggests the construction of a new storm sewer which would approximately follow the original alignment of the Grant Avenue Extension (Figure 8). By following the alignment, the sewer could be sized to accommodate storm water flows from the roadway surface and right-of-way.

The status of the Grant Avenue Extension is currently under review. If it remains in the City's long range plans, it will likely be decades before the section linking Archibald and the Seine River is built. This would mean either waiting for its construction before building the retention pond or building the storm sewer in advance of the roadway.

There are two other possible options for providing an outlet for the retention pond: the Dawson Road combined sewer and a surface drain to the Seine River.

There is a existing 1370mm x 2060mm combined sewer in Dawson Road. Although this sewer is not considered to have the capacity to handle additional storm water, it may be possible to introduce storm water during "dry flow" periods. If this were the case, an interim (or possibly permanent) connection to the Dawson Road sewer could serve as an outlet for the retention pond provided that adequate storage was designed into the pond to retain the water until dry flow conditions in the Dawson sewer were available.

Another possible option would be to construct a surface drain from the retention pond leading to the Dugald Drain near the intersection of Archibald and Marion. Storm water from the retention pond could flow into the drain either by gravity (if sufficient gradient is available) or be pumped into the drain. The latter option is currently used for the City's retention pond system in the St. Boniface Industrial Park. When the balance of the Public Markets is developed, the drain could be eliminated or, depending on the nature of the development, remain as part of the overall drainage system.

Both these options would allow for the immediate development of the retention pond, either in its full configuration, or in a staged configuration with initial capacity limited to allow for storm water relief for the Windsor Park area or the development of a regional public works yard.



Figure 8



### 6.3 Regional Streets

Although the future of the Grant Avenue Extension is under review as part of the TransPlan 2010 study, for purposes of this study it is recommended that a corridor on the "A" alignment (Figure 5) be protected for the time being. Ideally, the concept plan for the Public Markets should be flexible enough to delete the unneeded portions of the corridor or reduce its width if the Grant Avenue Extension is abandoned at a future date.

It is also recommended that land for the widening of Marion Street be acquired (or identified for acquisition as the opportunity arises) to provide for future roadway improvements including lane separation and channelization. This would be regardless of whether the Marion/Dugald Connection is built. Because a former railway spur ran parallel to the Marion frontage on these properties, all of the existing buildings are set well back from the street right-of-way. A widening of the right-of-way from 20.1 metres (66 feet) to 32.0 metres (105 feet) could be achieved with minimal property impacts.

### 6.4 Environmental

The previous environmental investigations indicated that, with the exception of the manure pit and piles in the south western area of the former Public Markets Limited land, the areas of the site which were tested for soil contamination are relatively clean and could be redeveloped for industrial or commercial uses with minimal remediation. Some specific locations containing oil and grease contaminated soil would likely require cleaning up prior to utilization of these areas for residential, institutional or other indoor public facilities.

The manure piles are isolated from existing roadways and separated from the residential areas in Windsor Park by the Paddington Yard (Figure 6). They pose no immediate environmental risk to adjacent land uses. On this basis, there appears to be no compelling reason to remove them until redevelopment in the general area is imminent. If they can be sold and removed, this should be considered now.

There are several options for dealing with the manure pit: it could be removed and the excavation filled with clean soil; it could be excavated in conjunction with the construction of a land drainage retention pond; or it could be left "as is" with appropriate actions to prevent the migration of methane gas to adjacent properties (if identified as a problem).

One of the potential obstacles in dealing with the manure pit is the cost associated with its clean up. The cost would likely exceed the value of the land on which it sits. This being the case, if the manure can remain without unacceptable risk to present or future users of the area or adjacent sites, this would be preferable. It may mean, however, the site would not be available for reuse except, perhaps, for outdoor recreational activities such as ball diamonds or outdoor industrial use.

It appears that the location of the manure pit is not ideal for a land drainage retention pond (refer to discussion under Section 6.2). Another consideration is its proximity to adjacent CN/CP owned lands. The retention pond would require sloping boundary lands around its perimeter and could not, therefore, be located in the exact location of the pit. If located in this general area, it would likely need to be somewhat north and east of the manure pit. This would likely mean that a significant portion of the pit excavation would need to be re-filled. This may reduce the potential cost benefit associated with utilizing the excavated pit for the retention pond.

Based on the information available at this time, it would appear that the best course of action would be to leave the manure pit and piles where there are for the time being. When this area of the Public Markets begins to develop or if other unforeseen circumstances arise, the surface piles should be removed. An alternative would be to try to sell the manure.

It appears that the most cost effective plan for the manure pit would be to leave the manure in place and designate an area of approximately 2½ - 4 hectares (6 - 10 ac.) in this corner of the site as public reserve or as an industrial site permitting only outdoor storage activities. Appropriate investigations and, if required, methods of remediation to prevent the migration of methane gas, would need to be developed prior to a final decision on this matter.

## 6.5 Public Works Yard

The feasibility of establishing an 8 hectares (20 ac.) yard in the eastern part of the Public Markets site has been considered in this study. Three site-specific land use issues have been examined: can adequate access be provided at reasonable cost; how would the site be serviced; and compatibility with adjacent land uses.

### *Access*

One of the key issues for the location of a regional works yard is safe and convenient access to the regional street network, and Lagimodiere Boulevard in particular. If the Grant Avenue Extension is built with a connection to Dawson Road (and a signalized intersection at Lagimodiere), this criteria would be met. However, because the Grant Avenue Extension may be many years in the future, a more cost-effective interim access would need to be established which would permit the works yard to be developed prior to the extension.

Subject to negotiations with CN Rail, one option for site access would be to establish the yard immediately west of the CN Sprague line and build a private approach and rail crossing to Dawson Road on an interim basis. If and when the Grant Avenue Extension is built, the private approach and crossing would be closed.



A second option would be to locate the yard at the southeast part of the site and make a connection to Speers Road. Speers connects to Maginot a short distance to the south and there is an existing signalized intersection at Maginot and Lagimodiere. This option would not require a crossing of the CN Sprague line.

One possible drawback to the Speers Road option is that residents of Windsor Park have in the past expressed concern about increased yard-related truck traffic on Elizabeth Road if access was provided via Speers Road. The City would have to address this concern if this option was considered. The advantage of this option is a lower cost associated with the Speers connection because the Maginot/Lagimodiere intersection is already signalized and the CN Sprague line could be avoided.

Both options should include an interim secondary emergency access to the yards. This could be provided by utilizing the existing City-owned approach northeast of 850 Marion Street and the gravel access road to the former C.H.E. site. This would become redundant once an internal roadway system was developed to service the rest of the Public Markets site.

### *Servicing*

There is adequate existing wastewater sewer and watermain capacity along Dawson and Speers to service a public works yard located in the eastern part of the Public Markets. Land drainage sewer capacity is inadequate. Previous studies have recommended the construction of a new retention pond in the Public Markets site (see Section 6.2).

Land drainage for a public works yard could be provided either by building a conventional, full-sized retention pond or building a local pond to serve only the public works yard. The latter was done for the Pacific Avenue central works yard. Both options are dependent on confirmation that the Dawson Road combined sewer could handle storm water from the pond during low flow periods or that a surface drain to the Seine could be constructed.

A TSR (trunk service recovery) pay-back from other land in the Public Markets area would likely be spread out over a protracted period of time. The decision to construct the pond should, therefore, be based primarily on the merits of establishing a regional public works yard and/or the opportunity to provide storm water relief to the Windsor Park area.

### *Compatibility*

There are two considerations regarding the compatibility of a public works yard with other land uses: would it an appropriate use for this site, and would it be compatible with adjacent land uses?

Given the nature of the existing heavy industrial businesses along Dawson Road, a public works yard would be an appropriate use in a transitional zone between heavy and lighter industrial or other less intensive land uses. This would apply regardless of the intended use for the balance of the Public Markets assuming that it will not remain as heavy industrial..

When the City first proposed in 1991 establishing a consolidated central works yard at the Public Markets site, there was considerable opposition from neighbouring residents. Much of this opposition arose from concern about the possible development of asphalt and concrete batching plants.

A regional public works yard would not include an asphalt or concrete plant. It would consist of repair shops and storage buildings, outdoor parking for trucks and service vehicles, and outdoor storage of granular material used primarily for street sanding in the winter. These uses are consistent with those found in a variety of businesses operating in industrial districts such as the St. James and Fort Garry industrial parks.

Depending on whether it was sited north or south of the Grant Avenue Extension, a yard located in the eastern area of the Public Markets site would be 300 - 500 metres (1,000 - 1,600 feet) away from existing residential development separated by the Paddington Yard and the TriMac trucking terminal. Based on the activities associated with a regional yard and the distance to existing housing, it would have a minimal impact on the residents living in Windsor Park.

## **6.6 Recreational Uses**

The Public Markets could be considered for recreational uses. These include conventional outdoor uses such as sports fields, golf courses or even equestrian facilities. Enclosed uses could include sports arenas, roller rinks, etc. A recreational scheme could include a mix of all of these activities.

The problem of odour from adjacent uses must be a major consideration if outdoor activities are planned. Short-term exposure to the odour from the Dawson Road industries may be tolerable, but remaining in the area for one or two hours (or longer) during outdoor recreational events may not be comfortable for many people.



Indoor recreational facilities (arenas, roller rinks, tennis clubs, etc.) are compatible in industrial and most residential areas. There is, however, limited demand for private facilities and scarce public funding available for new facilities. Those that are identified as being appropriate for this location could likely be accommodated within either the industrial or residential redevelopment options.

The possible use of part of or all of the Public Markets site for major new facilities associated with the 1999 Pan American Games to be staged in Winnipeg was explored. The Pan American Games Society advised that it does not require land for new facilities except a baseball stadium and possibly a velodrome/roller rink facility. The Society is not interested in the Public Markets site for either facility.

### *Golf Course*

Utilizing the Public Markets for a new golf course has recently been proposed by others. Assuming that the existing industrial uses remained, approximately 58 - 60 hectares (143 - 148 ac.) of land could be available for this use. If allowance is made for the Grant Avenue Extension, the site would be bisected and the area available reduced by 4 hectares (10 ac.). Land drainage would likely be handled as part of the landscaping features of the course.

Based on the preliminary proposals put forward to the City regarding developing the Public Markets as a golf course, the City is being asked to consider trading other golf course lands to a private company to redevelop as housing to help pay for the cost of developing the new course (estimated to be in the range of \$3.6 - 4.5 million<sup>7</sup>, plus clubhouse facilities).

It is beyond the Terms of Reference of this study to determine the relative merits of giving up existing City-owned golf course lands as part of an agreement to develop the Public Markets site. On the surface, however, there would appear to be only a marginal net financial long-term gain to the City resulting from the increased assessment associated with new housing on those portions of the existing golf courses which would be redeveloped.

It is our understanding that part of the rationale for this proposal is based on the opportunity to create a superior golf course in the area than presently exists (larger land area) and to generate higher realty tax assessments associate with new housing to be built on existing golf course land. Implicit in this assumption is that the market value of new residential housing on the Public Markets site would be lower than new residential housing built elsewhere.

---

<sup>7</sup>

Based on an estimated development cost of \$200,000 - 250,000 per hole.

Golf courses are assessed at relatively low values and the portioned percentage is less than a quarter of that for residential categories and less than a sixth of commercial and industrial categories. Although redeveloping the Public Markets as a golf course may relieve the City from any further development costs, it would not provide any recovery of the initial investment or carrying costs nor would it produce significant assessment returns in the future.

## 7.0 DEVELOPMENT OPTIONS

The primary purpose of this study is to consider different land use scenarios with respect to the future use of the Public Markets. Three general land use alternatives have been considered: industrial, residential, and recreational.

The industrial scenario would be a general continuation of the present use of the land and would be consistent with Plan Winnipeg policy. The redesignation of the site from industrial to residential use has been recommended in the past by the Riel Community Committee at the request of some residents of the Windsor Park area. A proposal to redevelop the lands as a golf course has been put forward by a private development company.

It has also been suggested that a major public recreational and sports complex be developed on the site. Previous proposals suggest that these facilities would occupy only part of the site and would need to be combined with another use if the site was to be fully utilized. There is not enough land to accommodate both an 18 hole golf course and other major recreational facilities on the site. Therefore, other recreational uses would have to be developed in combination with industrial, residential or some other use. Alternatively, a nine hole golf course could be developed in association with other uses.

From a financial perspective, in the short-term the redevelopment of the Public Markets site is likely to be a break-even proposition at best regardless of which land use scenario is adopted. This assumes that the costs to date for acquisition, outstanding realty taxes, demolition, and environmental and planning studies are costs which are non-recoverable. With the exception of frontage lands and those presently occupied, the overall present value of the balance of the land is considered to be zero.

Indications are that the lands cannot be redeveloped profitably in the current market. There are, however, other financial considerations including a long-term perspective of maximizing the realty tax return to the City and the potential impact on the value of the surrounding residential areas by leaving the site in its present condition.



The following assumptions apply to each of these scenarios discussed below:

- the existing railway lines and yards will remain;
- the existing (or similar) industrial/commercial uses along Dugald Road and Marion Street will remain;
- the Grant Avenue Extension will eventually be constructed along alignment "A" (Figure 5).

## 7.1 Residential

### *Market Demand*

Based on current trends, the southeast quadrant of the City has a 15 – 20 year supply of land which is designated for residential development and which is readily serviceable. Most of this is contained in current and future stages of the Southland Park, Island Lakes, Royalwood Estates and River Park South subdivisions as well as in several smaller infill subdivisions such as the recently approved extension of Windsor Park.

If the Public Markets were to be developed for residential use, house builders would be competing in a market with houses located in the aforementioned subdivisions, all of which are well established. Unless the location is obviously superior, new subdivisions are often at a market disadvantage because of a lack of amenities such as schools and consumer reluctance to be the pioneers of a new area.

If the area were to develop as residential, because of declining student enrollments generally, it seems unlikely that a new school would be built within the subdivision. This means that the children would either require busing or they would be crossing active rail lines to get to and from school.

In addition, based on the location of the Public Markets next to existing heavy industrial uses and its relative isolation created by rail lines and existing commercial and industrial businesses, it would be at a disadvantage to other markets in the general area. It is not an attractive location in which to try to sell homes, especially compared to other available subdivisions.

This being the case, new houses or apartments located in the Public Markets area would have to be very attractive in terms of price to be competitive. Since the costs of developing the Public Markets are expected to be comparable with other suburban locations, selling building lots at a price below the competitive market for single family lots would reduce potential returns, likely resulting in potential losses to the City. The

negative impact of the adjacent heavy industry would clearly decrease the potential market value of homes in the area, even before discounting building lots to be more competitive.

Significant development expenses, low market appeal, slow market absorption, an adequate supply of other building lots in the quadrant, and the potential for significant losses are clear indications that redeveloping the Public Markets for residential use would be a poor financial investment<sup>8</sup>.

In the long term, redevelopment of the Public Markets site with residential uses would provide the City with a higher realty tax return than a vacant site or redevelopment with recreational uses.

### *Land Use Conflicts*

Based on earlier discussion in this report (Section 6.1), we cannot recommend residential development of the Public Markets regardless of the potential market because of the inappropriateness of establishing new housing in such close proximity to heavy industry. It would be poor planning and contrary to the policies contained in Plan Winnipeg.

## 7.2 Recreational

There may be some interest in developing the Public Markets land for recreational uses, however, in our opinion the presence of the adjacent heavy industrial uses severely limits the desirability of outdoor activities in the eastern part of the site. Notwithstanding this, if the interest is sincere, it should be considered.

---

<sup>8</sup> The cost to service the Public Markets for residential development has been estimated using another recently approved subdivision in suburban Winnipeg for comparison prices. Yields are estimated at approximately at 500 - 550 frontage metres per hectare (200-220 front feet per acre). Off-site contributions for rail crossings of the CP Emerson line and the CN Sprague line, traffic signals on Archibald and Lagimodiere, and widening or upgrading Marion are not included in the servicing cost estimate.

The cost to service the Public Markets is estimated to be in the range of \$2,000 - 2,150 per frontage metre (\$600 - 650 per front foot). Current lot prices in this quadrant of the city range from approximately \$2,300 - 2,800 per frontage metre (\$700 - 850 per front foot). Selling the lots at a price to recover only the cost of services would mean a discount on a 12.2 metre (40 foot) lot of approximately \$4,000 below current market prices. This would result in a small reduction in the average monthly P & I payment. The savings are not likely to be enough of an enticement to draw potential purchasers from other competing subdivisions.



It is questionable, however, whether there would be any interest in developing the site without financial assistance from the City, either directly or through a land swap. This being the case, and with marginal, if not negative, returns to the City from any form of recreational use, the City would have to give consideration to its objectives prior to following this course of action.

We recommend the City consider seeking development proposals for the land with broad terms of reference. These could include releasing the site to a single user or considering proposals for limited portions of the site. If the latter option was offered and potential users came forward for only part of the site, the question of land drainage would need to be resolved. Strategies for dealing with the land drainage should be developed prior to requesting development proposals.

### 7.3 Industrial

The industrial concept is the recommended scenario. This would be a long-range strategy based on a general continuation of the present use of the land, but with more restrictive land use zoning than presently applies to most of the site. Because the current supply of serviced industrial land in St. Boniface is more than adequate to meet the demand, options for staging development of the site are addressed.

The industrial concept is illustrated on Figures 9 and 10. Figure 9 illustrates a retention pond in the south east corner of the site adjacent to Windsor Park. Figure 10 illustrates a pond adjacent to the CN Sprague line where it could act as a buffer to the heavy industrial uses along Dawson Road.

Components of the concept include:

- protecting the Grant Avenue Extension Alignment "A" (Archibald/Cusson to Dawson Road), and the option to construct only those portions of the road within the Public Markets industrial area that are needed for local needs. The Archibald and Dawson Road connections would be deferred until the rest of the Grant Avenue Extension is constructed. The Dawson Road connection could develop sooner if justified by local traffic needs.
- building a storm water retention pond in the easterly portion of the site to provide storm water relief for Windsor Park. The pond would have excess capacity to retain storm water for release only during dry flow conditions in the Dawson Road combined sewer (or alternatively to a surface drain leading to the Dugald Drain). Options to be considered include building a pond with capacity limited to providing relief for Windsor Park or building the pond to its full capacity to service the Public Markets.



Figure 9  
*Industrial Park Concept - Option A*



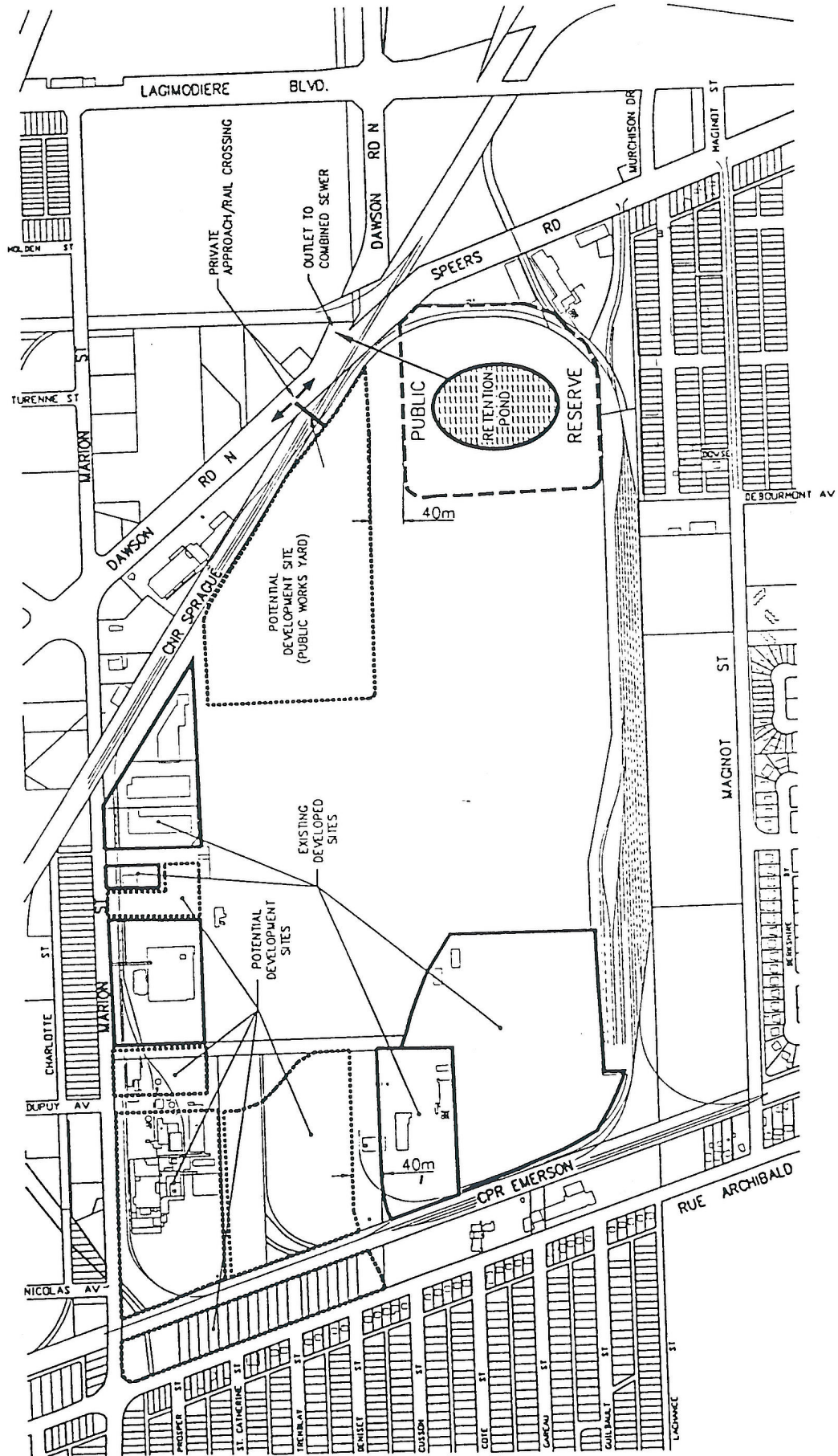


Figure 10  
Industrial Park Concept - Option A/Phase 1

- provision for two industrial collector connections to Marion Street. One of these would be located on an alignment with Dupuy Avenue to replace the existing private approach west of Manitoba Pork Inc. and the other would be located east of 800 Marion.
- provision for the future widening of the Marion Street right-of-way to 32 metres.
- provision for the continued operations of Super-tech Feeds and Auto Haulaway at their present locations with primary access from Marion and interim secondary emergency access via the existing private approach on Archibald.
- provision for development on the former Swifts site with a conventional land drainage sewer system utilizing the Dugald Drain.
- allowance to isolate and or leave in place the manure pit by designating this area as public reserve and limiting its use to outdoor activities. Alternatively, the area could be left with industrial zoning, but the future industrial uses would be evaluated and likely limited to outdoor storage (e.g., vehicle storage).

The absorption of new industrial land in the St. Boniface area has been relatively slow over the past decade averaging between two to four hectares per year. Assuming current trends continue, there appears to be an adequate supply of industrial land in this quadrant of the city to meet the expected demand for at least the next 15 – 20 years. Much of this land is in the City's St. Boniface Industrial Park.

Given the current limited demand for serviced industrial land, it would not be prudent to service the Public Markets until warranted by demand<sup>9</sup>. However, the possible staging of development based on available services has been considered. Figures 11 and 12 illustrate staging options which would create an opportunity to sell some of the land without incurring significant costs for new services.

Stage 1 (in both options) would allow the immediate development of several sites along the Marion Street and rue Archibald frontages and the potential redevelopment of the former Swifts site. The land for the two future collector streets would be reserved, but the streets would not necessarily be built at this time. In the event that the Swifts site is sold, the land drainage for the site could become a developer responsibility. The extension of Dupuy as a replacement for the existing private approach and road could also be tied into the development of the Swifts site and deferred until warranted. This extension would require an agreement of the current owner of the Canada Packers site

---

<sup>9</sup> The cost to service the Public Markets site for industrial use has been estimated at approximately \$124,000 - 148,000 per hectare (\$50,000 - 60,000 per acre), excluding significant off-site contributions. The current average sales value of serviced industrial land in the St. Boniface area is comparable to the cost of servicing, at \$124,000 - 148,000 per hectare.





Figure 11



Figure 12



## 8.0 SUMMARY AND CONCLUSIONS

### 8.1 Land Use

Based on current limitations and constraints imposed by adjacent land uses, the most appropriate use for most of the Public Markets site is a mix of medium and light industry. It is recognized, however, that this may be a long term strategy. Demand for industrial land in St. Boniface is limited and the Public Markets site is not likely to be redeveloped for new industrial use for several decades. With this in mind, the most appropriate short term strategy would be to develop and sell the frontage lands and defer servicing the balance of the site until demand warrants its development. This would also give the City the flexibility to reconsider the use of the remaining land in the event there was a marked improvement in the housing market and if new technologies significantly reduced odours and emissions generated by adjacent heavy industrial uses.

The current uses within the site could remain (Super-tech and Auto Haulaway), but some accommodation would need to be made with respect to compliance with provisions of lighter industrial districts if the zoning in the area was reduced from "M3". Alternatively, if the preferred strategy is to keep options open for other potential long-term uses for the site, the sale of the Super-tech site may limit the future use of the adjacent parcels.

We consider it unlikely that market conditions or industrial technologies will sufficiently change to significantly improve the suitability of the Public Markets site for residential use. On this basis, we are of the opinion that the Super-tech site could be sold without prejudicing the future use of the balance of the site provided that the issue of compliance with "M2" or "M1" industrial zoning standards is addressed prior to the sale.

At least one potential development parcel could be created on the City-owned property along the Marion frontage. In addition, the City could begin to market the former Swifts site (with a conventional land drainage system). Access could be provided by utilizing the existing City-owned private approach on an interim basis or, depending on what is intended for the site and the circumstances at the time of sale, by the southerly extension of Dupuy.

### 8.2 Transportation

Provision for the proposed Grant Avenue Extension along an Archibald/Cusson – Dawson alignment fits in well with the proposed industrial land use concept for the Public markets. In the event that the extension is dropped from the long range transportation plans, the concept plan would not be compromised. Without the Grant Avenue Extension, a connection between Archibald and the Public Markets land east of the CPR Emerson would not likely be needed and may not be desirable.

Rights-of-way for two collector streets which intersect with Marion should be protected to provide future access to the site. These would be opposite Dupuy Avenue and to the east of 800 Marion Street. A future widening of the Marion Street right-of-way to 32 metres should be identified and the land protected from development. The two City-owned private approaches which serve the area businesses including Manitoba Pork, the video store and the industrial plaza would eventually be closed and alternative access points to these businesses considered. In the interim, any upgrading or improvements to these approaches should be considered in the context that they will eventually be abandoned in favour of public street access.

### 8.3 Land Drainage

Prior to the redevelopment of the majority of the site, a land drainage retention pond needs to be constructed. In addition, there is a desire to provide storm water relief to the northeast part of Windsor Park.

Two options for the retention pond outlet have been considered: a connection to the Seine River via a surface drain connecting to the Dugald Drain; and a connection to the existing combined sewer in Dawson Road. Although the Seine River connection appears to be the more costly option, there is no surplus storm capacity in the Dawson combined sewer. It may be possible, however, to design the retention pond with adequate storage capacity to retain storm water during "wet flow" periods to be slowly released into the Dawson sewer during "dry flow" periods without affecting the capacity of the sewer.

We recommend that the feasibility of both options be explored.

Constructing a retention pond prior to the redevelopment of the Public Markets would be a policy decision based primarily on the need for storm water relief for Windsor Park. The pond would also provide an opportunity to consider the development of a regional public works yard at the east end of the Public Markets. Alternatively, a smaller retention pond could be constructed to serve only the works yard.

### 8.4 Regional Public Works Yard

A public works yard (without an asphalt or concrete plant) located somewhere in the eastern part of the Public Markets site would be compatible with adjacent land uses and the industrial concept for the Public Markets. It may be possible to develop the yard just west of the CN Sprague line with direct access to Dawson Road or Speers Road. If the yard was located with a Speers Road connection (which appears to be the most cost-effective option), consideration should be given to addressing the previously stated concerns of the residents of Windsor Park regarding the potential for additional truck traffic on Elizabeth Road.



## 8.5 Environmental

Based on the studies undertaken to date, the Public Markets appears to be relatively "clean" with the exception of the manure pit. There is no compelling reason to undertake any environmental remediation of contaminated soil within the Public Markets until a specific use is identified for a particular site. At that time, a detailed sensitivity analysis should be carried out. Construction should not occur on or in close proximity to the manure pit until further testing and analysis for the potential for methane gas migration is undertaken. It may be possible to sell the surface manure piles and have them removed.

The former Swifts plant site was not included in the previous environmental site investigations. Given the nature of these investigations and the common practice of financial institutions of requiring up-to-date site investigations, we recommend waiting until a prospective purchaser or use is identified prior to carrying out any testing of this area.

## 8.6 Aesthetics

The outward appearance of the Public Market areas does not benefit St. Boniface or the city. The overall area is perceived as being run-down and derelict. For the most part, these perceptions are associated with the presence of the former Canada Packers plant at the corner of Marion and Archibald, the abandoned parking areas along Archibald and the vacant buildings which were once associated with the stock yards. The concrete floor slabs from the former barns and the manure piles are not visible from Marion or Archibald and are of less of a concern.

We recommend the City demolish the remaining vacant buildings on the former Public Markets Ltd. land and clean up the frontage lands. It should also encourage the owner of the former Canada Packers plant to complete the demolition of the buildings and removal of the abandoned tanks and equipment as soon as possible. This would help with the appearance of the area generally and may assist the City in its efforts to sell some of the frontages and the former Swifts site.

## 9.0 SUMMARY OF OUTSTANDING ISSUES AND RECOMMENDED ACTION

There are a number of issues raised in this report and specific recommendations put forward. To begin to address them, the following actions are suggested:

1. The report and recommendations should be forwarded to the appropriate standing committees of council for their review and comments.

It is anticipated that the Committee on Planning and Community Services may refer the report to the recently constituted Task Force on the Public Markets which may, in turn, recommend or initiate a public consultation program to inform the adjacent communities of the study and its recommendations and seek their input.

2. A decision should be made as to the compatibility of the two current uses (Super-tech and Auto Haulaway) in the southwestern part of the site from the perspective of the recommended land use concept and possible zoning changes (assuming a more restrictive zoning than the present "M3").

Council should also review standards for appropriate separation distances between heavy industrial areas ("M3" districts) and residential districts. This review would apply to all heavy industrial districts within the city for the possible adoption of a city-wide policy.

3. Assuming that a general consensus can be reached on an acceptable land use concept, Council should consider the initiation of an application to amend the zoning by-law to redesignate the lands from an "M3" category to an appropriate mix of lighter industrial uses, as recommended in this report, or other uses which may be recommended by the Task Force.
4. Concurrent with the aforementioned recommended actions, it is suggested that:
  - a) The Streets and Transportation Department should confirm the recommended widening of the Marion Street right-of-way (along the south side) and the alignments for the two proposed collector streets to serve the Public Markets site and take steps to protect or acquire these lands.



- b) The Water and Waste Department should initiate a study to determine the feasibility of utilizing the existing combined sewer in Dawson Road to accept storm water during "dry flow" conditions from a retention pond to be located in the Public Markets and/or of constructing a surface drain from the proposed retention pond to connect to the Dugald Drain somewhere in the vicinity of the Marion/Archibald intersection and to accordingly formulate its recommendations.

These studies can be initiated immediately because they do not depend on the final mix of land uses proposed for the site and should not prejudice the work of the Task Force.

Once these steps have been initiated or completed, the City will be in a position to make further recommendations or decisions with respect to:

- the construction of the storm water retention pond;
- the development of a regional public works yard; and
- the sale of surplus frontage properties along rue Archibald and Marion Street and the former Swifts site.

Although further investment in the development of the balance of the Public Markets site is not recommended at this time, by addressing these issues and adopting an overall development concept plan for the site, the City will be in a much better position to respond in a timely manner to any future opportunities which may arise.

## **APPENDIX A**

A.1 Legislative Review

A.2 Environmental Impact Review

A.3 Analysis

Table 1 1990 Criteria for Soils for Industrial Sites

Table 2 1996 Criteria for Soils for Industrial Sites

Table 3 1996 Criteria for Soils for Residential Sites

Table 4 1990 Criteria for Groundwater for Industrial Sites

Table 5 1996 Criteria for Groundwater for Industrial Sites



## A.1 Legislative Review

The following summarizes the relevant legislation and guidelines in place in 1990, at the time of the original investigation, and in 1996, at the time of this review.

### A.1.1 Legislation – 1990

#### A. Federal

1. Canadian Environmental Protection Act c.16.
3. Transportation of Dangerous Goods Act (S.M.1984, c.7) and Regulations.

#### B. Provincial

##### Manitoba

1. The Dangerous Goods Handling and Transportation Act, L.R.M. 1987, c. D12.
  - The Handling, Offering for Transport and Transporting of Dangerous Goods Regulation 172/85.
  - Generator Registration and Carrier Licencing Regulation, 175/87.
  - Classification Criteria for Products, Substances and Organisms Regulation 282/87.
  - Environmental Reporting Regulation 439/87.
2. The Environment Act C.C.S.M. c.E125.
  - Storage of Handling of Gasoline and Associated Products Regulation 97/88.
3. Manitoba Environment, Departmental Guideline, Petroleum Contaminated Soils, August 1990.
4. Manitoba Environment Soil and Water Quality Guidelines, adapted from: British Columbia Standards for Managing Contamination of the Pacific Place site, January 1990.

##### British Columbia

1. British Columbia Standards for Managing Contamination of the Pacific Place site, January 1990.

##### Ontario

1. Ontario Ministry of Environment *Guidelines for the Decommissioning and Cleanup of Sites in Ontario*, February 1989.

#### C. Municipal

1. The City of Winnipeg policy for acceptance of hydro-carbon contaminated soils at City-owned landfills.

The 1990 assessment applied Manitoba Environment Guidelines where available and British Columbia and Ontario criteria where no Manitoba criteria existed.

### A.1.2 Legislation – 1996

#### A. Federal

1. Canadian Environmental Protection Act c.16.
2. Transportation of Dangerous Goods Act and Regulations c.34.
3. Canadian Council of Ministers of the Environment (CCME) *Interim Canadian Environmental Quality Criteria for Contaminated Sites*, CCME EPC-CS34, September 1991.
4. Canadian Council of Ministers of the Environment (CCME) *National Guidelines for Decommissioning Industrial Sites*, CCME-TS/WM-TRE013E, March 1991.

#### B. Provincial

##### Manitoba

1. The Dangerous Goods Handling and Transportation Act, L.R.M. 1987, c. D12.
  - The Handling, Offering for Transport and Transporting of Dangerous Goods Regulation 172/85.
  - Generator Registration and Carrier Licencing Regulation, 175/87.
  - Classification Criteria for Products, Substances and Organisms Regulation 282/87.
  - Environmental Reporting Regulation 439/87.
2. The Environment Act C.C.S.M. c.E125
  - Storage of Handling of Gasoline and Associated Products Regulation 97/88.
3. Manitoba Environment A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, July 1993.

#### C. Municipal

1. The City of Winnipeg "Petroleum contaminated soil acceptance criteria for the Brady Road Landfill site", February 1, 1995.

The changes with the most significant potential impact on the assessment of the Public Market site are the introduction of the Manitoba Environment *A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba*, changes to City of Winnipeg criteria for accepting contaminated soils at the Brady Landfill site, and the introduction of the 1991 CCME *Interim Canadian Environmental Quality Criteria for Contaminated Sites*.

Use of the Manitoba Environment guideline necessitates a site sensitivity analysis which requires an understanding of the soil and groundwater conditions at the site plus a specific plan for the future use of the site and an idea of the types of exposure the contamination presents to humans, i.e., ingestion through breathing, oral ingestion of soil and/or water.

The City of Winnipeg requires that any contaminated soil to be disposed of at one of its landfill sites must meet certain criteria. The latest criteria are shown in Table 3.

In 1991, the Canadian Council for Ministers of the Environment (CCME) produced a set of interim criteria for identifying contaminated soil and contaminated water. The guidelines do not differ significantly from the Ontario guidelines in use at the time of the original Public Markets site assessment. The criteria for soils and water are shown in Tables 3 and 5 respectively.

### A.2 Environmental Impact Review



A review was conducted of the test results of samples from test holes (TH), bore holes (BH) and groundwater wells (MW) previously reported in the 1990 study: *Environmental Assessment, Public Markets Site*. The testing locations illustrated in Figure 6 were copied from this report<sup>10</sup>.

#### A.2.1 Soils

The results of the tests are summarized in Tables 1 – 3, for comparison with current federal, provincial and municipal criteria. Table 1 presents the test results on soil and water samples relative to the 1990 guidelines and regulations in effect for industrial sites and used in the *Environmental Assessment, Public Markets Site* report. Parameters that exceeded the guidelines are highlighted.

Table 2 compares the test results with 1996 regulations and guidelines for industrial sites.

Table 3 presents the test results relative to 1996 regulations and guidelines for residential/ parkland use. Results that exceed the regulations and guidelines are highlighted.

#### A.2.2 Groundwater

Five groundwater wells were sampled and tested in 1990. The results are presented in Table 4 and compared with the *Guidelines for Canadian Drinking Water Quality, 4th ed* and a combination of Manitoba and Ontario guidelines in effect at the time.

In Table 5, the results are compared with the CCME guidelines as presented in 1991 *Interim Canadian Environmental Quality Criteria for Contaminated Sites* and the *Guidelines for Canadian Drinking Water Quality (03/95)*.

### A.3 Analysis

The results of the tests on the soils indicated that, relative to the 1990 guidelines for industrial sites (Table 1), the site was found to be “largely uncontaminated and developable”. Some elevated levels of hydrocarbons (as demonstrated by the levels of BTEX<sup>11</sup>) were noted in BH4, but not enough to exceed the maximum levels for industrial sites. Similarly, Table 2 would indicate that none of the test results exceeded the CCME 1991 criteria for “Commercial/Industrial” sites and DOE 1993 criteria Level III (industrial) sites except for levels of electric conductivity.

High levels of electric conductivity were found in test holes MW2, BH9, BH14, BH19 and BH20. High levels of electric conductivity are usually an indication of soil salinity. However, the corresponding sodium adsorption ratio (SAR) levels are relatively low and the high electric conductivity values would not normally be considered a problem by themselves.

Significant levels of vapour concentration as ppm or lower explosive limit (LEL) were measured in test holes BH3, BH17 and BH18. The vapours may be attributable to the significant levels of oil & grease in BH3.

---

<sup>10</sup> The location of TH 2 was not included in the report.

<sup>11</sup> Benzene, toluene, ethyl benzene and xylene.

However, the presence of manure in the areas of BH17 and BH18 could point to methane gas as the reason for the high levels. Although there are no maximum levels for methane gas, the levels found in a number of the test holes could present problems if encountered while working in confined spaces such as excavations. As well, the potential for explosions could exist when working with electric equipment or open flames in the area.

Table 2 compares the soil test results with the Level III criteria. None of the test results exceed the Level III criteria and, therefore, no general clean-up or remediation of the site would be required. However, a site specific soils investigation should be conducted with a site specific sensitivity analysis for all proposed development to insure that the area is clean enough for the proposed use.

Table 3 compares the test results with the 1991 CCME criteria for "Residential/Parkland" sites and the 1993 DOE criteria for Level I sites (e.g., residential). The test results that exceed either or both the DOE and CCME criteria include the BTEX levels in BH4, the oil & grease, lead and copper in BH3, barium in BH5, electric conductivity levels in MW2, BH9, BH14, BH18, BH19 and BH20 and nitrogen levels in BH19, BH20 and BH23.

The oil & grease levels exceed 1993 DOE criteria for Level I sites. There are no CCME criteria for oil & grease. The elevated levels appear to be confined to the upper soils. The lead levels at the 0.5 m depth in BH3 were almost double the 1991 CCME criteria for "Residential/Parkland" sites and almost two and one-half times the levels for a Level I site under the 1993 DOE criteria. The copper levels at the 0.5m depth are only slightly above the CCME criteria for "Residential/Parkland" sites.

The concentration of barium at the three metre depth in BH5 is only slightly above the maximum concentration allowed for a residential/parkland setting under the CCME guidelines. Although it is more than double the average found in all of the other bore holes and the CCME assessment value for background levels, the elevated level is probably related to the former operation of a garage at this location.

Most of the elevated concentrations noted above are generally associated with automotive and related materials such as fuel, lubricating oils and batteries, normally identified with the operation of a garage. However, BH3 is somewhat removed from the area noted in an earlier report as the site of the former Public Market garage. It is possible that this site may have been used as a disposal area for used automotive associated products. The contamination appears to be confined to the upper one metre of soil.

Significant levels of vapour concentrations were found in a number of bore holes. Levels in BH3 may be the result of trace quantities of Trichlorofluoromethane, usually associated with refrigerants and solvents. Levels in BH4, BH5 and BH17 are likely the result of hydrocarbons. Levels in BH20, BH21, TH24, TH25, TH27, TH28, TH31, TH33, TH36, TH38 and TH39 are probably the result of methane gas. As previously pointed out, although there are no criteria for methane levels, the levels encountered could be of some concern during construction of infrastructure on the site.

A detailed sensitivity analysis cannot be conducted without specific information on the use of a site. However, if the area around BH4 is proposed for a use which might result in a high sensitivity ranking, the site would require clean up to meet the Level I criteria. A site specific analysis could be conducted once the proposed use has been identified. Similarly, if the proposed use of site was determined to have a moderate or high sensitivity ranking, the site would have to be cleaned up to a Level II and Level III, respectively.



Table 1  
1990 Criteria for Soils for Industrial Sites  
Public Market

Parameter	Ontario Criteria Commercial/ Industrial (1)	Manitoba DG& T Act	Manitoba/ Ontario Criteria Industrial (2)	COW Criteria	MW1-A 0.5	MW1-B 1.5	MW1-C 3.0	MW 2 0.5	MW2-B 1.5	MW2C 3.0	MW2A 0.5	MW2A 1.5	MW2A 3.0	MW 3 0.5	MW 3 1.5	MW 3 3.0	MW3A 0.5	MW3A 1.5	MW3A 3.0	MW 4 0.5	MW4-B 1.5	MW 4 3.0	MW 5 0.5	MW 5 1.5	MW 5 3.0	
Sample depth (m)					0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	
General																										
pH	6-8		6-8		7.5	7.3		8.2	7.5					8.2	7.9						8		7.9	7.9		
electric conductivity	4,000 µs/cm		4,000 µs/cm		414	1960		944	5010					336	406						500		926	804		
nitrogen (mg/kg)	6000		6000		960	5140		1660	490					850	140						250		3150	530		
SAR	12		12		0.17	2.78		2.98	2.1					0.01	0.28						0.67		1.11	1.02		
Loss on Ignition (%)			8																							
Inorganic Parameters (µg/g)																										
antimony	1		50		0.2	<1		<1	<1					<1	<1						0.2		<1	<1		
arsenic	50		50		8.2	5.7		2.6	5.4					1.2	2.8						3.6		3.9	5.9		
barium	2000		2000		200	203		179	196					67	57						96		318	223		
beryllium	10		10		1	1		<1	1					<1	<1						<1		<1	1		
cadmium	8		20		1	1		<1	<1					<1	<1						<1		<1	<1		
chromium (total)	1000		800		33	33		33	36					5	13						20		10	45		
cobalt	100		300		11	11		12	16					3	5						6		5	18		
copper	300				39	31		38	36					11	13						16		75	42		
cyanide (total)																										
lead	1000		1000		69	37		38	33					44	9						19		139	33		
mercury	2		10		0.15	0.04		0.02	0.04					0.02	0.01						0.02		0.78	0.02		
molybdenum	40		40		<2	3		<2	<2					<2	<2						<2		3	<2		
nickel	200		500		30	31		38	39					8	14						15		19	47		
selenium	10		10		0.3	0.7		0.2	0.4					<0.2	<0.2						<0.2		0.4	<0.2		
silver	50		40		<1	<1		<1	<1					<1	<1						<1		<1	<1		
vanadium	250		250		139	43		44	49					6	17						27		18	63		
zinc	800		1500		48	93		80	81					48	26						30		83	96		
Monocyclic Aromatic Hydrocarbons (µg/g)																										
benzene			5		<0.005	<0.005															<0.005					
ethylbenzene			50		<0.005	<0.005															<0.005					
styrene			50		<0.013	<0.013															<0.013					
toluene			30		<0.005	<0.005															<0.005					
xylene			50		<0.005	<0.005															<0.005					
total semi-volatile hydrocarbons																										
total volatile hydrocarbons																										
oil & grease	1000		5000		203	160		108	171					214	173						111		178	111		
Leachate Quality (mg/L)																										
Lead		5																								
Other																										
Recorded Vapour Concentration (ppm)					125	50	200	20	25	75	5	10	50	20	120	45	ND		10	70	ND	20	25	75	110	100
Equivalent Methane Concentration (ppm)																										
Recorded Vapour Concentration (% LEL)																										
Equivalent Methane Concentration (% LEL)																										
Flashpoint		>61		>61																						

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea  
Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.

(1) "Guidelines for the Decommissioning and Cleanup of Sites in Ontario", February 1989 for  
commercial/industrial sites in medium & fine textured soils

(2) Maximum Allowable Concentration for Industrial Sites (Manitoba Guidelines where applicable,  
remainder are Ontario MOE Guidelines)

Table 1  
1990 Criteria for Soils for Industrial Sites  
Public Market

Parameter	Ontario Criteria Commercial/ Industrial (1)	Manitoba DG & T Act	Manitoba/ Ontario Criteria Industrial (2)	COW Criteria	BH-1 0.5	BH1-B 1.5	BH1-C 3.0	BH2-A 0.5	BH2-B 1.5	BH2-C 3.0	BH3-A 0.5	BH3-B 1.5	BH3-C 3.0	BH4-A 0.5	BH4-B 1.5	BH4-C 3.0	BH5-A 0.5	BH5-B 1.5	BH5-C 3.0	BH6-A 0.5	BH6-B 1.5	BH6-C 3.0	BH7-A 0.5	BH7-B 1.5	BH7-C 3.0
Sample depth (m)																									
General																									
pH	6-8		6-8			7.4		7.6	7.6	7.2	7.4	7.3	7.6		7.5	7.4		8.1	7.4		7.5		7.3	7.4	
electric conductivity	4,000 µs/cm		4,000 µs/cm			444		430	434	1080	620	696	419		431	696		676	780		985		984	1460	
nitrogen (mg/kg)	6000		6000			210		500	230	610	1460	590	290		350	760		700	790		100		1590	690	
SAR	12		12			0.6		1.1	1.57	1.57	1	2	2.48		0.56	1.14		0.97	1.46		1.78		1.15	1.03	
Loss on Ignition (%)			8																						
Inorganic Parameters (µg/g)																									
antimony	1		50			<1		<1	<1	<1	0.7	<1	<1		<1	<1		<1	<1		<1		<1	<1	
arsenic	50		50			3.5		2.3	5.5	6.3	4.3	7.4	4		4.1	6.7		3.9	5.8		4.5		5.2	4.9	
barium	2000		2000			117		112	110	214	231	174	334		164	229		99	509		81		172	126	
beryllium	10		10			1		1	1	2	<1	1	1		1	2		1	2		<1		2	1	
cadmium	8		20			<1		<1	<1	1.2	<1	<1	<1		<1	1.3		<1	1.3		<1		1	<1	
chromium (total)	1000		800			29		24	24	54	15	43	58		36	60		21	46		21		54	46	
cobalt	100		300			10		8	10	19	5	14	20		12	19		9	15		9		17	16	
copper	300					25		17	25	50	117	34	48		27	49		20	56		21		32	33	
cyanide (total)											<0.1	<0.1	<0.1								<0.1				
lead	1000		1000			13		9	22	45	903	36	37		10	15		13	43		17		44	10	
mercury	2		10			0.04		<0.01	<0.01	0.02	0.06	<0.01	<0.01		<0.01	0.02		0.02	0.02		<0.01		<0.01	<0.01	
molybdenum	40		40			<2		2	2	2	<2	<2	2		<2	3		4	3		<2		<2	2	
nickel	200		500			24		19	25	45	13	37	47		31	60		21	50		23		42	41	
selenium	10		10			0.3		0.7	0.4	0.4	<0.2	<0.2	0.2		0.9	0.3		0.3	1		0.5		0.6	0.3	
silver	50		40			<1		<1	<1	<1	<1	<1	<1		<1	<1		<1	<1		<1		<1	<1	
vanadium	250		250			33		29	38	71	19	60	62		44	80		33	68		30		72	67	
zinc	800		1500			47		42	41	115	43	81	94		63	115		38	102		41		111	94	
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene			5			<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.2	<0.005		<0.005	0.04		<0.005		<0.005	<0.005	
ethylbenzene			50			<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		1.8	<0.005		<0.005	0.01		<0.005		<0.005	<0.005	
styrene			50			<0.013		<0.013	<0.013	<0.013	<0.013	<0.013	<0.013		<0.062	<0.013		<0.013	<0.013		<0.013		<0.013	<0.013	
toluene			30			<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.2	<0.005		0.01	<0.005		<0.005		<0.005	<0.005	
xylene			50			<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		5.5	<0.005		<0.005	0.005		<0.005		<0.005	<0.005	
total semi-volatile hydrocarbons																									
total volatile hydrocarbons																									
oil & grease	1000		5000			99.6		39	72.5	129	2680	105	106		1050	68		75	175		58		53	78.5	
Leachate Quality (mg/L)																									
Lead		5																							
Other																									
Recorded Vapour Concentration (ppm)						75	30	ND	25	10	100			80	110	280	220	250	325	ND	30	50	55	85	30
Equivalent Methane Concentration (ppm)																									
Recorded Vapour Concentration (% LEL)											100	60	10												
Equivalent Methane Concentration (% LEL)																									
Flashpoint		>61		>61																					

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea  
Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.

(1) "Guidelines for the Decommissioning and Cleanup of Sites in Ontario", February 1989 for  
commercial/industrial sites in medium & fine textured soils

(2) Maximum Allowable Concentration for Industrial Sites (Manitoba Guidelines where applicable,  
remainder are Ontario MOE Guidelines)



Table 1  
1990 Criteria for Soils for Industrial Sites  
Public Market

Parameter	Ontario Criteria Commercial/ Industrial (1)	Manitoba DG& T Act	Manitoba/ Ontario Criteria Industrial (2)	COW Criteria	BH8-A 0.5	BH8-B 1.5	BH8-C 3.0	BH9-A 0.5	BH9-B 1.5	BH9-C 3.0	BH10-A 0.5	BH10-B 1.5	BH10-C 3.0	BH11-A 0.5	BH11-B 1.5	BH11-C 3.0	BH12-A 0.5	BH12-B 1.5	BH12-C 3.0	BH13-A 0.5	BH13-B 1.5	BH13-C 3.0	BH14-A 0.5	BH14-B 1.5	BH14-C 3.0	
Sample depth (m)																										
General																										
pH	6-8		6-8			7.7		7.3	7.5		7.6	8	7.5	8	8		7.6	7.6			7.6		7.3	7.6		
electric conductivity	4,000 µs/cm		4,000 µs/cm			1430		4820	2860		670	656	1270	1750	1880		470	601			1390		15300	12100		
nitrogen (mg/kg)	6000		6000			220		1570	120		1490	190	540	630	580		970	270			240		1090	130		
SAR	12		12			1.06		7.31	4.99		0.89	0.5	0.98	3.98	5.25		1.31	3.97			6.63		6.55	25.1		
Loss on Ignition (%)			8																							
Inorganic Parameters (µg/g)																										
antimony	1		50			<1		<1	<1		<1	2	<1	<1	<1		<1	<1			<1		<1	<1		
arsenic	50		50			3.6		7.6	3.8		4.2	2.7	7.3	6.5	6.9		6.2	4.4			8		3.3	4.3		
barium	2000		2000			125		225	100		243	48	225	208	243		194	186			136		197	126		
beryllium	10		10			<1		1	<1		1	<1	2	1	1		1	1			1		1	1		
cadmium	8		20			<1		1.2	<1		<1	<1	1.1	1.1	1		1.2	1			<1		<1	<1		
chromium (total)	1000		800			19		44	21		25	12	59	44	45		35	69			36		43	25		
cobalt	100		300			6		15	7		8	5	20	14	18		13	25			11		15	9		
copper	300					15		34	18		27	11	54	36	44		38	52			27		36	21		
cyanide (total)						<0.1																				
lead	1000		1000			9		34	16		29	4	49	14	33		37	17			24		33	22		
mercury	2		10			<0.01		0.04	<0.01		0.04	<0.01	0.04	0.04	0.04		0.04	<0.01			<0.01		<0.01	<0.01		
molybdenum	40		40			<2		<2	<2		<2	<2	4	2	<2		<2	<2			<2		<2	<2		
nickel	200		500			15		39	17		21	9	56	36	44		36	63			31		40	23		
selenium	10		10			<0.2		<0.2	<0.2		0.2	<0.2	0.6	0.3	0.3		0.3	<0.2			0.2		0.4	<0.2		
silver	50		40			<1		<1	<1		<1	<1	<1	<1	1		<1	<1			<1		<1	<1		
vanadium	250		250			25		73	28		34	12	78	67	62		50	77			57		48	35		
zinc	800		1500			29		87	30		62	24	116	81	94		80	123			55		90	46		
Monocyclic Aromatic Hydrocarbons (µg/g)																										
benzene			5			<0.005		<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005			<0.005		<0.005	<0.005		
ethylbenzene			50			<0.005		<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005			<0.005		<0.005	<0.005		
styrene			50			<0.013		<0.013	<0.013		<0.013	<0.013	<0.013	<0.013	<0.013		<0.013	<0.013			<0.013		<0.013	<0.013		
toluene			30			<0.005		<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005			<0.005		<0.005	<0.005		
xylene			50			<0.005		<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005			<0.005		<0.005	<0.005		
total semi-volatile hydrocarbons																										
total volatile hydrocarbons																										
oil & grease	1000		5000			73.8		139	44.7		93.2	56.8	64.5	25.3	63.3		50.5	52.4			196		75.6	97.3		
Leachate Quality (mg/L)																										
Lead		5																								
Other																										
Recorded Vapour Concentration (ppm)						105	475	205	ND	25	10	75	85	25	15	10	20	20	20	15	20	15	20	5	15	10
Equivalent Methane Concentration (ppm)																										
Recorded Vapour Concentration (% LEL)																										
Equivalent Methane Concentration (% LEL)																										
Flashpoint		>61		>61																						

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea  
Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.

(1) "Guidelines for the Decommissioning and Cleanup of Sites in Ontario", February 1989 for  
commercial/industrial sites in medium & fine textured soils

(2) Maximum Allowable Concentration for Industrial Sites (Manitoba Guidelines where applicable,  
remainder are Ontario MOE Guidelines)

Table 1  
1990 Criteria for Soils for Industrial Sites  
Public Market

Parameter	Ontario Criteria Commercial/ Industrial (1)	Manitoba DG & T Act	Manitoba/ Ontario Criteria Industrial (2)	COW Criteria	BH15-A 0.5	BH15-B 1.5	BH15-C 3.0	BH16-A 0.5	BH16-B 1.5	BH16-C 3.0	BH17 3.0	BH18 0.5	BH18 1.5	BH18 3.0	BH19 0.5	BH19 1.5	BH19 4.5	BH19 9.0	BH20 0.5	BH20 1.5	BH20 3.0	BH21 0.5	BH21 1.5	BH21 3.0	BH22 0.5
Sample depth (m)																									
General																									
pH	6-8		6-8		7.6	7.4		7.5	7.7				7.8			7.8	7.8	8	8.8	8	7.5		7.4		
electric conductivity	4,000 $\mu\text{S}/\text{cm}$		4,000 $\mu\text{S}/\text{cm}$		1520	2490		732	958				3620			1260	3310	6060	10400	2600	1880		5680		
nitrogen (mg/kg)	6000		6000		1640	530		910	40				<5			1270	3500	4920	2400	240	30		170		
SAR	12		12		3.52	2.63		3.67	2.84				2.11			0.33	0.56	0.54	0.35	0.36	0.5		1.79		
Loss on Ignition (%)			8													7.9	11.8	15.8	10.9	4.8	2				
Inorganic Parameters ( $\mu\text{g}/\text{g}$ )																									
antimony	1		50		<1	<1		<1	<1				<1			<1	<1	<1	<1	<1	<1		<1		
arsenic	50		50		4.4	6.6		3.7	3.6				<0.1			3.5	2.5	3	5.5	3.4	<0.1		0.7		
barium	2000		2000		162	170		274	77				21			164	129	169	145	90	25		96		
beryllium	10		10		1	1		1	<1				<1			1	<1	<1	1	<1	<1		<1		
cadmium	8		20		<1	<1		<1	<1				<1			<1	<1	<1	<1	<1	<1		<1		
chromium (total)	1000		800		28	45		36	12				8			19	15	18	24	20	8		20		
cobalt	100		300		9	13		15	3				2			7	6	6	10	6	2		6		
copper	300				25	32		26	10				5			37	18	19	26	18	6		17		
cyanide (total)																									
lead	1000		1000		13	14		12	10				5			49	20	23	24	12	2		21		
mercury	2		10		0.03	0.04		0.02	0.02				0.02			0.06	0.03	0.13	0.03	0.07	0.01		0.02		
molybdenum	40		40		<2	<2		<2	<2				<2			<2	<2	<2	<2	<2	<2		<2		
nickel	200		500		27	37		35	10				6			21	18	20	30	18	7		18		
selenium	10		10		<0.2	0.2		<0.2	<0.2				<0.2			0.3	0.5	0.3	<0.2	<0.2	0.3		0.2		
silver	50		40		<1	<1		<1	<1				<1			<1	<1	<1	<1	<1	<1		<1		
vanadium	250		250		42	68		55	22				9			27	20	23	42	23	10		22		
zinc	800		1500		58	77		76	16				10			67	47	58	56	37	12		33		
Monocyclic Aromatic Hydrocarbons ( $\mu\text{g}/\text{g}$ )																									
benzene			5		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		
ethylbenzene			50		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		
styrene			50		<0.013	<0.013		<0.013	<0.013				<0.013			<0.013	<0.013	<0.013	<0.013	<0.013	<0.013		<0.013		
toluene			30		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		
xylene			50		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		
total semi-volatile hydrocarbons																<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		
total volatile hydrocarbons																									
oil & grease	1000		5000		120	73.5		133	33.2				95.4			757	196	436	149	112	115		154		
Leachate Quality (mg/L)																									
Lead		5																							
Other																									
Recorded Vapour Concentration (ppm)					ND	5	30	30	50	20	3750	30	60	1125	20				410	250	310	35	170	220	5
Equivalent Methane Concentration (ppm)																									
Recorded Vapour Concentration (% LEL)												30					5	9							
Equivalent Methane Concentration (% LEL)																									
Flashpoint		>61		>61																					

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.

(1) "Guidelines for the Decommissioning and Cleanup of Sites in Ontario", February 1989 for commercial/industrial sites in medium & fine textured soils

(2) Maximum Allowable Concentration for Industrial Sites (Manitoba Guidelines where applicable, remainder are Ontario MOE Guidelines)



Table 1  
1990 Criteria for Soils for Industrial Sites  
Public Market

Parameter	Ontario Criteria Commercial/ Industrial (1)	Manitoba DG& T Act	Manitoba/ Ontario Criteria Industrial (2)	COW Criteria	BH22	BH22	BH23	BH23	BH23	BH24	BH25	BH25	BH25	BH26	BH27	BH28	BH28	BH29	BH30	BH31	BH32	BH33	BH34	BH35	BH36
Sample depth (m)					1.5	3.0	0.5	1.5	3.0	3.0	3.0	3.0	6.0	3.0	6.0	6.0	9.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
General																									
pH	6-8		6-8		7.6		7.7	7.9	7.7																
electric conductivity	4,000 µs/cm		4,000 µs/cm		1400		373	2810	3260																
nitrogen (mg/kg)	6000		6000		490		3190	560	630																
SAR	12		12		1.61		0.07	2.6	1.85																
Loss on Ignition (%)			8																						
Inorganic Parameters (µg/g)																									
antimony	1		50		<1		<1	<1	<1																
arsenic	50		50		3.3		<0.1	5.2	5.2																
barium	2000		2000		242		103	93	67																
beryllium	10		10		1		<1	1	1																
cadmium	8		20		<1		<1	<1	<1																
chromium (total)	1000		800		47		16	26	32																
cobalt	100		300		17		8	11	15																
copper	300				36		15	32	38																
cyanide (total)																									
lead	1000		1000		33		18	24	30																
mercury	2		10		0.04		0.03	0.05	0.05																
molybdenum	40		40		<2		<2	<2	2																
nickel	200		500		47		17	34	44																
selenium	10		10		<0.2		<0.2	0.6	0.7																
silver	50		40		<1		<1	<1	<1																
vanadium	250		250		54		20	39	47																
zinc	800		1500		100		45	80	90																
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene			5		<0.005		<0.005	<0.005	<0.005																
ethylbenzene			50		<0.005		<0.005	0.006	<0.005																
styrene			50		<0.013		<0.013	<0.013	<0.013																
toluene			30		<0.005		<0.005	<0.005	<0.005																
xylene			50		<0.005		<0.005	<0.005	<0.005																
total semi-volatile hydrocarbons																									
total volatile hydrocarbons																									
oil & grease	1000		5000		207		153	160	149																
Leachate Quality (mg/L)																									
Lead		5																							
Other																									
Recorded Vapour Concentration (ppm)					25	10	ND	20	10	100	220	60		20	200	400			10	175	45	160	75	90	260
Equivalent Methane Concentration (ppm)										240	528	144		48	480	960			24	420	108	384	180	216	624
Recorded Vapour Concentration (% LEL)																									
Equivalent Methane Concentration (% LEL)														6											
-----														2.5											
Flashpoint		>61		>61														16		12					
																		6.7		5					

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea

Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.

(1) "Guidelines for the Decommissioning and Cleanup of Sites in Ontario", February 1989 for commercial/industrial sites in medium & fine textured soils

(2) Maximum Allowable Concentration for Industrial Sites (Manitoba Guidelines where applicable, remainder are Ontario MOE Guidelines)

Table 1  
1990 Criteria for Soils for Industrial Sites  
Public Market

Parameter	Ontario Criteria Commercial/ Industrial (1)	Manitoba DG& T Act	Manitoba/ Ontario Criteria Industrial (2)	COW Criteria	BH36	BH37	BH38	BH39
Sample depth (m)					6.0	3.0	3.0	3.0
General								
pH	6-8		6-8					
electric conductivity	4,000 µs/cm		4,000 µs/cm					
nitrogen (mg/kg)	6000		6000					
SAR	12		12					
Loss on Ignition (%)			8					
Inorganic Parameters (µg/g)								
antimony	1		50					
arsenic	50		50					
barium	2000		2000					
beryllium	10		10					
cadmium	8		20					
chromium (total)	1000		800					
cobalt	100		300					
copper	300							
cyanide (total)								
lead	1000		1000					
mercury	2		10					
molybdenum	40		40					
nickel	200		500					
selenium	10		10					
silver	50		40					
vanadium	250		250					
zinc	800		1500					
Monocyclic Aromatic Hydrocarbons (µg/g)								
benzene			5					
ethylbenzene			50					
styrene			50					
toluene			30					
xylene			50					
total semi-volatile hydrocarbons								
total volatile hydrocarbons								
oil & grease	1000		5000					
Leachate Quality (mg/L)								
Lead		5						
Other								
Recorded Vapour Concentration (ppm)					475	45	180	175
Equivalent Methane Concentration (ppm)					1140	100	432	420
Recorded Vapour Concentration (% LEL)								
Equivalent Methane Concentration (% LEL)								
Flashpoint		>61		>61				

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea  
Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.

(1) "Guidelines for the Decommissioning and Cleanup of Sites in Ontario", February 1989 for  
commercial/industrial sites in medium & fine textured soils

(2) Maximum Allowable Concentration for Industrial Sites (Manitoba Guidelines where applicable,  
remainder are Ontario MOE Guidelines)



Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Parameter	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria																
	Assessment Criteria	Remediation				Level I	Level II	Level III		MW1-A	MW1-B	MW1-C	MW2	MW2-B	MW2C	MW2A	MW2A	MW2A	MW3	MW3	MW3	MW3A	MW3A	MW3A	
		Agricultural	Residential/ Parkland	Commercial/ Industrial																					
Sample depth (m)										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	
General																									
pH	6-8	6-8	6-8	6-8						7.5	7.3		8.2	7.5					8.2	7.9					
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						414	1960		944	5010					336	406					
nitrogen (mg/kg)										960	5140		1660	490					850	140					
SAR	5	5	5	12						0.17	2.78		2.98	2.1					0.01	0.28					
Loss on Ignition (%)																									
Inorganic Parameters (µg/g)																									
antimony	20	20	20	40						0.2	<1		<1	<1					<1	<1					
arsenic	5	20	30	50						8.2	5.7		2.6	5.4					1.2	2.8					
barium	200	750	500	2000						200	203		179	196					67	57					
beryllium	4	4	4	8						1	1		<1	1					<1	<1					
cadmium	0.5	3	5	20						1	<1		<1	<1					<1	<1					
chromium (total)	20	750	250	800						33	33		33	38					5	13					
cobalt	10	40	50	300						11	11		12	16					3	5					
copper	30	150	100	500						39	31		38	36					11	13					
cyanide (total)	2.5	5	50	500																					
lead	25	375	500	1000		375	500	1000		69	37		38	33					44	9					
mercury	0.1	0.8	2	10						0.15	0.04		0.02	0.04					0.02	0.01					
molybdenum	2	5	10	40						<2	3		<2	<2					<2	<2					
nickel	20	150	100	500						30	31		38	39					8	14					
selenium	1	2	3	10						0.3	0.7		0.2	0.4					<0.2	<0.2					
silver	2	20	20	40						<1	<1		<1	<1					<1	<1					
vanadium	25	200	200							48	43		44	49					6	17					
zinc	60	600	500	1500						139	93		80	81					48	26					
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005														
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005														
styrene	0.1	0.1	5	50						<0.013	<0.013														
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005														
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005														
total semi-volatile hydrocarbons						500	2000	2000	1000																
total volatile hydrocarbons						100	150	800	800																
oil & grease						1000	5000	5000	30000	203	160		108	171					214	173					
Leachate Quality (mg/L)																									
Lead					5				5																
Other																									
Recorded Vapour Concentration (ppm)										125	50	200	20	25	75	5	10	50	20	120	45	ND	10	70	
Equivalent Methane Concentration (ppm)																									
Recorded Vapour Concentration (% LEL)																									
Equivalent Methane Concentration (% LEL)																									
Flashpoint					>61				>81																

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS Lea Consultants by TetraE consultants Inc/Wardrop Engineering Inc.

Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Parameter	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria															
	Assessment Criteria	Remediation				Level I	Level II	Level III																
		Agricultural	Residential/ Parkland	Commercial/ Industrial						MW 4	MW4-B	MW 4	MW 5	MW 5	MW 5	BH-1	BH1-B	BH1-C	BH2-A	BH2-B	BH2-C	BH3-A	BH3 B	BH3-C
Sample depth (m)										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0
General																								
pH	6-8	6-8	6-8	6-8						8			7.9	7.9			7.4		7.6	7.6	7.2	7.4	7.3	7.6
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						500			926	804			444		430	434	1080	620	696	419
nitrogen (mg/kg)										250			3150	530			210		500	230	610	1460	590	290
SAR	5	5	5	12						0.67			1.11	1.02			0.6		1.1	1.57	1.57	1.0	2	2.48
Loss on Ignition (%)																								
Inorganic Parameters (µg/g)																								
antimony	20	20	20	40						0.2			<1	<1			<1		<1	<1	<1	0.7	<1	<1
arsenic	5	20	30	50						3.6			3.9	5.9			3.5		2.3	5.5	6.3	4.3	7.4	4
barium	200	750	500	2000						96			318	223			117		112	110	214	231	174	334
beryllium	4	4	4	8						<1			<1	1			1		1	1	2	<1	1	1
cadmium	0.5	3	5	20						<1			<1	<1			<1		<1	<1	1.2	<1	<1	<1
chromium (total)	20	750	250	800						20			10	45			29		24	24	54	15	43	58
cobalt	10	40	50	300						6			5	18			10		8	10	19	5	14	20
copper	30	150	100	500						16			75	42			25		17	25	50	117	34	48
cyanide (total)	2.5	5	50	500																				
lead	25	375	500	1000		375	500	1000		19			139	33			13		9	22	45	903	36	37
mercury	0.1	0.8	2	10						0.02			0.76	0.02			0.04		<0.01	<0.01	0.02	0.06	<0.01	<0.01
molybdenum	2	5	10	40						<2			3	<2			<2		2	2	2	<2	<2	2
nickel	20	150	100	500						15			19	47			24		19	25	45	13	37	47
selenium	1	2	3	10						<0.2			0.4	<0.2			0.3		0.7	0.4	0.4	<0.2	<0.2	0.2
silver	2	20	20	40						<1			<1	<1			<1		<1	<1	<1	<1	<1	<1
vanadium	25	200	200							27			16	63			33		29	38	71	19	60	62
zinc	60	600	500	1500						30			83	96			47		42	41	115	43	81	94
Monocyclic Aromatic Hydrocarbons (µg/g)																								
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
styrene	0.1	0.1	5	50						<0.013							<0.013		<0.013	<0.013	<0.013	<0.013	<0.013	<0.013
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
total semi-volatile hydrocarbons						500	2000	2000	1000															
total volatile hydrocarbons						100	150	800	800															
oil & grease						1000	5000	5000	30000															
Leachate Quality (mg/L)										111			178	111			111		39	72.5	129	2680	105	106
Lead						5			5															
Other																								
Recorded Vapour Concentration (ppm)										ND		20	25	75	110	100	75	30	ND	25	10	100		
Equivalent Methane Concentration (ppm)																								
Recorded Vapour Concentration (% LEL)																								
Equivalent Methane Concentration (% LEL)																						100	60	10
Flashpoint						>61			>61															

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lee Consultants by TetraE consultants Inc/Wardrop Engineering Inc.



Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Parameter	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria																		
	Assessment Criteria	Remediation				Level I	Level II	Level III																			
		Agricultural	Residential/ Parkland	Commercial/ Industrial																							
Sample depth (m)										BH4-A	BH4-B	BH4-C	BH5-A	BH5-B	BH5-C	BH6-A	BH6-B	BH6-C	BH7-A	BH7-B	BH7-C	BH8-A	BH8-B	BH8-C			
										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0			
General																											
pH	6-8	6-8	6-8	6-8							7.5	7.4		8.1	7.4		7.5		7.3	7.4			7.7				
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm							431	696		676	780		985		984	1460			1430				
nitrogen (mg/kg)											350	760		700	790		100		1590	690			220				
SAR	5	5	5	12							0.56	1.14		0.97	1.46		1.78		1.15	1.03			1.06				
Loss on Ignition (%)																											
Inorganic Parameters (µg/g)																											
antimony	20	20	20	40							<1	<1		<1	<1		<1		<1	<1			<1				
arsenic	5	20	30	50							4.1	6.7		3.9	5.8		4.5		5.2	4.9			3.6				
barium	200	750	500	2000							164	229		99	509		81		172	126			125				
beryllium	4	4	4	8							1	2		1	2		<1		2	1			<1				
cadmium	0.5	3	5	20							<1	1.3		<1	1.3		<1		1	<1			<1				
chromium (total)	20	750	250	800							36	60		21	46		21		54	46			19				
cobalt	10	40	50	300							12	19		9	15		9		17	16			6				
copper	30	150	100	500							27	49		20	56		21		32	33			15				
cyanide (total)	2.5	5	50	500													<0.1						<0.1				
lead	25	375	500	1000		375	500	1000			10	15		13	43		17		44	10			9				
mercury	0.1	0.8	2	10							<0.01	0.02		0.02	0.02		<0.01		<0.01	<0.01			<0.01				
molybdenum	2	5	10	40							<2	3		4	3		<2		<2	2			<2				
nickel	20	150	100	500							31	60		21	50		23		42	41			15				
selenium	1	2	3	10							0.9	0.3		0.3	1		0.5		0.6	0.3			<0.2				
silver	2	20	20	40							<1	<1		<1	<1		<1		<1	<1			<1				
vanadium	25	200	200								44	80		33	68		30		72	67			25				
zinc	60	600	500	1500							63	115		38	102		41		111	94			29				
Monocyclic Aromatic Hydrocarbons (µg/g)																											
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5		<0.2	<0.005		<0.005	0.04		<0.005		<0.005	<0.005			<0.005				
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100		1.8	<0.005		<0.005	0.01		<0.005		<0.005	<0.005			<0.005				
styrene	0.1	0.1	5	50							<0.062	<0.013		<0.013	<0.013		<0.013		<0.013	<0.013			<0.013				
toluene	0.1	0.1	3	30		0.1	3	30	100		<0.2	<0.005		0.01	<0.005		<0.005		<0.005	<0.005			<0.005				
xylene	0.1	0.1	5	50		0.1	5	50	100		5.5	<0.005		<0.005	0.005		<0.005		<0.005	<0.005			<0.005				
total semi-volatile hydrocarbons						500	2000	2000	1000								<0.005		<0.005	<0.005			<0.005				
total volatile hydrocarbons						100	150	800	800																		
oil & grease						1000	5000	5000	30000		1050	68		75	175		58		53	78.5			73.8				
Leachate Quality (mg/L)																											
Lead						5			5																		
Other																											
Recorded Vapour Concentration (ppm)											80	110	280	220	250	325	ND	30	50	55	85	30	105	475	205		
Equivalent Methane Concentration (ppm)																											
Recorded Vapour Concentration (% LEL)																											
Equivalent Methane Concentration (% LEL)																											
Flashpoint						>61			>61																		

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lee Consultants by TetraE consultants Inc/Wardrop Engineering Inc.

Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Parameter	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria																		
	Assessment Criteria	Remediation				Level I	Level II	Level III		BH9-A	BH9-B	BH9-C	BH10-A	BH10-B	BH10-C	BH11-A	BH11-B	BH11-C	BH12-A	BH12-B	BH12-C	BH13-A	BH13-B	BH13-C			
		Agricultural	Residential/ Parkland	Commercial/ Industrial																							
Sample depth (m)										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0			
General																											
pH	6.8	6.8	6.8	6.8						7.3	7.5		7.6	8	7.5	8	8		7.6	7.6				7.6			
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						4820	2860		670	656	1270	1750	1880		470	601				1390			
nitrogen (mg/kg)										1570	120		1490	190	540	630	580		970	270				240			
SAR	5	5	5	12						7.31	4.99		0.89	0.5	0.98	3.98	5.25		1.31	3.97				6.63			
Loss on Ignition (%)																											
Inorganic Parameters (µg/g)																											
antimony	20	20	20	40						<1	<1		<1	2	<1	<1	<1		<1	<1				<1			
arsenic	5	20	30	50						7.6	3.8		4.2	2.7	7.3	6.5	6.9		6.2	4.4				8			
barium	200	750	500	2000						225	100		243	48	225	208	243		194	186				136			
beryllium	4	4	4	8						1	<1		1	<1	2	1	1		1	1				1			
cadmium	0.5	3	5	20						1.2	<1		<1	<1	1.1	1.1	1		1.2	1				<1			
chromium (total)	20	750	250	800						44	21		25	12	59	44	45		35	69				36			
cobalt	10	40	50	300						15	7		8	5	20	14	18		13	25				11			
copper	30	150	100	500						34	18		27	11	54	36	44		38	52				27			
cyanide (total)	2.5	5	50	500																							
lead	25	375	500	1000		375	500	1000		34	16		29	4	49	14	33		37	17				24			
mercury	0.1	0.8	2	10						0.04	<0.01		0.04	<0.01	0.04	0.04	0.04		0.04	<0.01				<0.01			
molybdenum	2	5	10	40						<2	<2		<2	<2	4	2	<2		<2	<2				<2			
nickel	20	150	100	500						39	17		21	9	56	36	44		36	63				31			
selenium	1	2	3	10						<0.2	<0.2		0.2	<0.2	0.6	0.3	0.3		0.3	<0.2				0.2			
silver	2	20	20	40						<1	<1		<1	<1	<1	<1	1		<1	<1				<1			
vanadium	25	200	200	800						73	28		34	12	78	67	62		50	77				57			
zinc	60	600	500	1500						87	30		62	24	116	81	94		80	123				55			
Monocyclic Aromatic Hydrocarbons (µg/g)																											
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005			
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005			
styrene	0.1	0.1	5	50						<0.013	<0.013		<0.013	<0.013	<0.013	<0.013	<0.013		<0.013	<0.013				<0.013			
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005			
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005			
total semi-volatile hydrocarbons						500	2000	2000	1000																		
total volatile hydrocarbons						100	150	800	800																		
oil & grease						1000	5000	5000	30000																		
Leachate Quality (mg/L)										139	44.7		93.2	56.8	64.5	25.3	63.3		50.5	52.4				196			
Lead					5				5																		
Other																											
Recorded Vapour Concentration (ppm)										ND	25	10	75	85	25	15	10	20	20	20	15	20	15	20			
Equivalent Methane Concentration (ppm)																											
Recorded Vapour Concentration (% LEL)																											
Equivalent Methane Concentration (% LEL)																											
Flashpoint					>61				>61																		

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS- Lea Consultants by TetraE consultants Inc/Wardrop Engineering Inc.



Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Parameter	CCME Criteria for Soils				DG&T Act	DOE Criteria			COW Criteria																
	Assessment Criteria	Remediation				Level I	Level II	Level III																	
		Agricultural	Residential/ Parkland	Commercial/ Industrial																					
Sample depth (m)										BH14-A	BH14-B	BH14-C	BH15-A	BH15-B	BH15-C	BH16-A	BH16-B	BH16-C	BH17	BH18	BH18	BH18	BH19	BH19	
										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	3.0	0.5	1.5	3.0	0.5	1.5	
General																									
pH	6-8	6-8	6-8	6-8						7.3	7.6		7.6	7.4		7.5	7.7				7.8			7.8	
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						15300	12100		1520	2490		732	958				3620			1260	
nitrogen (mg/kg)										1090	130		1640	530		910	40				<5			1270	
SAR	5	5	5	12						6.55	25.1		3.52	2.63		3.67	2.84				2.11			0.33	
Loss on Ignition (%)																								7.9	
Inorganic Parameters (µg/g)																									
antimony	20	20	20	40						<1	<1		<1	<1		<1	<1				<1			<1	
arsenic	5	20	30	50						3.3	4.3		4.4	6.6		3.7	3.6				<0.1			3.5	
barium	200	750	500	2000						197	126		162	170		274	77				21			164	
beryllium	4	4	4	8						1	1		1	1		1	<1				<1			1	
cadmium	0.5	3	5	20						<1	<1		<1	<1		<1	<1				<1			<1	
chromium (total)	20	750	250	800						43	25		28	45		38	12				8			19	
cobalt	10	40	50	300						15	9		9	13		15	3				2			7	
copper	30	150	100	500						38	21		25	32		26	10				5			37	
cyanide (total)	2.5	5	50	500																					
lead	25	375	500	1000		375	500	1000		33	22		13	14		12	10				5			49	
mercury	0.1	0.8	2	10						<0.01	<0.01		0.03	0.04		0.02	0.02				0.02			0.06	
molybdenum	2	5	10	40						<2	<2		<2	<2		<2	<2				<2			<2	
nickel	20	150	100	500						40	23		27	37		35	10				6			21	
selenium	1	2	3	10						0.4	<0.2		<0.2	0.2		<0.2	<0.2				<0.2			0.3	
silver	2	20	20	40						<1	<1		<1	<1		<1	<1				<1			<1	
vanadium	25	200	200	1500						48	35		42	68		55	22				9			27	
zinc	60	600	500	1500						90	46		58	77		76	16				10			67	
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
styrene	0.1	0.1	5	50						<0.013	<0.013		<0.013	<0.013		<0.013	<0.013				<0.013			<0.013	
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
total semi-volatile hydrocarbons						500	2000	2000	1000																
total volatile hydrocarbons						100	150	800	800																
oil & grease						1000	5000	5000	30000	75.6	97.3		120	73.5		133	33.2				95.4			757	
Leachate Quality (mg/L)																									
Lead					5				5																
Other																									
Recorded Vapour Concentration (ppm)										5	15	10	ND	5	30	30	50	20	3750	30	60	1125	20		
Equivalent Methane Concentration (ppm)																									
Recorded Vapour Concentration (% LEL)																									
Equivalent Methane Concentration (% LEL)																			30			9			
Flashpoint					>61				>61																

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea Consultants by TetraEis consultants Inc/Wardrop Engineering Inc.

Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Parameter	CCME Criteria for Soils				DG& T Act	DOE Criteria			COW Criteria	BH19 4.5	BH19 9.0	BH20 0.5	BH20 1.5	BH20 3.0	BH21 0.5	BH21 1.5	BH21 3.0	BH22 0.5	BH22 1.5	BH22 3.0	BH23 0.5	BH23 1.5	BH23 3.0	BH24 3.0
	Assessment Criteria	Remediation																						
		Agricultural	Residential/ Parkland	Commercial/ Industrial																				
Sample depth (m)																								
General																								
pH	6-8	6-8	6-8	6-8						7.8	8	8.8	8	7.5		7.4		7.6		7.7	7.9	7.7		
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						3310	6060	10400	2600	1880		5680		1400		373	2810	3260		
nitrogen (mg/kg)										3500	4920	2400	240	30		170		490		3190	560	630		
SAR	5	5	5	12						0.56	0.54	0.35	0.36	0.5		1.79		1.61		0.07	2.6	1.85		
Loss on Ignition (%)										11.6	15.6	10.9	4.8	2										
Inorganic Parameters (µg/g)																								
antimony	20	20	20	40						<1	<1	<1	<1	<1		<1		<1		<1	<1	<1		
arsenic	5	20	30	50						2.5	3	5.5	3.4	<0.1		0.7		3.3		<0.1	5.2	5.2		
barium	200	750	500	2000						129	169	145	90	25		96		242		103	93	67		
beryllium	4	4	4	8						<1	<1	1	<1	<1		<1		1		<1	1	1		
cadmium	0.5	3	5	20						<1	<1	<1	<1	<1		<1		<1		<1	<1	<1		
chromium (total)	20	750	250	800						15	18	24	20	8		20		47		16	26	32		
cobalt	10	40	50	300						6	6	10	6	2		6		17		6	11	15		
copper	30	150	100	500						18	19	26	18	6		17		36		15	32	38		
cyanide (total)	2.5	5	50	500																				
lead	25	375	500	1000		375	500	1000		20	23	24	12	2		21		33		18	24	30		
mercury	0.1	0.8	2	10						0.03	0.13	0.03	0.07	0.01		0.02		0.04		0.03	0.05	0.05		
molybdenum	2	5	10	40						<2	<2	<2	<2	<2		<2		<2		<2	<2	2		
nickel	20	150	100	500						18	20	30	18	7		18		47		17	34	44		
selenium	1	2	3	10						0.5	0.3	<0.2	<0.2	0.3		0.2		<0.2		<0.2	0.6	0.7		
silver	2	20	20	40						<1	<1	<1	<1	<1		<1		<1		<1	<1	<1		
vanadium	25	200	200	500						20	23	42	23	10		22		54		20	39	47		
zinc	60	600	500	1500						47	58	58	37	12		33		100		45	80	90		
Monocyclic Aromatic Hydrocarbons (µg/g)																								
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	<0.005	<0.005		
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	0.006	<0.005		
styrene	0.1	0.1	5	50						<0.013	<0.013	<0.013	<0.013	<0.013		<0.013		<0.013		<0.013	<0.013	<0.013		
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	<0.005	<0.005		
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	<0.005	<0.005		
total semi-volatile hydrocarbons						500	2000	2000	1000							<0.005		<0.005		<0.005	<0.005	<0.005		
total volatile hydrocarbons						100	150	800	800															
oil & grease						1000	5000	5000	30000	196	436	149	112	115		154		207		153	160	149		
Leachate Quality (mg/L)																								
Lead					5				5															
Other																								
Recorded Vapour Concentration (ppm)												410	250	310	35	170	220	5	25	10	ND	20	10	100
Equivalent Methane Concentration (ppm)																								240
Recorded Vapour Concentration (% LEL)										5	9													
Equivalent Methane Concentration (% LEL)																								
Flashpoint					>61				>61															

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-See Consultants by TetraEis consultants Inc/Wardrop Engineering Inc.



Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Parameter	CCME Criteria for Soils				DG& T Act	DOE Criteria			COW Criteria																
	Assessment Criteria	Remediation				Level I	Level II	Level III																	
		Agricultural	Residential/ Parkland	Commercial/ Industrial																					
Sample depth (m)										BH25 3.0	BH25 3.0	BH25 6.0	BH26 3.0	BH27 6.0	BH28 6.0	BH28 9.0	BH29 3.0	BH30 3.0	BH31 3.0	BH32 3.0	BH33 3.0	BH34 3.0	BI135 3.0	BI136 3.0	
General																									
pH	6-8	6-8	6-8	6-8																					
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm																					
nitrogen (mg/kg)																									
SAR	5	5	5	12																					
Loss on Ignition (%)																									
Inorganic Parameters (µg/g)																									
antimony	20	20	20	40																					
arsenic	5	20	30	50																					
barium	200	750	500	2000																					
beryllium	4	4	4	8																					
cadmium	0.5	3	5	20																					
chromium (total)	20	750	250	800																					
cobalt	10	40	50	300																					
copper	30	150	100	500																					
cyanide (total)	2.5	5	50	500																					
lead	25	375	500	1000		375	500	1000																	
mercury	0.1	0.8	2	10																					
molybdenum	2	5	10	40																					
nickel	20	150	100	500																					
selenium	1	2	3	10																					
silver	2	20	20	40																					
vanadium	25	200	200																						
zinc	60	600	500	1500																					
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5																
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100																
styrene	0.1	0.1	5	50																					
toluene	0.1	0.1	3	30		0.1	3	30	100																
xylene	0.1	0.1	5	50		0.1	5	50	100																
total semi-volatile hydrocarbons						500	2000	2000	1000																
total volatile hydrocarbons						100	150	800	800																
oil & grease						1000	5000	5000	30000																
Leachate Quality (mg/L)																									
Lead					5				5																
Other																									
Recorded Vapour Concentration (ppm)										220	60		20	200	400			10	175	45	160	75	90	260	
Equivalent Methane Concentration (ppm)										528	144		48	480	960			24	420	108	384	180	216	624	
Recorded Vapour Concentration (% LEL)												6				16	12								
Equivalent Methane Concentration (% LEL)												2.5				6.7	5								
Flashpoint					>61				>61																

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS Lea Consultants by TetraEis consultants Inc/Wardrop Engineering Inc

Table 2  
1996 Criteria for Soils for Industrial Sites  
Public Market

Public Market	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria	BH36	BH37	BH38	BH39
Parameter	Assessment Criteria	Remediation		Commercial/ Industrial		Level I	Level II	Level III					
		Agricultural	Residential/ Parkland										
Sample depth (m)										6.0	3.0	3.0	3.0
General													
pH	6-8	6-8	6-8	6-8									
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm									
nitrogen (mg/kg)													
SAR	5	5	5	12									
Loss on Ignition (%)													
Inorganic Parameters (µg/g)													
antimony	20	20	20	40									
arsenic	5	20	30	50									
barium	200	750	500	2000									
beryllium	4	4	4	8									
cadmium	0.5	3	5	20									
chromium (total)	20	750	250	800									
cobalt	10	40	50	300									
copper	30	150	100	500									
cyanide (total)	2.5	5	50	500									
lead	25	375	500	1000		375	500	1000					
mercury	0.1	0.8	2	10									
molybdenum	2	5	10	40									
nickel	20	150	100	500									
selenium	1	2	3	10									
silver	2	20	20	40									
vanadium	25	200	200										
zinc	60	600	500	1500									
Monocyclic Aromatic Hydrocarbons (µg/g)													
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5				
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100				
styrene	0.1	0.1	5	50									
toluene	0.1	0.1	3	30		0.1	3	30	100				
xylene	0.1	0.1	5	50		0.1	5	50	100				
total semi-volatile hydrocarbons						500	2000	2000	1000				
total volatile hydrocarbons						100	150	800	800				
oil & grease						1000	5000	5000	30000				
Leachate Quality (mg/L)													
Lead					5				5				
Other													
Recorded Vapour Concentration (ppm)										475	45	180	175
Equivalent Methane Concentration (ppm)										1140	100	432	420
Recorded Vapour Concentration (% LEL)													
Equivalent Methane Concentration (% LEL)													
Flashpoint					>61				>61				

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS- Lea Consultants by TetraE consultants Inc/Wardrop Engineering Inc.



Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

Public Market	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria																
Parameter	Assessment	Remediation				Level I	Level II	Level III		MW1-A	MW1-B	MW1-C	MW 2	MW2-B	MW2C	MW2A	MW2A	MW2A	MW 3	MW 3	MW 3	MW3A	MW3A	MW3A	
		Agricultural	Residential/ Parkland	Commercial/ Industrial																					
Sample depth (m)										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	
General																									
pH	6-8	6-8	6-8	6-8						7.5	7.3		8.2	7.5					8.2	7.9					
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						414	1960		944	5010					338	406					
nitrogen (mg/kg)										960	5140		1660	490					850	140					
SAR	5	5	5	12						0.17	2.78		2.98	2.1					0.01	0.28					
Loss on Ignition (%)																									
Inorganic Parameters (µg/g)																									
antimony	20	20	20	40						0.2	<1		<1	<1					<1	<1					
arsenic	5	20	30	50						8.2	5.7		2.6	5.4					1.2	2.8					
barium	200	750	500	2000						200	203		179	198					67	57					
beryllium	4	4	4	8						1	1		<1	1					<1	<1					
boron	1	2																							
cadmium	0.5	3	5	20						1	1		<1	<1					<1	<1					
chromium (total)	20	750	250	800						33	33		33	36					5	13					
cobalt	10	40	50	300						11	11			12	16				3	5					
copper	30	150	100	500						39	31		38	38					11	13					
cyanide (free)	0.25	0.5	10	100																					
cyanide (total)	2.5	5	50	500																					
fluoride (total)	200	200	400	2000																					
lead	25	375	500	1000		375	500	1000		69	37		38	33					44	9					
mercury	0.1	0.8	2	10						0.15	0.04		0.02	0.04					0.02	0.01					
molybdenum	2	5	10	40						<2	3		<2	<2					<2	<2					
nickel	20	150	100	500						30	31		38	39					8	14					
selenium	1	2	3	10						0.3	0.7		0.2	0.4					<0.2	<0.2					
silver	2	20	20	40						<1	<1		<1	<1					<1	<1					
sulphur	250	500																							
thallium	0.5	1																							
tin	5	5	50	300																					
vanadium	25	200	200							139	43		44	49					6	17					
zinc	60	600	500	1500						48	93		80	81					48	26					
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005														
chloro-benzene	0.1	0.1	1	10																					
1,2-dichlorobenzene	0.1	0.1	1	10																					
1,3-dichlorobenzene	0.1	0.1	1	10																					
1,4-dichlorobenzene	0.1	0.1	1	10																					
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005														
styrene	0.1	0.1	5	50						<0.013	<0.013														
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005														
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005														
total semi-volatile hydrocarbons						500	2000	2000	1000																
total volatile hydrocarbons						100	150	800	800																
oil & grease						1000	5000	5000	30000	203	160		108	171					214	173					
Leachate Quality (mg/L)																									
Lead					5				5																
Other																									
Recorded Vapour Concentration (ppm)										125	50	200	20	25	75	5	10	50	20	120	45	ND	10	70	
Equivalent Methane Concentration (ppm)																									
Recorded Vapour Concentration (% LEL)																									
Equivalent Methane Concentration (% LEL)																									
Flashpoint					>61				>61																

Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

Parameter	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria																		
	Assessment	Remediation				Level I	Level II	Level III																			
		Agricultural	Residential/ Parkland	Commercial/ Industrial						MW 4 0.5	MW4-B 1.5	MW 4 3.0	MW 5 0.5	MW 5 1.5	MW 5 3.0	BH-1 0.5	BH1-B 1.5	BH1-C 3.0	BH2-A 0.5	BH2-B 1.5	BH2-C 3.0	BH3-A 0.5	BH3-B 1.5	BH3 C 3.0			
Sample depth (m)																											
General																											
pH	6-8	6-8	6-8	6-8						8			7.9	7.9			7.4		7.6	7.6	7.2	7.4	7.3	7.6			
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						500			926	804			444		430	434	1080	620	696	419			
nitrogen (mg/kg)										250			3150	530			210		500	230	810	1460	590	290			
SAR	5	5	5	12						0.67			1.11	1.02			0.6		1.1	1.57	1.57	1	2	2.48			
Loss on Ignition (%)																											
Inorganic Parameters (µg/g)																											
antimony	20	20	20	40						0.2			<1	<1			<1		<1	<1	<1	0.7	<1	<1			
arsenic	5	20	30	50						3.6			3.9	5.9			3.5		2.3	5.5	6.3	4.3	7.4	4			
barium	200	750	500	2000						96			318	223			117		112	110	214	231	174	334			
beryllium	4	4	4	8						<1			<1	1			1		1	1	2	<1	1	1			
boron	1	2																									
cadmium	0.5	3	5	20						<1			<1	<1			<1		<1	<1	1.2	<1	<1	<1			
chromium (total)	20	750	250	800						20			10	45			29		24	24	54	15	43	58			
cobalt	10	40	50	300						6			5	18			10		8	10	19	5	14	20			
copper	30	150	100	500						16			75	42			25		17	25	50	117	34	48			
cyanide (free)	0.25	0.5	10	100																							
cyanide (total)	2.5	5	50	500																		<0.1	<0.1	<0.1			
fluoride (total)	200	200	400	2000																							
lead	25	375	500	1000		375	500	1000		19			139	33			13		9	22	45	903	36	37			
mercury	0.1	0.8	2	10						0.02			0.76	0.02			0.04		<0.01	<0.01	0.02	0.06	<0.01	<0.01			
molybdenum	2	5	10	40						<2			3	<2			<2		2	2	2	<2	<2	2			
nickel	20	150	100	500						15			19	47			24		19	25	45	13	37	47			
selenium	1	2	3	10						<0.2			0.4	<0.2			0.3		0.7	0.4	0.4	<0.2	<0.2	0.2			
silver	2	20	20	40						<1			<1	<1			<1		<1	<1	<1	<1	<1	<1			
sulphur	250	500																									
thallium	0.5	1																									
tin	5	5	50	300																							
vanadium	25	200	200							27			16	63			33		29	38	71	19	60	62			
zinc	60	600	500	1500						30			83	96			47		42	41	115	43	81	94			
Monocyclic Aromatic Hydrocarbons (µg/g)																											
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			
chloro-benzene	0.1	0.1	1	10																		<0.005	<0.005	<0.005			
1,2-dichlorobenzene	0.1	0.1	1	10																		<0.013	<0.013	<0.013			
1,3-dichlorobenzene	0.1	0.1	1	10																		<0.015	<0.015	<0.015			
1,4-dichlorobenzene	0.1	0.1	1	10																		<0.025	<0.025	<0.025			
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			
styrene	0.1	0.1	5	50						<0.013							<0.013		<0.013	<0.013	<0.013	<0.013	<0.013	<0.013			
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005							<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			
total semi-volatile hydrocarbons						500	2000	2000	1000																		
total volatile hydrocarbons						100	150	800	800																		
oil & grease						1000	5000	5000	30000																		
Leachate Quality (mg/L)										111			178	111			99.6		39	72.5	129	2680	105	106			
Lead						5			5																		
Other																											
Recorded Vapour Concentration (ppm)										ND	20	25	75	110	100	75	30	ND	25	10	100						
Equivalent Methane Concentration (ppm)																											
Recorded Vapour Concentration (% LEL)																											
Equivalent Methane Concentration (% LEL)																							100	60	10		
Flashpoint						>61			>61																		

Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

1996 Criteria for Soils for Residential Sites																								
Public Market																								
Parameter	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria															
	Assessment	Remediation				Level I	Level II	Level III		BH4-A 0.5	BH4-B 1.5	BH4-C 3.0	BH5-A 0.5	BH5-B 1.5	BH5-C 3.0	BH6-A 0.5	BH6-B 1.5	BH6-C 3.0	BH7-A 0.5	BH7-B 1.5	BH7-C 3.0	BH8-A 0.5	BH8-B 1.5	BH8-C 3.0
		Agricultural	Residential/ Parkland	Commercial/ Industrial																				
Sample depth (m)																								
General																								
pH	6-8	6-8	6-8	6-8						7.5	7.4		8.1	7.4		7.5		7.3	7.4				7.7	
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						431	696		676	780		985		984	1460				1430	
nitrogen (mg/kg)										350	760		700	790		100		1590	690				220	
SAR	5	5	5	12						0.56	1.14		0.97	1.46		1.78		1.15	1.03				1.06	
Loss on Ignition (%)																								
Inorganic Parameters (µg/g)										<1	<1		<1	<1		<1		<1	<1				<1	
antimony	20	20	20	40						4.1	6.7		3.9	5.8		4.5		5.2	4.9				3.6	
arsenic	5	20	30	50						164	229		99	509		81		172	126				125	
barium	200	750	500	2000						1	2		1	2		<1		2	1				<1	
beryllium	4	4	4	8																				
boron	1	2								<1	1.3		<1	1.3		<1		1	<1				<1	
cadmium	0.5	3	5	20						36	60		21	46		21		54	46				19	
chromium (total)	20	750	250	800						12	19		9	15		9		17	16				6	
cobalt	10	40	50	300						27	49		20	56		21		32	33				15	
copper	30	150	100	500																				
cyanide (free)	0.25	0.5	10	100												<0.1							<0.1	
cyanide (total)	2.5	5	50	500																				
fluoride (total)	200	200	400	2000																				
lead	25	375	500	1000		375	500	1000		10	15		13	43		17		44	10				9	
mercury	0.1	0.8	2	10						<0.01	0.02		0.02	0.02		<0.01		<0.01	<0.01				<0.01	
molybdenum	2	5	10	40						<2	3		4	3		<2		<2	2				<2	
nickel	20	150	100	500						31	60		21	50		23		42	41				15	
selenium	1	2	3	10						0.9	0.3		0.3	1		0.5		0.6	0.3				<0.2	
silver	2	20	20	40						<1	<1		<1	<1		<1		<1	<1				<1	
sulphur	250	500																						
thallium	0.5	1																						
tin	5	5	50	300																				
vanadium	25	200	200							44	80		33	68		30		72	67				25	
zinc	60	600	500	1500						63	115		38	102		41		111	94				29	
Monocyclic Aromatic Hydrocarbons (µg/g)										<0.2	<0.005		<0.005	0.04		<0.005		<0.005	<0.005				<0.005	
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5															
chloro-benzene	0.1	0.1	1	10																				
1,2-dichlorobenzene	0.1	0.1	1	10																				
1,3-dichlorobenzene	0.1	0.1	1	10																				
1,4-dichlorobenzene	0.1	0.1	1	10																				
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	1.8	<0.005		<0.005	0.01		<0.005		<0.005	<0.005				<0.005	
styrene	0.1	0.1	5	50						<0.062	<0.013		<0.013	<0.013		<0.013		<0.013	<0.013				<0.013	
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.2	<0.005		0.01	<0.005		<0.005		<0.005	<0.005				<0.005	
xylene	0.1	0.1	5	50		0.1	5	50	100	5.5	<0.005		<0.005	0.005		<0.005		<0.005	<0.005				<0.005	
total semi-volatile hydrocarbons						500	2000	2000	1000															
total volatile hydrocarbons						100	150	800	800															
oil & grease						1000	5000	5000	30000															
Leachate Quality (mg/L)																								
Lead						5			5															
Other																								
Recorded Vapour Concentration (ppm)										80	110	280	220	250	325	ND	30	50	55	85	30	105	475	205
Equivalent Methane Concentration (ppm)																								
Recorded Vapour Concentration (% LEL)																								
Equivalent Methane Concentration (% LEL)																								
Flashpoint						>61			>61															



Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

Public Market	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria															
Parameter	Assessment	Remediation				Level I	Level II	Level III		BH9-A	BH9-B	BH9-C	BH10-A	BH10-B	BH10-C	BH11-A	BH11-B	BH11-C	BH12-A	BH12-B	BH12-C	BH13-A	BH13-B	BH13-C
		Agricultural	Residential/ Parkland	Commercial/ Industrial																				
Sample depth (m)										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0
General																								
pH	6-8	6-8	6-8	6-8						7.3	7.5		7.6	8	7.5	8	8		7.6	7.6				7.6
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						4820	2860		670	656	1270	1750	1880		470	601				1390
nitrogen (mg/kg)										1570	120		1490	190	540	630	580		970	270				240
SAR	5	5	5	12						7.31	4.99		0.89	0.5	0.98	3.98	5.25		1.31	3.97				6.63
Loss on Ignition (%)																								
Inorganic Parameters (µg/g)																								
antimony	20	20	20	40						<1	<1		<1	2	<1	<1	<1		<1	<1				<1
arsenic	5	20	30	50						7.6	3.8		4.2	2.7	7.3	6.5	6.9		6.2	4.4				8
barium	200	750	500	2000						225	100		243	48	225	208	243		194	186				136
beryllium	4	4	4	8						1	<1		1	<1	2	1	1		1	1				1
boron	1	2																						
cadmium	0.5	3	5	20						1.2	<1		<1	<1	1.1	1.1	1		1.2	1				<1
chromium (total)	20	750	250	800						44	21		25	12	59	44	45		35	69				36
cobalt	10	40	50	300						15	7		8	5	20	14	18		13	25				11
copper	30	150	100	500						34	18		27	11	54	36	44		38	52				27
cyanide (free)	0.25	0.5	10	100																				
cyanide (total)	2.5	5	50	500																				
fluoride (total)	200	200	400	2000																				
lead	25	375	500	1000		375	500	1000		34	16		29	4	49	14	33		37	17				24
mercury	0.1	0.8	2	10						0.04	<0.01		0.04	<0.01	0.04	0.04	0.04		0.04	<0.01				<0.01
molybdenum	2	5	10	40						<2	<2		<2	<2	4	2	<2		<2	<2				<2
nickel	20	150	100	500						39	17		21	9	56	36	44		36	63				31
selenium	1	2	3	10						<0.2	<0.2		0.2	<0.2	0.6	0.3	0.3		0.3	<0.2				0.2
silver	2	20	20	40						<1	<1		<1	<1	<1	<1	1		<1	<1				<1
sulphur	250	500																						
thallium	0.5	1																						
tin	5	5	50	300																				
vanadium	25	200	200							73	28		34	12	78	67	62		50	77				57
zinc	60	600	500	1500						87	30		62	24	116	81	94		80	123				55
Monocyclic Aromatic Hydrocarbons (µg/g)																								
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005
chloro-benzene	0.1	0.1	1	10																				
1,2-dichlorobenzene	0.1	0.1	1	10																				
1,3-dichlorobenzene	0.1	0.1	1	10																				
1,4-dichlorobenzene	0.1	0.1	1	10																				
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005
styrene	0.1	0.1	5	50						<0.013	<0.013		<0.013	<0.013	<0.013	<0.013	<0.013		<0.013	<0.013				<0.013
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005				<0.005
total semi-volatile hydrocarbons						500	2000	2000	1000															
total volatile hydrocarbons						100	150	800	800															
oil & grease						1000	5000	5000	30000															
Leachate Quality (mg/L)										139	44.7		93.2	56.8	64.5	25.3	63.3		50.5	52.4				196
Lead					5				5															
Other																								
Recorded Vapour Concentration (ppm)										ND	25	10	75	85	25	15	10	20	20	20	15	20	15	20
Equivalent Methane Concentration (ppm)																								
Recorded Vapour Concentration (% LEL)																								
Equivalent Methane Concentration (% LEL)																								
Flashpoint					>61				>61															

Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

Public Market	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria																
Parameter	Assessment	Remediation				Level I	Level II	Level III		BH14-A	BH14-B	BH14-C	BH15-A	BH15-B	BH15-C	BH16-A	BH16-B	BH16-C	BH17	BH18	BH18	BH18	BH19	BH19	
		Agricultural	Residential/ Parkland	Commercial/ Industrial																					
Sample depth (m)										0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	3.0	0.5	1.5	3.0	0.5	1.5	
General																									
pH	6-8	6-8	6-8	6-8						7.3	7.6		7.6	7.4		7.5	7.7				7.8			7.8	
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						15300	12100		1520	2490		732	958				3620			1260	
nitrogen (mg/kg)										1090	130		1640	530		910	40				<5			1270	
SAR	5	5	5	12						6.55	25.1		3.52	2.63		3.67	2.84				2.11			0.33	
Loss on Ignition (%)																								7.9	
Inorganic Parameters (µg/g)																									
antimony	20	20	20	40						<1	<1		<1	<1		<1	<1				<1			<1	
arsenic	5	20	30	50						3.3	4.3		4.4	6.6		3.7	3.6				<0.1			3.5	
barium	200	750	500	2000						197	126		162	170		274	77				21			164	
beryllium	4	4	4	8						1	1		1	1		1	<1				<1			1	
boron	1	2																							
cadmium	0.5	3	5	20						<1	<1		<1	<1		<1	<1				<1			<1	
chromium (total)	20	750	250	800						43	25		28	45		36	12				8			19	
cobalt	10	40	50	300						15	9		9	13		15	3				2			7	
copper	30	150	100	500						36	21		25	32		26	10				5			37	
cyanide (free)	0.25	0.5	10	100																					
cyanide (total)	2.5	5	50	500																					
fluoride (total)	200	200	400	2000																					
lead	25	375	500	1000		375	500	1000		33	22		13	14		12	10				5			49	
mercury	0.1	0.8	2	10						<0.01	<0.01		0.03	0.04		0.02	0.02				0.02			0.06	
molybdenum	2	5	10	40						<2	<2		<2	<2		<2	<2				<2			<2	
nickel	20	150	100	500						40	23		27	37		35	10				6			21	
selenium	1	2	3	10						0.4	<0.2		<0.2	0.2		<0.2	<0.2				<0.2			0.3	
silver	2	20	20	40						<1	<1		<1	<1		<1	<1				<1			<1	
sulphur	250	500																							
thallium	0.5	1																							
tin	5	5	50	300																					
vanadium	25	200	200							48	35		42	68		55	22				9			27	
zinc	60	600	500	1500						90	46		58	77		76	16				10			67	
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
chloro-benzene	0.1	0.1	1	10																					
1,2-dichlorobenzene	0.1	0.1	1	10																					
1,3-dichlorobenzene	0.1	0.1	1	10																					
1,4-dichlorobenzene	0.1	0.1	1	10																					
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
styrene	0.1	0.1	5	50						<0.013	<0.013		<0.013	<0.013		<0.013	<0.013				<0.013			<0.013	
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005				<0.005			<0.005	
total semi-volatile hydrocarbons						500	2000	2000	1000																
total volatile hydrocarbons						100	150	800	800																
oil & grease						1000	5000	5000	30000	75.6	97.3		120	73.5		133	33.2				95.4			757	
Leachate Quality (mg/L)																									
Lead						5			5																
Other																									
Recorded Vapour Concentration (ppm)										5	15	10	ND	5	30	30	50	20	3750	30	60	1125	20		
Equivalent Methane Concentration (ppm)																									
Recorded Vapour Concentration (% LEL)																			30			9			
Equivalent Methane Concentration (% LEL)																									
Flashpoint						>61			>61																

Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

Parameter	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria																
	Assessment	Remediation				Level I	Level II	Level III		BH19	BH119	BH20	BH20	BH20	BH21	BH21	BH21	BH22	BH22	BH22	BH23	BH23	BH23	BH24	
		Agricultural	Residential/ Parkland	Commercial/ Industrial																					
Sample depth (m)										4.5	9.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	0.5	1.5	3.0	3.0	
General																									
pH	6-8	6-8	6-8	6-8						7.8	8	8.8	8	7.5		7.4			7.6		7.7	7.9	7.7		
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm						3310	6060	10400	2600	1880		5680			1400		373	2810	3260		
nitrogen (mg/kg)										3500	4920	2400	240	30		170			490		3190	560	630		
SAR	5	5	5	12						0.56	0.54	0.35	0.36	0.5		1.79			1.61		0.07	2.6	1.85		
Loss on Ignition (%)										11.6	15.6	10.9	4.8	2											
Inorganic Parameters (µg/g)																									
antimony	20	20	20	40						<1	<1	<1	<1	<1		<1		<1		<1	<1	<1			
arsenic	5	20	30	50						2.5	3	5.5	3.4	<0.1		0.7		3.3		<0.1	5.2	5.2			
barium	200	750	500	2000						129	169	145	90	25		96		242		103	93	67			
beryllium	4	4	4	8						<1	<1	1	<1	<1		<1		1		<1	1	1			
boron	1	2																							
cadmium	0.5	3	5	20						<1	<1	<1	<1	<1		<1		<1		<1	<1	<1			
chromium (total)	20	750	250	800						15	18	24	20	8		20		47		16	26	32			
cobalt	10	40	50	300						6	6	10	6	2		6		17		6	11	15			
copper	30	150	100	500						18	19	26	18	6		17		36		15	32	38			
cyanide (free)	0.25	0.5	10	100																					
cyanide (total)	2.5	5	50	500																					
fluoride (total)	200	200	400	2000																					
lead	25	375	500	1000		375	500	1000		20	23	24	12	2		21		33		18	24	30			
mercury	0.1	0.8	2	10						0.03	0.13	0.03	0.07	0.01		0.02		0.04		0.03	0.05	0.05			
molybdenum	2	5	10	40						<2	<2	<2	<2	<2		<2		<2		<2	<2	2			
nickel	20	150	100	500						18	20	30	18	7		18		47		17	34	44			
selenium	1	2	3	10						0.5	0.3	<0.2	<0.2	0.3		0.2		<0.2		<0.2	0.6	0.7			
silver	2	20	20	40						<1	<1	<1	<1	<1		<1		<1		<1	<1	<1			
sulphur	250	500																							
thallium	0.5	1																							
tin	5	5	50	300																					
vanadium	25	200	200							20	23	42	23	10		22		54		20	39	47			
zinc	60	600	500	1500						47	58	56	37	12		33		100		45	80	90			
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	<0.005	<0.005			
chloro-benzene	0.1	0.1	1	10																					
1,2-dichlorobenzene	0.1	0.1	1	10																					
1,3-dichlorobenzene	0.1	0.1	1	10																					
1,4-dichlorobenzene	0.1	0.1	1	10																					
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	0.006	<0.005			
styrene	0.1	0.1	5	50						<0.013	<0.013	<0.013	<0.013	<0.013		<0.013		<0.013		<0.013	<0.013	<0.013			
toluene	0.1	0.1	3	30		0.1	3	30	100	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	<0.005	<0.005			
xylene	0.1	0.1	5	50		0.1	5	50	100	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005		<0.005		<0.005	<0.005	<0.005			
total semi-volatile hydrocarbons						500	2000	2000	1000																
total volatile hydrocarbons						100	150	800	800																
oil & grease						1000	5000	5000	30000	196	436	149	112	115		154		207		153	160	149			
Leachate Quality (mg/L)																									
Lead					5				5																
Other																									
Recorded Vapour Concentration (ppm)												410	250	310	35	170	220	5	25	10	ND	20	10	100	
Equivalent Methane Concentration (ppm)																								240	
Recorded Vapour Concentration (% LEL)																									
Equivalent Methane Concentration (% LEL)																									
Flashpoint					>61				>61																



Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

Parameter	CCME Criteria for Soils				DG&T Act	DOE Criteria			COW Criteria																
	Assessment	Remediation				Level I	Level II	Level III																	
		Agricultural	Residential/ Parkland	Commercial/ Industrial																					
Sample depth (m)										BH25 3.0	BH25 3.0	BH25 6.0	BH26 3.0	BH27 6.0	BH28 6.0	BH28 9.0	BH29 3.0	BH30 3.0	BH31 3.0	BH32 3.0	BH33 3.0	BH34 3.0	BH35 3.0	BH36 3.0	
General																									
pH	6-8	6-8	6-8	6-8																					
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm																					
nitrogen (mg/kg)																									
SAR	5	5	5	12																					
Loss on Ignition (%)																									
Inorganic Parameters (µg/g)																									
antimony	20	20	20	40																					
arsenic	5	20	30	50																					
barium	200	750	500	2000																					
beryllium	4	4	4	8																					
boron	1	2																							
cadmium	0.5	3	5	20																					
chromium (total)	20	750	250	800																					
cobalt	10	40	50	300																					
copper	30	150	100	500																					
cyanide (free)	0.25	0.5	10	100																					
cyanide (total)	2.5	5	50	500																					
fluoride (total)	200	200	400	2000																					
lead	25	375	500	1000		375	500	1000																	
mercury	0.1	0.8	2	10																					
molybdenum	2	5	10	40																					
nickel	20	150	100	500																					
selenium	1	2	3	10																					
silver	2	20	20	40																					
sulphur	250	500																							
thallium	0.5	1																							
tin	5	5	50	300																					
vanadium	25	200	200																						
zinc	60	600	500	1500																					
Monocyclic Aromatic Hydrocarbons (µg/g)																									
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5																
chloro-benzene	0.1	0.1	1	10																					
1,2-dichlorobenzene	0.1	0.1	1	10																					
1,3-dichlorobenzene	0.1	0.1	1	10																					
1,4-dichlorobenzene	0.1	0.1	1	10																					
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100																
styrene	0.1	0.1	5	50																					
toluene	0.1	0.1	3	30		0.1	3	30	100																
xylene	0.1	0.1	5	50		0.1	5	50	100																
total semi-volatile hydrocarbons						500	2000	2000	1000																
total volatile hydrocarbons						100	150	800	800																
oil & grease						1000	5000	5000	30000																
Leachate Quality (mg/L)																									
Lead					5				5																
Other																									
Recorded Vapour Concentration (ppm)										220	60		20	200	400			10	175	45	160	75	90	260	
Equivalent Methane Concentration (ppm)										528	144		48	480	960			24	420	108	384	180	216	624	
Recorded Vapour Concentration (% LEL)												6				16	12								
Equivalent Methane Concentration (% LEL)												2.5				6.7	5								
Flashpoint					>61				>61																

Table 3  
1996 Criteria for Soils for Residential Sites  
Public Market

Public Market	CCME Criteria for Soils				DG & T Act	DOE Criteria			COW Criteria				
Parameter	Assessment	Remediation				Level I	Level II	Level III		BH36	BH37	BH38	BH39
		Agricultural	Residential/ Parkland	Commercial/ Industrial									
Sample depth (m)										6.0	3.0	3.0	3.0
General													
pH	6-8	6-8	6-8	6-8									
electric conductivity	2,000 µs/cm	2,000 µs/cm	2,000 µs/cm	4,000 µs/cm									
nitrogen (mg/kg)													
SAR	5	5	5	12									
Loss on Ignition (%)													
Inorganic Parameters (µg/g)													
antimony	20	20	20	40									
arsenic	5	20	30	50									
barium	200	750	500	2000									
beryllium	4	4	4	8									
boron	1	2											
cadmium	0.5	3	5	20									
chromium (total)	20	750	250	800									
cobalt	10	40	50	300									
copper	30	150	100	500									
cyanide (free)	0.25	0.5	10	100									
cyanide (total)	2.5	5	50	500									
fluoride (total)	200	200	400	2000									
lead	25	375	500	1000		375	500	1000					
mercury	0.1	0.8	2	10									
molybdenum	2	5	10	40									
nickel	20	150	100	500									
selenium	1	2	3	10									
silver	2	20	20	40									
sulphur	250	500											
thallium	0.5	1											
tin	5	5	50	300									
vanadium	25	200	200										
zinc	60	600	500	1500									
Monocyclic Aromatic Hydrocarbons (µg/g)													
benzene	0.05	0.05	0.5	5		0.05	0.5	5	5				
chloro-benzene	0.1	0.1	1	10									
1,2-dichlorobenzene	0.1	0.1	1	10									
1,3-dichlorobenzene	0.1	0.1	1	10									
1,4-dichlorobenzene	0.1	0.1	1	10									
ethylbenzene	0.1	0.1	5	50		0.1	5	50	100				
styrene	0.1	0.1	5	50									
toluene	0.1	0.1	3	30		0.1	3	30	100				
xylene	0.1	0.1	5	50		0.1	5	50	100				
total semi-volatile hydrocarbons						500	2000	2000	1000				
total volatile hydrocarbons						100	150	800	800				
oil & grease						1000	5000	5000	30000				
Leachate Quality (mg/L)													
Lead					5				5				
Other													
Recorded Vapour Concentration (ppm)										475	45	180	175
Equivalent Methane Concentration (ppm)										1140	100	432	420
Recorded Vapour Concentration (% LEL)													
Equivalent Methane Concentration (% LEL)													
Flashpoint					>61				>61				

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.

Table 4  
1990 Criteria for Groundwater for Industrial Sites  
Public Market

Parameter	Canadian Water Quality Guidelines	Manitoba/ Ontario Criteria	MW1	MW 2	MW 3	MW 4	MW 5
Sample depth (m)		(1)					
<b>General</b>							
alkalinity			362	288	430	422	
pH	6.5-8.5		7.7	8	7.7	7.7	7.4
electric conductivity							2780
nitrogen (mg/kg)							1.55
SAR							
Loss on Ignition (%)							
<b>Inorganic Parameters (mg/L)</b>							
aluminum			<0.02	<0.02	<0.02	0.36	
antimony			<0.001	<0.001	<0.001	<0.001	0.004
arsenic	0.05	0.05	0.018	0.004	0.002	0.005	0.023
barium	1	1					0.04
beryllium			<0.01	<0.01	<0.01	<0.01	<0.01
cadmium	0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
calcium			130	92.5	310	153	
chloride			171	192	110	171	
chromium (total)	0.05	0.05	<0.02	<0.02	<0.02	<0.02	<0.02
cobalt		0.05	<0.02	<0.02	<0.02	<0.02	<0.02
copper	1	0.1	<0.02	0.03	0.08	<0.02	0.02
cyanide (total)	0.2	0.1	<0.005	<0.005	<0.005	<0.005	<0.005
fluoride				1			
lead	0.01	0.05	<0.02	0.02	<0.02	0.13	<0.02
magnesium			64.2	60.4	93.5	85.3	
mercury	0.001	0.001	<0.1	<0.1	<0.1	<0.1	<0.1
molybdenum		0.5	<0.02	<0.02	<0.02	<0.02	<0.02
nickel		0.5	<0.02	<0.02	0.07	<0.02	0.02
nitrate	45		0.08	0.08	1.06	0.42	
potassium			6.8	8.5	7.8	7.4	
selenium	0.01	0.01	<0.002	<0.002	<0.002	<0.002	<0.002
silver	0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
sodium	200		98.6	133	157	103	
sulphate	500		270	280	930	340	
thallium			<0.005	<0.005	<0.005	<0.005	
tin		0.5					
vanadium			0.01	<0.01	<0.01	0.01	<0.01
zinc	5	0.2	0.03	0.03	0.08	0.04	0.05
<b>Monocyclic Aromatic Hydrocarbons (mg/L)</b>							
benzene	0.005	0.0005	<0.2	<0.2	<0.2	<0.2	<0.2
ethylbenzene	0.0024		<0.2	<0.2	<0.2	<0.2	<0.2
styrene			<0.5	<0.5	<0.5	<0.5	<0.5
toluene	0.024		<0.2	<0.2	<0.2	<0.2	<0.2
xylene	0.3		<0.2	<0.2	<0.2	<0.2	<0.2
total semi-volatile hydrocarbons							
total volatile hydrocarbons							
oil & grease		1500					<1.0
<b>Halogenated Methanes</b>							
carbon tetrachloride	0.005		<0.2	<0.2	<0.2	<0.2	
<b>Chlorinated Hydrocarbons</b>							
1,2-dichlorobenzene	0.2		<0.5	<0.5	<0.5	<0.5	
1,4-dichlorobenzene	0.05		<1.0	<1.0	<1.0	<1.0	
dichloromethane	0.05		<0.2	<0.2	<0.2	<0.2	

7

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea Consultants by TetraE Consultants Inc/Wardrop Engineering Inc.  
(1) (Manitoba Guidelines where applicable, remainder are Ontario MOE Guidelines)



Table 5  
1996 Criteria for Groundwater for Industrial Sites  
Public Market

Parameter	Canadian Water Quality Guidelines	CCME Drinking Water (1)	MW1	MW 2	MW 3	MW 4	MW 5
Sample depth (m)							
General							
alkalinity			362	288	430	422	
pH		6.5-8.5	7.7	8	7.7	7.7	7.4
electric conductivity							2780
nitrogen (mg/kg)							1.55
SAR							
Loss on Ignition (%)							
Inorganic Parameters (mg/L)							
aluminum			<0.02	<0.02	<0.02	0.36	
antimony			<0.001	<0.001	<0.001	<0.001	0.004
arsenic	0.025	0.025	0.018	0.004	0.002	0.005	0.023
barium	1	1					0.04
beryllium			<0.01	<0.01	<0.01	<0.01	<0.01
cadmium	0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
calcium			130	92.5	310	153	
chloride	[<250]	[<250]	171	192	110	171	
chromium (total)	0.05	0.05	<0.02	<0.02	<0.02	<0.02	<0.02
cobalt			<0.02	<0.02	<0.02	<0.02	<0.02
copper	[<1.0]	[<1.0]	<0.02	0.03	0.08	<0.02	0.02
cyanide (total)	0.2	0.2	<0.005	<0.005	<0.005	<0.005	<0.005
fluoride		1.5		1			
lead	0.01	0.01	<0.02	0.02	<0.02	0.13	<0.02
magnesium			64.2	60.4	93.5	85.3	
mercury	0.001	0.001	<0.1	<0.1	<0.1	<0.1	<0.1
molybdenum			<0.02	<0.02	<0.02	<0.02	<0.02
nickel			<0.02	<0.02	0.07	<0.02	0.02
nitrate	45	45	0.06	0.08	1.06	0.42	
potassium			6.6	8.5	7.8	7.4	
selenium	0.01	0.01	<0.002	<0.002	<0.002	<0.002	<0.002
silver			<0.01	<0.01	<0.01	<0.01	<0.01
sodium	[<200]	[<200]	98.6	133	157	103	
sulphate	[<500]	[<500]	270	280	930	340	
thallium			<0.005	<0.005	<0.005	<0.005	
tin							
vanadium			0.01	<0.01	<0.01	0.01	<0.01
zinc	[<5]	[<5]	0.03	0.03	0.08	0.04	0.05
Monocyclic Aromatic Hydrocarbons (mg/L)							
benzene	0.005	0.005	<0.2	<0.2	<0.2	<0.2	<0.2
ethylbenzene	[<0.0024]	[<0.0024]	<0.2	<0.2	<0.2	<0.2	<0.2
styrene			<0.5	<0.5	<0.5	<0.5	<0.5
toluene	[<0.024]	[<0.024]	<0.2	<0.2	<0.2	<0.2	<0.2
xylene	[<0.3]	[<0.3]	<0.2	<0.2	<0.2	<0.2	<0.2
total semi-volatile hydrocarbons							
total volatile hydrocarbons							
oil & grease							<1.0
Halogenated Methanes							
carbon tetrachloride			<0.2	<0.2	<0.2	<0.2	
Chlorinated Hydrocarbons							
1,2-dichlorobenzene	0.2:[<0.003]	0.2:[<0.003]	<0.5	<0.5	<0.5	<0.5	
1,4-dichlorobenzene	0.005:[<0.001]	0.005:[<0.001]	<1.0	<1.0	<1.0	<1.0	
dichloromethane			<0.2	<0.2	<0.2	<0.2	

data source: "Environmental Assessment, Public Market Site", 1990, prepared for DS-Lea Consultants by TetraEa Consultants Inc/Wardrop Engineering Inc.

(1) Values in [] are aesthetic objectives