Brady Road Resources Management Facility Operating Plan

The City of Winnipeg
Solid Waste Services Department

Version 1.0
December 2011

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1.0 Introduction

1.1 THE FACILITY

The Brady Road Resource Management Facility (formerly Brady Road Landfill; herein the "Brady Road facility") site is located south of the Perimeter Highway, between Brady Road and Waverley Street (Figure 1-1). Opened in 1973, this 790-hectare Class 1 Solid Waste Disposal facility currently holds approximately 8.5 million metric tonnes of waste. Currently, approximately 400,000 tonnes of waste are disposed of at the landfill annually. The site now has capacity for approximately 100 additional years of waste disposal. Residential Municipal Solid Waste (MSW), Institutional-Commercial-Industrial (ICI) solid waste, and Construction and Demolition (C&D) waste are landfilled at the site.

1.2 THE OPERATING PLAN

This document is a revised "Operating Plan" for the Brady Road facility. The Operating Plan is a living document and will evolve over time. This Plan is derived from years of operations experience by City of Winnipeg staff at the Brady Road facility and at other City-owned and -operated landfills. The Plan (Version 1.0) was prepared by Stantec Consulting Ltd. in consultation with the City's Solid Waste Services Division, Water and Waste Department, for use by staff managing and working at the landfill. This Plan includes Standard Operating Procedures (SOPs) along with programs and management plans required for the ongoing operation and monitoring of the facility, along with information and design concepts to guide future cell and site developments. It includes photographs, drawings and schematics to illustrate the current situation and proposed future development of the site. The Plan's SOPs provide clear prescriptions to site management and operating personnel for the day-to-day operation of the facility. The SOPs address both routine and upset working conditions. This document also provides operating guidance for site management to maintain the facility in compliance with regulatory requirements of Manitoba Conservation. This document will also serve as a reference source to assist in personnel training.

1.3 PLAN OBJECTIVES

The document has been prepared to achieve a number of objectives:

- Explicit prescription of acceptable (and unacceptable) practices at the Brady Road facility to landfill management and operations staff.
- Improvements in SOPs to safeguard the environment and the health and safety of site workers, users and neighbours and to maximize efficiency of airspace use.

THE CITY OF WINNIPEG

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SOLID WASTE SERVICES

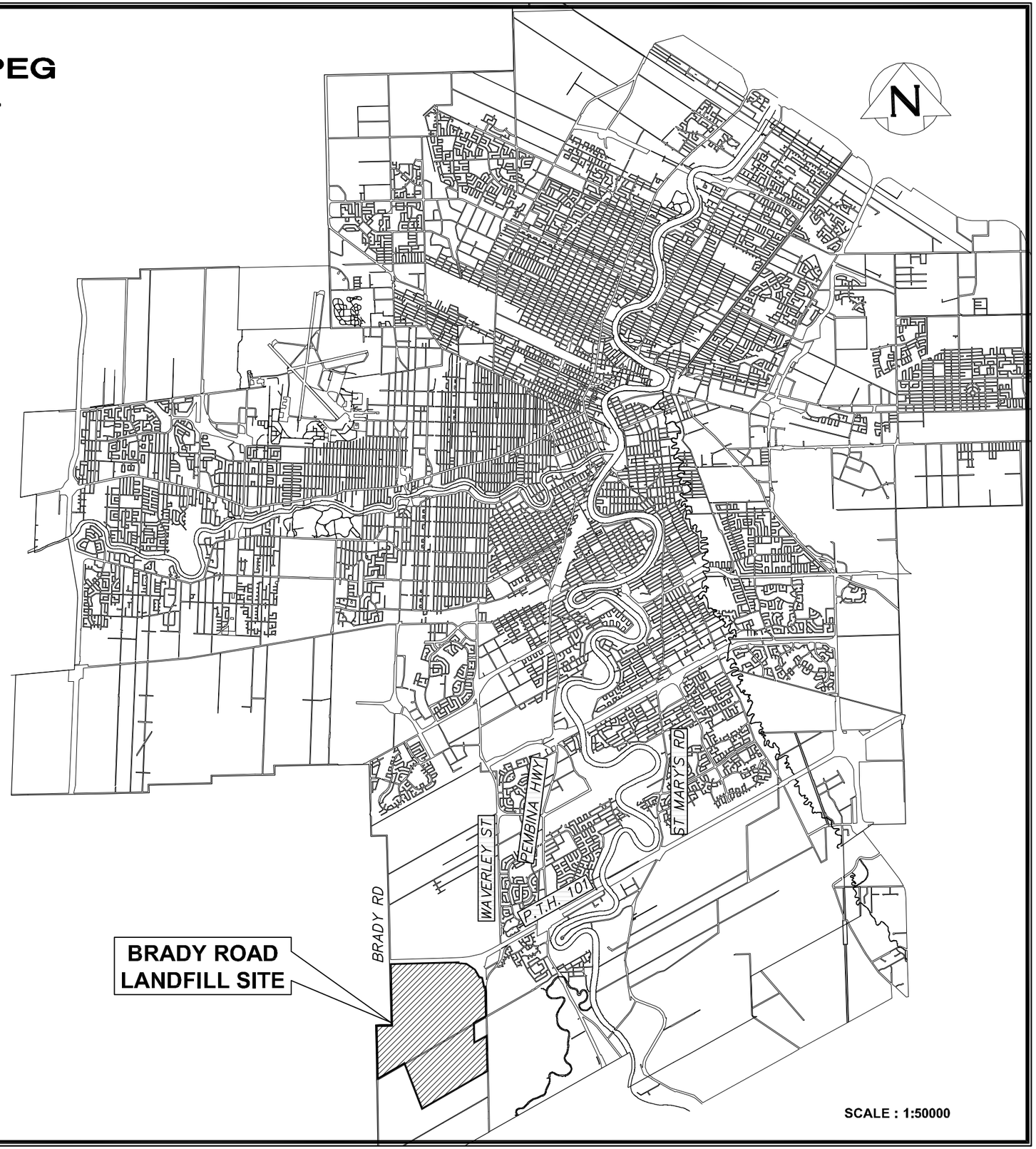


FIGURE 1-1

LOCATION PLAN

- Improvements in SOPs to manage or prevent previously unmanaged sources of potential risk to the City.

- Proactive and effective response to the City's new approach to the management of potentially recyclable or recoverable materials (i.e., having potential for commoditization) such that burial of residuals occurs only after all upstream opportunities for value recovery have been exhausted.

As noted above, this document is important as the foundation for a series of regulatory compliance initiatives by the City at the facility. As such, it is a key component of the City's environmental due-diligence programming. **For that reason, the document's prescriptions are to be understood and followed by City staff working at the Brady Road facility at all times**.

Table 1-1 below is to be maintained by appropriate staff to show the correct distribution of this Plan.

Table 1-1: Operating Plan Distribution List

Personnel	Position	Address/Email	Phone
	Supervisor of Disposal		
	Technologist III/Foreman		
	Manager of Solid Waste		
	Weighmaster		
	Traffic Director		
	Special Waste Technician		

1.4 EVOLUTION OF OPERATIONS PLAN

This Operations Plan outlines procedures required for the safe and efficient operation of the facility. As noted, primary site objectives are to protect human health and the environment while utilizing available land area and associated airspace to its maximum potential. Changes in economics, public-sector policies, societal values and technologies are expected to cause need for periodic review and improvements in the Plan in the future.

As noted in Section 1.3, periodic reviews of the Plan will be carried out to:

- Ensure compliance with the future *Environment Act* licence issued by Manitoba Conservation to regulate the landfill's operations and future development.

- Evaluate the need for revisions necessitated by changing conditions or requirements.

As waste-management concepts, procedures and regulations change, it may be necessary to adapt the Operating Plan accordingly.

It is currently expected that the Operating Plan will be reviewed, at minimum, every five years following 2011 (e.g., 2016, 2021, 2026, etc.). Any potential changes will be evaluated in the context of overall objectives of the City and, if appropriate, in consultation with regulatory agencies.

Table 1-2 is to signify understanding and acceptance of changes in Standard Operating Procedures (SOPs) over time at the landfill.

Table 1-2: Operating Plan Understanding and Acceptance of Confirmation

Reviewer				Date (D/M/Y)
Name Added	**Name Deleted**	**Print Name**	**Signature**	

2.0 Background to Landfill Design Considerations

2.1 TOPOGRAPHY

Based on 2007 topographic data and available 2009 data (Figure 2-1) the landfill surface elevations reach 258.5 metres above sea level (masl) (848 feet above sea level [fasl]) at the 1992/93 cell on the south part of the site, 262 masl (860 fasl) at the 1986 and 1987 cells on the east part of the site, and 251 masl (823 fasl) at the 1991 and 1992 cells on the north part of the site. These elevations correspond to refuse placed between 18 m to 29 m (59 ft to 95 ft) above the surrounding prairie level. The side slopes of the landfill range from approximately 5H:1V to 7.5H:1V.

Landfill cells have been excavated to a depth of 5 m to 6 m (16 ft to 20 ft) below prairie level.

2.2 SITE GEOLOGY AND HYDROGEOLOGY

The landfill is underlain by overburden consisting of clay and silty till units. The upper stratigraphic unit is Pleistocene glaciaolacustrine clay, which has a thickness between 11 and 16 m, averaging 13.8 m. Weathered olive-brown clay is found in the upper 5 to 8 m, while the lower portion of the unit is grey in color. The clay unit overlies grey silty till. The thickness of the silty till ranges from 1.5 to 13 m, with average value of 5.8 m. Total thickness of the overburden covering ranges from 16 to 29 m. The bedrock consists of white dolomitic limestone of the Red River Formation of Ordovician age. The upper, more weathered, portion of bedrock hosts an aquifer.

Piezometric levels in the bedrock are 4.5 to 7 m below the ground level. Groundwater flows in a north-east direction, towards to the central part of Winnipeg. Hydraulic gradients range from 0.0003 to 0.002 with average value of 0.0007. The horizontal gradient in the aquifer increases from southeast to northeast. The bedrock and silty till usually have similar piezometric levels, indicating good connection between these strata. In the clay unit, water levels are approximately 4 m higher than carbonate aquifer, indicating a preferential downward movement of water within clay. Independent estimates show that vertical movement of solutions through the clay occurs in the order of several centimetres per year.

Leachate mounding has occurred at the “Wet Weather Cell,” with elevations reaching 7 to 8 m above the original prairie level (KGS, 2009). Currently, the City will be implementing measures to reduce the mounding by the improvement of the leachate-collection system of the cell and cover maintenance.

BRADY ROAD LANDFILL

N

PERIMETER HWY

EXISTING FENCE

MANITOBA HYDRO STATION

EXISTING WEIR

PROPOSED RECREATION AREA

CURRENT GARBAGE BURIAL AREA

POTENTIAL GREEN RESEARCH/BUSINESS AREA

R.M. OF MACDONALD

BRADY RD

TREE SHELTER BELT

EXISTING PUBLIC RECYCLABLES DROP

COMPOSTING AREA

PROPERTY BOUNDARY

WAVERLEY ST

ENTRANCE

CHARETTE ROAD

POTENTIAL SAND RECYCLING AREA

WETLANDS

COMMUNITY RESOURCE RECOVERY CENTER

SCALE BUILDING

OLDER COMPLETED BURIAL AREA

PROPOSED WEIR

POTENTIAL SAND RECYCLING WASHWATER PONDS

CBC TOWERS

OLDER COMPLETED BURIAL AREA

TRANS CANADA PIPELINE EASEMENT

EXISTING FENCE

MANITOBA HYDRO

MANITOBA HYDRO

RUE DES TRAPPISTES

CITY PROPERTY FOR LONG TERM WASTE DIVERSION AND BURIAL USE

THIS DRAWING CONTAINS A 2009 AERIAL PHOTO

LEGEND

PROPOSED SURFACE WATER DRAINAGE SYSTEM

0.0 0.05 0.1 0.2 0.3 0.4 0.5

DISTANCES IN KM

B.M. ELEV.	FIELD BOOK #:		
POSTED TO LBIS			
1		11/11/25	KB
NO.	REVISIONS	DATE	BY

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

BRADY ROAD LANDFILL

MASTERPLAN CONCEPT

SHEET 1 OF 1

CITY DRAWING NUMBER

FIGURE 2-1

The aquifer contains non-potable groundwater due to elevated concentrations of salinity and Total Dissolved Solids (4,000-5,000 mg/L). The saline nature of the groundwater in the landfill area, and in general within the bedrock aquifer west of the Red River and south of the Assiniboine River, is a historic consequence of:

- Evaporation of residual seawater within the bedrock and subsequent mixing and dilution with fresher meteoric waters.
- Water-rock interactions over geologic timescales.

Topographic lows defined by major river and lake systems define a generally north-south trending hydraulic divide, which acts as a boundary between saline waters to the west, and fresher waters to the east. High salinity restricts current and future use of the aquifer (KGS 2009).

2.3 WASTE QUANTITIES

Current annual waste acceptance at the Brady Road Landfill is approximately 400,000 tonnes. In the four-year period of 2002-2006, province-wide waste disposal grew by approximately 12%, while the provincial population increased by only approximately 2%. The new Comprehensive Integrated Waste Management Plan (CIWMP) seeks to improve waste diversion from the 2010 value of 17% to values exceeding 50%.

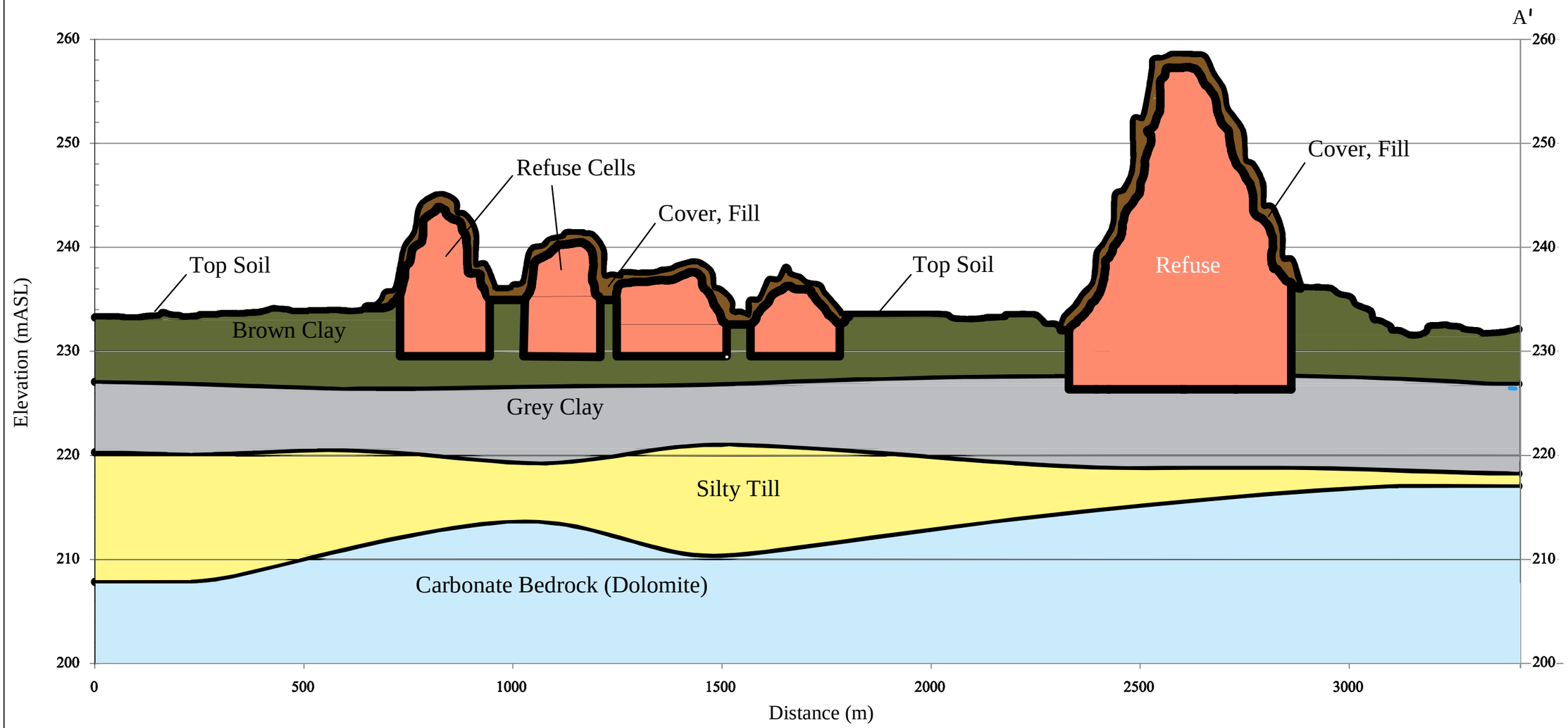
2.4 LANDFILL DEVELOPMENT

The Brady Road Facility landfill component will continue to be constructed using an area-fill method in adjoining cells from the northwest corner progressing from north to south. Daily cover is required at the end of each working day (or at least once every 24 hours). Earth cover is introduced to control windblown material, to minimize the potential for fires, and to provide a vehicle travel surface across the placed fill. Figure 2-1 illustrates the current Master Plan for future development of the facility.

2.5 LANDFILL LINER

The landfill benefits from careful previous siting above up to 30 m of low-permeability clay and silty till between placed wastes and the groundwater table. The glaciolacustrine clay varies in thickness between approximately 11 and 16 m. The silty clay varies from approximately 2 and 12 m, with an average depth of approximately 6 m (Figure 2-2).

An Environmental Impact Assessment (EIA) of the facility completed by Stantec in parallel with this Operating Plan found that vertical migration of leachate is in the order of only several centimeters per year. Leachate has not reached the saline (non-potable) groundwater after more than three decades of operations, indicating the containment effectiveness of the underlying clay.



Horizontal Scale = 1:10,000 (1cm:100m)
Vertical Scale = 1:400 (1cm:4m)

Cross Section AA
FIGURE 2-2

Nonetheless, to be consistent with current concepts of “Best Practices,” the City intends that all new cells to be created at the site will be designed to include plastic liners (e.g., ~60-mil HDPE or equivalent), as described elsewhere herein.

2.6 LEACHATE COLLECTION AND REMOVAL SYSTEM

Leachate produced in the buried waste is captured by a leachate-collection and -removal system consisting of perforated pipes installed in trenches containing gravel. In older sections of the site the collection system is retro-fit. The leachate-collection pipelines terminate in sumps at manholes, where leachate can be sampled, tested and pumped out for treatment at the City’s North End Water Pollution Control Centre.

Over the more than three decades of operation, a substantial quantity of leachate has arisen. Samples from collection and testing manholes (Figure 2-3) are periodically tested. The measured characteristics show the leachate contains dissolved minerals and metals that are diagnostic (i.e., able to serve as a “tracer” for assessing or tracking vertical movement).

The EIA completed in parallel with this Plan found that no organic contaminants from the leachate have reached the groundwater after more than three decades of operation. Slight elevations of dissolved copper and barium appear related to background soil chemistry conditions (e.g., barite leaching from the till).

2.7 LANDFILL GAS CONTROL

Landfill gas (methane primarily) is produced from the decomposition of readily degradable organic food waste, biosolids, and green waste. In wet wastes, hydrogen sulfide is produced from anaerobic decomposition of any high-sulphide materials that are present (e.g., Gyproc).

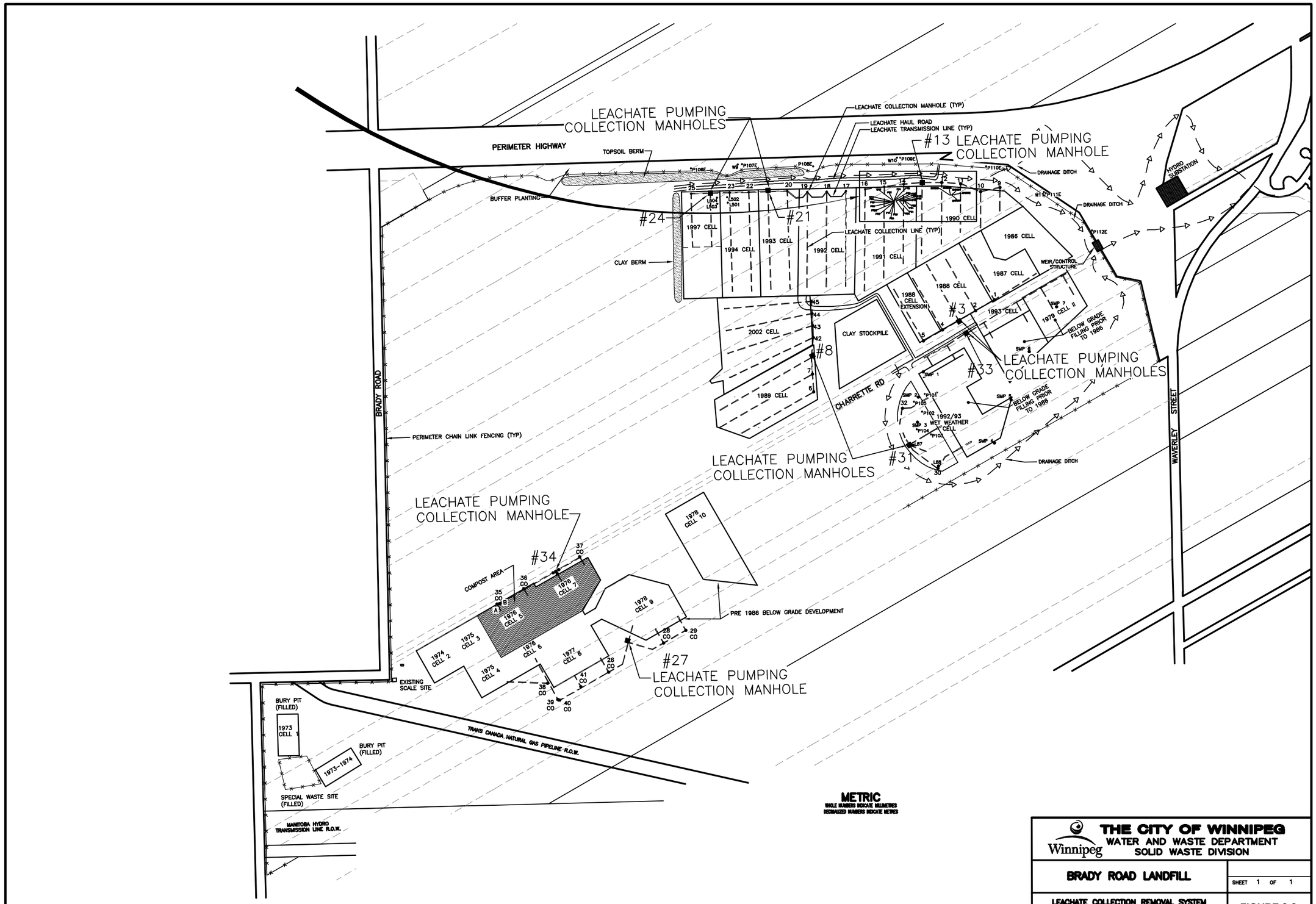
The City has initiated a landfill-gas capture project at the site. The project consists of installing a gas-collection system in a completed portion of the landfill and flaring the collected gas on-site (Figure 2-4). A final clay cap is placed over completed portions of the landfill to contain landfill gas and minimize air and precipitation infiltration.

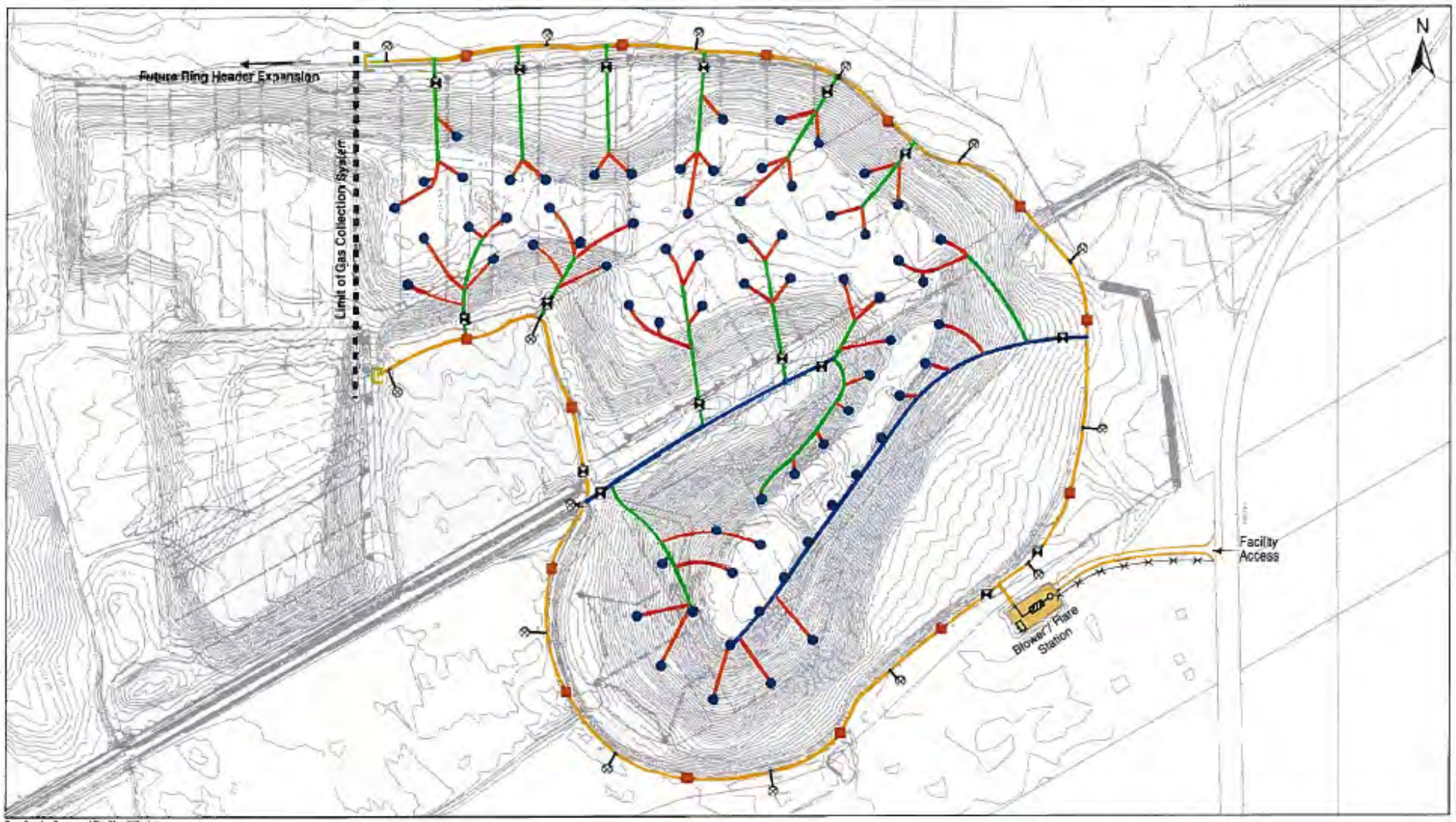
Ongoing monitoring will continue at the periphery of the site, to ensure that off-site migration of gas does not occur.

Ongoing visual inspection of the final cap system for stressed vegetation (indicating possible gas generation) will be implemented as part of the closure and post-closure plans (monitoring program).

2.8 SURFACE-WATER MANAGEMENT

Surface-water runoff at the site is captured in surface drains that convey accumulated water south to a wetlands retention area prior to discharge into a ditch on the north side of Rue des


LEACHATE PUMPING COLLECTION MANHOLES
LEACHATE COLLECTION MANHOLE (TYP)
LEACHATE HAUL ROAD
LEACHATE TRANSMISSION LINE (TYP)
#13 LEACHATE PUMPING COLLECTION MANHOLE
PERIMETER HIGHWAY
TOPSOIL BERM
BUFFER PLANTING
DRAINAGE DITCH
HYDRO SUBSTATION
#24
#21
1997 CELL
1994 CELL
1993 CELL
1992 CELL
1991 CELL
1990 CELL
1986 CELL
1987 CELL
1988 CELL
1988 CELL EXTENSION
1993 CELL
1979 CELL II
LEACHATE COLLECTION LINE (TYP)
CLAY BERM
WEIR/CONTROL STRUCTURE
2002 CELL
CLAY STOCKPILE
#8
#3
#33
LEACHATE PUMPING COLLECTION MANHOLES
BELOW GRADE FILLING PRIOR TO 1985
1989 CELL
CHARRETTE RD
1992/93 WET WEATHER CELL
BRADY ROAD
PERIMETER CHAIN LINK FENCING (TYP)
LEACHATE PUMPING COLLECTION MANHOLES
#31
WAVERLEY STREET
LEACHATE PUMPING COLLECTION MANHOLE
#34
COMPOST AREA
1978 CELL 10
1976 CELL 7
1976 CELL 5
1978 CELL 9
1975 CELL 3
1974 CELL 2
1976 CELL 6
1977 CELL 8
1975 CELL 4
PRE 1986 BELOW GRADE DEVELOPMENT
#27
LEACHATE PUMPING COLLECTION MANHOLE
EXISTING SCALE SITE
BURY PIT (FILLED)
1973 CELL 1
BURY PIT (FILLED)
1973-1974
SPECIAL WASTE SITE (FILLED)
TRANS CANADA NATURAL GAS PIPELINE R.O.W.
MANITOBA HYDRO TRANSMISSION LINE R.O.W.
METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES
THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
SOLID WASTE DIVISION
BRADY ROAD LANDFILL
SHEET 1 OF 1
LEACHATE COLLECTION REMOVAL SYSTEM
FIGURE 2-3



Source: CH2M HILL

Brady Road Landfill Site - LFG Collection System Preliminary Conceptual Design

Figure 2-4

Stantec

lfg_collect

Trappistes then drains into the “Westendorf Drain”. This drain is a native intermittent area draining into the Red River via the La Salle River (Figure 2-5).

2.8.1 Runoff Controls

All precipitation and snowmelt that falls on the site is directed to an engineered wetland and a stormwater-retention pond prior to release into the Rue des Trappistes ditch.

As need dictates, stored stormwater will potentially be used for washing salvaged winter road sand at a planned sand-washing area on-site. Otherwise, stored stormwater quality in the pond will be monitored, and discharged, subject to meeting applicable water-quality guidelines.

2.9 EROSION CONTROL

Erosion due to wind and drainage on the fill-area slopes is controlled by intermittent cover vegetation. Siltation as a result of drainage erosion is trapped on-site, or eventually in the stormwater-settling pond.

Proper waste placement procedures, such as maintaining a small working face and, compaction of the waste and application of daily cover helps to minimize erosion concerns.

The establishment of permanent vegetation in the ditches and on the exterior slopes of the final cover minimizes the potential for damage by drainage erosion, or nuisance from wind-blown soil or wastes.

2.10 SOIL CONSERVATION

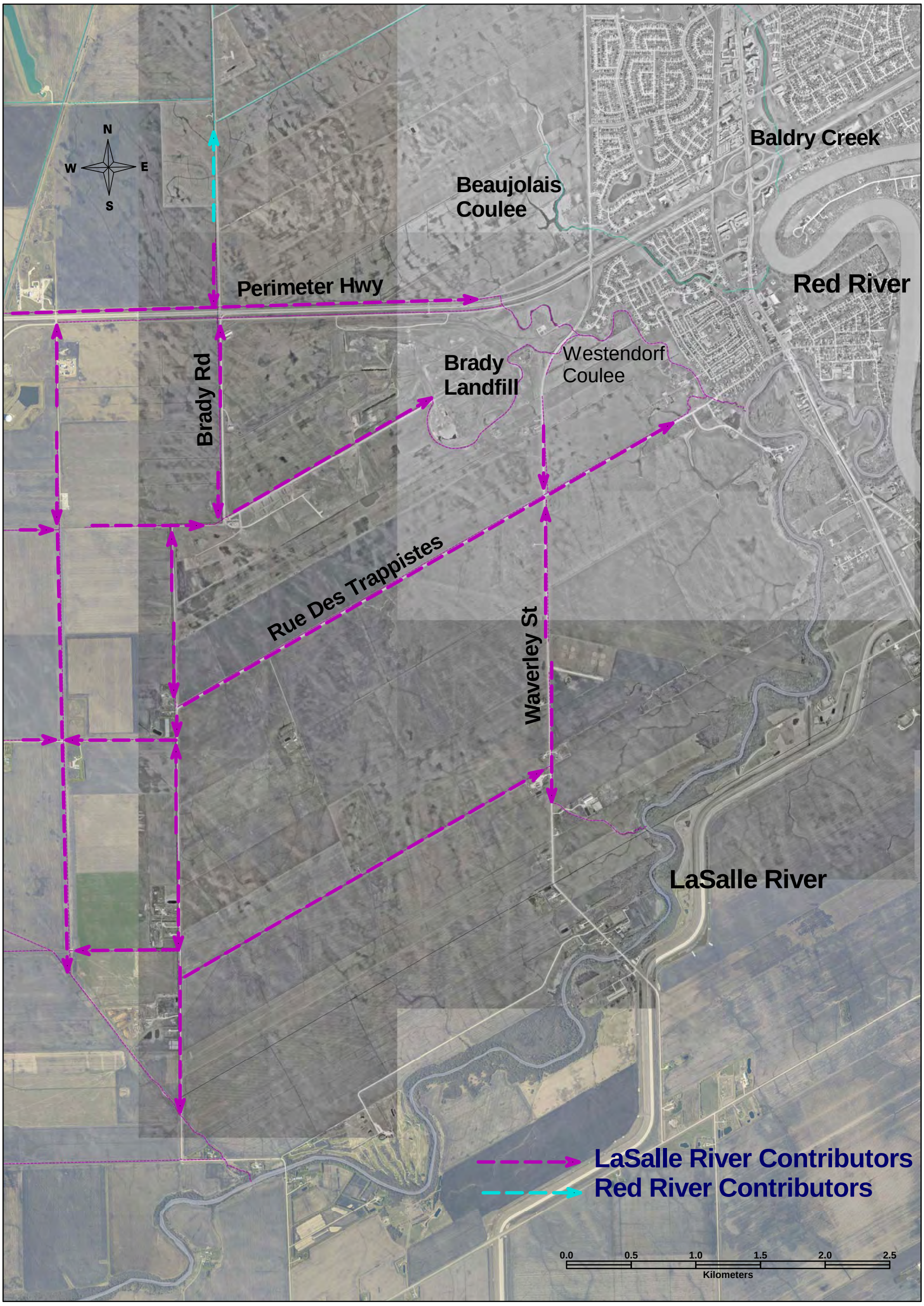
Topsoil and subsoil is stripped and stockpiled on-site prior to the construction of roadways and new cells. This material will be used on-site for cover purposes.

2.11 FINAL COVER SYSTEM

Final cover is placed as portions of the site are completed and in the area selected for the landfill-gas recovery project. As the final finished grade of the fill is reached, it is progressively covered with a barrier layer consisting of a 900-mm-thick layer of silty clay soil, and a layer of subsoil and topsoil to depths sufficient for revegetation. The final cover system will be vegetated with native grasses.

2.12 LANDFILL MINING

Many landfill sites throughout North America now excavate “old” areas of a landfill site to process material in the cells and to reclaim landfill space, cover material and, in some cases, recyclable materials. Site lives can be extended by landfill reclamation by separating and reusing the soil fraction, which includes the original cover soils and fines resulting from waste decomposition. This will be a future consideration.



Map of LaSalle River Contributing Drains in the St Norbert Area

1998 City Aerial
2009 Rural Aerial
Created January 26 2011
O:\Land Drainage\minor creeks and drains\La Salle
G:\Geoworkspaces\AD_LaSalle_DrainsMap2011_01_26.gws

Figure 2-5